SOME ASPECTS OF PERFORMANCE AT A PSYCHOKINETIC TASK

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SUMMARY

Psychokinetic phenomena are currently anomalous with respect to physics. They are not generally accepted as genuine nor are their possible physical mechanisms understood. It is argued here that a certain class of psychokinetic phenomena, termed "directly detectable" psychokinetic effects, are likely to yield possibly important insights into the physical mechanisms mediating psychokinetic phenomena generally.

The current use within parapsychological research of randomly behaving psychokinetic target systems is criticised on several grounds. They are of limited scope for use in delineation of physical mechanisms involved in psychokinesis, and their intrinsic characteristics prevent subjects from utilising their possible capacity to learn to produce larger magnitude effects.

It is argued that instrumented directly detectable psychokinetic tasks have characteristics which may allow subjects to treat their psychokinetic ability as akin to a normal skill which can be improved with continued practice, using an experimental paradigm similar to that used in the biofeedback training of physiological functions.

The task used in this work was a microscopic form of psychokinetic metal-bending, whereby subjects produce pulse-like electrical outputs in a ceramic piezoelectric element used as psychokinetic target. Subjects were not allowed to touch the target and many effects were obtained under witnessed conditions with subjects situated several metres from it.

One pilot and three principal longitudinal training studies were performed with a total of seventeen subjects. Six of the seventeen subjects showed significant improvement in their psychokinetic performance in the training studies, one showed a non-significant increase. The other ten failed to show any convincing signs of psychokinetic output. Three of the successful subjects did not show convincing signs of voluntary control over their effects, three did. Large individual differences were found including different rates of learning and levels of initial and final ability.

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KEY WORDS: training
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CHAPTER 1

PSYCHOKINETIC METAL-BENDING

PHENOMENOLOGY AND VALIDATION STUDIES

1.1 Terms and Definitions

Psychokinesis has been defined in the following manner, "psychokinesis.. operates if there are changes in physical objects or processes due to personal influence but without the intermediary of normal effectors or their normal extensions" (Gregory 1983). This definition is theoretically neutral in the sense that it does not imply any particular type of explanatory theory of psychokinesis. It differs from the usual definition which tends to incorporate implicit theoretical suggestions or assumptions such as the Collins dictionary definition of psychokinesis as "alteration of the state of an object by mental influence alone, without any physical intervention" (Hanks 1979). The citing of "mental influence" in the Collins definition might be taken to imply a particular view of the mind-body problem. In the present state of knowledge the need for a theory-free definition is clear, so that Gregory's definition is preferable and will be adopted here. In parapsychological publications it is standard practice to refer to psychokinesis by the abbreviated form "PK" and this form will be followed here.

Psychokinetic metal-bending is ostensibly a psychokinetic effect and will accordingly be referred to here by the cognate form "PKMB". Individuals ostensibly producing PKMB effects will be termed "PKMB agents". Objects which are designated to be subjected to modification by PKMB will be termed "PK targets" or "PKMB targets".

There are two forms of the metal-bending effect which differ greatly in scale. Macroscopic PKMB ("macro PKMB") effects can be defined as deformation events where changes of form of the PK target visible to the unassisted eye can be seen. The popular conception of PKMB is of the macroscopic effect.

Microscopic PKMB events ("micro PKMB") can be defined as microscopic deformations where the changes of form of the affected metal object have to be detected by instrumental methods (see appendix 1). A convenient abbreviation for the microscopic form is uPKMB, the u representing an approximation to the "Mu" symbol of the Greek alphabet, often conventionally used as a prefix representing the term "micro".

It is difficult to obtain macroscopic PKMB on objects which are not handled by the ostensible PKMB agent whilst deformation occurs. If the object has been handled while the deformation occurred this type of deformation is termed "with-touch" PKMB. If the object is not handled the PKMB effect is said to have occurred under "no-touch" or "without-touch" conditions. Micro PKMB is produced as a standard procedure under no-touch conditions, since the instrumental detection of deformation is sensitive enough to show effects due to handling of the PKMB target specimen.

Detailed physical analysis of uPKMB events has strongly indicated (see appendix 1) that they cannot be described as simple bending events, so that rather than the effects of PKMB being described as bendings, the more neutral term "deformation" will usually be employed. It should be noted that the fracture of metal objects submitted to ostensible PKMB action does also occur.

Since the existence of psychokinesis is still highly controversial there is a case for regarding all findings reported here with caution. This caution could be reflected by the use of such modifiers as "alleged", "ostensible", "putative", "apparent", "possible", "seeming" prefacing every claim regarding alleged paranormal events.

However the constant reiteration of these modifiers seems likely to become tedious and to add unnecessary complication to the text so that they have not been used routinely.

It appears that the degree of credibility of claims made within this area of research varies. Consequently modifiers of this type have been used selectively, reflecting the degree to which it is felt the various claims have been established. Nevertheless if it is felt appropriate to the reader, modifiers of this sort could be imagined to preface every statement made regarding any claim involving paranormality.

1.2 An Outline Phenomenology of PKMB

All the features described here will be reviewed in detail elsewhere, the purpose of this account being to provide a context in which the review of evidence for PKMB can be presented.

The popular concept of psychokinetic metal-bending typically involves an individual holding an item of cutlery while it bends (Wilson 1976). However the literature on PKMB reveals that the crucial putatively paranormal event is not the deformation but a short lived change of the state of the metal object (Hasted 1981a). Seemingly, it temporarily is made to lose strength and rigidity, possibly by some process of softening, so that it becomes deformable by small forces, either manually, or by the force due to the object's weight or by residual internal stresses. Deformations may occur in an upwards direction against the force of gravity as well as downwards in conformation to gravity (Cox 1974).

There is some evidence (see below, section 1.6.4) for the existence of this temporary plastic phase, but no serious investigation of it has been possible because it occurs unpredictably for only brief (a few seconds) periods. The question of whether force has or has not been applied to PKMB target objects can therefore be misleading. The important question is not whether any force was applied but rather how much was applied during a putatively paranormal deformation.

The typical phenomenology of the macroscopic PKMB effect is that an individual will hold a metal object, stroking it or touching it and perhaps instructing it to bend, or attempting to visualise it bending, or possibly simply intending it to bend. After a variable period the object may suddenly or gradually deform, either ostensibly without force being exerted or with some manual force being used.

It may continue to deform after the ostensible PKMB agent ends their attempt to affect it. Other objects which were not formal targets of the attempt may also bend (Hasted 1976b). The person producing the deformation may report feelings of tingling or heat in their hands or other areas during the event, or they may not. Objects may deform while the ostensibly PKMB agent is not touching them.

Various other phenomena have been reported as sometimes occurring in association with PKMB. Amongst these is commonly the starting of watches and clocks which have been stopped for some period, occurring apparently as a result of a PK attempt (Geller 1975).

However this type of event cannot be satisfactorily validated unless the state of the affected mechanism is known before the PK attempt. Watch starting has been stated by critics to be a normal phenomenon occurring in response to the movement and warmth received during a with-touch PK attempt. A well conducted study (Marks and Kamman 1980) has shown that many stopped watches will start when subjected to normal handling treatment. Watch and clock starting will therefore not be considered here.

Other types of occurrence, some of them of an extremely controversial nature, such as alleged teleportation events, have been claimed to occur in association with some PKMB agents but will not be considered here since they are separate categories of event from PKMB (Hasted 1981a).

1.3 A Brief History of PKMB

Psychokinetic metal-bending was first brought to prominence by the claims and performance of one individual, the Israeli Uri Geller. Much has been written about Geller (Geller 1975, Puharich 1974, Panati 1976, Leslie 1974, Ebon 1975, Randi 1975) and his status is still the subject of dispute.

However since PKMB as a phenomenon exists independently of Geller's credibility it is not proposed that Geller's PKMB career and claims be examined at length. Several of the validations of PKMB reviewed below in section 1.5 employed him as subject. But his withdrawal from experimentation at a relatively early stage has had the effect that most of the published physics-oriented material on PKMB and virtually all of the psychological observations made of the characteristics of PKMB have involved other putative PKMB agents than Geller.

Geller claims first to have noticed his claimed PKMB ability whilst still a child (1975). After exploiting his ostensible PKMB ability in stage performances in Israel news of Geller reached the eccentric amateur American psychic researcher Andrija Puharich who went to Israel and met him in August 1971.

Puharich quickly accepted Geller's phenomena as genuine and brought him to the USA in 1972 where he performed as a subject in tests of ESP and PK at Stanford Research Institute. This research was reported in a paper published in the journal *Nature* (Targ & Puthoff 1974). However, the authors considered that only his ESP abilities had been satisfactorily validated, the PKMB phenomena being regarded as having not been produced under sufficiently controlled conditions to be considered as validated. From 1972 to 1975 Geller participated in research conducted by many groups (Panati 1976).

However the sceptical reaction to his phenomena gathered strength and a book by the professional conjurer James Randi (Randi 1975) publicised and elaborated the many claims by sceptics that Geller was a conjurer masquerading as a psychic.

Geller has been reported as showing considerable fear at the thought of having to produce effects under laboratory conditions (Puharich 1974) and was noted as a difficult, sometimes uncooperative and usually mercurial and unpredictable laboratory subject. His failure to honour promises to cooperate in research with some senior American parapsychologists (Honorton 1974) reinforced suspicion of him within the parapsychological community and the mutual antagonism has since prevented a definitive and sustained investigation of his PK abilities.

Geller's credibility was not helped by his friend and mentor of the early period, Puharich, subscribing to the belief that he had been selected by intelligences from space to be the bearer of some form of message (Puharich 1974). Geller had not shown any awareness of this mythical quest until contact with Puharich (Rogo 1975). The fantastic nature of these claims made Geller's acceptance by the scientific community still less likely.

However as Price and others have pointed out (1977a) the advent of Geller initiated a new phase within parapsychology because many thousands of individuals in Europe, Australia, South Africa and Japan claimed to have experienced PKMB events as a result of exposure to Geller's appearances on television and radio. These claims were surveyed in Germany (Bender et al 1975, 1976) and South Africa (Price 1977a). Various follow-up studies resulted (Price 1977b, Keil 1979, 1980, Keil & Hill 1975, Keil & Osborne 1981, Cantor 1979) which provided preliminary evidence that some of the "mini-Gellers" who claimed continuing PKMB ability could succeed at various PKMB tasks.

The redirection of attention towards macroscopic PK effects had several other effects on parapsychology. It reinvigorated interest in macro PK generally. It also drew several physicists into experimentation with PKMB, some of whom have made significant contributions to its study (Hasted 1981a, Panati 1976, Sasaki 1976). Hasted in particular has developed the use of strain sensitive instrumentation to detect dynamic uPKMB strains and has made a preliminary exploration of many of the physical aspects of uPKMB (Hasted 1981a).

However, PKMB research has received several reverses. One was occasioned by a study (Collins & Pamplin 1975) in which child "mini-Gellers" were found to attempt to cheat if left apparently unwitnessed (in a room with a one-way mirror). The physicist John Taylor first published reports of apparently successful validations of PKMB effects (1975, 1977) but later retracted his claims (1980).

The conjurer Randi engaged two accomplices who served as experimental subjects in a newly founded parapsychology laboratory and who successfully deceived the staff into thinking that their effects were genuine (Randi 1983, Auerbach 1983, Shafer 1983). It should be remarked that the staff involved were newly recruited and were parapsychologically inexperienced.

Nevertheless, parapsychological interest in PKMB remains high in some quarters and it has had sufficient status to be the sole topic of a symposium at two Parapsychological Association conventions (Beloff 1977, Isaacs 1983) and papers dealing with PKMB have been presented at several other Parapsychology Association conventions (eg Keil & Osborne 1981, Shafer 1982).

Recent developments within the study of PKMB have included the development of methods of identifying potential PKMB agents independently of Geller's involvement. One method is due to Isaacs (1981) and has been used in Britain, the other was developed by Houck (1982) and has been used mainly in the USA.

Psychological studies of PKMB lag far behind the physics-oriented studies, work being limited to a series of case studies performed by Cantor (1979), the surveys performed by Price (1977a) and Bender's group (Gruber-Wendlandt 1977), anecdotal observations of psychological characteristics of PKMB by several individuals and groups (Hasted 1981a, Shafer 1980, Keil 1983) and one published study of the training of uPKMB (Isaacs 1983).

1.4.1 Validation of PKMB : Methods of Fraud

Since the status of PKMB is still subject to active dispute any review of this field should begin with a consideration of the evidence showing PKMB to be a genuinely paranormal effect. Accordingly, validation studies of the macrosopic effect will be reviewed first. Validation studies of the instrumentally detected effect will be reviewed in chapter 2 dealing with physical aspects of PKMB. A first step in evaluating validation studies would seem to be the consideration of possible methods of cheating which might be employed to produce fraudulent effects.

Taylor (1977), Hasted (1976a), Marks and Kamman (1980), and Randi (1975) amongst others have commented on methods of fraudulent production of deformation in metal specimens.

Some authors have hypothesised that mercuric salts might be used to produce softening in metal specimens (Leslie 1976). However, all the above authors feel certain that this would be hazardous (because mercury salts are highly toxic and very irritant to skin) and that metal rendered weak by this means would show obvious signs of corrosion. No reports of any deformed or fractured PKMB specimens showing evidence of chemical attack have ever been published either, so that this method of fraud can be discounted.

The three authors cited above are in agreement as to the principal methods of fraudulent production of ostensible macroscopic PKMB effects. One method is the surreptitious bending of specimens out of sight of the witnesses, followed by its being held in such a fashion as to appear not to be bent. The specimen is either then uncovered or rotated so as to gradually disclose the bend.

The second method, which frequently produces fracture, is secretly to bend the specimen to and fro, before the formal attempt, producing metal fatigue until it weakens sufficiently to be bent by very slight pressure. It can then be held between two fingers or finger and thumb, when pressure will produce visible deformation or fracture.

A third technique is surreptitiously to substitute a pre-fatigued or pre-bent specimen for an undeformed one at some stage, concealing the exchange and slowly revealing the bend. This is naturally only successful if the specimens are not uniquely marked. Randi has emphasised the effectiveness of the above rather prosaic methods of cheating and is doubtful that more exotic methods are either necessary or likely to be effective.

In private communication Randi (1984) has stressed the open-ended, creative and opportunistic nature of the conjurer's art. This precludes rigid formulae for methods of cheating from being specifiable because each opportunity to cheat may be unique and demand a unique method of evading the attention of witnesses and of producing the fraudulent effect.

The misdirection of witnesses' attention is an important component of success in many if not all of the methods of fraud discussed by Randi. Another important principle is that the fraudulent action is more likely to be unobserved if it is performed in advance of the event for which it is the preparation, this being a general principle of conjuring.

1.4.2 Methodological Requirements

Hasted has discussed the requirements he sees as applying to macroscopic PKMB validation attempts (1976a, 1981a).

He recommends the use of only three or four witnesses, as larger numbers may introduce too much attention-consuming interaction between them. Fewer witnesses would each have to scan too large a visual angle, but multiple witnesses are less likely simultaneously to suffer lapses in attention. He recommends that the field of view to be observed by each witness should not exceed 0.05 steradian. This requirement is generally easily met in macroscopic PKMB validation attempts where the area to be observed is small. Hasted recommends that observation should take place from a distance of not more than two to three feet between the PKMB target and the witnesses'eyes. Lighting should be arranged so as to minimise shadows and distractions should be minimised. The use of a variety of different angles and heights in the placement of witnesses relative to the PKMB target is commended as being helpful in preventing successful concealment of PKMB target specimens.

Hasted comments that in order for normal bending to be performed a three point load has to be exerted upon the specimen. This is more easily accomplished in a concealed manner if the PKMB target specimen is long enough for a three point loading to be possible using the forefinger, the ball of the thumb and the base of the palm of the hand. Hasted states that specimens of less than 50 mm length cannot be bent in this way but must be bent by use of the thumb and two fingers, which is a much more difficult procedure to conceal. He therefore chose latchkey specimens as PKMB targets since they are too rigid to be bent by hand without obvious effort being made.

Deformations which proceed quickly are inherently more secure against fraud since the witnesses' task is less exacting than when deformations take protracted periods to produce.

Hasted acknowledges the inhibitory effect of videotape recording of putative PKMB events and sees two useful roles fulfilled by videotaped records, one being the ability to review a given event many times, the other being the use of video to provide convincing evidence for other groups interested in PKMB.

In commenting on the use of sealed containers for PKMB specimens he claims that glass containers must be used, since they can be checked effectively for tampering. Epoxy-resin sealed containers (such as those used by Taylor) are held by Hasted to be ineffective because according to Hasted epoxy seals can be broken open with little damage to the body of the resin used, and resealed by the application of fresh resin without this necessarily being detectable.

Hasted makes some interesting observations regarding the problems associated with the credibility of validation studies. He considers that their credibility depends not only upon the protocol used, but also upon the credibility of the experimental personnel conducting the validation.

He states that there is an implicit clash between the requirement for maximum numbers of witnesses, to guarantee independence and increase credibility, and the opposing demands of convenience and possible inhibitory effects on subjects. He notes that the credibility of witnesses has a complex relationship with their involvement with parapsychology. Thus individuals who have good academic reputations in non parapsychological fields can lend their own credibility to their accounts of validation studies they witness, but parapsychologically naive witnesses may either miss important events they should have observed, or possibly unintentionally act so as to cause inhibition.

Parapsychologists may be seen as having too much prior commitment to the field to be credible witnesses of PKMB. This is of course a sociological factor, since those most experienced in a specialist area of research would normally be regarded as having the greatest expertise, so that their testimony would, if the field were not subject to such fundamental dispute, be regarded as having expert status, rather than being likely to suffer from bias.

The conjurer Randi has (1975) made a strong case that PKMB validation protocols must be designed in collaboration with conjurers because their skills of deception are a specialism and may not be obvious to scientists who are naive with respect to sleight of hand tricks.

This point has been accepted generally by those who have sought to perform validations of macro PKMB. Thus Hasted (1976a), Crussard and Bouvaist (1978) and Bersani (Bersani & Martelli 1983) state that they have consulted conjurers, and Cox (1974) has been an amateur conjurer for a long period.

Hasted makes the important point (1976a) that those attempting to validate paranormal effects such as PKMB tend to attempt to maximise their own credibility. This may involve their exerting a self-censorship over the reporting of results which may be so extreme or unusual as to be likely to lower their credibility in the estimation of sceptical critics of the field.

He speculates that this situation may even trigger some investigators into resolving the dissonance caused by this type of situation by denying that the extreme events in question did occur. His own stated approach to this problem has been to assume that his own credibility is unimportant, thus freeing himself to report events which will certainly be regarded as impossible and incredible by sceptics, such as disappearance-reappearance events (Hasted 1981a).

Finally, a methodological point which seemingly has been ignored by all commentators on methodological issues in PKMB research but which is of crucial importance is that the published description of the validation attempt must include sufficient detail. The account must provide details to show that every likely source of opportunity for fraud has been excluded. Details of the exact chronological procedure followed are helpful in establishing the credibility of validation attempts in this way. Legitimate criticism could be made of both Hasted's (1981a) studies and that of Bersani and Martelli (1983) and others (eg Wolkowski 1977) because their important work was not described sufficiently fully. Where lack of detail obscures the account this will be made clear. In some cases personal communication has allowed the published account to be supplemented with necessary extra detail. This is particularly the case with Hasted's work.

1.5.1 With-Touch Validation Attempts : Introduction

Various techniques have been developed to provide secure methods for the validation of macroscopic PKMB where the putative agent is allowed to touch the specimen to be bent. In all of these protocols the attempt at PKMB must be carefully witnessed.

The simplest method is for the putative PKMB agent to be instructed to limit his touch to forms of contact or holding where little or no manual force can be exerted. Thus the validation attempt by Hasted et al (1976) allowed Geller to touch the keys used as PKMB targets, but, it was claimed, only in such a way that force could be precluded or certainly recognised. The childen in the Collins and Pamplin study (1975) had to hold their spoons in a specific manner to conform to the protocol and a similar approach was taken by Osborne in his first stage test (Keil & Osborne 1981).

A second approach to restricting the possibility of exertion of manual force is to allow the subject access to only some surfaces of the specimen, making it impossible for him to exert a three point load upon it.

One method of realising this approach was used by Betz (1979), Randall (Randall & Davis 1982) and Cox (1974). Flat PKMB targets were placed on a flat surface. Pressure can then only be exerted downwards on the specimen, whereas the PKMB effect can produce bends occurring in an upward direction against gravity.

A variant of this approach is to enclose the specimen in a protective shield or cradle in such a way that the subject can touch the specimen but cannot exert a three point load upon it, such as was used in the Osborne (Keil & Osborne 1981) second stage test.

A third approach is to use specimens which are so strong and rigid that either they are too strong to be bent by hand, or else evident effort would be needed. The Crussard and Bouvaist (1978) and the Zorka (1976) validation use this approach.

A related approach is to use "impossible" tasks. One type of impossible task is illustrated by Hasted's (1981a) use of a specialised bismuth/cadmium/tin alloy cast into bars. This material is so brittle that it cannot be bent except by a creep mechanism, which is a slow process. Exertion of more than very slight manual force would lead to fracture of the specimens. However it appears that ostensible PKMB agents can accelerate the rate of creep bends (see appendix 1).

Shafer has reported the use of a similar technique where a rigid hacksaw blade was bent during a PKMB group meeting (1980). Normally the hacksaw blade would break rather than bend because of its being hardened.

Another type of "impossible" task is the creation of permanent bends in the specialised memory alloy Nitinol reported by Byrd (1976) and Randall and Davis (1982).

Three validation studies differ from all the others. The first of these was conducted by Taylor (1975, 1977) who later (1980) became a sceptic with respect to the paranormal and therefore withdrew his previous claims regarding his earlier validation study.

The second was conducted by Collins and Pamplin (1975) and demonstrated that child putative PKMB agents would attempt to cheat under certain circumstances.

The third (Shafer 1982) was of a much more exploratory nature and reported apparent PKMB caused by two ostensible PKMB agents who later turned out to have been accomplices of the conjurer Randi who declared that they had cheated deliberately so as to demonstrate the incompetence of the group testing them (Randi 1983).

1.5.2 Taylor's Validation Attempts

Taylor (1975, 1977) reported a number of validation attempts which he claimed as successful. The book (1975) is a popular work on PKMB which omits certain details presented in the paper, which is of a more scientific nature (1977). His conclusion stated in the 1977 paper was that PKMB was a genuine effect.

Taylor later changed his attitude and became very much more sceptical. He is unique in this field in having reversed his earlier position, the majority of other investigators having shown signs of becoming more, rather than less, convinced of the reality of the effects as their researches have proceeded (eg Hasted 1981a, Keil 1983).

His change of position was documented in another book (1980) dealing generally with the paranormal. Statements are made in the later book which seem to ignore or contradict apparent statements of fact made in the two earlier publications.

Thus in the earlier book (1975) and paper (1977) he made a series of unambiguous claims to have directly witnessed various ostensibly genuine PKMB deformations and fractures, some with, and some without touch.

In the later book (1980) his PKMB researches are given surprisingly little space. Only 14 pages of the 170 pages of the book are devoted to PKMB (ibid pp110-124) and a small fraction of the 14 pages is addressed to his own work. There are other inconsistencies. While the conclusion stated in the forward is that all claims of the paranormal are invalid, in the section dealing with PKMB he states that the evidence "is suggestive but certainly not watertight" rather than simply repudiating it in a wholesale manner as the foreword might perhaps suggest he would (ibid p117).

His principal stated criticism of his own earlier work was that in some tests he did not detect and record the amount of force being applied to PKMB target specimens. He also used as standard specimens metal strips which could be bent by manual force (although with evident effort) by his subjects, whereas in the second book he states that only specimens too rigid to be bent manually should be used in validations. Honorton (1977) criticised both these aspects of Taylor's research in a comment following Taylor's paper, and Taylor vigorously defended himself in a note following Honorton's comments (1977a).

However, in contradiction to the claim that he had not used methods of estimating the amount of manual force applied to specimens, in his earlier (1975, 1977) work Taylor reports the use of a letter balance, on the top pan of which strips of metal could be placed as PKMB targets, enabling the amount of downward pressure exerted to be observed.

Subjects were asked to stroke gently the upper surface of the metal strip. The position of the balance pan was also monitored continuously by measurement of the capacity change caused by its movement relative to a another plate connected to electronic instrumentation. The electronic pressure measuring system was calibrated by weights being placed on the balance pan. During PKMB attempts two measures of the position of the pan (and hence the force exerted) were obtained, one by visual observation, the other by the continuous chart recorded output of the pan position sensing system.

In the earlier publication (1977) Taylor reported several instances of ostensibly successful results using this apparatus. In the second (1980) book he states that after consultation with the conjurer James Randi, he employed video cameras to monitor this equipment and that neither Geller (in one attempt of 1 hour's duration) nor any other ostensible PKMB agent could create any effects on the metal strip PKMB target in a repeat series of tests with video observation installed.

He concludes by stating that since Geller has not responded to further invitations to be tested under these conditions he must therefore be fraudulent (ibid p 118). This statement is clearly a non sequitur because there could be many other reasons for Geller's reluctance to submit to laboratory testing.

Taylor undoubtedly expected to find that PKMB was caused by an input of electromagnetic energy from the agent (1975). He spent considerable effort attempting to detect electromagnetism at the sites of ostensible PKMB action, but failed to do so (1980).

Collins (1983) has stated that it was Taylor's not finding an explanation for PKMB within the accepted corpus of physics which logically compelled him to reverse his previous acceptance of it as real. The 1980 publication suggests a similar underlying attitude.

Other factors may have been his colleagues' scepticism towards and criticism of his earlier work, academic hostility, and the fading of memories of events previously felt as convincing, a phenomenon commonly encountered in psychical research (Inglis 1977) which may be due to cognitive dissonance effects.

Taylor's change in position makes it very difficult to evaluate his earlier work. Since he has not specified particular faults in particular instances of validation attempts nor published a detailed analysis or critique of this work it is difficult to know in what respects it may have been deficient.

Two responses seem possible to the reviewer faced with Taylor's publications, one being to discount and ignore this work because of

Taylor's later stated general caution about it, or else to review what seem to be the more evidential claims. The latter course will be taken, for completeness's sake.

There also seems to be a case for thinking that this work may not have been invalid and that the later repudiation of his claims may have been made not on account of faults in the work itself but because of the immensely more difficult path represented by continued adherence to the original claims.

Using the letter balance apparatus described above, under witnessed conditions Geller succeeded in producing a 10 degree bend in an upwards direction as a result of gentle stroking with a finger on the upper surface of a brass strip 220 mm long and 6 mm x 2 mm cross section. The maximum pressure observed and chart recorded was 20 grams. The deformation occurred within 30 seconds of the start of the attempt. The pointer of the balance also bent through 70 degrees, ostensibly without any contact by Geller.

Another subject ("B") apparently succeeded under the same conditions in producing an upward bend of 2 degrees (measured with a claimed accuracy of 0.2 degrees) in a copper strip of the same cross section but 195 mm length. The maximum pressure applied was 20 grams, the average pressure being 10 grams.

In another validation attempt conducted with Geller an instrumented aluminium strip of 360 x 15 x 3 mm was used. Inset into a milled and drilled excavation in the center of this strip was a pressure sensitive device incorporating a piezo-resistive silicon diaphragm and a monolithic integrated circuit wheatstone bridge amplifier. The output of this specially made transducer was chart recorded. The strip was designed to be held at one end by one hand of the subject whilst they stroked the center section between forefinger and thumb.

The trial with Geller initially appeared to have been unsuccessful and the instrumented specimen was left alone for three minutes. Geller was with Taylor in a different part of the laboratory during this period and no associate of Geller was present. The bar was then noticed to have bent by 13 degrees at its center. The probability of the center section bending had presumably been increased by the presence of the excavation there. Up to this time the maximum pressure registered by the transducer had been 100 grams.

Geller then recommenced stroking the specimen, producing a deflection of 43 degrees. However the transducer had ceased to work during this second contact. Taylor then examined the transducer and saw a small hole appear in the diaphragm. A crack slowly spread out from the hole and in ten seconds the entire diaphragm disintegrated. This would appear to have been a paranormally caused event, witnessed as it occurred. The strip was then placed on its side on a desk where within three minutes it bent by a further 29 degrees without further contact with Geller.

Taylor comments that the bar could not have been bent using only 100 grams of force and that substitution was not possible, since the bar with its associated transducer was a unique object, the pressure transducer having been designed and constructed four weeks prior to the validation attempt. Taylor was impressed by the abnormally slow rate of the crack propagation in the silicon diaphragm.

Geller caused a similar fracture in a single crystal of lithium fluoride, originally of dimensions 6 x 3.5 x 2.5 mm. It was located inside a plastic container and Geller held his hands over it without contact with it during his attempt to influence it. Taylor claims to have had a clear view of the gap between Geller's hands and the plastic container at all times from the start of the attempt until 10 seconds later when the crystal fractured. The piece which broke off was still in the container but part of it had been reduced to powder. Etching and analysis of the cleavage characteristics revealed that the crack had started at one corner and had then rather slowly spread across the fracture face.

Taylor also reports some ostensible without-contact deformations, although exact details in his account of the conditions under which he claimed his subject D bent a spoon by 90 degrees at its neck merely by looking at it are entirely missing. Geller apparently without touching it spontaneously caused an annealed strip of aluminium of dimensions 110 x 6 x 2 mm to bend through 30 degrees whilst it was enclosed in a cylindrical wire mesh tube having an end cap firmly closed on it. This was in the presence of two other witnesses and occurred during a period of fifteeen minutes while Geller was engaged in bending other objects nearby.

In another test Geller held his hand over Taylor's which was held without contact over two transparent pharmaceutical capsules in each of which were aluminium discs of 3 mm diameter, one of which was annealed, the other having been cold worked. Within five seconds the annealed disc was found to have deformed so as to be elliptical in shape.

Another subject, a 15 year old boy, was given a strip of aluminium (of cross section 6 x 2 mm) which had been sealed inside a clear plastic tube. The ends of the tube were secured with rubber bungs which had had brass screws inserted through them and the side of the tube at right angles to its axis to a depth of three-quarters of the width of the tube. The heads of the screws were covered with sealing wax which was marked to prevent opening of the tube. Within seven hours of a subject being given the tube it was returned seemingly intact, with the aluminium strip bent into an "S" shape.

The effectiveness of the closure of this type of tube has been challenged by Randi (1975) who claimed that he was able to pull a rubber bung out without disturbing the screws. However Taylor has made the counter allegation (1977a) that Randi broke the tube when he attempted to withdraw the bung during the making of a television programme in London. Hasted (see section 1.4.2 above) has criticised the use of epoxy sealing for PKMB target containers. Clearly the results of unwitnessed PKMB attempts using these tubes must be regarded cautiously.

The other evidence cited by Taylor would appear to be fair, except that his descriptions of the situation and circumstances surrounding some claimed PKMB events often lack detail.

1.5.3 The Collins and Pamplin Study

Collins and Pinch are sociologists of science based at the University of Bath. They have investigated several disputes within science (Collins & Pinch 1979, 1982).

Collins in association with the physicist Pamplin has published a participant-observer study of a PKMB validation attempt (Collins & Pamplin 1975). It has formed part of Collins' investigation of parapsychology which is of interest to him as being an instance of one particular controversial area within science.

Since at the time of their involvement with parapsychology PKMB was a prominent topic of dispute in Great Britain they decided to mount a validation attempt so as to appreciate some of the issues and to explore the reactions of sceptics and believers to their study.

They requested a protocol from Randi and set up a social psychology laboratory as the test site. Six local child claimants to PKMB ability were recruited to serve as subjects.

The protocol specified by Randi involved the children holding a spoon in a particular way while in videocamera view. The same shot included first a clock, then in a modified version of the protocol, a candle flame, as guarantee that the videotape had not been edited. The laboratory was equipped with a one way mirror behind which a videocamera and staff were located, out of sight of the subjects.

It was accidentally discovered that the children tended to cheat when one of the investigators went out of the laboratory and the subject was observed to bend their spoon manually by a member of the experimental team located behind the one way mirror.

The experiment was then modified to explore the fraudulent behaviour of the subjects. The experimenter supervising the children was instructed to relax their vigilance after a period of time in each session. Five of the six children then proceeded to cheat. Interestingly, it was only Hasted's subject Julie Knowles who was not accused of ever attempting to cheat by the experimenters.

In another modification of the experiment, the children were told that there was a videocamera hidden behind the one way mirror, yet when the experimenter left the room they still cheated.

It is a commentary on the attitude of the official bastions of conventional science towards PKMB that the Collins and Pamplin study was published in the foremost British scientific journal Nature (1975), whereas Hasted's group was limited to contributing a letter to the same journal (Hasted et al 1975), their findings from their validation study of Geller not being published in any non-parapsychological journal. Nor has any other validation study of PKMB been accepted for publication by any other major scientific journal.

The Collins and Pamplin study was given considerable publicity and influenced attitudes towards PKMB. However, the conclusions which can legitimately be drawn from it are rather few.

The subjects in the study were placed in a situation where they were subjected to a very high demand to produce PKMB. The lighting level was very high (to allow the view from the room behind the one way mirror to be clear) and the protocol isolated the subjects and made them the unique focus of attention. The subjects were inexperienced at working under laboratory conditions and they were unacquainted with the experimenter. This provided maximally inhibitory conditions so that the subjects were unable to produce genuine PKMB.

The manner in which Collins and Pamplin apparently expected to be able to perform their validation attempt disregarding the inhibitory effects inevitably elicited by the conditions specified in the Randi protocol, almost as if PKMB were a normal skill, was found indicative of their inexperience in the field of parapychology by some parapsychologists (Hasted 1984, Batcheldor 1984).

Randi has stated (1982) that children or uneducated people are often not credited with being capable of using sophisticated modes of cheating and he claims that PKMB children do use ingenious methods of cheating. However, the evidence from this study contradicts this claim, because the children cheated in very obvious and simple ways, bending the cutlery by placing it under a heel as fulcrum while pulling on its other end, or bending the spoon by pushing it against furniture or using both hands while holding the spoon out of sight.

One conclusion deriving from the study would seem to be that child ostensible PKMB agents will attempt to cheat if placed in a highly demanding and inhibitory situation if they perceive that their activities are not being effectively witnessed.

Another is that parapsychological studies reporting subjects as cheating are very much easier to publish in the journals of orthodox science than are reports of ostensibly positive results obtained in parapsychological studies.

A third is that parapsychologically inexperienced newcomers to the field may lack insight into what constitute inhibitory conditions for PKMB.

1.5.4 Shafer's Restricted-Touch Validation Attempt

Shafer (1982) has reported an exploratory attempt to use for macro PKMB validation purposes a perspex block with a shallow groove cut in it in which was placed a 3 mm thick metal rod PKMB target. The intention was that the groove would shield the rod from effective contact by the subject, because any pressure exerted on it would have to be in a downward direction. Shafer reported the creation of a 2.5 mm deformation in the rod by Stephen Shaw, one of two claimants to PKMB ability employed as subjects by the laboratory.

The two subjects later announced that they had been sent to the laboratory (the McDonnell Laboratory for Psychical Research, St Louis, USA) by Randi in order to prove that parapsychological research performed there and elsewhere was incompetently managed (Randi 1983).

The cheating was accomplished by Shaw simply removing the rod unnoticed, by pressing on one end with a finger so that it lifted out of the groove, bending it slightly by normal means and then reinserting it into the groove in such an orientation that the bend was not visible. During the formal PKMB attempt he then rotated the rod so as to make the bend appear. Randi claims that his two accomplices successfully deceived the experimenters in fraudulently performing many other ostensible ESP and PK tasks.

In defence of other PKMB research groups it should be made clear that both of the investigators in charge of research at this laboratory were inexperienced in the field of parapsychology. One (Mark Shafer) had only just completed his PhD on a topic unrelated to PKMB and the other (Dr Peter Phillips, director) was a physicist new to parapsychological research. The two fraudulent subjects conferred with each other and were in constant touch with Randi who presumably directed their activities.

One of the principal points made by Randi in response to their success was to point out that the subjects had been allowed to dictate the form of the protocol, which they certainly had. Randi had previously offered to act as a consultant in the studies of these two subjects but his offer had been refused. Randi states (1983) that he sent a list of 11 methodological suggestions to the laboratory. Randi's stated objective in this subterfuge was to draw attention to the necessity for professional conjurers to be consulted regarding security in parapsychological experimentation generally.

Undoubtedly, many features of the procedures used by Shafer and Phillips were ludicrously unsatisfactory, such as the use of paper labels secured by string to PKMB target objects for identification purposes, which could be switched around by the subjects (Randi 1983). The experimenters also ignored a rumour, deliberately spread by Randi a year or so before the subjects revealed themselves, that they were conjurers sent by him to their laboratory (Randi 1983).

1.5.5 The Birkbeck Validation Study

Hasted, Bohm, Bastin and O'Regan (1976) have reported briefly on a validation attempt mounted with Geller as subject at Birkbeck College.

Four witnesses were present (the authors) at the first session, an additional four being present at the second session.

The specimens used were Yale keys which had been numbered and weighed to an accuracy of 0.2 mg. At the first session two keys were used simultaneously. The keys were placed on a table top. Geller was allowed to stroke them with the forefinger and thumb of either hand, or sometimes by forefinger alone, with the specimens resting flat on the table and steadied by his thumb. At the second session a single key was bent similarly.

The deformations occurred gradually, usually taking several minutes to complete. Some specimens continued visibly to bend after Geller had stopped touching them so that the witnesses observed them resting alone on the table whilst the bent end continued to rise. The keys were reweighed and found to be of identical weights to the pre-bent weight to within the tolerance of the balance used. This would have excluded substitution and the use of chemicals.

As with some other of Hasted's material, the account given is not detailed enough to allow a precise reconstruction of events to be made. The validation attempt looks to be quite satisfactory, as the keys were placed on a defined surface and subjected to close witnessing. But the lack of detail in the account is a weakness, since potentially important details may thereby have been excluded.

1.5.6 Betz's, Cox's and Randall's Use of Flat Targets

Betz (1979), Cox (1974) and Randall and Davis (1982) have independently reported the successful use of virtually the same method of preventing fraud in with-touch macro PKMB validations In each case the specimen was substantially flat in shape and was laid flat upon a glass table surface during the PKMB attempt. Cox used two specimens, one a flat hard steel safety-deposit box key too hard to be bent by normal manual force, the other he described as being a zinc alloy three inch skeleton-key.

The steel key was used first. Cox was interested to observe whether Geller would attempt to cheat, so deliberately allowed him to handle the key. Geller then placed the key flat on the glass table top. Cox observed that the key was perfectly flat at this stage and then placed his right forefinger on the larger end of it while Geller gently stroked the exposed surface with his right forefinger. The key started to bend slowly at a point just beyond Cox's finger, the bend ceasing at 6 degrees. Cox then removed his finger and let Geller rock the key to and fro on the glass surface.

Cox then placed a small mirror in the palm of his left hand and held it under the glass table top so that he could see the underside of the key. He replaced the key on the table top, replaced his forefinger on one end and Geller recommenced stroking it. It gradually bent to a total deflection of 12 degrees. Geller's stroking was so light as not to cause the key to rock under Cox's finger. The second bend took about a minute to achieve. Cox estimated the key to be about 15 inches from his eyes.

The second key was also handed to Geller for a brief inspection and was returned in a perfectly straight condition. Cox laid it on the glass table top and placed his forefinger on the toothed end. Geller stroked only 25 mm of the shank at the handle end and a bend appeared at that point, 25 mm from Cox's finger. The key bent upwards to an angle of 36 degrees within one minute.

These two events must be considered good validations. The bending events were observed at close range while they occurred and the movement was against gravity, nor could any form of normal pressure produce such effects.

Betz prepared strips of metal (aluminium, copper and iron) of dimensions 120 mm length by 12 x 1 mm cross section. All of the strips were marked. In the validation attempt a strip was placed flat upon a glass table top. The subject was asked to place their left thumb on top of one end A, holding the strip flat down on the glass surface whilst they were allowed to stroke the area of the strip near the end A with their right thumb.

As soon as the subject placed their right thumb on the strip the free end furthest from the two thumbs started to move upwards from the glass surface as a bend developed in the area where the strip was being rubbed. The free end moved away from the table top at about 0.5 mm per second and after about one minute it was more than 40 mm from the table surface, the angle of the bend being about 50 degrees. Five specimens, including aluminium, copper and iron specimens were bent in one session, one after another.

This validation also rates as good, although the subject was allowed to hold down the specimen as well as to stroke it. But sleight of hand seems to have been excluded by the fact that the specimen was marked and kept continuously in view. It should also be noted that Betz had started his investigations of this subject thinking that they were fraudulent, so was extremely vigilant in his observation of them.

Randall (Randall & Davis 1982) has briefly reported a validation attempt employing an 11 year old boy subject. An aluminium strip was placed in a groove cut in a steel plate. The strip fitted the groove tightly so that it could not be easily removed. One end of the groove was open, the other was terminated in the body of the plate, providing a "cul de sac". The steel plate was placed on a table and the experimenters witnessed the subject closely. The subject gently stroked the upper surface of the strip, which after several minutes bent by a few millimeters. Randall (1984) regards this validation as informal, but personal communication regarding the event has established that the effects were probably genuine although Randall is cautious and has not made this claim.

1.5.7 Osborne's Validation Protocols

Osborne (Keil & Osborne 1981) has used two forms of restricted touch protocol for screening purposes. His work has not been published in detail but will be described in chapter 3. Although his work was not presented as a validation attempt a brief description will be given here because his protocols are of high quality and no less than 40 subjects in the 800 who were tested succeeded in performing satisfactorily under the conditions he imposed.

In the first protocol, normal household spoons were used, both sides of the bowl being blackened with soot. The subject was requested to hold the spoon at the end of its handle with one hand and they were allowed to stroke the middle section gently with one finger of the other hand. This was witnessed and videorecorded, the specimen having to be in video view from the point of its being handed to the subject until the attempt was ended. Only bends of more than 5 degrees were considered candidates for consideration as valid effects and the videotape was viewed by two independent judges who decided whether the protocol had been obeyed.

The second stage test involved subjects who passed the first test attempting to bend a bar of aluminium alloy of dimensions 150 mm length and 20 x 5 mm cross section. The bar was inset into a rectangular shaped excavation in a solid block of perspex which allowed access only to the top surface of the bar. The bar fitted closely (<1 mm) into the excavated rectangular recess, making it very difficult to remove.

The bending had to cause part of the bar to emerge out from the excavation. Subjects were allowed to touch the bar's upper surface. The PKMB attempts were witnessed by Osborne. All of the 40 subjects who succeeded at the first test succeeded also at this one.

The present author has seen Osborne's apparatus and the bar is probably too thick to be bent by hand and fits tightly into its locating recess. The bar is more substantial than the majority of macro PKMB targets. This author considers it remarkable that any subject managed to perform the second stage test because of its severity due to the cross section of the bar. It is therefore unfortunate that Osborne has not fully reported his work because it appears to be of a high standard of security against fraud.

1.5.8 The Crussard and Bouvaist Validation Attempt

Crussard and Bouvaist (1978) have reported what seems to be an excellent validation attempt with the French metal-bender Jean-Paul Girard as PKMB agent.

However, the conjurer Randi has challenged their account, both in print (1982) and in personal communication (1984). Randi's allegation is that in a film he saw of a validation attempt conducted by Crussard with Girard the claimed protocol was not followed. In particular he stated that Girard was allowed to turn away from the camera whilst holding a specimen (thus allowing surreptitious force to be exerted) and that Girard then held the bar in a rotated position so as to conceal the fraudulent bend which was presented edge-on to the camera and that Girard then slowly rotated the bar so as to make the bar appear to be bending on-camera.

This author has had some experience of Randi's conduct in supervising an attempt to win his $10,000 prize for the demonstration of a paranormal performance (Isaacs 1984). This experience, and the enormous number of clearly proven inaccuracies in Randi's accounts of other experiments (see Randi 1975 and Puthoff & Targ 1977 for an example) leads to the conclusion that Randi's accounts cannot be trusted. This situation makes it very difficult to evaluate the Crussard and Bouvaist claims without seeing the film and video records of their study which unfortunately this author has not seen.

Crussard and Bouvaist state that they have selected the material they present from a total of 150 deformations or metallurgical transformations (the metallurgical aspects are reviewed in appendix 1) produced by Girard. Only some 20 of these events were performed under conditions which the authors felt would enable them to claim them as definitely paranormal and 8 of these are presented in the paper.

Unfortunately they do not present accounts of many other interesting events which occurred during their work with Girard, some of them involving ostensible PKMB performed from a distance without contact and others involving the ostensible deformation of specimens held by other individuals than Girard. They have reported only events which occurred within a prespecified protocol.

They acknowledge the claim made by Randi and others that Girard has had experience of conjuring (they state that Girard told them this) and was a member of the French Magic Circle. They state that they have submitted film supplied to them from other groups showing Girard producing ostensible PKMB to analysis by members of the conjuring profession and others. They managed to change Girard's mode of operation from its originally conjurer-like style so as to render it amenable to adequate scientific control.

Taylor (1980) has reported a subject "Alpha" whom he claimed to have observed surreptitiously bending a spoon whom Randi (1982) has claimed was Girard. Crussard and Bouvaist also report that they had observed suspicious actions by Girard in film tendered to them by some other group.

While this may or may not constitute proof of Girard's having cheated, what is certainly true is that Crussard and Bouvaist were fully on guard against possible fraud by Girard in the work they performed with him. Hasted (1984) has reported results from working with Girard which suggest a genuine PKMB ability.

The basis of the Crussard and Bouvaist validation protocol was to employ metal bars which were of too great a strength to allow manual bending to be performed without considerable exertion. Crussard and Bouvaist tested the maximum manually produced bending moment developed by adult males by means of a dynamometric wrench with handles 400 mm long. The authors found that the maximum moment produced varied between individuals in the range 20 - 38 Newton-Metres (N.m), the median being around 25 N.m. Girard developed 26 Nm with very clear visible effort. The specimens to be subjected to PKMB were 250 to 350 mm long and 8 to 17 mm thick, being of aluminium, light alloys, copper, brass, mild steel, stainless steel and magnesium.

The authors present two validation attempts as being typical of those they consider satisfactory. In the first, an associate who was in charge of the stock of specimens located in a separate room from that in which Girard was waiting took a bar of hardened duralumin of length 250 mm and diameter 8 mm, rolled it on a table, confirmed that it had no roundness defects, marked it to identify it, and placed it in a glass tube which was sealed with a stopper. The minimum moment necessary to produce bending was 15 N.m so that the bar could not be bent manually without visible effort.

The associate carried the closed tube to another associate who gave it to Girard. From this point onwards the proceedings were filmed and either the tube's stopper or the bar in the tube were always visible in camera view. After having concentrated and having declared that he felt something, Girard returned the tube, still closed, to the person who handed it to him. The tube was opened by this associate and the bar which was visibly bent was taken out and placed on a flat surface. It had a deformation of 2 mm.

The second validation attempt employed the experimenter's largest bar, of length 300 mm and diameter 17 mm, formed from an aluminium alloy. The bar had been provided with engraved marks, had been transported to the test site in a separate car from that bringing Girard and was the only one of its type in the stock of specimens.

The bar had previously been subjected to bending tests by strong men and only one 136 kg individual had managed to produce a small but definite deformation of 0.6 mm on this bar, having first coated his hands with magnesia, this deformation corresponding to an applied moment of 38 N.m. Later tests performed before the bar was submitted to Girard had showed that an average man could not increase this deformation even by using a support at the center of the bar and bringing his entire weight (64 kg) to bear on the two ends.

During the test, the two investigators sat about three feet from Girard, one on each side. Girard worked in shirt sleeves, with the sleeves rolled up and unbuttoned. He produced four deformations of this bar in succession, by holding one end in the right hand and gently stroking the free part with his left hand (deformations 1 and 2), deformation 3 and 4 being produced whilst his left hand was held some 5 cm above the specimen. After each deformation one observer recorded the profile of the specimen while the other remained close to Girard. The largest deformations (3 and 4) could be followed visually. They both occurred downwards over intervals of 10 to 20 seconds. After each deformation it was checked that no heating was detectable by touching the bar and that the deformations produced by Girard were all in the same plane which was at 34 degrees to the plane of the bending produced earlier during the manual bending tests referred to above. Scratches marked on the bar indicated the previous bending plane and served also to provide the observers with assurance that it was always the same bar in view. Immediately after the test the specimens were locked in a briefcase and taken to a laboratory for examination.

All the marks and scratches and defects in the bar were as originally recorded, no substitution had taken place. An identical reference bar was subjected to mechanical bending which showed that to obtain the observed deformation of nearly 30 mm a moment of 75 N.m would have had to be applied, about twice the moment produced by the strongest individual tested. Changes in the hardness of the specimen had also occurred.

These validations must be considered satisfactory if the published descriptions are correct accounts. Since the first event was filmed it is potentially available for analysis.

1.5.9 Zorka's Validation Attempt

Artur Zorka is a professional magician and was chairman of the Atlanta Occult Investigations Committee of the Atlanta chapter of the Society of American Magicians at the time of the validation attempt. In June of 1975 he attended a recording of a television programme featuring Geller and afterwards asked him to perform in private. Geller accepted and he, Zorka and Ab Dickson, a fellow professional magician tested

Geller in a locked room (Zorka 1976).

Zorka had selected as PKMB target a stainless steel fork which was so strong that he could not bend it by hand. The fork was constructed in two major units. The prongs formed an integral forging with a short shaft of thick stainless steel. At the bottom of this shaft, where it met the nylon handle was an extension of the shaft, in the form of a cylinder of stainless steel of perhaps one third of the cross section of the shaft and about one and a half inches in length (estimated) which was inset into the nylon handle so that it was not visible in the intact fork.

Zorka tried to bend a duplicate fork by clamping the bottom of the nylon handle in a vice and pulling on the prongs of the fork. The nylon handle broke, and the steel upper assembly parted from the handle, but neither the prongs section, the shaft, nor the extension of the shaft was bent by this process. The nylon had given way before the force was sufficient to bend any of the steel sections.

Zorka gave the test fork to Geller who held it in one hand with the prongs and the bottom of the handle protruding out of his hand. Within seconds the handle of the fork exploded, sending fragments of plastic across the room and making a noise like cracking ice. Geller's hand, with the ends of the fork protruding, had been visible continuously from the instant that Geller had been handed the fork. The extension at the bottom of the steel prongs and shaft assembly was seen to be visibly bent.

Some tests of ESP were attempted, and some further PKMB, but none occurred until Geller was on the point of leaving Zorka. As Geller got out of the car Zorka was in, Zorka asked him to attempt to bend a key which Zorka had selected as being short and rigid. Geller stroked it while Zorka held it by its handle section between thumb and forefinger. Geller did not take the key at any time. It started to bend as soon as Geller stroked it. After it had started to bend and after Geller had ceased to touch it Zorka watched the key continuing to bend in his own palm.

Zorka's conclusion was that he could not explain Geller's PKMB on the basis of any conjuring known to him, so that unless Geller knew some other more advanced type of conjuring trick the events were genuine.

Zorka's validation attempt, although not mounted formally within a laboratory situation must be granted credence because there is good evidence that he is a competent conjurer and he had intended to catch Geller in fraudulent activities.

1.5.10 "Impossible" PKMB Tasks : Brittle Alloy Specimens

Hasted (1981a) has reported the use of the triple eutectic alloy of bismuth, tin and cadmium (54% Bi, 26% Sn, 20% Cd) as PKMB target in with-touch PKMB attempts. The alloy is brittle and does not work harden with deformation so that it will tend to fracture if manual attempts are made to bend it, although it can be bent slowly by manual means if extreme care is taken.

It will not deform in a ductile manner but because it has a low melting point (103 degrees centigrade) is subject to creep deformation at room temperature. Creep deformation is a very slow process caused by the continuous application of a load. Hasted cast this alloy into bars of 6 x 8 mm cross section. A bar was placed on knife edges set 100 mm apart and was loaded with 3.2 Kg at its center. This produced a 16 degree bend in 4.25 hours. A sudden application of 3.5 Kg under the same conditions was found to fracture the specimen.

The bars were possible to deform manually if great care was taken, but the maximum rate of deformation was found to be 10 degrees per minute. Attempts to increase the rate of bending above this level produced fracture.

Specimens of 150 mm length and 6 x 8 mm cross section were given to subjects Andrew G and Nicholas Williams and were all bent without fracture, the bends achieved being 135 degrees in 10 min, 100 degrees in 5 min, 67 degrees in 3 min, 62 degrees in 2 min, 40 degrees in 10 min and 34 degrees in 6 min. At one session Nicholas Williams placed four specimens in his coat pocket and within five minutes they were bent through 111 degrees, 135 degrees, 160 degrees and 170 degrees. Hardness measurements revealed the absence of significant work hardening.

For validation purposes only those specimens bent at a greater rate than 10 degrees per minute can be considered. The rates achieved (degrees/minute) for all the specimens are respectively 13.5, 20, 22, 31, 4, 5, 22, 27, 32, 34. Thus 7 of the 10 results are substantially (x 2 or more) above the maximum rate achieved by manual means.

These results must be considered good evidence for the paranormality of the PKMB effect, since the production of normal bends in the times specified would appear to be impossible. As long as the specimens could not have been substituted, the validation appears to have been satisfactory. Communication with Hasted (1984) has established that all specimens were produced specially for this study and were carefully accounted for, so that the importation of pre-bent specimens or the stealing of existing stock specimens did not occur.

1.5.11 Shafer's Brittle Steel Target

Shafer (1980) has reported the bending of a hacksaw blade into a "U" shape having a 25 mm diameter. The deformation took some three minutes to achieve and was accomplished in three or four discrete stages which were estimated to have taken about one second each. The event occurred during one of a series of meetings of a group of ostensible PKMB agents run by him. This work was accomplished prior to his appointment at the McDonell laboratory and the members of the group were not accomplices of Randi.

Identical hacksaw blades were used in a series of attempts by a number of other individuals to produce similar deformations but in every case the blades were broken without any permanent deformations being produced. This validation remains insufficiently documented however, because Shafer's description of the circumstances and precautions against substitution of specimens are not detailed enough for firm conclusions regarding this validation to be drawn.

1.5.12 Detection of Touch

Shafer (1980) has also reported an innovative but inconclusive validation attempt using an ingenious method of detecting the force applied to the specimen which was developed by an associate. The attempt took place at one of the group meetings referred to immediately above.

A 76 x 12 x 4 mm aluminium bar was sprayed with lacquer and before it dried, small thin shelled spheres of nickel-cadmium alloy were sprinkled on to its surface, leaving one small bare spot in the center of one side. The bar was given a second coat of lacquer. The spheres covered about 1/3 of the surface area and were too close to allow touching of the bar without contact with the spheres. The spheres were so fragile that they would be crushed by pressure which was very much less than that necessary to cause deformation of the bar.

Unfortunately the bending of the bar, which was accomplished ostensibly without contact, was not observed by Shafer. The bar was placed on a table in front of the ostensible PKMB agent who was observed by another member of the group. After 20 minutes' concentration the bar bent near the center by some 15 degrees, the bending apparently taking some 5 seconds. The observer watching the attempt reported that the ostensible PKMB agent had not touched the bar. The experimenter was seated nearby and had periodically observed the attempt.

When the bar was examined a few spheres were found to be broken, mostly on or near the ends. Shafer concluded that this was due to handling of the bar after it had bent and stated that in his opinion the deformation was paranormally produced, although he concedes that the result was not conclusive because of the presence of the broken spheres.

1.5.13 Byrd's and Randall's Nitinol Validations

Byrd (1976) has reported the use of the memory alloy nitinol in a validation of PKMB. Nitinol is a nickel-titanium alloy having the property of "remembering" a particular shape which has been impressed upon it at high temperature. Subjecting it to stress at temperatures in the region of 500 degrees centigrade will produce permanent modifications in its memorised shape. Normally this shape is the as-manufactured configuration.

Thin (0.5 mm dia) nitinol wire can readily be deformed by hand, but has the property that if heated to above its transition point (usually in the region of 100 degrees centigrade) it will revert to its as-manufactured shape.

However, nitinol will only recover strain of less than 8%. If subjected to extreme stress (more than 1.45 kg/mm shear stress) a strain of more than 8% will be produced and the excess strain will remain to produce a permanent deformation (Schetky 1979, Buehler & Cross 1969). Severe bends produced by normal means will therefor leave permanent deformations in nitinol wire.

Byrd conducted two experiments with Geller, the first in October 1973, the second a year later. At the first occasion Geller attempted to influence a block of nitinol and a thicker wire, without success.

Byrd then cut a 0.5 mm diameter piece of nitinol wire into three 127 mm lengths. He held one of the pieces tautly between the thumbs and index fingers of both hands. Geller put his thumb and index finger over the wire and started to rub it. After 20 seconds he stated that he felt a lump forming in the wire. When he removed his fingers, the wire had a small "U" shaped kink in it. Boiling water was then brought in and the wire was immersed in it. Normally the wire would have regained its as-manufactured shape. However it changed shape, but the kink became an approximately right angle bend. Heating the wire with a match flame did not change the bend.

The second time that Byrd met Geller he had brought three of four pieces cut from a wire which had been carefully checked and physically characterised by his own laboratory (US Naval Surface Weapons). The fourth piece was left at the laboratory to serve as a control sample. The wire was of 0.5 mm diameter.

Byrd held one piece between his hands as in the first test, and Geller stroked it as before. A kink formed in it. Byrd took a second piece, held it at one end and Geller stroked it, whereupon it too developed a kink. The third piece of wire was given to Geller to manipulate. He rolled it between his thumb and forefinger and it kinked sharply.

All of the nitinol wires kinked by Geller showed a permanent deformation which if the wire were bent normally by hand could be restored by heating them to about 99 degrees centigrade. Byrd concluded his report by stating that none of the personnel within his establishment could explain the results obtained. Metallurgical analysis had revealed a slight increase in crystal size in the kinked sections of the wire.

Byrd's conclusions were challenged by the sceptic Martin Gardner (1977), who claimed that the 0.5 mm nitinol wire could be kinked by normal means using pliers, fingernails, biting with the teeth or compression between two coins. He claimed that Geller could have substituted nitinol specimens which he had secretly prepared with a permanent deformation or else could have secretly produced the changes by subjecting it to compression using the above methods, producing effects which only became apparent upon heating of the wire in boiling water.

Byrd stated that in 1973 nitinol wire was commercially unavailable. However, Gardner has challenged this. It is difficult to establish this point definitively in either way. Nitinol wire of 0.5 mm diameter is now available from orthodontic sources because it is used in dental braces.

Tests performed by this author have revealed that fingernails are very unlikely to produce permanent bends of more than a very slight angle in 0.5 mm nitinol wire. However, compression between the jaws of pliers or two coins or the teeth certainly could produce such bends. But the compression of the wire in the small radius "U" shape nessary to produce such bends also produces a small relatively sharp pointed kinking which is impossible fully to remove, so that pre-formed specimens made in this way would easily have been detected by the presence of these small but very definite kinks at the point of the permanent bend. The mechanism of fraud, if such there were, must have been the unnoticed infliction of a permanent bend to Byrd's specimen while Byrd was not observing.

Gardner's case becomes seriously weakened because of this, because the kinks in the wire would have been visible immediately they were made, whereas the description given by Byrd makes it clear that the wire was seen as being unaffected just before Geller started stroking it. Despite Gardner's criticisms the Byrd validation may still be valid because of the impossibility of concealing the kinks which must have been produced in the pre-validation preparation of the hypothetically substituted specimens.

Randall (Randall & Davis 1982) has reported a validation accomplished in 1977 by the use of nitinol. A 688 mm length of wire of mean diameter 0.361 mm was placed over an A4 sheet of paper, about 200 mm of its length being on the paper, the rest extending beyond it. The wire had been previously checked that it had a straight configuration when heated to 100 degrees centigrade. The wire was taped to the table with sellotape in two places where it extended beyond the paper and was taped to the paper at its edge where it extended on to it with strong binding tape.

This assembly was placed on a school laboratory bench. The subject M.B. was a 13 year old schoolboy who had participated in earlier validation attempts using different tasks in 1975 and 1976 (see section 1.5.6). The subject sat at one side of the bench and was allowed to gently stroke the wire at a position near to its point of fixture to the paper. Randall sat at the other side of the bench watching the subject. Davis moved around the subject constantly taking photographs from various angles.

The end section of the wire on the paper, which had not been touched by the subject, started to deflect upwards and in the course of ten minutes developed an "S" shaped bend. Initially unnoticed to the experimenters, the portion of the wire not on the paper had also suffered a deformation, forming a gentle curve in the form of an arc of a circle of spproximately 300 mm radius. At the end of the curve, approximately 60 mm from the end of the wire a right angle bend had formed.

After the subject had left the laboratory a number of photographs of the wire were taken. Crocodile clips were then attached to its ends and a current was passed through it to bring its temperature to 100 degrees centigrade. The wire resumed its straight configuration except for the end section where the right angle bend had been. The current was raised and the sheet of paper began to show slight signs of charring where it contacted the wire. The kink remained, although its angle was 120 degrees. Upon cooling the kinked section of the wire resumed its 90 degrees bend.

Four days later two attempts were made to straighten the wire by heat and tension. In the first attempt a tension of 0.5 kg was used and the wire was heated electrically to the point where it was just visibly red. The bend remained on cooling, although it was now about 140 degrees.

At the second attempt the tension was increased to 1 kg and the temperature was increased to the point where the wire glowed dull red, the authors estimating its temperature to be about 600 degrees centigrade. The wire broke under this treatment but the kinked section resumed its 140 degrees angle upon cooling.

The authors concluded that the memory of the wire had been affected by its treament by the subject and that the replication of

Byrd's study had been successful. This conclusion would certainly appear to be correct.

1.6.1 Without-touch Validations : Introduction

Without-touch macroscopic PKMB effects are generally acknowledged to be more difficult to obtain than with-touch events (Hasted 1981a, Shafer 1981). The degree of security against fraud of without-touch validations must however be considered potentially superior to that of with-touch validations because of the reduced opportunity for surreptitious manipulation or substitution of PKMB targets so that attempts to obtain this type of evidence have been made by several groups. Various approaches have been tried.

Hasted (1981a) has reported events where aluminium strips were twisted together while he and the ostensible PKMB agent remained outside the room in which the events took place. In experimental sessions with his subject Nicholas Williams instrumented latchkey PKMB targets suffered deformations under no-touch conditions.

There are several reports of metal specimens deforming while being held by persons other than the putative PKMB agent (Leslie 1976, Owen 1974a, b). However, as discussed in chapter 3 it is not always clear in this situation to whom responsibility for the effects should be assigned. In the account by Leslie it seems clear that Geller was the agent, but in the case of Owen the agency for the effect is less certain. The Owen event did not take place under strictly controlled conditions but is included here because of Owen's experience in evaluating paranormal claims (1964) and because the account is detailed.

In this type of validation the identity of the individual holding or otherwise in control of the specimen is obviously crucial to the validity of the event, since they are in as good a position to produce fraudulent events as a putative PKMB agent would be if allowed to hold the specimen.

Although the holding of the specimen, without contact from the putative PKMB agent would appear to be a secure method of obtaining genuine PKMB, the desirability of touch being completely excluded by the specimen being completely enclosed is obvious. Unfortunately this appears to be the maximally inhibitory manner in which PKMB targets can be presented to subjects.

Two studies have utilised total enclosure (ignoring Taylor's which has been reviewed above in section 1.5.2). Bersani and Martelli used glued or sealed plastic containers (1983) and Wolkowski has performed the only validation so far achieved where effects were obtained in fully sealed glass tubes (1977). In some respects it is strange that the Wolkowski study has not received any publicity, since it has satisfied the criteria stated by some critics that PKMB can only be proved genuine by sealed glass container validation methods.

1.6.2 Instances from Hasted's Work

Hasted (1981a) describes the intertwining and folding of soft aluminium strips (300 mm x 8 mm x 0.75 mm) which he had placed on a table in the bedroom of his subject Nicholas Williams. After placing the strips on the table, Hasted followed Williams out of the room after checking that the strips were straight. Hasted and Williams stood outside the door of the room while they listened to noises suggestive of the movement and folding of the strips. Hasted had searched the bedroom and was certain that there was no one concealed within it, nor did the room have another door. There was no one else present in the house during these events.

Hasted expresses caution about these unwitnessed events but it is difficult to explain them as fraudulent since personal communication with Hasted (1984) has established that the search for hidden confederates left little opportunity for concealment. Instrumental records of four of these folding events were obtained (see appendix 1).

With the same subject, in several sessions, Hasted obtained macroscopic bends on instrumented latchkey uPKMB targets which were located well beyond the subject's reach.

One (1976a) of these sessions has been published as a validation attempt. The results must be considered seriously, since Hasted was seated next to the subject and the subject did not stand up or approach the PKMB target (2.5 metres distant) at any time after the start of the session. Hasted checked the state of the key immediately prior to the start of the experimental period. He measured the angle of the bend produced several times, which changed as a result of successive periods of action.

The chart record from the instrumented latchkey provided an addition to the security of the result, since the chart recorder pen made a noise when it moved, so that periods of action were identified and the activities of the subject at these times was especially vigilantly attended to. A fuller account of this series of sessions and the validation attempt is given in Appendix 1 section 3.2.

1.6.3.1 Target Under Control by a Third Party

The Danish professional magician Leo Leslie has reported an instance where a key was bent while he was holding it and Geller was not touching it (1976). Leslie was highly sceptical of Geller's claims and had been consulted by a Danish television company regarding the conditions to be observed in the televising of a performance by Geller in Copenhagen in 1974.

After the performance although Geller had apparently shown ESP and PKMB during it Leslie was still sceptical and told Geller so. Geller responded by asking what he could do to convince him. Leslie suggested an ESP and PKMB test. The ESP test was apparently successful and they proceeded to the PKMB test. Present were a local journalist, a photographer, a psychologist and a female assistant from the television studio.

Leslie gave Geller a nickel-plated enamelled key. The key had been painted because Leslie wished to exclude the possibility of chemical attack. Geller asked the journalist to hold the key between two fingers. Geller then rubbed it very lightly a couple of times with his forefinger. Geller then said that he could not bend that key and Leslie retrieved the key from the journalist and examined it closely.

While Leslie sat looking at the key the enamel suddenly started to crack and strips of the nickel plating started to curl up while the key bent in Leslie's hand. All present concluded that the event was paranormal and Leslie's book (1974) endorses Geller's claims. Since the key was under Leslie's control and close scrutiny at the moment of its deforming this must be considered a convincing validation, even though it was not conducted under formal laboratory conditions, especially in view of the fact that Leslie had been so sceptical at first.

Owen (1974a) has provided a less convincing but similar account. He, his wife and five members of the "Philip" sitter group (Owen & Sparrow 1974) attended a television performance given by Geller in Toronto. Owen had contributed several items to a collection of metal objects (chiefly keys and cutlery) which was assembled on a bronze tray placed on a low table in front of Geller and the interviewer.

Just before the start of the programme Owen examined the keys, spoon and fork he had placed on the tray to ensure that they were intact and undeformed. He had also checked the other items to discover if any of them had been prepared by fatiguing or the bonding of broken parts etc and had found no suspicious objects. Once he had made his examination of the contents of the tray he kept it under continuous observation and saw that none of the objects had been handled by anyone.

During the first commercial break after the first part of the interview with Geller Owen's wife opened her purse and inspected her group of six keys of various types. Previously they had been examined by herself, Margaret Sparrow, and Bernice Mandryk and had been undeformed. One of the yale keys was bent about 25 degrees and was examined by every member of the group. Mrs Owen had not been in Geller's presence before her arrival in the studio immediately before the start of the interview and had not talked to Geller or been near him during the performance.

At the resumption of the interview Geller performed some ostensible PKMB involving the apparent temporary plasticisation and then fracture of a fork which was later found to be the one which Owen had contributed and had checked just prior to the start of the interview.

Geller then selected a pair of keys which were hanging from a string loop and which Owen recognised as his own, the keys being two he had used at Cambridge University. Geller picked them up by the string loop and it was noticed that one of the keys was visibly bending. Geller supported this key on one finger and the TV camera provided a close-up view of the key as it continued to bend, suspended from the top by the string, its bottom end resting against Geller's finger. The final bend was of 15 degrees. The keys were then placed back on the tray and it and its contents were placed at the back of the studio. When Owen collected his specimens the key was found to have fractured.

Mrs Sparrow retrieved her old fashioned teaspoon from the tray which appeared normal when she collected it but which was found an hour later at her house to have bent. Owen states that in his opinion the PKMB events were certainly genuine and paranormal. Interestingly, Geller had told Mrs Owen that it was she who had bent the key in her purse, and the presence of the other members of her sitter group also renders ascription of responsibility for this event to Geller uncertain. Owen remarks on the curious coincidence that so many of the objects selected for attention by Geller were his. This account, although not of a controlled series of events, is strongly suggestive of genuine PKMB both because of the bending of the key in the purse which Geller had never seen or touched and because of the precautions taken by Owen in checking and observing the PKMB target objects.

1.6.3.2 The Birkbeck "Plasticisation" Event

Hasted has published several accounts (1976a, b, 1981a, Hasted et al 1976) of a rare ostensible PKMB event which is considered here because the specimen was held by an experimenter whilst it was apparently in a paranormally induced state.

It will be recalled (see section 1.2) that individuals creating ostensible macroscopic PKMB deformations frequently report that the specimen has suddenly become soft and pliable for a short period. Extreme examples of this are claimed by some subjects (Hasted 1984), but the phenomenon is very difficult to validate because of the short life of this phenomenon.

Hasted states (1976b) that he had just handed a stainless steel teaspoon (which had previously been deformed slightly by a child subject) to Geller as soon as he arrived at the Birkbeck laboratory. On Geller's grasping it by one end the spoon immediately appeared to go soft and sag at the point of the previous bend. Geller then held the other end as well and began to bend it to and fro.

Hasted then took the spoon from Geller. It retained its bend of 60 degrees during the changeover and with a gentle action Hasted continued the to and fro motion for about thirty seconds. He could sense the plasticity and describes the spoon's resistance to deformation was similar to chewing gum. Hasted then very gently laid it on a desk. When he attempted to move it, it fractured as a "neck" had developed.

Hasted claims that the spoon's behaviour was quite different and distinguishable from that of a spoon which has been weakened by normal manual to and fro bending, which cannot be continued for this period before fracture will occur. Hasted has had considerable experience of the behaviour of this type of pre-fatigued specimen. Normal manipulation by manual means would not have produced thinning of the cross section of the spoon. The weight of the spoon was within 0.4 mg of its weight prior to treatment by Geller.

Hasted is cautious in his published conclusions regarding this event, but privately (1984) feels certain that it was genuine. It appears to be the only published account of a well authenticated plasticisation event. Two witnesses were present, the distinguished theoretical physicist David Bohm, and a technician Nicholas Nicola.

1.6.4 Bersani and Martelli's Validation Attempts

Bersani and Martelli (1983) have reported a total of ten instances where deformations were obtained in specimens enclosed in containers of various sorts. Two of these are reported in detail in section 3.4 of appendix 1 dealing with the validation of uPKMB because strain gauges were used. The experimenters consulted two conjurers regarding their experiments and the conjurers' opinions of each test are appended to their accounts.

A problem affecting some of the validations performed by Bersani and Martelli is that they used seals to secure the closure of various of their containers. The seals were impressed with an original design made by Bersani.

Of the eight instances reviewed here, five used seals and four of these five sealed containers were left with subjects for periods of several days. While it may be beyond the capacity of a child or young teenager to copy sealing wax seals, a motivated adult, such as one of the subject's parents or relatives may have been capable of making a negative mould by means of a silicone rubber covering of the seals. Duplicate seals could have been cast in the rubber moulds and then secured to the containers by means of a thin layer of cyanoacrylate resin.

While this is an entirely speculative hypothesis and may well not have been possible or not have occurred, the possibility of the duplication of their seals seems not to have struck the authors as a serious possibility, although their consultant conjurers asked whether the seals could have been duplicated. The experimenters therefore did not attempt to duplicate their own seals, which would have clarified this question.

The consultant conjurers also asked if the seals could have been removed from the containers. Their adhesion would have been dependent upon the state of the surfaces of the containers. The authors do not deal with this question. The four validations which are subject to these objections will consequently not be reviewed in detail and will be reviewed first.

The first sealed-in object was a puppet constructed from coloured putty overlying a 2 mm copper wire. It was placed in a transparent plexiglass box. The lid of the box was secured by means of a band of canvas over it bearing two seals at the center of the lid and one on each side of the box.

Within the box was placed a small closed cylindrical plastic container containing two layers of coloured fine powder and a space above them. If the box had been shaken the powders would show signs of mixing, so that bending of the specimen by shaking it against the sides of the box was made impossible. This control procedure was stated to be often used where specimens were sealed into closed containers.

After being left with the subject (O.B.) for thirteen days the box was returned with the seals apparently intact and the puppet showing visible changes in configuration. The powders in the control tube were unmixed.

Another subject (S.G.) was given a rigid plexiglass cylindrical container within which was a plexiglass spatula coated in aluminium paint. The lid was closed with two strips of material which were sealed to the sides of the box. The authors state that the unique pattern of wax gutter on the strips served as an additional safeguard against opening of the container.

The container was left with the subject for ten days and was returned with the seal assembly apparently intact but the spatula broken. Chips of aluminium paint were visible on the sides of the container which the authors claim is indicative of the breakage having taken place within it.

This subject also succeeded in creating clearly visible deformations in a spoon and a screwdriver placed in separate 100 ml measuring cylinders which were closed by means of rubber stoppers over which a strip of canvas was stretched and sealed at each end on to the cylinder sides.

A similar container and plastic spatula to that used in the previous validation was employed in a witnessed validation attempt. Its lid was secured with Scotch tape rather than being sealed. The subject (O.B.) held the container in front of the experimenters for five minutes, at the end of which a sharp noise was heard. The spatula was found to be fractured when the container was examined, no suspicious movements of the subject having been seen.

Transparent plexiglass boxes were used for some validation attempts. The boxes were sealed by having all their sides glued together with acrylic resin. In one experiment a zinc strip was coated with a thin layer of putty and placed in such a box also containing a control tube to detect shaking. The purpose of the putty was to detect whether deformation occurred in response to the imposition of psychokinetic forces upon the surface of the strip.

The box was given to the subject (O.B.) at his home who went to the living room unaccompanied, placed the box on the piano and started playing. The experimenters heard him stop playing for a short period and then continue. After five minutes he returned to the experimenters with the box. The bar was bent but the putty layer was undisturbed except for slight bulging at the topmost end of the bar. The powders in the control tube remained unmixed.

An aluminium strip of dimensions 60 x 15 x 1 mm was enclosed within a similar box also containing a control tube. The box was given to the subject (O.B.) at his home. There had been a slight fracas between the experimenters and the subject immediately prior to the box being given to him and the boy first scratched the box with a defiant gesture, left the dining room, but returned seconds later with the strip bent and the box and its control tube unaltered. The strip was sufficiently short so that it lay on the bottom of the box, so that shaking or the sudden deceleration of the box could not have caused the bend.

Another validation attempt was completed in a short period. A spoon was enclosed in a polythene jar (described as "semi-rigid"). The spoon had been coated with low melting point "rice wax" in order to detect any possible imprints. The screw cap had been sealed with tape and impressed sealing wax seals. The jar was given to O.B. at his home. He held it for an estimated ten second period, long enough to open the door, go into the hallway, then return immediately. The spoon was clearly bent, but the seals were still intact. An important detail regarding the compressibility of the jar was ommitted from this account, since if it was possible to compress the jar, the spoon could have been bent by manipulation through the sides of the vessel.

Bersani and Martelli's work is of uneven evidential quality. Those events where the action occurred within a short time of a sealed container being handed to the subject would appear to be likely to be genuine, although the attempt using the polythene jar remains questionable. The two instances of the use of plastic boxes sealed by glue on joining surfaces seem to be acceptable, especially that where the deformation occurred within a few seconds of the box being handed to the subject.

1.6.5 Wolkowski's Sealed Glass Tube Validation

The French physicist Wolkowski has reported (1977) the deformation of a strip of metal, a spring and a nail which had been sealed into pyrex tubes of approximately 12 mm diameter. The sealing was accomplished by a professional glassblower using a glassblower's torch. The sealed tubes were measured to an accuracy of 0.1 mm and weighed to an accuracy of 0.1 mg. They were then left with Girard.

The tubes were returned and were reweighed and remeasured and examined by the glassblower. No changes in appearance, dimensions or weight had ocurred. However, the specimens had bent. A photograph of the tubes (reproduced in Hasted 1981a p48) shows a clearly visible bend in the spring and metal strip so that they could no longer move freely within their tubes, the nail being only slightly affected. Wolkowski reported that the angles of the bends varied from 10 degrees to 30 degrees. Wolkowski also reported other bendings of apparently thicker metal objects in sealed tubes, although the details of these events were not given.

1.6.6 Conclusions

The evidence provided for the reality of PKMB by the validation attempts reviewed above obviously varies in quality, some being better than others.

Osborne's two validation protocols (section 1.5.7) are particularly impressive because in the first the possibility of the imposition of a three point load was excluded by the blackening of the bowl of the spoon and the resulting videotape of each ostensibly successful attempt was submitted to evaluation by two independent judges. In the second, the author's examination of the apparatus has shown both that unnoticed removal of the bar from its cradle would be impossible under conditions of close witnessing, and that bending of the bar would demand considerable physical effort from an adult, whereas child subjects were used.

The Cox and Betz accounts (section 1.5.6) are persuasive because the method of control of the PKMB target, its stationary position and the exclusion of the possibility of the exertion of a three point load all exclude fraud.

Randall's use of Nitinol (section 1.5.13) is convincing because opportunity for the subject to have substituted a pre-prepared length of nitinol wire was excluded by the securing of the wire to the paper and by the high level of witnessing employed, by the short time of exposure of the wire to PKMB, so that lapses in witnessing were avoided, by the presence of two witnesses and by the character of Randall himself, who is known to the author and is a sound and cautious investigator.

Wolkowski's sealed tube validations seem unassailable, although his written account is not very detailed. Since glassblowers are capable of recognising interference to structures they have made (Hasted 1981a) and the tube was carefully measured and weighed these seem to be adequate instances of validation.

The other accounts, such as that produced by Bersani, (section 1.6.4) include events which are very difficult to account for on the basis of fraud although they are not quite as convincing as the events cited above.

In conclusion, it would seem that at the least a very good prima facie case for the reality of PKMB has been established by this work.

CHAPTER TWO

PSYCHOLOGICAL FACTORS IN PKMB

2.1 Introduction : The Sceptical Attitude

Since PKMB is still the subject of active controversy it is important that brief attention should be paid to the sceptical interpretation of statements made regarding its psychological features.

If there were a large body of high quality experimental research in existence which had been conducted into psychological factors in PKMB the sceptical interpretation would lose some of its relevance. However, PK in general has only relatively recently been subject to sustained investigation of psychological factors (Stanford 1977).

PKMB in particular remains virtually virgin territory for the psychological experimenter. To date only one study has been published which examines psychological factors within a fully experimental context (Isaacs 1983).

However a useful case study of twelve British child/teenage ostensible PKMB agents has been reported by Cantor (Cantor 1979) which represents the only study of its kind in being specifically devoted to the psychology of the agents and their families rather than being concerned merely to document claims of PKMB.

Physicists Hasted (Hasted et al 1976, Hasted 1981a, Hasted & Robertson 1980a) and Taylor (1975) have commented briefly on a restricted range of psychological factors. Shafer has reported his running of group meetings for PKMB agents but what little comment is included on psychological factors deals mainly with PKMB elicitation techniques (Shafer 1980).

Several surveys have been performed in the following up of reports of PKMB events being caused by appearances of Geller on radio or television but only one of these, conducted by a group centered around Bender, included many enquiries directed towards psychological questions. Unfortunately only a summary of this work has been published in English (Gruber-Wendlandt 1977), the main body remaining untranslated from the German (Bender et al 1975, 1976). This and the other surveys are discussed further in chapter 4 which deals with the incidence of PKMB ability.

Since the noting of psychological factors in PKMB has as yet relied entirely on personal observation and generalisation by those active in the field rather than upon controlled experimentation these observations must be regarded with appropriate caution since they may be contradicted or greatly modified by later fully experimental findings.

A high proportion of those who have performed observation or investigation of PKMB are physicists or other non-psychologists whose psychological observations must be regarded as having only lay status.

In addition, many of the personal observations underlying the generalisations made by those working in PKMB derive from situations where PKMB may have occurred, but where conditions of control over the subject were not sufficient definitely to exclude fraud.

The sceptical attitude towards all of the psychological factors affecting PKMB performance is that they represent fictions, brought in to excuse the non appearance of PKMB under strict test conditions which exclude fraud. Randi appears to believe that these psychological factors have been invented by dogmatic believers in the reality of PKMB who have created an extensive and unfalsifiable mythology which insulates them from the unwelcome appreciation that the apparent effects are all created by trickery (Randi 1975).

The fundamental psychological feature of PKMB inviting this sceptical response is the relative lack of voluntary control over their effects shown by PKMB agents. Thus as the observational conditions are made more rigorous and the numbers of observers are increased, it becomes increasingly difficult for the effects to be obtained (Hasted 1981a, Cantor 1979). If PKMB could be demonstrated reliably on demand under conditions of close observation the sceptical attack would probably have been overcome within a few years of the effect's publicisation.

Parapsychologists and physicists active in PKMB research interpret their subjects' proneness to inhibition and consequent lack of positive results under conditions of tight control and good observation as evidence in favour of PKMB being under only partial voluntary control (Hasted 1981a).

The high relative frequency of bending events which occur at moments when the attention of the subject and especially of other sceptical potential observers is distracted from the PKMB task is interpreted by many parapsychologists as evidence that inhibition is caused by the effort to produce PK and by conscious attention to the PKMB task. The inhibition is released at moments of inattention and relaxation of effort (Hasted 1981a, Shafer 1980, Cantor 1979). The inhibition appears to be akin to an extension of the Yerkes-Dodson law to paranormal performances.

To the sceptic both these characteristics are the hallmark of fraud. Bends do not readily occur under conditions of close scrutiny because opportunity for fraud is thereby excluded. Conversely, bends occur at moments of distraction because undetected fraud is facilitated by inattention of the observers.

The sceptical positions taken by critics are not all identical and may also differ greatly in their degree of sophistication. Thus

Randi appears to believe that if psi events are real, they should be robust and reliable (Randi 1975). He appears committed to an essentially lay ontology whereby if things exist, they can be observed in straightforward and reliable ways.

Such an ontology is not consistent even with normal weak psychological effects which have to be detected statistically, and is certainly not compatible with much of the phenomenology of PKMB and with such relatively subtle concepts such as psychological resistance or witness inhibition which are employed to explain these forms of inhibition within Batcheldor's theory of PK induction (1968).

2.2 The Phenomenology : Inhibitory Factors in PKMB

As noted above the predominant psychological feature of PKMB is its ready inhibition by a variety of factors.

This feature has had a dominating effect on the reception of PKMB and is directly responsible for the marginal status which PKMB still has amongst even the parapsychological community. Yet paradoxically, theorising about the mechanisms and causes of inhibition in PKMB remains at a very early stage.

It has had another important consequence because the risk of inducing inhibition has sometimes imposed constraints upon the methodologies used to study PKMB. For example, Taylor (Taylor 1977) has been criticised by Honorton for choosing to work with metal specimens which could be bent manually by his subjects (Honorton 1977), yet the choice was made deliberately so as to avoid giving the subjects specimens which they might find inhibiting because of their rigidity. Other examples of this tendency exist (see Stokes' review of Hasted's book (1981)).

All commentators on the psychology of PKMB have shown awareness of the ease with which it can be inhibited (Hasted et al 1976b, Hasted 1981a, Cantor 1979, Keil 1980, Taylor 1975, Shafer 1980, Bersani & Martelli 1981, Price 1977, Isaacs 1981).

Reported inhibitory factors appear to be diverse and numerous and they have not been subject to experimental test as yet. They can usefully be divided into subject-related, setting-related and task-related groups.

Subject-related inhibitory factors (Hasted et al 1976, Hasted & Robertson 1980a, Cantor 1979) include (1) anxiety or tension, (2) over striving at the PK task, (3) over attention to the PK task, (4) illness or fatigue, (5) negative affect or mood, (6) serious concurrent real life distracting concerns, (7) doubt of success or belief on the part of the subject that they will fail at the PK task.

Setting related factors (Hasted 1976a, Hasted 1981a, Cantor 1979) include (8) lack of familiarity with the surroundings, (9) lack of familiarity with the experimental personnel, (10) unsupportive, hostile or sceptical behaviour on the part of experimental personnel, (11) formal or "official" conduct of experimental personnel, (12) obtrusive or intense witnessing of the PK task and subject by witnesses, (13) use of mechanical means of recording (film, video etc).

Task-related factors (Hasted 1981a, Cantor 1979) include (14) tasks which the PKMB agent construes as impossible, (15) tasks which the agent has not succeeded at performing before, (16) tasks at which the PKMB agent has previously failed.

Since the lists above are somewhat compendious they pose the question whether there may be a core factor or factors which are responsible for the diversity of the observed phenomenology. This issue is discussed below but here it can be noted as a preliminary that the inhibition operates against the conscious intention of PKMB agents, since they appear to want to succeed and have everything to gain by exhibiting a successful performance. The inhibition can therefore be construed as an involuntary loss of control over their PKMB output by agents. The weakness of voluntary control over PKMB is the common factor linking many of its characteristics as will become evident below.

Many other human performances are subject to ready inhibition resulting from the presence of observers or experimenters such as creative work, some forms of problem solving, learning of complex skills, sexual activity, religious activities etc. PKMB shows a similar proneness to inhibition which is perhaps more severe than is encountered in other areas of human performance.

2.3 Spontaneous PKMB Effects

It has been frequently reported by PKMB agents (and their parents in the case of child and teenage PKMB agents) that they encounter metal objects which have bent inexplicably and ostensibly paranormally and which they did not intend to bend (Hasted 1981a, Cantor 1979). The impression is created by the literature that children suffer a higher incidence of spontaneous effects than adults, but the evidence is not good enough to establish this point.

Usually the objects have never been the target of intended PK and are found after they have been bent. In some cases the usual focus of this activity is domestic cutlery, but a wide range of objects are cited in scattered references in the literature on PKMB (Hasted 1981a, Cantor 1979, Taylor 1975).

Cantor reported that his interviewees thought that the incidence of their spontanous PKMB decreased over time as a result of their increasng control over it (Cantor 1979).

An interesting feature which has been reported in this context by Cantor (Cantor 1979) is the selective "sparing" of valuable or antique cutlery or precious metal objects. This suggests that even the spontaneous effects may be under some rather loose form of control.

2.4 Displacement

One of the common effects found in studies of PKMB where the setting is stressful for the ostensible PKMB agent (as in some validation attempts) is that subjects fail to produce effects upon formally designated PKMB targets but other nearby metal objects are discovered to be bent after the termination of an unsuccessful attempt (Hasted 1984, Stanford 1977, Isaacs 1981).

The displacement of effects onto other metal objects also occurs under less stressful conditions of PKMB elicitation (Hasted 1976b, Taylor 1977, Smukler & Seifer 1977). Geller seems to have deliberately incorporated this feature into his stage and media performances as he usually insists upon a number of metal objects being placed together from which he selects one as target, but claims credit for any in the larger group which are later found to have bent (Geller 1975).

2.5 Anticipation Effects

Anticipation effects are more easily noticed in instrumental uPKMB experimental sessions than with macroscopic PKMB because uPKMB effects' time of occurrence can be accurately recorded. Anticipation effects are those which occur just prior to the subject's intending to start producing PKMB events. Not only does uPKMB show this feature (Hasted 1983) but Geller also produced a classic instance of this effect during his attempt to influence a geiger counter tube when he performed a count down from 1 to 10 and produced the effect on his shouting "nine" rather than "ten" (Hasted 1976b).

2.6 Release of Effort Effects

Release of effort effects have been reported in other areas of PK research (Stanford & Fox 1975, Watkins, Watkins & Wells 1973). They are defined as PK effects which occur after the end of subjects' formal PK attempts. Wells and Watkins (1975) have commented that the release of effort effects may be a more reliable finding than their main effects. The salient psychological factors precipitating the effects may not just be perseveration but also that the PK agent releases the inhibition created by their trying to produce effects.

Release of effort effects are common in both macroscopic and microscopic PKMB (Hasted 1981a, Stanford 1977, Cantor 1979). Like anticipation effects, release of effort effects can be more certainly identified with uPKMB than with macroscopic PKMB. In uPKMB they tend to occur instantaneously upon the subject's cessation of effort, whereas with the macroscopic effect the release of effort effects unless they are very sudden may be impossible to distinguish from linger effects.

2.7 Distraction Effects and "Conversational" uPKMB

What may be a subspecies of release of effort effects occurs with uPKMB at instants when the PKMB agent's attention is suddenly diverted from the PK task by some momentary stimulus such as someone talking to them or if their attention is suddenly captured by some event or object in the room in which they are situated (Isaacs 1981, Hasted 1981a). These effects have been termed "distraction" effects (Isaacs 1981). One teenage uPKMB agent produced effects whilst reading a book of jokes apparently just at the instant when she appreciated the point some of the jokes (ibid).

Thouless, using a die face PK task with himself as subject reported (1951) that a severe decline in his performance was temporarily reversed when he read poetry durng PK trials. The improvement of performance decreased as his engagement with the poetry lessened.

An apparently similar type of effect has been noted (Hasted 1981a, Isaacs 1981) which occurs in conversational settings. The effect is marked by the occurrence of spontaneous uPKMB events at moments when the conversational topic apparently acquires emotional salience to one or more of the conversational participants.

The identity with distraction effects is however complicated by the fact that because of their occurrence in a context where the eliciting stimulus has an apparent emotional salience two possible mechanisms may be involved. The effect could either be due to the affective reaction producing a powerful temporary distraction or else a more poltergeist-like psychological mechanism (Roll 1976) could be invoked which would posit the affective response as the direct releaser of PK as a reactive response. This is considered further in the theory section.

Interestingly, these spontaneous uPKMB events have been reported as happening to groups none of whose members individually could produce uPKMB events deliberately (Isaacs 1981).

2.8 Linger Effects

Linger, or perseveration, effects have been reported in other areas of PK research (Watkins, Watkins & Wells 1973, Wells & Watkins 1975). Many instances of apparent linger effects have been reported in studies of the macroscopic effect where specimens which have been bent continue to bend after the attention of the ostensible PKMB agent has been withdrawn from them (Cantor 1979, Hasted 1981a).

Similar linger effects seem very much rarer in uPKMB but Hasted has reported one instance where uPKMB signals continued to be recorded from a uPKMB sensor which had been superseded as designated PK target by another sensor which did not receive uPKMB signals (Hasted 1981a).

2.9 Temporary Transfer of Ostensible PKMB Ability

Many reports have been made of the apparent temporary transfer of PKMB ability to others by ostensible PKMB agents (Wolkowski 1977, Hasted 1981a, Alvarado 1980).

These reports must be evaluated with caution because of the existence of two alternative explanations, either that the individual's own latent PKMB ability was stimulated by the previous displays of PKMB by the ostensible PKMB agent present, or that the known ostensible agent was responsible. Since no objective means of assessing an individual's PKMB output exists which is independent of their producing effects in conformity with their intentions the conclusive identification of the agency for the effects is not possible.

However, when the known PKMB agent is in close physical proximity to the individual who shows the apparently induced ability and if the induced ability ceases upon the departure of the known PKMB agent, it seems reasonable to ascribe the effects to the known agent.

Conversely, if the PKMB events occur in proximity to the individual who shows the induced ability but they are very distant from the known agent, and the distant individual is unknown to the known agent as has happened in those cases resulting from television or radio appearances by Geller when many people have reported various PKMB events (Price 1977) it seems very much more likely that their own PKMB ability was stimulated into action by exposure to the suggestive effects of the media (see the discussion on this topic in section 2.3.3).

Ostensible induction effects occurring in the immediate presence of a PKMB agent can be valuable adjuncts to validation of macroscopic PKMB because they enable metal specimens to be held by experimenters and to be not touched by the known PKMB agent whilst they deform. Hasted reports events of this sort as occurring to physical scientists in the presence of Jean-Pierre Girard although the identity of the scientists was kept secret (Hasted 1981a).

2.10 Task-Dependent Differential Effects

A major feature of the phenomenology of PKMB is that there appears to be a commonly observed scale of difficulty involved in PKMB tasks, both macroscopic and microscopic.

Thus with the macroscopic effect, the easiest task is frequently the deformation with-touch of insubstantial specimens. It is usually more difficult to obtain deformation of robust specimens than weak ones and with-touch PKMB is very muh more readily obtained than without-touch deformation (Shafer 1980, Hasted 1984, Cantor 1979). There are some indications that the distance between the ostensible PKMB agent and the PKMB target may affect the probability of a given without-touch task being performed. Soft metals are more readily deformed by PKMB than hard ones (Hasted 1984).

The sceptical response to these features has been to interpret the events as being fraudulent, with-touch conditions being seen as allowing fraud more readily than without-touch conditions. However, there are strong indications (Hasted 1984) that the transition to without-touch PKMB is facilitated by the subject gaining confidence from the ready performance of easier, with-touch tasks, the transition occurring as a result of the subject gradually reaching an appropriate involuntary belief state, as would be hypothesised by Batcheldor (Keil 1983).

Microscopic PKMB shows similar trends in that the distance between the uPKMB target and the subject is an important determinant of the occurrence of effects. Strong individual differences are shown in this respect between different subjects (Hasted 1981a). Large amplitude uPKMB signals are more rarely obtained than weaker signals (Hasted 1984).

2.11 Individual Differences : Induction Techniques

Despite many similarities of conceptualisation and approach individual differences seem to exist between PKMB agents across all parameters of their performance. As yet none of these individual differences have been measured under controlled conditions, but some differences nevetheless appear clearly to have a basis in fact. Few investigators have been interested in this aspect of PKMB agents, the only case study (of twelve children) having been reported by Cantor (Cantor 1979).

One of the most obvious differences between PKMB agents is that they vary in the strategies which they employ to elicit PKMB. The strategies which they use seem to represent not only their preferences but also their stage in a commonly exhibited sequence of learning. The learning sequence not only affects their capacities (see section 2.20 below) but also appears to determine their elicitation strategy.

Cantor was struck by the apparent universality of this development amongst his twelve interviewees who had seemingly followed similar paths in the evolution of their techniques for the elicitation of their PKMB in isolation from each other (Cantor 1979).

The sequence of elicitation strategies started with the children copying Geller's behaviour which they had seen or heard on radio or television (all twelve children had discovered their PKMB ability as a result of exposure to Geller). The metal objects (usually cutlery) would be held and stroked or rubbed whilst being verbally instructed out loud or in interior monologue to bend.

Stage two of the sequence developed as they realised that merely holding the objects was sufficient to initiate their eventual bending, without stroking.

Stage three developed as they found that bending could occur without sustained physical contact with the object. At this stage contact would be maintained for a brief period prior to the objects' being placed in convenient places to deform. Cantor reported that the transition to without-touch bending seemed to occur in response to the children's appreciation of the significance of the spontaneous PKMB which occurred to them all and none of which had involved deliberate and prolonged contact.

Changes in psychological elicitation strategies also seemed to occur in response to the gradual realisation that conscious effort and striving were inhibitory to success. All of Cantor's group started by telling the cutlery to bend, but many gradually realised that simply intending the objects to bend was sufficient to elicit the effect. They had all realised that a striving, effortful approach was inhibitory by the time of their encounter with Cantor (ibid p39). Shafer reports a similar learning of a deliberately non effortful PKMB elicitation approach in his group of ostensible PKMB agents in

California (Shafer 1980).

Visualisation strategies have varied. A distinction can be drawn between two broad types, goal oriented or instrumental. Typical goal oriented imagery might be of the PK target object in its post-deformation state, or in process of bending (Cantor 1979).

Some adults have used instrumental visualisation which may include various images, such as white or purple radiation or light entering or surrounding the PK target object (Isaacs 1981) or heat melting the object (Shafer 1980). Some adults appear deliberately to induce such experiences, others appear to experience them occurring autonomosly of their will.

Cantor reported that some child PKMB agents have deliberately induced states of anger to facilitate the occurrence of PKMB and that this has been successful (Cantor 1979). This appears to be rare amongst adult subjects.

2.12 Experiences Reported During Production of PKMB

Experiences reported as accompanying PKMB production have common themes and also striking variation between individuals. However there are no obvious correlations between experiences and the level of results.

Many PKMB agents have felt their bodies or their hands becoming warm or tingling during active phases of PKMB (Cantor 1979 p27, Price 1977, Isaacs 1981). Sometimes the PKMB metal specimen is felt to be hot just prior to the start of its bending or during its deformation (Cantor 1979, Houck 1982, Isaacs 1981). Cantor (ibid) reported a wide range of sensations as having been felt by the child PKMB agents during their PKMB attempts, including pains in the arm and sometimes headaches (more often in the early phase of their posession of the ability), both in the putative PKMB agent, and in onlookers.

2.13 Preferences in Location

Cantor has reported strong preferences being shown by child PKMB agents towards the location of PKMB attempts, most having favourite places in their home at which to perform PKMB (Cantor 1979). The characteristics of these sites appear to include privacy and the child feeling secure at being on his own territory.

Hasted reports very similar preferences being shown by his subjects, although he found that Stephen North habituated well to regular sessions held in a small private laboratory and later to working in a small screened enclosure sited in a different room used as a PKMB laboratory (Hasted 1981a). Taylor also conducted all of his work on PKMB in a laboratory at Kings College (Taylor 1977).

Hasted performed his early research during visits to the homes of PKMB agents in order to make use of the favourable effects of their home setting as opposed to their being placed in an unfamiliar laboratory which could be predicted to create stress and higher levels of anxiety. In this context it is interesting that Ellison (1977) obtained some ostensible PKMB effects with a child subject in their home which was followed by a series of null results when this subject was taken to a laboratory.

2.14 PKMB Agents' Theories of Origin of their PKMB Ability

Cantor in his interviews with twelve British child PKMB agents and their families found (Cantor 1979) that they perceived their abilities as deriving from themselves rather than from some outside force or discarnate entity. However surveys of ostensible PKMB occurring in response to media performances of Geller (Price 1977, Gruber-Wendlandt

1977) have found that more than 75% of respondents believe Geller responsible for the alleged effects.

European physical mediumship has historically developed within a spiritualist belief system whereby ownership of paranormal abilities is believed to be shared between the human exponents who act as channels for the paranormal abilities and deceased individuals who are construed as the source (Fraser Nicol 1977). In this context it is interesting to note that one PKMB agent participating in the twelve session study who was recruited from a spiritualist group construed herself as acting as a channel or medium for PKMB which she conceived as originating from her dead son.

Hasted also reports some of his subjects as believing that their power comes from outside them (Hasted 1981a), although they seemed to be vague as to its exact origin. Japanese metal benders appear to construe themselves as channelling some form of universal energy, although one Japanese PKMB agent has been reported as believing that a discarnate personality is responsible for his PKMB (Uphoff & Uphoff 1980).

At one period Geller exhibited a well developed mythology of origin of his PKMB as deriving from advanced intelligences located in deep space (Geller 1975), although it is unclear how much of this belief system was created by his companion during an early phase of his career (Puharich 1974). Apparently the swiss PKMB agent Silvio sees his PKMB as originating from the forces of nature (Uphoff & Uphoff 1980). Adult English PKMB agents have mainly ascribed their abilities to themselves (Isaacs 1981).

2.15 Adjustment to PKMB

Cantor concluded that his child interviewees and their families had adjusted well to the possession of their ostensibly paranormal abilities (Cantor 1979). Their PKMB abilities had not excluded the children from showing a normal balance of interest between PKMB and other concerns and interests. They were neither frightened of their abilities nor subject to unrealistic self inflation consequent upon the unusual nature of their gifts, although many of them reported that since first gaining their PKMB ability their self confidence had increased (ibid p45).

However, many of them had suffered a period of social ostracism by their peers and sometimes the staff at their schools who were sometimes sceptical or suspicious that they were making inflated claims for themselves.

An important finding of Cantor's was that at least one parent and usually the siblings of ostensible PKMB children had maintained a supportive attitude towards the child's having PKMB ability. Frequently the most supportive and acceptant parent was the child's mother (ibid p32). Hasted has also found that at least one parent of his child subjects, frequently the mother, has had an approving and supportive attitude (Hasted 1981).

It seems likely that children whose parents are heavily disapproving or anxious about PKMB would not be brought to the attention of the media or parapsychological investigators, so that this trend in the data could be anticipated. This finding invites the speculation germane to the question of the frequency of occurrence of PKMB ability of how many other child PKMB agents there might be whose abilities have not been reported because of their parents' attitudes.

Cantor stressed the normality of the children and their families although he also noted (ibid p38) that occasionally some of the children unintentionally used their PKMB abilities for destructive purposes if they were subjected to long periods of frustration or stress. However, the evident normal academic and social functioning of the children strongly suggested that PKMB itself was not a symptom of psychopathology, as did the harmonious familial context.

This is an important theoretical issue. PKMB ability could be construed as being allied to the poltergeist syndrome (Roll 1976, Owen 1964) where individuals (frequently children and teenagers) exhibit powerful agressive and destructive spontaneous PK. Poltergeistery has often been seen as a symptom of concealed tensions and conflict in family settings (Roll 1976). Cantor explicitly draws a distinction between poltergeistery and PKMB, even though all of his group had experienced some spontaneous PK events in addition to their PKMB (ibid p41).

A question in his questionnaire directed to uncovering pathological fantasies revealed a similar incidence of feelings of "mission" amongst the PKMB children's siblings as in the PKMB group itself.

The intelligence range of the children, although not tested, seemed to span a range from well above average ("Peter" - son of an Oxford academic who was Hasted's subject "Andrew G") to perhaps slightly below average ("Julie" - Hasted's subject "Julie K" (Hasted 1984).

2.16 Motivation, Effort and Attention

Hasted has reported (Hasted 1981a) that his technique for motivating his teenage and child ostensible PKMB agents was to appeal to the curiosity of his subjects and their families. He has also tended to work with the children of academic families. He states that he has avoided payment for results, both because this may lead to a motive for attempted cheating and also because it would dissipate his research funding.

However it seems reasonable to conclude that other motivating factors may also be at work because some of his subjects have reported (North 1983, Knowles 1977) that they felt a certain loyalty and affection for Hasted as a person, and there may be some prestige felt to be gained by young teenagers in working with a "professor" from London.

Hasted states that he has been careful to appear to accept null results (ie absence of PKMB) with equanimity in the presence of the ostensible PKMB agent (ibid p159) and that it is important not to impose a potentially inhibitory burden of demand for positive results on to subjects.

Cantor's interviewees reported that a reward for success was neither an important motivating nor inhibiting factor, (ibid p39). It should be noted however that one of the children is also reported in his individual interview as having said that promise of a reward by his mother in return for PKMB was almost always effective in spurring him to successful performance (ibid 27).

Several studies using die face and REG tasks (Camstra 1973, Honorton & Barksdale 1972, Steilberg 1975) have shown superior PK performance to be associated with conditions of less effort, where more than one effort condition was employed.

Both Cantor and Hasted have reported that although motivation to achieve PKMB results is helpful if not at too high a level, high motivation and direct effort is inhibitory.

Two thirds of Cantor's (12) interviewees felt that they could work more effectively if they were genuinely interested in the project, and ten thought that an uninteresting project inhibited success (Cantor 1979). Seven thought that it was important to want PKMB to happen, that for them, going through the motions without caring or wanting PKMB to happen was less effective than actively wanting it to happen.

However, he reported that many of the children had succeeded even when they were not deeply involved in wanting PKMB to happen. Too high a level of wanting was seen by the children as more very much more inhibitory than too low a level. They could only recall rare instances where they had succeeded at PKMB when they had exceedingly wanted it to happen (ibid p39).

This point should be noted because it it is consistent with the inhibition which is aroused by attempts to produce the effect to order in front of hostile or sceptical witnesses. Cantor comments (ibid p39) that the situations where the children were very much wanting PKMB to happen had tended to be in situations where they were under close scrutiny, in public view, or in laboratory situations etc (as in the Collins and Pamplin study, see chapter 1). Cantor cites other factors he considers could have been contributory to the failure in this type of situation, such as anxiety, overwhelming desire to be believed and fear of failure (ibid p39).

Hasted has made statements consistent with the above (Hasted et al 1976), and additionally places stress on the importance of the PKMB agent learning deliberately not to attend too closely to the metal specimen, instrumentation, or task (Hasted 1981a). Cantor also reported that inattention to the PKMB task, including not looking at the metal specimen was found to be facilitating (ibid p39). As noted in the section on PKMB elicitation strategies, the children had learnt that an initial concentration followed by the release of effort and attention were facilitating. Shafer noted the same characteristic amongst the 13 members of his mixed group of teenage and adult ostensible PKMB agents (Shafer 1980).

Intense application of effort is usually associated with high motivation and close attention to the PKMB task. Consequently these three factors tend to be closely interlinked in stressful attempts at PKMB which seem nearly always to be unsuccessful (Hasted 1981a, Cantor 1979, Shafer 1980, Isaacs 1981). Stanford lays much stress on the inhibitory effects of "willing-wishing" inhibition (Stanford 1977).

2.17 Mood

Cantor reported that his interviewees told him that feelings of well-being, confidence and happiness were unlikely to inhibit them, but that lack of confidence, sadness or lack of interest were inhibitory (ibid p39).

Few other investigators have explicitly commented on the effect of mood on performance, although all of them stress the proneness to inhibition caused by hostile or sceptical treatment of subjects which seems likely to be a mood associated factor (Cantor 1979, Shafer 1981, Keil 1980).

Hasted has commented (1984) that his long term subject Stephen North's PKMB performance tended to decrement when he was feeling depressed and a long period of unemployment was accompanied by a slow decline. Introduction of interesting and novel features into PKMB sessions (such as the presence of popular music performers whom he admired) temporarily improved his performance during this period, suggesting a possibly mood dependent cause for the observed decline. Recently North has become interested in the theoretical implications of his experimentation with Hasted which has been accompanied by improvement in his performance.

Very few studies of other forms of PK have investigated mood effects, and those that have (Andre 1972) have not revealed statistically significant results, although it should be stressed that very small numbers of subjects were used (3 & 6).

2.18 Measurement of PKMB Ability

Several commentators have shown awareness of the problems involved in attempting generally to derive measures of psi ability (Schmeidler & McConnell 1958, Millar 1979). Keil (1980) has to a very limited extent discussed some of these problems as they apply to PKMB.

Problems arise both in attempting to measure PKMB ability and in conceptualising it.

The conceptual problem arises because of the multiple parameters which could be reasonably proposed as relevant to measuring PKMB ability and because there must be an arbitrary decision made as to what range of tasks the ability is measured across and presumed to be relevant to.

A single precisely defined task represents the most economical approach, but if performance at this task is not correlated to related but different tasks the utility of its measurement becomes questionable. A wide a range of assessment tasks may be more suitable in order to derive a generalised measure of PKMB ability but may generate confounding effects due to order and preference effects, or differential learning by subjects across the range of test tasks. Fundamental to the selection of tasks is the identification of relevant task parameters.

As parameters of macroscopic PKMB's magnitude the rapididity of the deformation, the severity of deformation produced, the precision of the resultant deformation in matching a prespecified norm, the size of the cross-section of the specimen which could be successfully deformed and its strength, hardness and composition all seem to be reasonable factors.

In addition there are a number of less obvious possible indices of control over PKMB, including the amount of displacement of PKMB on to unintended targets, the amount of wholly spontaneous PKMB, the range of types of metal specimen which can be successfully deformed, the number of deformations which can be achieved before decline sets in at each session (a paranormal equivalent of stamina), and importantly, the distance over which effects could be obtained.

But there are many relevant psychological factors which present much more difficult problems, such as the resistance of the subject to the effects of various hypothesised sources of inhibition.

Another difficulty arises as a consequence of the quite general situation that in measuring any form of ability the individual's performance on any one occasion must naturally be construed as a sampling of the possible set of performances which are available from that individual. The reliability of such performances in providing accurate reflections of the underlying ability obviously depends upon their spread, which in turn will reflect the degree to which variable factors affect performance.

From the work performed so far it is clear that fluctuating setting-related and subject-related psychological factors determine to a very great extent the performance levels available from subjects. As a consequence there appear to be some indications that performances by individuals can vary widely (Cantor 1979, Hasted 1981a).

Since the relevant parameters of the subject's internal state and those of the setting for PKMB tests have by no means either been fully identified or understood and measures for these factors remain undeveloped it is therefore premature to expect more than a very crude and qualitative approach to the question of PKMB ability yet to be available.

This area represents an important theoretical and experimental challenge, since definition and measurement of relevant psychological factors should if successful enable PKMB performance to be very much more accurately predicted. Deliberate manipulation of these factors may also allow the reliability of PKMB performance to be enhanced.

After these prefatory comments, it should be clear why at this stage of the progress of this field, only the informal observations of the experimental investigators can be offered as the data base from which to survey differences in PKMB ability.

2.19 Differences in PKMB Ability

There appears to be a wide range of ability levels shown by ostensible PKMB agents as a group, but the development of measures for PKMB ability has not yet seriously been attempted.

Hasted has noted strong differences between his subjects (Hasted 1981a). Williams was able to create no-touch uPKMB effects at four to five times the distance that North was able to operate over, and his effects were not related to the directions his hands were pointing. He also quite frequently produced without-touch macroscopic deformation of uPKMB target specimens. His subject Julie K apparently produced effects on very thick metal rods that were superior to either North's or Williams' (Hasted 1984). However, his subject Andrew G ("Peter" of the Cantor Study (Cantor 1979)) showed the most detailed coordination of his PKMB in producing sculpted figures from wire. It should be noted however that Julie K's result on the bar and Andrew G's sculptures were not produced under witnessed conditions.

The French metal bender Jean-Paul Girard has apparently produced deformation under well witnessed conditions upon the strongest bars so far affected by any PKMB agent (Crussard & Bouvaist 1978).

The PKMB agents recruited by Shafer (Shafer 1980) clearly varied in that only some of them were estimated by him to have produced evidential effects. Bersani (Bersani 1984) reports that there were clear individual differences between his Italian ostensible PKMB agents, both in terms of the degree of control they could exert over the incidence of their PKMB, and also in terms of the magnitudes of deformations produced.

Osborne in Australia developed a severe test of PKMB which only 40 out of 800 self-selected individuals succeeded in passing (Keil & Osborne 1981, see also chapter 3). If PKMB ability is distributed over a wide range, a severe test of this type could be expected to select a small group of superior PKMB agents from the others. There would thus seem to be prima facie evidence for the existence of large differences between the PKMB abilities of different individuals.

The development of measures of the abilities of uPKMB agents would appear to be more easily accomplished than for the macroscopic effect because the quantification of chart recorded signals may readily be performed (Isaacs 1983). It should be noted however that many of Isaacs' uPKMB subjects appeared to not be particularly powerful as macroscopic PKMB agents (ibid), suggesting that PKMB ability may be fairly task-specific.

2.20 Learning Effects

It is a commonplace of experimental parapsychology that declines in performance are ubiquitous when forced choice tasks are used, both in individual test runs and also over the longer term in individuals submitted to extensive experimentation (Rhine 1970).

PK studies using dice as targets have clearly shown declines, but REG based work seems associated with less rapid decline, or even maintained performance, although inclines seem to be extremely rare or non existent (Stanford 1977). One complicating factor is that parapsychological interest in declines has waned, so that REG results are not usually reported in such a way as to allow declines to be assessed, although if significant inclines or declines were obtained in REG studies they would be certain to have been reported since these trends would be quickly recognised.

Only one study of PK training has been reported (Thouless 1945), the author serving as subject and using a spinning coin as PK task. He obtained an overall positive significant deviation, along with a statistically signifcant decline across sessions. The prospects for training at REG or dice tasks would appear to be dim. Tart has discussed the conditions he construes as necessary for individuals to improve their scoring rate in REG PK tasks (Tart 1983). The question of why REG and dice PK tasks should not be nearly as suitable for training purposes as PKMB is discussed below in chapter 4 .

In some contrast to the situation with REG PK tasks, PKMB has been reported by several sources to improve with practice.

Cantor reported that all of his interviewees claimed that their PKMB ability had not declined over the four years since they had discovered it. Nine of the twelve claimed that control over PKMB increases with practice. Cantor noted that "Peter" (Hasted's subject "Andrew G") had found his sculptural abilities to improve with practice. Several of the other children reported that their ability to control the shape of their ostensibly PKMB-caused deformations had improved with practice. Children who had not exercised their PKMB for some time found that at first their ability had declined but that they could improve their performance with practice sessions (Cantor 1979).

Hasted has reported improvement in the PKMB ability of his subjects following practice (Hasted 1981a). He also reports (Hasted 1984) that while still at school Stephen North did not participate in PKMB experimentation during the school holidays and that upon his return to experimentation it would usually take three weekly sessions for his performance to reach its normal level.

Bersani (Bersani 1984) reports very similar evidence of improvement of PKMB with practice amongst the ostensible PKMB agents he worked with. Lack of practice of PKMB also produced decrements in performance analogously to those reported by Hasted and Cantor.

2.21 Within-Session Inclines and Declines

The data relevant to this aspect of PKMB performance must be regarded with considerable caution for several reasons. No studies of the within-session patterns of PKMB output (other than those reported below in chapters 4) have been performed, so that the evidence is dependent upon memory.

There are also indications (see below) that patterns of decline and incline may be dependent upon the identity of both subject and experimenter and can even be variable from session to session. If, as will be discussed in the psychological theory section, (2.3.5) performance may partly depend upon rapidly fluctuating attitudinal and cognitive factors, this variability could be expected.

One constant seems to emerge from all reports, which is that PKMB like other human capacities declines with fatigue, so that no ostensible PKMB agent can produce an indefinitely extended output. Thus all PKMB performances if protracted for long enough during a single session will decline (Hasted 1981a, Cantor 1979, Bersani 1984).

However, an interesting reported finding here (Robertson 1980) is that "marathon" sessions held by David Robertson (Hasted's assistant) with Julie K at her home showed an apparently cyclic pattern of uPKMB output and an overall incline across a protracted period.

Robertson would arrive on the Friday evening, set up and run the strain gauge equipment continuously for the rest of the evening. On the Saturday morning he would again start the equipment and run it continuously all day, leaving on the Sunday morning. Typically, uPKMB signals would be relatively infrequent on the Friday night and an overall incline took place whereby signals were frequent by the evening of the Saturday. Within the Friday night and Saturday periods however, there would be cyclic variations of the frequencies of signals, although no formal analysis of these sessions was performed so that the durations and spacings of bursts of signals cannot be reported. PKMB attempts were interspersed with quite long periods of inattention to the equipment during these day-long trials.

In the single uPKMB session held by Hasted with Julie K at her home attended by this author, the cyclic variation of her uPKMB output over a period of about six hours was very evident. Unfortunately no other experimenter seems to have held similar protracted sessions with his PKMB subjects.

Hasted has reported (Hasted 1984) typical patterns of uPKMB output with Stephen North as being a slow incline through the session. A similar pattern was followed by most of his other uPKMB agents.

It is important to note that Hasted encourages his uPKMB subjects to attempt uPKMB for only fairly brief periods of between 5 and 10 minutes (Hasted 1984). He believes that effortful striving at the PK task is inhibitory and that even direct attention paid to the PKMB task is inhibitory, so that periods of direct attention or effort are deliberately restricted. Stephen North also strongly believes that in order to avoid inhibition his attention must not focus narrowly upon the uPKMB task (North 1983). The pattern of working in Hasted's uPKMB experimental sessions therefore consists of short periods of attention to the uPKMB task, interspersed with longer periods where the PK task is only rather indirectly attended to.

Several other workers have produced accounts of their PKMB sessions which indirectly imply the existence of some form of incline in performance. The main evidence of this is the use of "warm-up" PKMB tasks (Shafer 1980) where deliberate use is made of rather insubstantial cutlery under intentionally loose observational conditions to provide an easily accomplished PKMB task before more secure tasks and more careful witnessing are introduced into the session.

Similar procedures have been used in Houck's PKMB party screening technique (Houck 1982 see chapter 3) and they have also been reported as being used by Japanese teenage ostensible PKMB agents (Uphoff 1980).

However, within-session inclines in uPKMB performance are by no means invariable and the suggestive evidence cited above should be viewed cautiously. This author has noted that the tendency towards inclines or declines differs between subjects and also may vary with the same subject on different occasions (see chapters 4, 5 and 6).

2.22 Cognitive and Belief Factors

As well as providing indirect evidence for a possible incline effect, the use of warm-up PKMB tasks provides a suggestive indication that the subjects' reactions to what they perceive as success at the warm-up PKMB task may be an important cause of increases of PKMB seen after completion of such tasks.

Success at the warm-up task may enable subjects to reach an involuntary belief state which has been hypothesised to strongly facilitate the elicitation of their PKMB (Keil 1980).

If a shift in belief state were to be caused by the perception that a metal specimen had bent, the elicitation of additional observed PKMB could then reinforce the belief state still further, leading to a sudden increase in the elicitation of PKMB. Elicitation of PKMB might then be predicted to occur as a step function rather than linearly with time, the step function occurring as some threshold of the subject's belief state was exceeded.

Some of the attempts to elicit PKMB in group screening procedures (see chapter 3) seem to have involved this type of threshold-exceeding step function where ostensible PKMB effects have rather suddenly broken out and then spread through the group (Houck 1982, Isaacs 1981), although these accounts must be viewed with caution because low standards of security against deliberate or unconscious fraud were applied.

Threshold effects during Hasted's uPKMB sessions have also been reported (Hasted 1984), Hasted terming this the "we're off" phenomenon. Hasted has attempted as far as possible unobtrusively to reinforce this perception on the part of his uPKMB subjects because he sees their uPKMB output as being facilitated by their construing themselves as succeeding at the PK task.

Cantor has laid emphasis on the importance of his child interviewees' confidence of succeeding as being an important determinant of success (Cantor 1979).

This author (Isaacs 1981) has laid stress on the crucial role played by the ostensible PKMB agent's belief state in facilitating the elicitation of PKMB. The source of this approach lies in the theoretical formulations of K.J.Batcheldor (Batcheldor 1968, 1979, 1984).

2.23 A Physiological Study of PKMB

Dierkens (1978) has conducted the only study yet published of the use of EEG monitoring during (two) macroscopic PKMB sessions run with Jean-Paul Girard as subject. The EEG was recorded with Girard sitting in a standard EEG armchair within an electrostatically shielded enclosure. Electrodes were placed at frontal (F3-C3), parietal (C3-P3 and C4-P4) and occipital (P3-O1, P4-O2 and O1-O2) positions. An 11 channel pen recorder provided a permanent visual record and a 7 channel tape recorder provided an alternative record for spectral analysis.

The metal specimens used were aluminium bars. Three video cameras were employed. One gave a general view of Girard and the bars placed on the adjacent table, a second constantly observed his hands whilst the third was focussed on the EEG pen recorder. In addition to Dierkens and his technician, two and sometimes three other persons were present as witnesses. No attempt at fraud was seen either directly or on the videotape of the sessions.

In the first session the EEG recordings were reduced in value by artifactual signals deriving from the subject tensing the muscles of his upper jaw. In the second session Girard was requested to desist and artifact free EEG recordings were obtained. Electrocardiogram recordings were also taken.

At the first session Girard took several hours to produce the first effect. He adapted to the conditions more rapidly at the second session and produced the first deformation after only 15 minutes. Clearly visible deformations were produced on 10 occasions at the second session. Girard was allowed to handle the bar during his PKMB attempts, but bars were found to be bent, ostensibly without Girard having touched them before and after the formal session (possible anticipation and release of effort effects).

An attempt was made in this study to utilise strain gauge recording of possible uPKMB effects occurring to bars remote from the subject and of specimens bending whilst the subject held them. However an error was made by mounting the strain gauge upon a strip of aluminium sheet which was then taped to the bars by means of Scotch-tape. This prevented uPKMB signals from being recorded.

It should be noted that in the discussion section of the paper (which was presented at a Parapsychological Foundation conference) Dierkens was asked whether the EEG had been submitted to blind analysis. Dierkens misunderstood the question, so that the answer is unknown. Thus the possibility exists that the results may be suspect because of analysis of the EEG record not being conducted under blind conditions. But the text makes it clear that electronic spectrum analysis was performed, and the amplitude of the alpha wave signals was large, so that error due to checker bias may not be present either because estimation of alpha percent-time was made instrumentally, or because the alpha pattern dominated the EEG when present, as Dierkens implies.

Girard's resting EEG showed a general background of predominantly beta frequency components with bursts of alpha of a few seconds duration with highest amplitude in the occipital region. During the PKMB attempts Dierkens found that the EEG showed two distinct phases.

In the first phase bursts of alpha occurred most prominently in the parietal region. Whereas Girard's resting EEG showed a percent-time level of less than 20% alpha in the parietal region, during the first phase of PKMB attempts the percent-time alpha rose above this level. The first phase lasted variable periods, Dierkens stating that its length depended upon Girard's confidence, the first phase of the first PKMB attempt of the second session lasting 7 minutes, the second 3 minutes, but no first phase period lasted for less than 20 seconds.

The second phase was characteristically marked by a sudden shift in which the bursts of alpha in the parietal region became a continuous quite high amplitude alpha output of 10 Hz, lower but detectable quantities of alpha occurring generally at other electrode sites. Spectrum analysis showed no theta content in the EEG from either phase one or two. Beta was frequently observed, although its frequency was of exactly twice that of the alpha detected. Dierkens admits that this could suggest some artifact was present but states his own opinion that it was not artifactual - two other individuals had EEGS recorded under identical conditions and their beta spectra were quite different. No specific beta waveform was observed at instants of PKMB action, although visual inspection probably would not reveal low level but PKMB-associated waveforms.

Deformation was observed usually to occur during this phase and if the transition to continuous alpha did not occur the PKMB effects either did not occur or were greatly reduced in magnitude.

During the second phase Girard's heart rate increased markedly, usually to between 95 -100 beats per minute, although peaks of 115 to 120 were recorded at times. Despite the high heart rate Girard appeared to be in a relaxed and abstracted state, as if he were daydreaming.

Typically, intervals of from 1 to 2 minutes would occur between the onset of the second phase and observable deformation of the PKMB target. In conversation Girard claimed that at the start of the second phase he would know that PKMB was about to occur. In view of the EEG and cardiographic changes it is not surprising that he should be able to identify the internal state changes indicative of imminent PKMB.

When Girard was asked to reproduce his PKMB state in the absence of a PKMB target specimen his EEG record was very similar to those obtained in other attempts, but his heart rate did not show as large an increase as in the other attempts conducted with a PK target present.

Girard was given a wooden bar as PKMB target which he only managed to deform to a minimal extent after a protracted effort. During this attempt and other unsuccessful attempts the transition to the second phase did not occur.

Girard's PKMB elicitation behaviour suggested to Dierkens a possible similarity to masturbation. He therefore ran a control EEG session on Girard whilst he did actually masturbate but found that the EEG at orgasm differed from the PKMB EEG in that the parietal output, although of large amplitude, was of 4 Hz frequency rather than 10 Hz. It is surprising that no replication of this study has been reported because the EEG changes accompanying PKMB appeared to be consistent and striking.

2.24.1 Theories of the Psychology of PKMB : Introduction

PKMB seems to present a phenomenology akin to that of some only partially controllable physiological function. Unlike most normal sensorimotor tasks, PKMB may not be accompanied by specific sensory or other awareness of when it is being accomplished and subjects have only a limited control over the effects they do produce (Cantor 1987).

Many of the characteristic features of PKMB seem to derive from this relative lack of voluntary control. The lack of control is an important theoretical problem which has still not been fully understood. Hypothetically, the lack of control could arise from many different sources.

If PKMB improves with practice, which the evidence reviewed above (and see chapters 4 to 7) suggests it does, one almost certain source of deficiencies in control is the novelty of the PK task as compared to sensorimotor abilities which are usually highly overlearned. When compared to their level of practice of normal sensorimotor tasks the amount of practice time spent by PKMB agents performing PK tasks is negligible, even in the most practised PKMB agent.

The gaining of control over PKMB seems not to be a task which is facilitated by already learnt motor control patterns acquired from performance of normal sensorimotor tasks. Its improvement by practice seems not comparable to the learning of the many specialised sensorimotor tasks used within experimental psychology which require only the incorporation and adaption of preexisting motor patterns and sensory skills which are already overlearnt.

There is also evidence to show that arousal itself is a highly inhibiting factor in PK (Robinson 1981) so that the normal orienting, attentional and arousal processes employed in voluntary motor coordination may, if deployed in service of PKMB, result in inhibition. The PKMB phenomenology certainly strongly suggests that this is so.

This probably slows the learning of control, since the normal attentional and vigilance sets of subjects may be extremely difficult fully to discard, despite the self reports of ostensible PKMB agents that they are aware of the specialised attentional strategy necessary in order to optimise PKMB performance (Cantor 1979). The relapsing into these inappropriate strategies in highly stressful PK performance situations, such as validation attempts, is therefore predictable and would be predicted to result in failure at the PKMB task. Stanford (see below) lays great stress on the inhibitory effects of "willing-wishing inhibition" (Stanford 1974b) which could be expected to be evoked by "crucial-test" atmosphere of most validation attempts.

2.24.2 The Biofeedback Analogy

PK performance has been compared by Beloff to the control of physiological functions by biofeedback methods (Beloff 1979). This may be a fruitful perspective from which to view PK, because there are undoubtedly some parallels to be drawn. Beloff however goes on to suggest that the similarities may be symptomatic of a deeper underlying identity because he advocates a dualist view of the mind/brain relationship wherein control over brain function to initiate voluntary behaviour is accomplished by PK.

Beloff points to the similarities in what appear to be the optimal elicitation strategies. In both PK and biofeedback, effortful striving is counterproductive and inhibitory of the desired effects. "passive volition" seems the optimal elicitation strategy for each (Green 1976 et al, Shafer 1980, Stanford 1977, Hasted 1981a).

Sometimes early in biofeedback training, reversal of the desired effect takes place, so that opposite changes take place to those intended (Green et al 1976). REG PK tasks are subject to analogous psi-missing effects, where statistically significant displacement of effects onto unintended targets takes place (Stanford 1977).

Both processes seem to be beyond the reach of introspective awareness. They also seem, from certain points of view, to be essentially goal oriented or teleological in character. Goal oriented imagery can be facilitating for both (Green et al 1976) although some PK studies (eg Stanford 1969) have shown that visualisation was most effectively used by subjects showing a predominantly visually oriented cognitive style, non visual methods of elicitation being more effective for subjects having a predominantly non-visual cognitive style. Specification of the goal state (plus feedback on its attainment) appears to be sufficient, with practice, to allow it to be achieved - without the individual needing to have any intellectual knowledge of the processes involved, nor any sensory awareness of possible mediating or intermediate processes (Green et al 1976).

From this perspective the problem of PKMB elicitation would appear merely to be that of subjects having to learn by a form of feedback assisted trial and error learning to reach the psychological and physiological state which is productive of PK, errors (ie failure to produce PKMB) being caused by inexperience in reaching the elicitation state.

But there is an important conceptual distinction to be drawn between failures of control, ascribable to various sources, and systematic inhibition which may at some level be motivated in a consistent fashion, although not experienced as such by subjects. Additionally, certain cognitive factors seem to play a much more crucial role in PKMB elicitation than do cognitive factors in biofeedback control.

2.24.3 Batcheldor's Theory of PK Induction

It is these latter factors which are given an important role in Batcheldor's theory in the form of variously titled "resistances" and in Batcheldor's stress on suggestion as the principal PK eliciting factor. If a convincing case can be presented for some forms of inhibition in PKMB to be systematic and motivated, then the parallel with biofeedback processes weakens considerably.

However, the primary factor which in Batcheldor's theory is hypothesised as determining PK performance (including PKMB) is a form of involuntary belief state or suggestion (Batcheldor 1983).

This represents a very different conceptual basis from the biofeedback paradigm, because biofeedback performance is generally not construed in terms of a cognitive model involving suggestion or belief.

In some formulations of the theory (Batcheldor 1968) this mechanism is talked of in terms of belief or expectation, but later clarification of elements of the theory have shown (Isaacs 1983, Batcheldor 1983) that the central concept is based on suggestion, not directly upon belief, although belief has a very important role.

PK is hypothesised by Batcheldor as being elicited by the PK agent involuntarily acting upon a suggestion that PK is about to occur or is currently occurring. The source of the suggestion is usually contextual and implicit, although it can be explicit and verbally formulated, as in hypnotic induction practices.

Diverse sources of PK eliciting suggestions exist, some of which may be available for deliberate use by the PK agent such as saying "bend, bend, bend", a common starting point for PKMB agents attempting PKMB elicitation (Cantor 1979, Shafer 1980). But the paradigmatic source is the subject's consciously held belief that PK is about to happen or is in progress of occurring. This is a central axis of the theory because it supports a major hypothesis that PK can be elicited by the misconstrual by the PK agent of normal events as being PK. This feature has been termed the "artifact induction hypothesis". Artifacts, if misconstrued as being genuine PK by the PK agent can heighten his belief state, leading to the elicitation of genuine PK.

The artifact induction hypothesis was formulated in response to Batcheldor's noticing that ostensible macroscopic PK effects in sitter groups could seemingly be triggered by the group construing a normal (ie non PK) movement of the table used as PK target as being paranormal. Similar elicitation of ostensible PK would occur in response to normal noises which were construed as psychokinetic in origin, whereupon apparently paranormal rapping noises would occur.

Manipulation of PK agents' performances is hypothesised to be possible by exposure of them to deliberate artifacts which they misconstrue as PK. This has been reported in a quasi-experimental study by Brookes-Smith (1975) using deliberate deception of members of a sitter group. Reichbart has commented on the possible use of this technique by shamanic and magical practitioners (1978). Unfortunately systematic studies of this potentially important factor have not been performed yet. However, the use of deception in experimentation naturally raises ethical issues. The artifact induction mechanism is explicitly mentioned by Hasted as being an effective means of precipitating increments in the PKMB agent's performance (Hasted 1981a).

Batcheldor's theory is also highly compatible with the use of artifact-prone "warm-up" tasks which are seen within the theory as generating the all important belief that PK is occurring. Artifacts may arise in warm-up sessions with flimsy cutlery either because the ostensible PKMB agent incorrectly senses the cutlery bending when it is not, the illusiory sensory impression generating a pro-PKMB belief state, or artifacts may arise because the individual may not correctly sense that the amount of manual force their are using is sufficient to deform the cutlery. It is also compatible with there being within-session and across-sessions inclines in performance of PK as a result of a gradually accumulating confidence on the part of the PK agent that PK is occurring.

The belief state cannot be voluntarily attained, so that the onset of PK may be slow at first, since at every new PK attempt there is present the countersuggestion that perhaps PK will not occur on this particular occasion, even if the context is familar. However, if events occur which generate a powerful suggestion that PK is already occurring, elicitation may follow a step function, as has been discussed above (section 2.21).

Implicit in Batcheldor's theory is the concept of some form of summation process applying to the suggestions to which PK agents are subject. Suggestions which imply that PK will not occur (such as the utterances or behaviour of sceptics or doubts about their success on the part of the PK agent) enter the summation process together with suggestions that it will occur, and independently of the conscious intention of the PK agent the summation process determines the elicitation or inhibition of PK. For this reason the PK performance of PK agents is construed to be largely determined by external situational factors which trigger certain construals which serve as suggestions entering the summation process.

However Batcheldor posits that very experienced PK agents may have had such a large amount of experience of PK production in different circumstances that they will be relatively less susceptible to countersuggestions generated by any new context because they will be able to class the new situation with a past one where they were successful. Their faith in their ability to succeed will then supply the suggestion necessary for PK elicitation.

But the process of gaining this experience will perforce be a slow one. With familar tasks the knowledge of previous success is available to generate positive suggestions of success. But new tasks per se always imply failure because the knowledge that the PK agent has been successful in that context will be lacking.

This has the consequence that in the modification of PK tasks to make them more severe (as perceived by the PKMB agent), only slight modifications can be tolerated or the summation process will be upset by doubt of success consequent on the construal of the modified task as sufficiently different for previous success not to supply grounds for belief in success at the new task. An essential ingredient of the growth of more advanced PK displays in sitter groups is postulated to be its gradualism, the use of carefully graded tasks so as to maintain plausibility of accomplishment at each step in the development (Batcheldor 1968).

In addition to the suggestion mechanism, Batcheldor hypothesises that a passive orientation towards the PK task is necessary, and that especially during extreme displays of PK a non analytical mental state is necessary for their starting and continuance. Several experimental studies have shown that "nonanalytic" modes of thinking are more PK conducive than are "analytic" modes (Andrew 1975, Braud, Smith, Andrew and Willis 1976).

2.24.4 "Resistance" to PK

As well as positing that inhibition can be caused by countersuggestions of failure biassing the suggestion summating process or by an overly analytical mental state, Batcheldor posits the existence of various resistances to PK. Resistances are hypothesised by Batcheldor to arise as a result of a fear reaction to paranormal phenomena.

It is important to note that Batcheldor proposes that the elicitation of this reaction is dependent on cognitive and personality-related factors but is also highly dependent on contextual and setting factors, so that appropriate adjustments to these can lessen the severity of the reaction.

In sitter group practice ownership resistance is diminished by the group setting making it difficult to ascribe ownership of the PK to one person. Witness inhibition is decreased by preventing direct visual witnessing of PK events in the early stages of development of the group and in early stages of the development of new PK phenomena. Much of the gradualistic approach of sitter group technique seems to derive from the need slowly to desensitise the members of the group to displays of PK.

The fear reaction is hypothesised not to be directly experienced but is repressed. However the presence of the resistance is hypothesised to mobilise defensive behaviour unconsciously directed to stop the display of paranormality. These behaviours can in principle be used as criteria to establish the inferred existence of the resistances, so that the concept of resistance is not unfalsifiable, although as yet it has not been put to experimental test in PK research.

One likely means of dealing with the implicit threat posed by the fear associated with psi would be to deny its existence, and Batcheldor has stated (Batcheldor 1983) that resistance may motivate some of the more emotional attacks upon psi and parapsychology mounted by some sceptics. In a PK agent it is hypothesised to create inhibition of their PK output.

Batcheldor has been reluctant to speculate as to what the source of the fear motivating resistance behaviours could be and the written formulations of his theory do not include extensive analysis of possible sources of the fear of psi.

Possible sources (Isaacs 1983) might be the fact that psi phenomena are so anomalous with respect to the normal world view that they create powerful cognitive dissonance. Thus Taylor (Taylor 1975) gave his reaction to the sight of Geller bending metal ostensibly paranormally as one of extreme shock and intellectual insecurity because he thought that if real, psi phenomena posed a threat to the cannons of science that he adhered to.

Media treatment of psi phenomena has often been to present them as frightening intrusions from an unknown realm. Frequently the association between psi phenomena and death and fears of the malevolent ghosts and entities of folklore and legend has been heavily emphasised in popular treatment of psi. This is especially evident in the popular treatment of poltergeistery where the divergence between current parapsychological thinking and the popular press's treatment is particularly acute.

This general tendency of the media may have caused a general reaction that to accept the claims of parapsychology is tantamount to returning to a mediaeval world of witches and demons. It is also true that a fraction of spontaneous psi cases do involve its occurrence at times of death, or its association with other serious and life threatening trauma (Rhine 1961). One of the most potentially fear inducing aspects of psi may be its relative uncontrollability. Tart has discussed the various fear reactions to psi phenomena and methods of dealing with them (1983a).

Batcheldor has focussed on three main aspects of resistance to psi. One is the existence of a general resistance to psi as outlined above. The second is "ownership resistance", the third is "witness inhibition" (Batcheldor 1966).

The quasi-experimental data base upon which the theory was developed has been generated by Batcheldor's extensive running of sitter groups (Batcheldor 1979). These are small groups which meet under seance room conditions of darkness to attempt to induce various macroscopic PK phenomena including the movement of objects (Brookes-Smith 1973).

Within his groups Batcheldor claimed to find a marked reluctance of individuals to self-ascribe the PK agency to themselves. He took this apparently rather highly motivated denial of ownership of the PK (hence "ownership resistance") to be a form of resistance, because individuals were hypothesised to find possession of PK ability threatening.

His examination of the 19th and 20th century literature regarding physical mediumship revealed an analogous tendency even amongst individuals whose presence in groups apparently was responsible for the ostensible PK occurring in them, since ownership of the PK ability was usually vested in some form of discarnate being, the living person construing their role as merely that of a channel to allow the ingress of influences from outside. This he took to be further evidence of the operation of ownership resistance (Batcheldor 1979).

In this context it is interesting that the ostensible PKMB agents Geller and Silvio appear to believe that their powers derive from sources outside themselves (see section 2.14). The survey data (Price 1977, Gruber-Wendlandt 1977) have shown that more than 75% of individuals claiming PKMB effects resulting from exposure to Geller ascribed ownership of the effects to Geller rather than themselves even though in most cases the ostensible effects almost certainly originated from themselves rather than Geller.

Evaluation of the claim that denial of ownership constitutes a sign of resistance rather than being simply a symptom of the ego-alien nature of PK depends upon the establishment of the claim that ownership of PK ability is threatening to the individual denying ownership. This has not been done by formal experimentation as yet.

The type of ostensible macroscopic PK phenomena encountered in sitter groups is notoriously shy of being closely observed or submitted to decisive tests of its genuineness (Batcheldor 1979). Batcheldor hypothesised that the direct visual witnessing of macroscopic PK events aroused a particularly strong emotional resistance, "witness inhibition", which inhibited this type of PK event if it would have been observed under good conditions, hence preventing an otherwise disturbing observation.

The sight of some object behaving anomalously in response to PK would run directly counter to the normal cognitive habits of the observer and thereby is hypothesised as possibly arousing fear. Where the observer would have been the PK agent, this is hypothesised to cause inhibition of their PK output.

In the sitter group context Batcheldor prefers to conceptualise all members as playing a role as potential PK agents, even if the ostensible PK events are at first initiated by one particular individual. He hypothesises that perhaps all observers or potential observers of PK events may play some part in either shaping the events or in inhibiting them, so that there are no PK-neutral witnesses.

This form of inhibition was hypothesised as general, applying to any situation in which large scale PK events were to either be witnessed or instrumentally detected or recorded (Batcheldor 1983).

He hypothesised that the degree to which resistance would be aroused would relate directly to how threatening the resultant observations of PK would be. The degree of threat depends upon the extent to which the PK display departs from the behaviour of normal non psi-based processes. Thus for example, macroscopic with-touch deformations are hypothesised to arouse less cognitive dissonance, and hence less resistance, than are without-touch PKMB deformations, which clearly depart more radically from physical activities to which onlookers will be habituated. Since observation of macroscopic PK events would seem to pose much more of a threat than observation of REG trial hits Batcheldor's theory would predict that successful REG PK studies could be relatively readily performed, compared to the elicitation of macroscopic PK events.

REG PK events are hypothesised to pose much less of a threat than are macroscopic PK events because for any sequence of REG outputs, hits cannot be differentiated from the chance states of the machine so that confrontation with paranormality is limited to the relatively innocuous observation of statistical deviations from chance, rather than involving the observation of some overt anomalous behaviour by an object, such as its moving or deforming for no obvious reason.

2.25.1 Batcheldor's Theory Applied to PKMB

In summary, applied to PKMB, Batcheldor's theory would predict that :-

(1) Confidence in success or the belief that PKMB is occurring or imminent would be PK conducive (PKMB is elicited by suggestion).

(2) PKMB could be elicited by artifacts or artifact-prone "warmup" PKMB tasks (artifacts create suggestions of success).

(3) PKMB "contagion" (a step function in PKMB elicitation) could occur in group settings, or even with individuals (as a result of

the sudden generation of PKMB eliciting suggestions).

(4) Experienced PKMB agents would be less readily inhibited than inexperienced ones (the agent's confident belief state is hypothesised as the source of PKMB eliciting suggestions).

(5) PKMB would be more readily elicited by "passive volition" (egocentric effort is inhibitory).

(6) PKMB performance is facilitated by a non-vigilant, non analytical frame of mind.

(7) Once started, deformation would continue most readily if the agent and observers could continue to observe passively and non analytically.

(8) PKMB would tend to displace from formal targets onto other objects (because PKMB occurring unobserved creates less witness inhibition and active willing is inhibitory).

(9) PKMB events would tend to occur unobserved, or when attention was withdrawn from the task or specimen momentarily (witness inhibition and withdrawal of effort).

(10) The presence of sceptics or crucial tests would be highly inhibitory (suggestions of failure).

(11) Changes of place or situation from settings where success had already been achieved would be potentially inhibitory (suggestions of failure).

(12) A relaxed informal mood amongst persons present at a PKMB attempt would be conducive, and conversely, hostility or tension are inhibitory (stress and tension lead to egocentric effort and possible suggestions of failure).

(13) PKMB agents would tend to deny "ownership" of their phenomena (ownership resistance).

(14) The ascription of ownership to some other source is facilitating

to PKMB (ownership resistance reduced and facilitation of non striving attitude towards PKMB task, belief in powers of other source generates suggestions of success).

(15) Micro PKMB should be more readily elicited than macroscopic PKMB (because of less witness inhibition).

(16) With-contact macroscopic PKMB effects should be more readily obtained than without-touch PKMB effects (belief in success is more likely if touch is allowed and resistance is lower for with-touch PKMB because the PK action is then less dissonant with the normal behaviour of manually stressed metal objects).

As will be seen from a comparison of the phenomenology of PKMB with the list above, Batcheldor's theory provides a good first approximation to much of the data as it appears to be configured at present.

In communication with Batcheldor (1984) he has elaborated some of the content of his publications. He has stressed that his theory frequently provides multifactorial explanations for facilitation or inhibition of PK (as for example in the bifactorial explanation for the increased readiness with which with-touch PKMB can be obtained in (16) above).

Batcheldor considers that some of the phenomenology of PK would be well described by an explanation based on conditioning or probability, the likelihood of PK occurring on a particular occasion depending on its frequency of occurrence in the same setting before. This aspect is the feature motivating his emphasis on the importance of gradual changes in conditions being made. However this element has not found its way into the later, published versions of the theory. Batcheldor also emphasises that he does not regard his theory as final but as still being in evolution.

2.26 Stanford's Theoretical Formulations

Accounts of Batcheldor's theory have only recently started to become available in published form (Batcheldor 1983) although unpublished manuscripts have been available since 1968 (Batcheldor 1968). Virtually all of its central hypotheses remain untested experimentally. However, acknowledgement of elements of Batcheldor's theory has been made by the other major theorists of the psychology of PK, Rex Stanford and William Braud.

The main thrust of Stanford's own major published theoretical contribution to the psychology of PK has been directed towards non intentional PK (Stanford 1974b), although laboratory performance has been discussed by him briefly in this publication and at greater length elsewhere (Stanford 1977). The choice of spontaneous PK as the starting point for his theoretical formulations was made as a result of the reasonable assumption that if PK abilities exist they do so because they have some role to play within the life activities of organisms, rather than existing for the sake of experimental parapsychologists. Nevertheless his hypotheses regarding spontaneous PK have been explicitly formulated so as to be experimentally testable.

The formulation presented in the 1974 publications (Stanford 1974a & 1974b) is the Psi Mediated Instrumental Response (PMIR) model whereby psi responses (ESP and PK) are viewed as instrumental to satisfaction of the organism's needs. The view taken is deliberately general, encompassing both human and possible animal psi and including both ESP and PK.

The Conformance theory (Stanford 1978) was published later although Stanford had already formulated it and had it in mind when publishing the PMIR formulation (Stanford 1976). It is presented as a correlational rather than a transmission theory of psi. PK was conceptualised as an ordering, organising principle involving the somewhat mysterious ability of the universe to reconfigure itself in part so as to conform to the needs of organisms, rather than as involving an energy of any kind transmitted from the organism. The Conformance theory was intended to be even more general than the PMIR model, possibly even encompassing psi events occurring in association with non living systems and was explicitly formulated to be compatible with the observational theories of psi (Millar 1978).

Stanford lays stress on the reconceptualisation of ESP incorporated in the theory. ESP is no longer pictured as an essentially perceptual-cognitive process but is seen as involving the facilitation of a wide range of potentially need satisfying behavioural responses some of which may have cognitive aspects but others of which may be the completely unconscious selection of behavioural responses not involving psi-salient cognitive states atall.

An hypothesis made within the Conformance theory is that the paradigmatic PK target is a randomly behaving system, because the major theorists of the observational theories (Schmidt 1975, Walker 1975) have started from a quantum-theoretic viewpoint where the biassing of quantum randomicity is hypothesised as being the point of ingress of PK into physical systems. REG PK target systems employ quantum indeterminate systems as their source of randomicity, and Walker (1975) has sought to show that dice subject to multiple bounces are subject to quantum indeterminacy resulting from the Heisenberg indeterminacy in their shape. In ESP processes some aspects of brain function are construed to be subject to quantum indeterminacy, allowing psi influences to elicit specific responses, some of which may have cognitive consequences (eg the facilitation to consciousness of memories, images etc).

In some respects the incorporation of the randomly behaving target hypothesis could be seen as narrowing the range of the model, since it is not clear at this stage whether all varieties of PK do in fact derive from a biassing process on quantum indeterminate reactions. Certainly the solid state specimens used in PKMB studies do not show spontaneous random behaviour except to a limited extent on a microscopic level.

The model involves three elements ; a "disposed" system (typically an organism with a need although in principle it could be a non living system having a presumably goal seeking configuration) ; a system which is behaving randomly, or which can be influenced by components subject to random behaviour ; some form of outcome which can be provided directly or indirectly by the randomly behaving system which is rewarding or need satisfying to the disposed system. A subsidiary hypothesis was that the disposed system should be organised to a greater degree of complexity than the random system.

The Conformance model hypothesises that disposed systems are capable of influencing the behaviour of random systems so as to bias their operation in such a way as to provide a need satisfying outcome for themselves (Stanford 1977). The disposed system is said to constrain the randomly behaving system to exhibit conformance behaviour (conforming to the disposition of the disposed system).

Stanford agrees with Batcheldor that egocentric effort and striving are inhibitory to PK, and that the externalisation of the responsibility for PK effects to some other agency which is construed to possess the capability for PK is facilitating (1974b). Much of the emphasis in both the PMIR and Conformance formulations is upon the relative autonomy of psi from conscious processes, PK being seen as essentially ego-alien. Egocentric effort must on this view be "wrong effort" (1977).

However because Stanford's central interest in the PMIR formulation was concentrated on non intentional spontaneous PK it could be questioned whether a model explicitly formulated to cover this domain is necessarily relevant to deliberate PK performances. It could be that in Stanford's emphasis on the need satisfying role of PK he does not include aspects which may superficially conflict with or not be implicit in this potentially somewhat biological view.

Batcheldor (1984) has commented that Stanford's concentration on need as the motive for PK seems not to answer the question as to what determines when psychokinetic responses are used to create need satisfying outcomes rather than normal action being used.

Prima facie there would seem to be large numbers of people (eg individuals in mental hospitals) who have powerful conscious and non conscious needs who are prevented from satisfying these needs by normal means, yet few instances of the use of PK in these contexts seem to be documented. Equally, Batcheldor comments (1984) that sitter group members may experience a powerful need or desire for PK phenomena to occur, yet PK performance does not appear to correlate positively with the degree of experienced need (and seems at times to correlate negatively with need).

There is indeed some evidence that non intentional spontaneous PK can serve the satisfaction of needs and Stanford has successfully submitted the need-satisfaction hypothesis to experimental test (Stanford, Zenhausern, Taylor, & Dwyer 1975). Several anecdotal examples of PK performing this function are also given by Stanford (1974b). Somewhat ironically, some theorists have suggested that a high proportion of the significant results achieved in parapsychological experimentation have occurred as a result of non intentional psi influence by psi-gifted experimenters (Millar 1979), a proposition also debated by Stanford(1981).

However, there would appear to be at least three distinguishable domains where PK phenomena are encountered which certainly appear broadly to differ in phenomenology and in the PK elicitation mechanisms involved, although there are also commonalities. One of these is the area of spontaneous non intentional need-satisfying PK addressed by Stanford.

Poltergeistery (recurrent spontaneous PK - RSPK) is the second, where the eliciting mechanism at least in some cases seems to be reactive rather than instrumental, although it certainly would seem that instrumental components do enter into the aetiology at times (Roll 1976, Scott Rogo 1978).

It could also be argued that at some level reactive responses were need satisfying within the economy of the individual, although there is a danger in so doing of making any human response classifiable as need satisfying and thereby trivialising the concept.

The third is intentional PK performance, which seems to differ from both of the other two phenomenologies, although many similar characteristics are present. It can certainly be argued that successful performance of intentional PK tasks fulfills several types of need, such as the gaining of approval from the experimenter, maintaining a favourable self image, self expression or achievement or even curiosity, as has been argued by Hasted (Hasted 1981a). All of these needs appear to be involved in experimentation with PKMB (Cantor 1979, Hasted 1981a, Shafer 1980).

Unfortunately the need satisfaction hypothesis as an explanation for intentional PK performance is always overdetermined, since a variety of possible needs could always be mustered in explanation if necessary. The problem seems to be whether these hypothetical needs can be isolated and separated sufficiently to provide falsifiable hypotheses for testing. Non intentional studies evade most of these methodological problems.

However, what is missing from a purely need-based explanation is an account of the effect of certain cognitive and mood factors which Batcheldor's theory identifies and supplies. The fundamental drive activating intentional PK could reasonably be hypothesised as need satisfaction. But the phenomenology demands the recognition of the salience of some crucially important intervening variables which mediate the characteristics of the PK and determine its occurrence.

Intentional attempts to produce PK must potentially be subject to factors resulting from the involvement of the agent's cognitive state and from its interaction with any PK occurring.

By contrast the PK elicitation scenario providing the context for Stanford's theory is a situation where the PK agent typically never knows that they have produced a given need satisfying situation by PK, so that cognitive factors can either be discounted or presumed to have only marginal effects. This crucial difference goes some way towards explaining the divergences in conceptualisation and approach.

But one central difference of approaches concerns the intended domains of the two theories. Stanford set out to create a very general theory, of potential biological relevance. The motivating impulse behind Batcheldor's theory was originally to explain the occurrence of PK at specific junctures within sitter group meetings, although he is now concerned that his theory should have as wide an application as possible within the PK domain (Batcheldor 1984).

Stanford's and Batcheldor's customary experiences of PK have also differed in significant ways and these differences are reflected in their theoretical treatments. To the experimental parapsychologist, such as Stanford, the presence of PK is typically detected as a slight but cumulative effect across many REG or dice trials, whereas the most striking feature of (macroscopic) PK immediately obvious to Batcheldor is its specific sudden occurrence or non occurrence at particular times within sittings.

If PK is regarded as a slight cumulative effect it is logical to consider the experimentally determined condition under which it is produced as being stable for the period of the run of trials, this being an aim of the classic experimental psychology paradigm.

However, since sitter groups involve essentially rather uncontrolled and spontaneous shifts in the states of consciousness, moods and belief states of the participants, they tend to direct the psychological observer's attention to rapidly fluctuating variables, in contrast to the experimental case. It is not surprising that Batcheldor therefore focusses upon specific potentially rapidly fluctuating factors, such as the belief states of the participants and their role in generating PK eliciting suggestions, since this mechanism is much more readily obvious in the context of a sitter group than it has been within the classical experimental designs usually used in parapsychology.

2.27 Braud's Theoretical Contributions

Braud has commented (1978) on psychological aspects of PK. He agrees with Stanford and Batcheldor that egocentric effort is inhibitory to PK and that externalisation of responsibility is facilitating.

He also agrees with Stanford and Batcheldor that ritual can be facilitating for PK, for which there is some suggestive evidence (Honorton & Barksdale 1972). Braud ascribes the facilitating effect of ritual to its assisting the externalisation of responsibility and reduction of striving. Interestingly, he comments that some of the success of psi facilitating manipulations of subjects (Braud 1978) may derive from the reduction of striving due to the responsibility removing aspects of the "ritual" involved in the performance of the psi facilitating procedures.

Braud has contributed to the debate over the observational theories and their implications regarding the nature of PK target systems and the role of feedback in psi processes. In a review of a series of 17 PK experiments (Braud 1978) where the amount of feedback given to the PK agent and to the experimenter was varied from study to study he found that comparable PK scores were achieved with very different feedback conditions. These studies demonstrated that PK could be obtained under conditions where neither subject nor experimenter received immediate trial by trial feedback, and where delayed feedback to the subject and experimenter was limited either to run scores or overall results.

The observational theories of psi have been construed as predicting that the amount of PK obtainable from a subject (and/or the experimenter) is dependent upon the amount and level (trial by trial : run score : overall scores) of feedback given to them. His results would appear to challenge the predictions of the observational theories. However these experiments were not decisive since further analysis might show that the level of PK encountered could be explained on the basis of a high level PK input from the experimenter or subjects to create results they were given feedback information about.

Braud has developed a number of hypotheses about the possibly inhibitory effects of immediate trial by trial feedback from PK target systems since in some studies (1978) subjects achieved higher scores in the non-feedback condition. He proposes that this form of feedback can arouse egocentric striving and that feedback may discourage subjects if they construe it as showing that they are failing to have an effect upon the PK target.

Batcheldor has hypothesised that trial by trial feedback could be facilitating if it created the belief in the subject that they were succeeding, but inhibitory if they construed themselves as failing. Batcheldor has also stated (1984) that trial by trial feedback may arouse resistance if given to subjects who would be threatened by strong positive results and that under some conditions trial by trial feedback may destroy the subject's PK-eliciting non analytic state of consciousness.

Braud has also hypothesised that psi tasks may be more readily accomplished whilst subjects are engaged in non demanding non analytic secondary tasks, such as appreciating music, rather than when engaged in analytical logical tasks, such as counting the numbers of letters in words or listening to closely reasoned pieces of prose. This hypothesis has been successfully tested (Braud et al`1976), although Stanford (1977) has pointed out that possibly confounding effects could have been created by task preferences and differences in mood created by subjects' responses to the two different subsidiary normal tasks.

Another theoretical contribution from Braud indirectly deriving from the observational theorists' construal of quantum indeterminate systems as the point of entry for PK concerns the relative accessibility of different types of PK target system to PK influences.

He has hypothesised (1980) that "labile" systems, those subject to large amounts of spontaneous change and having many possible alternate states, will be better PK targets than "inert" systems which do not show spontaneous fluctuations nor have extensive repertoires of spontaneously attainable alternate states.

This approach leads logically to the use of highly complex systems, such as biological systems, as PK targets. He reviews the results of several studies employing PK target systems of differing degrees of lability and concludes that his hypothesis is supported. However, there is an important confounding factor to which these studies are prone. Considered from the perspective of Batcheldor's artifact induction hypothesis, labile target systems (of which dice and REGs are specialised examples) could by pure chance present subjects with feedback which leads them to construe themselves as succeeding in influencing the PK target system in the desired direction. This may then lead to more effective PK elicitation because the change in the subject's belief state will, on Batcheldor's hypothesis be PK facilitating.

Conversely, the appreciation of failure by the subject early in their attempt to influence an inert PK target system may lead to them being discouraged by their apparent lack of success, possibly leading to increasing inhibition.

Until studies are performed which separate the factors due to the feedback properties of PK targets from factors due to their intrinsic physical nature the interpretation of Braud's studies and hence the evaluation of the labile versus inert PK target hypothesis must remain open.

The lability-inertia question is of direct relevance to PKMB since PKMB targets would appear to show zero lability. However, this is almost certainly highly deceptive, since on the Batcheldor view, which seems to offer the more fundamental analysis in this area, it is the perceived characteristics of the PK target (as construed by the subject) which is crucial. Macroscopic PKMB targets can easily generate illusory sensations in hopeful PKMB agents that the metal is bending or is becoming softer. UPKMB target systems can generate feedback which subjects construe as signalling success, so that if the crucial feature of labile PK targets is their generation of artifactual signals of PK success, both types of PKMB targets can appear to have this property. The uncritical acceptance of the debate over lability in PK target systems on Braud's terms would be naive in view of the important and probably salient difference of view introduced by the Batcheldor perspective on these issues.

2.28 Thouless's Theoretical Contribution

Thouless (1951) reported a PK die face experiment with himself as subject, using mechanical throwing of four dice. In this publication he also reported a number of tentative conclusions regarding psychological factors. A methodological reservation regarding this study is that it was self-scored, although Thouless shows awareness of this possible weakness and describes his procedures for ensuring scoring accuracy. The study was not intended as a validation attempt and his performances were not formally witnessed.

He found the same decline effects as have been widely reported elsewhere (eg Rhine 1970) in die face studies. He also found the declines to be specific to particular experiments, so that at the same session he would show different scoring rates according to which experiment he was contributing scores towards. Decline seemed to be a function of the reduction of novelty and interest in an old task (it should be borne in mind that experiments usually involved thousands of dice throws which could become very boring).

He thought PK more easily inhibited than ESP. He stressed the inhibitory effects of striving at the PK task, reporting that turning the experiment into a game played with his son was helpful because it changed the situation from being construed as an experiment, with which he became too engaged and anxious, to being a game towards which he could take a less serious attitude. The group around Rhine (Rhine 1970) had found a game like atmosphere conducive to good PK performance.

Thouless found that becoming very involved with the experiment, as he did with one performed during a university vacation, was inhibitory. Anxiety about results was also highly inhibitory. He described the optimal approach as " I want to succeed but I don't really care whether I do or not". He described this as embodying an effortless intention to succeed.

He cites an instance (ibid p123) confirming Braud's hypothesis about the possibly inhibitory effects of feedback. Thouless had completed 27 runs of a section of an experiment without totalling the scores. Upon calculating the scores he found that he had achieved a good rate and urged himself to maintain it. However he then scored below chance level on the next block of 27 runs, an effect he ascribed to anxiety about continuing to score at that level. He recommended not working out final scores until the experiment was completed.

Thouless found a variation in scoring rate with time of day, mornings and evenings producing higher rates than afternoons, even when he had not performed any morning sessions prior to the afternoon sessions. He noted that scoring was depressed if he felt tired, cross, ill or anxious. He reports that in performing experiments with other subjects he noticed that positive results would disappear if any person present showed hostility, suspicion or if tension was increased by over emphasis on experimental precautions. Rhine found a similar "witness" effect where introduction of a witness who was not known to the PK agent would temporarily depress the scoring rate, although it would rise again if the witness were friendly towards the subject (Rhine 1970).

After a period of decline in one experimental series Thouless tried the effect of repeating poetry to himself while he performed PK and found that it dramatically improved his scoring rate. He reported that reciting poetry produced an state of mild exaltation. However, prolonged use of this technique led to its becoming ineffective which he ascribed both to the fact that it no longer produced an alteration in his frame of mind, and also to its having been a novelty in the early stages of its use.

CHAPTER THREE

THE DISTRIBUTION OF PKMB ABILITY

3.1 PKMB Distribution : Methodological Considerations

An important but as yet unanswered question concerns the incidence of PKMB ability amongst the general population. The distribution of PKMB ability has far reaching implications, not just for theoretical reasons but also because the distribution could be expected to have substantial practical consequences in terms of partly determining the potential supply of PKMB agents for use in experimentation. If PKMB agents show other psi abilities this consideration becomes even more relevant.

The distribution of psi ability remains a surprisingly neglected question in the wider field of parapsychology. Millar (Millar 1979) has initiated a reconsideration of the topic by publishing a review of earlier work relative to this question (eg Schmeidler & McConnell 1958) and giving an analysis of the effects of various different distributions of psi ability. Moreover some of Millar's suggestions are germane to methodological issues which arise in any form of attempted investigation of the incidence and distribution of psi abilities including PKMB.

Early work in the Rhine laboratory was conducted using selected subjects but a fairly sudden change of emphasis occurred in the late 1930s when from that point onwards unselected subjects were employed (Pratt 1977). This tendency has continued generally within parapsychology and implicitly enshrines the assumption that psi ability is distributed normally, or near normally in a unimodal manner. Millar dubs this the "democratic" psi distribution hypothesis.

Schmeidler and McConnell (1958) speculated that psi might be distributed in a bimodal manner, most of the population being included within a distribution centered on a low level of psi ability (the democratic component of the distribution), but that so-called "star" subjects might constitute a second minor peak in distribution occurring at a much higher level of psi ability. Schmeidler and McConnell could not reach any conclusion about the actual distribution of psi ability because of the lack of relevant data available to them. Millar comments (1979) that this situation remains similar because no further work on distributions has been performed, but that some new data is available from other sources which supports a radically different view of the distribution of psi ability.

Millar argues in favour of the true distribution of psi being only of "star-subject" type amongst a tiny fraction of the population, without a corresponding "democratic" type wide distribution of a low level psi ability amongst the majority of the population. Only star psi subjects exist who may be found by screening processes and who will show psi effects even with experimenters who have no psi ability themselves.

Much more challengingly, he then proceeds further, to advocate the view that a very large fraction of the total parapsychological research employing unselected groups of subjects and achieving statistically significant results has been performed by a very small number of experimenters who are themselves concealed psi "stars".

Experimenters falling into the psi star category are hypothesised to be able to influence their subjects by psi into producing results which by and large confirm the hypotheses brought to their experiments by the experimenters. Psi-mediated experimenter effects can be produced without the experimenter having social contact with the subjects they influence. Experimenters who are not psi stars find either chance results or non replicable statistically artifactual results from work with unselected subjects.

However only fairly weak individual psi performances can be created in groups of subjects by psi star experimenters, although the pooled results may be statistically highly significant. Millar considers that the apparently rather homogenous distribution of psi scoring in groups of subjects revealed by analysis of parapsychological data is an important sign that it is not subject psi which is operative, because it could be expected to show a broader distribution, but concealed experimenter psi (ibid p93). The weakness of these psi effects have, on Millar's hypothesis, prevented a widescale recognition of this feature because of the unavoidable insensitivity of tests of distribution when scoring is only slightly above chance.

The possibility and extent of experimenter psi effects have been recognised and have occupied an increasing role in parapsychological debate of late (White 1976, Kennedy & Taddonio 1976). The discovery of psi-mediated experimenter and data-checker effects (Feather & Brier 1968) holds radical implications for parapsychological methodology because it suggests that very much more data should be gathered about the states, motivations and moods of experimental personnel in parapsychological experimentation than has been usual so far, and that experiments must always be designed so as to take account of potential experimenter effects. Millar advocates multiple experimenter designs as a basic requirement (ibid p106).

However, the implications of Millar's position are also important for any survey or screening work because there are at least two ways in which psi-star experimenters might unintentionally use their psi ability to bias results.

Firstly, if the test used in a screening procedure is one which can be performed by the experimenter or other screening personnel, it could be that the numbers of screenees apparently succeeding at the test would be artificially inflated by effects originating from the experimental personnel. This is of course an aspect of a more general question because other screenees may make undetected and unintentional contributions to other screenee's apparent psi performances. Millar points out that psi effects between subjects and experimenters may be additive, still further complicating the picture.

But Millar suggests that there are limits to possible psi contributions made by individuals. The limits are based on the observational theories of Schmidt and Walker (Schmidt 1975, Walker 1975) and are dependent on the feedback of results.

Psi effects on the performance of subjects (or any other PK sensitive systems) are hypothesised as only possible if the person acting as the psi source receives feedback concerning the performance of the person or the system that they affect. Because PK can act retroactively, results could potentially be affected by their examination by a psi star individual even after the experiment had been performed. This somewhat counter-intuitive PK mechanism has been shown to exist (Schmidt 1976) and at present it is unclear as to what, if any, limits apply to retroactive psi effects. Retroactive PK provides one mechanism whereby psi mediated experimenter effects may operate.

However, Braud found apparently very similar levels of PK performance to be obtained under differing conditions of feedback given to subjects (and also feedback given to the experimenter) (Braud 1978), suggesting that the observational theory hypothesis about the role of feedback may be too conservative. Research is in too early a phase for clear conclusions to be drawn, but the conservative view is that only if experimental personnel obtain feedback about screenee's PKMB results are they thereby enabled to influence them if they are themselves psi sources. A less conservative view is that widespread contamination of screening or survey results both by experimental personnel and ostensible PKMB agents may be possible in the absence of feedback.

The second type of confounding effect proposed by Millar is that the experimental personnel's psi may be capable of biassing the selection of populations to screen for psi ability, artificially inflating results (ibid p96). Stanford's PMIR model (Stanford 1974a & b) would suggest that the unconscious manipulation by psi gifted screening personnel of potential psi stars' behaviour so as to precipitate their attendance at psi screenings would certainly be potentially possible, although no experimental test of this has been performed.

Reports of surveys of and screenings for PKMB ability must therefore be regarded with caution and account taken of the psi performances of the screening personnel.

3.2 Surveys of Ostensible PKMB Events

Two surveys of reports of PKMB events associated with media appearances of Geller have been performed, one in West Germany by the group centered on Bender at Freiburg (Bender et al 1974, 1975, 1976a, 1976b, Gruber-Wendlandt 1977, Bender & Gruber-Wendlandt 1977), the other in South Africa (Price 1976, 1977a). Both of these surveys were succeeded by follow-up studies where visits were paid to individuals reporting PKMB events in the original surveys (Keil 1979, 1980, Price 1977b).

Unfortunately the German survey has not been published in full in

English, although all major findings were reported. The questionnaire was constructed in four sections. Section A dealt with the restarting of watches and clocks. Section B dealt with the deformation of cutlery. Section C consisted of questions about attitudes towards Geller, the respondents' interpretation of the claimed phenomena and their degree of familarity with the paranormal and the occult and their opinion on future economic and political developments. Section D was a standardized personality questionnaire developed by the Freiburg group.

Some 2,500 people had responded to Geller's media appearances in Germany in January 1974 by telephoning a radio station and notifying the newspaper Bild. The Bild mass test of PKMB involved people concentrating on watches or cutlery at a predetermined time when Geller would try to influence them.

Development of the questionnaire was performed in two stages. A sample of 80 respondents was interviewed by Gruber-Wendlandt, then a preliminary sample of 150 respondents were sent the questionnaire. Finally a further group of 850 were randomly selected and sent the questionnaire. Return rates for the two groups were 69% and 72%, indicating strong motivation.

On the item analysis, 402 out of 612 persons reported 559 influenced watches or clocks and 151 out of 612 reported 243 cutlery deformations. One quarter of those reporting effects on watches claimed spontaneous starting ; 17% of reports of cutlery deformation were of spontaneous effects. Of those respondents who later attempted to start a watch, 75% reported success. More than half those who attempted to repeat PKMB claimed success. Some 25% of the ostensible PKMB agents claimed that metal objects had deformed in their presence without touch, a fifth of them reporting fractures of metal objects.

Slightly more than two thirds of the watch and cutlery phenomena were witnessed by at least one other person.

Half the sample thought that Geller had caused the effects directly, a fifth considered themselves the cause of the phenomena but felt that they had been triggered by Geller and a third had no explanation. Of those who thought Geller the cause of the phenomena, 47% thought he might have done it with the help of "unknown forces" ; 22% thought of "supernatural powers" ; 52% thought him a medium with extraordinary abilities. Only 12 persons thought Geller a cheat.

A set of control groups was selected on the basis of age sex and educational attainment, to match the PK group, each control group having 191 members. The PK group reported a slightly closer connection with an occult attitude towards life than the controls, in a ratio of 50 to 30. Ninety five percent of the members of the control groups had heard of Geller and half of them thought that the Geller effect was no more than a "good trick".

The evaluation of the personality section of the questionnaire showed no significant deviations from the norm for the PK group. A set of questions sensitive to deception was used in this questionnaire so that the hypothesis that dishonest answers could account for the normality of the PK group's personality profiles seems unlikely. The remaining interpretations of this result would seem to be that the PK group was indeed similar to the norm, or else that the questionnaire used was not sensitive to relevant factors.

An important finding from factor analysis of the 103 item attitude section (part C) of the questionnaire was that 8 factors emerged as independently significant, the three most important being termed "belief in destiny", "Geller and miracle fascination" and "intellectual interest in the occult". Intercorrelation measures showed significant intercorrelation for all factors except "Geller and miracle fascination", suggesting that the Geller-cult aspects were independent of other beliefs.

Follow-up studies of some PKMB claimants were performed. The first (Bender 1977) reported that five of six "mini-Gellers" (presumably children ?) attempted to cheat when controlled experiments were performed with them. The sixth produced seemingly genuine phenomena which were apparently inhibited by attempts to film them. One family in Karlstadt seemingly were subject to an almost poltergeist-like attack of spontaneous PKMB wherein 54 pieces of cutlery were deformed, some of them whilst being observed under no-touch conditions by members of the local police force who had been called in. In the same publication Bender reports successful experimentation with Silvio and Jean-Paul Girard who both particpated in further experiments and showed long term PKMB ability.

Keil (Keil 1975) published a somewhat uninformative brief report of the progress of his following-up of some of the respondents to the Bender/Gruber-Wendlandt questionnaire. No results are given, but he makes the important observations that the respondents seemed to hold Geller responsible for the results and that this would be facilitating for their PKMB (because of increased relaxation and decreased striving for results and lessening of ownership resistance).

Keil later performed another follow-up (Keil 1979a & b), this time bringing a PK task with him to the subjects' homes, the task being to cause compass needle movements by PK. An initial approach was made by letter to 150 respondents to the original questionnaire, but only 40 replies were received (this was some 4 years after the questionnaire had been administered), 10 of which made claims that PKMB (as opposed to watch starting or other effects) had been performed by them personally. Keil visited 30 subjects, but only one family appeared to produce results on the compass. These were later thought to be due to magnetic fields created by the lift in their building (Gruber 1980). Keil took a strain gauge apparatus with him to 26 subjects but results were marginal. Keil estimated that 5 of the 30 claimants had demonstrated some form of PK ability during his visit (1979b).

In a discussion of this follow-up study (Keil 1984) he ventured the opinion that perhaps between 10% and 20% of the original questionnaire cases were genuine PKMB. His overall conclusions were that directly observable PK is more commonly distributed throughout the population than parapsychologists believe, but that the elicitation of PK is dependent upon particular psychological conditions being achieved. He states that he thinks that Batcheldor's concepts provide the most effective means whereby directly observable PK effects can be elicited for study.

Geller visited South Africa from mid July to mid August 1974. He performed five lecture-demonstrations and appeared on the radio four times, although only once did he make an appeal to listeners to attempt PKMB.

Price has reported the results of an analysis of 137 questionnaires received from individuals claiming PK events occurring during this period (Price 1977a). This figure represents a return rate of 85% of the total number sent out. A total of 144 individuals sent in written reports of their experiences, which numbered 183 in total, some individuals reporting more than one experience. The questionnaire data was computer analysed.

Price cites several cases as examples of the range of ostensible PK phenomena encountered. Ostensible PKMB events occurred before, during and after Geller's broadcasts and also to a few individuals who did not directly hear a broadcast themselves.

An analysis of the ages of experients was performed which yielded interesting results. Price cites the ratios of experients in different age groups compared to the proportion of the age groups given in the white population census of 1970 (all respondents were white).

For the 0-10 year old group this ratio was 0.2, for the 11-20 group it was 0.7, for the 21-50 group it was 1.2 and for the 51-100 group it was 1.6.

These results probably reflect the greater night-time radio listener population of older and possibly relatively isolated people, because a breakdown by marital status yielded corresponding ratios of 0.7 for single people, 1.2 married, 2.7 widowed and 1.9 divorced. The under representation of single people may reflect the fact that children and adolescents form a large fraction of this group.

The sex ratio of respondents was nearly equal, corresponding proportions being 0.95 for men and 1.03 for women. This is in sharp contradiction to the findings reported by Green (1960), Dale, White and Murphey (1960) and Rhine (1961) which show a strong apparent preponderance of women over men in reporting spontaneous psi events varying from a ratio of 10:1 to 3:1.

The interesting finding of an over representation of respondents in the older age groups probably reflects the distribution of the radio listener population and their readiness to initiate written correspondence, as remarked before, but even if this result is inflated to several times its true level it nevertheless strongly contradicts the popular myth that has grown up that PKMB ability is restricted to the young. However, Price points out that nearly all those who claimed to continue to be able to create PK effects were under 20 years of age (Price 1977a 103). This is an interesting and instructive disparity.

The numbers of respondents were also analysed with respect to their occupation and educational background. Since the census categorisations of occupation were not the same as those used by Price only general conclusions can be drawn.

It appears that academic and professional groups were over represented in the PK group, professional and technical workers constituting 5.5% of the census population but 23% of the respondents. Two other large groups of respondents were "scholars" (17%) and housewives (17.5%), although it should be noted that the unclassified-others group constituted 38% of the respondents.

The impression that academic and professional groups were over represented is reinforced by the finding that the group formed by graduates, postgraduates and diplomates was 60% of respondents, whereas this group constituted only 32% of the general white population.

Analysis of the ostensible psi events reported revealed that 17% were claimed as telepathic, 36.5% as PKMB, 30% were restarting of watches or clocks, 12% moving the hands of watches by PK, and 4.5% of other types.

Price claims that in 82% of cases there had been no possibility of Geller being able personally to influence the events through trickery because of the PK target being located remotely from him. Only 18% of the respondents had experienced the events whilst they were in close proximity with Geller, 15% of the events occured while Geller was on stage, 23% happened while Geller was talking on the radio and the experient was at home.

A total of 25.5% were multiple experiences following more than one type of contact with Geller (radio/stage, or private meeting). In all 20.5% of respondents claimed that they had on numerous occasions repeated their production of PK effects without the presence or assistance of Geller and 4% felt that they could do so but had not yet tried.

Some respondents (23%) claimed that they had directly watched the PK events as they occurred, sometimes for several minutes, 36% stated that they had not seen the events in progress and in 41.5% of cases it was impossible to judge one way or the other. Price shows a suitably cautious attitude towards these figures and points out that it is difficult to be certain whether the respondents had seen the PK action actually in progress or had just compared the before and after states.

Eighteen respondents experienced ostensible PK events during a live broadcast by Geller, whereas fifteen had experienced them during a recorded broadcast. Price points out that this is strong evidence in favour of the ostensible PK originating with the respondents rather than Geller, an impression all other similar work has reinforced and which is consonant with Batcheldor's hypothesis of suggestion being a principal PK eliciting factor (Batcheldor 1984).

Nearly half (43%) of the respondents reported a sensory or emotional experience associated with the PK event. Some 14% of respondents reported a feeling of warmth or tingling, another 9% experienced this and some other emotional experience. Thus over half of all those reporting associated experiences reported warmth or tingling, 17.5% reporting other forms of emotional experience.

Price (1977a) includes data on changes in attitude caused by the respondents' experiences. However a feature which should lead to these results to being viewed with caution is that the pre-experience attitudes were reported retrospectively, so may have been influenced either way by the respondents' subsequent experiences.

The distribution of pre-experience attitudes was centered on moderate positions. There were only 13% sceptics and 13% confirmed believers but 36.5% were doubtful and 38% were "well disposed". Unfortunately the exact questions to which the attitudes were evinced were not cited. Only 38% of respondents had had previous psi experiences.

After their ostensible PK experiences the respondents' attitudes changed. Only 6.5% remained sceptical, 12.5% were still doubtful, 28% were well disposed and 53% classed themselves as confirmed believers. However, the scale of the change in belief was surprisingly moderate, 41% showing no change, 42% showing a one step shift from one category to an adjacent one (eg from sceptical to doubtful or from well disposed to confirmed believer), 12.5% showing a two step change and 3.5% showing a three step change. Only 1.5% showed a change in a negative direction.

Price makes the point that these results appear to contradict the psi "sheep-goat" findings (Schmeidler & Murphey 1976) which have indicated that psi believers tend to obtain positive scores in forced choice ESP tests whereas psi sceptics tend to score in the negative direction.

Clearly the tasks and attitudes are not comparable, but the fact that half the respondents were seemingly on the doubtful side of neutral regarding the reality of psi before their experience is an interesting finding.

A similar independence of REG and die face PK scoring rates from stated attitudes towards PK has been noted by Stanford in his review of experimental PK (Stanford 1977).

This feature appears to contradict Batcheldor's theory if the elicitation mechanism is expressed in terms of belief, rather than suggestion. Batcheldor hypothesises that PK may be elicited by suggestion even when the conscious beliefs of the individual are sceptical towards PK. Another factor proposed by Batcheldor to explain this type of situation is the temporary induction of "instant" short-lived positive beliefs contradicting the individuals' long term beliefs, in this case resulting from exposure to the Geller broadcasts and stage performances. A further possibly relevant factor was that it was not the PK ability of the respondents which was construed as being involved but Geller's, 78% of respondents believing that Geller had produced the ostensible PK events rather than themselves.

Price comments that Batcheldor's witness inhibition appeared to play a part in inhibiting the mini-Gellers if they started their PKMB attempts whilst observed, although once the effects had started they would more easily continue whilst being witnessed. He explicitly ascribes responsibility for the elicitation of ostensible PK events to the effects on the respondent's beliefs of Geller's apparently successful performances on radio and the stage and likens this effect to that of the artifact induction mechanism.

Price's publication includes a histogram showing the numbers of respondents producing ostensible PK events and the relation in time of their ostensible PK events to the moment of the respondent having first direct exposure to Geller. Three respondents showed anticipation effects where ostensible PK occurred 24 hours, 75 and 15 minutes before exposure to Geller, but the largest two peaks (of 7 persons each) occurred in the intervals from 1 to 11 and 12 to 24 hours after exposure to Geller, showing what Price terms "lag" effects.

In his follow-up study Price (1977b) states that the previous survey had discovered 10 "mini-Gellers", 6 being children, 3 teenagers and 1 adult, who claimed a continuing PKMB ability, 7 being males and 3 female. Only 5 of the 10 claimants could be investigated.

Three groups of PKMB targets were prepared by Price for submission to the ostensible PKMB agents. Each group included a number of copper and stainless steel strips sealed in glass tubes and other metal and plastic objects. One group was locked inside a metal box, another was locked in a wooden box, whilst the third was left unenclosed so as to be handled freely by the subjects. The three target assemblies were left with the subjects at their home.

The results were largely negative. Only the objects left out of the boxes were affected, no strips enclosed in glass tubes were deformed and all deformations took place under unwitnessed conditions. Four of the five ostensible PKMB agents reported deforming metal specimens, but only if they could touch them. Two subjects broke metal specimens and bent and broke plastic objects.

Price mentions a number of factors which he thought might explain the results. He believed, on the basis of his visits and interviews, that it was unlikely that deliberate fraud had been perpetrated. Possible inhibitory factors he mentions include inhibition due to enclosure of the PK targets, possible physical shielding by the boxes, and the possible reduction in interest excitement and motivation caused by the passing of time since the original events had been reported.

3.3 Osborne's Australian PKMB Screening Tests

Keil has reported survey work performed by Osborne in Melborne Australia (Keil & Osborne 1981). Geller has visited Melbourne on three occasions. Osborne first obtained a video recording of Geller which he replayed to a total of 120 students, without any PKMB being forthcoming.

He next made a televised appeal for experients of PKMB to contact him. Some 1000 individuals did so and at the time of the report (1980) Osborne had tested 800 people of whom 40, many children, had produced deformation of specimens under his test conditions.

Osborne used two levels of test. The first employed household spoons which were blackened on the front and back of the bowl. The spoons had to be bent with one hand holding the extreme end opposite the bowl and one finger gently stroking the middle section of the spoon. The action was witnessed and videotaped. The bend, to be counted as successful, had to exceed 5 degrees and any blackening of the subject's hands invalidated the attempt. The spoon had to be in video view for the entire duration of the deformation. The videotape of each valid attempt was submitted to two independent judges and if they judged the protocol to have been obeyed, the subject was sumitted to the second level test.

The second level test was to bend an aluminium bar of 5 mm thickness, 20 mm width and approximate length 150 mm. The bar was inset into a close fitting slot cut into a perspex slab which surrounded all of the back of the bar and which came up to about half of the thickness of the bar around its perimeter, making it impossible for the bar to be bent by application of pressure to any exposed surface. To bend the bar it had to be deformed so that part of it emerged from the slot in the perspex slab. Forty subjects passing the level one test succeeded at the second level test.

Osborne also attempted to use strain gauges to register uPKMB events, but was not certain that the results obtained were definitely not artifactual.

Osborne's screening test is by far the most severe yet used by any worker attempting to screen large numbers of ostensible PKMB agents. It is therefore of considerable interest that he found even 40 of the 800 individuals tested able to perform the two tests successfully. His results suggest that levels of PKMB ability, and possibly resistance to inhibition, vary across PKMB agents, as might be expected, alhough this has not yet been established in formal studies. His results would appear to suggest that careful screening of large numbers of ostensible PKMB agents may produce a small set of highly inhibition resistant individuals who could make a significant contribution to the establishment of the existence of PKMB by sucessfully performing in very severe validation studies.

3.4 A Mass Public Experiment

Smukler and Seifer (1977) have reported what they term a mass public experiment in PK and ESP, using Geller as agent. The number of participants in the experiment was estimated by Smukler to lie between 15,000 and 50,000 although this is a speculative estimate.

Geller's photograph was reproduced on the cover of the American magazine ESP, which had a circulation of 40,000 for that issue. Across Geller's forehead in the picture was printed "This cover can bend your key on September 1, 1976 at 11.00 EDT". Inside the magazine was printed a positive, illustrated article about Geller written by Smukler. Two pages described the proposed experiment.

Readers were told to place keys, silverware and broken watches and appliances on the cover. Smukler reports that Geller was very exacting in prescribing the form of words used in the instructions. The readers were instructed to concentrate and to repeat the words "work" and "bend" over and over again. Participants were also requested to attempt to receive a simple picture sent by Geller. If any ostensible psi events occurred participants were requested to fill in and send back a coupon from the magazine.

Some 100 copies of the magazine were posted to individuals appearing in the American Society for Psychical Research's education directory which included a number of parapsychologists. Another 200 copies were sent to radio and TV stations, newspapers and prominent personalities. The response to these postings appears to have been very slight.

Attempts using the cover were performed live at three television and one radio station but none succeeded in the studios, nor did any of the experiments performed in the presence of Smukler or Seifer.

However some 150 responses were made to the live performances of the experiment at the TV stations and radio station. The failure of the in-studio broadcast attempts did not appear to prevent the reporting of ostensible PK events by viewers, over 100 calling the Cleveland TV station WJW-TV. Unfortunately no effective attempts were made by the authors to follow-up the responses they provoked.

A total of 127 coupons were returned from approximately 142 participants. From the names of the respondents it was concluded that 77 were female and 65 were males. Respondents appeared to be distributed across the USA fairly evenly. Sixteen letters claimed PKMB deformed cutlery, of which 14 people involved were women and 5 men. These claims were not followed up by the authors because they felt that it was too easy to bend cutlery by fraudulent means. Thirty seven respondents claimed to have restarted watches or clocks, of which 12 were men and 25 women.

Sixteen coupons claimed bent, broken or twisted keys, these incidents involving 9 female and 20 male participants. These ostensible PKMB incidents were taken more seriously by the authors and a follow-up letter was sent requesting that the affected objects be sent to them. Six people sent 7 keys, a nail file and a nail, the objects showing various degrees of deformation.

The authors report the results of examinations of these objects which led them to conclude that probably only the nail file showed evidential deformation, as a consultant had expressed the opinion that it would be very difficult to reproduce the observed deformation by normal means. However the photograph of the nail file (ibid p15) seems not to be very convincing.

It is of course impossible to estimate the genuineness of the ostensible PKMB deformation of objects which have been deformed under unwitnessed conditions and which have not been extensively examined beforehand unless very carefully prepared specialist objects are used, or else specimens sealed in glass or plastic tubes. Specimens showing very extreme deformation which would normally be accompanied by fracture may be exceptions, but no such items were received in this study. The results of the ESP test will not be reviewed since the evaluation of the results performed by the authors was wholly uncontrolled.

The most interesting results to emerge to from this study are only suggestive, but appear to indicate that PKMB elicitation is more effectively performed by exposure to a live TV or radio appearance or exposure to a group attempt at PKMB elicitation than via a magazine cover and article.

The most apparently successful results are those reported by an amateur psychical research group named MESA meeting in Toledo, Ohio. The group met and shouted "work" and "bend" to start with and maintained their PKMB attempt for some 20 minutes. At the end of this period 5 keys had bent, the best result being obtained by a 10 year old boy. The group credited their apparent success to "confidence plus expectation plus excitement" (ibid p9). Their procedure resembled the Houck "PKMB party" screening technique reviewed below.

Another potentially interesting result was the report received from one person that all the cutlery in their house had deformed (similarly to the case reported by Bender et al above). However the ostensible PKMB stopped shortly before investigators arrived (ibid p21).

The value of this study was greatly reduced by the almost complete lack of follow-up. It seems odd that the authors took so much trouble to set up a PKMB elicitation attempt without intending to make any serious efforts to later check the claims of PKMB in any effective way.

3.5 Houck PKMB "Parties"

Houck has described (1982) a technique he has developed for eliciting PKMB in a group setting. In contrast to the German and South African surveys reported above, the technique is used to detect possible PKMB agents within a deliberately contrived setting rather than studying PKMB events occurring in response to Geller.

Both the Houck and Isaacs (1981) screening techniques are essentially methods of identifying possible PKMB agents for use in future research, rather than being intended as methods for researching the incidence of individuals in the population possessing PKMB ability. This difference of aim is an important distinguishing feature separating them from the surveys reviewed above.

Importantly, the Houck technique incorporates several features which are intended to promote the facilitation of PKMB, so that it represents a screening process which deliberately attempts to manipulate the screenees' state during attempts to elicit PKMB. This characteristic is shared by Isaacs' mass screening technique reviewed immediately below.

Unfortunately, there is as yet no written account of the results obtained by use of the Houck technique and because of the deliberate use of non secure PKMB tasks the rate of PKMB agents identified by Houck's method remains unknown. Houck has however privately published a description of the method (1982).

The method calls for the assembly of a group in a congenial setting, preferably in one of the members' home. Cutlery is used as PKMB target. Selection of the cutlery is performed by what is presented as a dowsing technique using a pendulum. This is a possibly PKMB facilitating procedure because it allows for the rejection of cutlery which is felt to be impossible to bend or otherwise uncongenial by participants. If available, videotape of previous successful "PK parties" is shown, which is intended to create a favourable belief state and to provide potentially PKMB eliciting suggestions. Cutlery bent at previous sessions may be exhibited.

A short talk is given to participants by a member of the screening team. Emphasis is laid on the widespread distribution of PKMB ability and on the fact that up to 85% of participants at previous PKMB parties have achieved bends in cutlery. Expectation of success is deliberately created. The cutlery used is deliberately selected to be weak enough to be fairly readily bent by manual means.

The group is told that their cutlery may become soft for a brief period of time. Much emphasis is laid on the need to catch the cutlery in its temporarily soft state and that participants should deliberately exert steady pressure on their cutlery so as to detect the appearance of the soft phase because deformation will start during it. Participants are told that when they detect the cutlery becoming soft, they must then use manual force to some extent to rapidly deform it.

The PKMB attempt is then initiated by the group chanting "bend, bend bend" and much shouting and laughter usually then occurs, group excitement being deliberately encouraged. Deformations then start to occur and may spread rapidly throughout the group.

Once deformations are freely taking place, a much more severe test is then performed. In this test the participants typically hold a spoon or fork in each hand. The cutlery is then instructed aloud to bend as before, and some "flop-overs" may occur whereby some of the cutlery deforms under its own weight, flopping over as it does so. No manual force should be used in the second stage PKMB attempt. Individuals succeeding at this second stage are considered to be good candidates for possession of PKMB ability.

From the perspective of Batcheldor's theory many PK conducive features are present in the Houck method. Firstly, deliberate attempts are made to manipulate the belief state of the group to be favourable to PK by the talk, videotape and display of bent cutlery. The experience of seeing others producing apparent PKMB effects may also elicit PKMB in onlookers in the group.

Secondly, the mood of the group is encouraged to be carefree, relaxed and non analytical, in analogous manner to that of a sitter group (Batcheldor 1966). The disinhibition caused by the ritualised shouting of "bend" etc contributes greatly to this because the group is thereby forced to perceive their own performance as having a humorous aspect.

Thirdly, the first stage bendings are set up in such a manner as to make it very likely that artifactual, normal deformations due to manual force will be accepted as having at least a PKMB component, if not as being altogether genuine.

The presentation of the PKMB effect as occurring suddenly and as therefore requiring the sudden application of manual force is an effective means of precipitating relatively unnoticed violent manual manipulation, because the sudden and swift deformation of cutlery may not be sensorially felt as much as if the cutlery were to be subjected to slow deformation which would make the fact that normal force was responsible for results much more obvious. Participants sometimes interpret the swiftness of the deformations as evidential of genuine PKMB. Given the positive encouragement not to be afraid of exerting manual force it is not surprising that incidences of deformation as high as 85% are reported.

It is not possible to obtain an exact estimate of the proportion of individuals who succeed at the second stage test because of the lack of published results and because different observers give different estimates of results. Estimates from those familar with some of the Houck PKMB party screenings vary from 5% passing the second stage test (Alexander 1982) to 1% (Hansen 1982). These results would seem to be in agreement with those of Isaacs' mass screenings, although the latter were conducted using groups who might be expected to show a higher incidence of PKMB ability than the unselected groups generally employed in the Houck screenings.

3.6 Isaacs' Mass Screening Technique

Isaacs (1981) has published a detailed account of the technique used in his mass screening attempts together with a description of results obtained.

The mass screening technique has three variants for suggested use in three different situations. One, for small (10 to 20 individuals) group use, resembles the Houck method. A second consists in setting up a stand at exhibitions, festivals etc at which individuals may attempt both uPKMB and macroscopic deformation as they want.

These two methods are described as possibly less effective than the principal method used, which consists essentially of an extended lecture about PKMB during which the audience attempts to create deformations in cutlery handed out to them. The small group and stall methods do not allow the state of the screenees to be manipulated as effectively as is felt to occur during the lecture process.

Similarly to the Houck method, attempts are made to manipulate the beliefs and mood of the audience. In the lecture the research into uPKMB and the macroscopic effect is presented in such a way as to provide convincing evidence for PKMB's reality. The lecture is delivered in an informal manner so as to create relaxation, security and trust in the audience. The normality of PK ability is stressed so as to reduce possible inhibition due to fear. The audiences for screening were carefully selected and the majority have been either members of spiritualist churches or practitioners of healing, alternative therapies, New Age groups etc, all of which would have a pro-psi attitude and an already established acceptant attitude towards PKMB.

Many of the (early) screenings employed strain gauge based uPKMB detection equipment operating during the course of the lecture. The occasional occurrence of spontaneous uPKMB effects was used to reinforce the belief that PKMB events would occur.

The cutlery handed out to the audience was done so explicitly on the understanding that if any members of the audience did not find their piece to be congenial they could replace it with a more satisfactory specimen. This feature is similar to Houck's use of dowsing to select cutlery, the Houck incorporation of a completely free choice probably being optimum.

An important difference between Isaacs' and Houck's techniques is that Isaacs has specifically discouraged the use of force to deform cutlery. This has produced a considerable disparity in terms of the incidence of reported deformations, Isaacs reporting an average rate of only some 5% of the audience as producing macroscopic deformations. Some 2,500 individuals have been screened to date (1984), although the publication (1981) cites only 1,500. Since neither screening method employs secure conditions they are regarded by their originators as being efficient methods of selecting individuals from a large group who may repay further careful investigation of their possible PKMB ability, rather than as producing good evidence for PKMB.

Isaacs has incorporated a test of uPKMB in some screenings, subjects being encouraged either to form a queue in front of the uPKMB instrumentation or else to attend for a uPKMB test in a room separate from the main auditorium. uPKMB success rates are comparable to those for the macroscopic effect (5%) but although the uPKMB and macroscopic test results overlap, the overlap is limited and it is estimated that only about 25% of successful screenees cause both ostensible macroscopic and uPKMB effects. Some of this discrepancy may be explicable in terms of task differences and some as due to ostensible macroscopic PKMB effects being produced by normal manual effort.

In order to decrease the incidence of unintentional manual bending and in order to utilise to the full the phenomenology of PKMB Isaacs has incorporated several features into his screening procedure whereby the attention of screenees is diverted from their cutlery. Screenees are requested to place their cultery unattended into a pocket for some part of the lecture and are encouraged to continue to gently handle it during other periods when their attention is presumably fully focussed on the lecture presentation which incorporates showing of a videotape of ostensible PKMB deformations, deformed metal specimens, slides and sometimes audiotape.

Rather than a single attempt at PKMB being used, the audience at screenings are told that there will be several attempts to produce PKMB, which is intended both to relax the screenees relative to any one attempt, and to allow time between deliberate attempts during which spontaneous effects can manifest.

PKMB elicitation strategies employed during deliberate PKMB attempts start with the first attempt being preceded by a much shortened version of Jacobson's progressive relaxation procedure (Jacobson 1938). This is used as much for its invocation of a slightly ritualised atmosphere which Isaacs feels may heighten suggestibility as for any direct effect upon the screenees' PK. Screenees are then talked through a sequence of visualisations which are intended as goal oriented representations of the PK effect required. Later attempts are performed without the relaxation procedure but may include other imaginative evocations of the required goal state, such as the screenees feeling the cutlery becoming soft in their hands. Some five or six separate attempts may be made during the course of a screening.

Screenees are requested to inform the screening personnel as soon as they notice any deformation of their cutlery. the occurrence of deformations is immediately announced to the audience and the successful screenee is deliberately treated in a friendly and acceptant manner, even if the screening personnel may harbour doubts as to the genuineness of their results.

Only a limited number of screenees producing ostensible PKMB have been investigated in follow-up examinations because mass screening was developed as a means of finding subjects rather than surveying populations. Since it has provided the majority of subjects used in the presently reported experimentation described in chapters 5, 6 and 7 it would therefore appear to justify the investment of time and effort which has been made in its development.

3.7 Conclusions

It is clear that no firm conclusions can be drawn from the limited amount of survey and screening work so far performed.

In all of the surveys and other studies reviewed the populations studied may have differed in distribution from that of the general population. None of the studies other than Osborne's and the follow-up studies used a secure PKMB task which adds another dimension of uncertainty to the reported results. Generalisation from these findings therefore may be hazardous.

Additionally, these studies seem to suggest that as Price (1977), Keil (1983), Houck (1982) and Isaacs (1981) argue, the elicitation of PKMB is dependent upon the individual being in a restricted range of PKMB-favourable psychological states which implies that PKMB ability will only be detected as a successful PKMB performance under certain conditions.

This complicates any attempt to survey PKMB ability and would seem to demand that reliable measures of PKMB-favourable states be available and be applied to screenees at the point of screening before accurate estimates of the incidence of PKMB ability can in principle be derived from screening data. The potential interaction of these factors with personality factors adds to the possible complexity of this question.

There is also the question raised by Millar regarding the role of possible psi-star members of PKMB survey or screening teams in biassing results.

Some features do seem to emerge, even if they are not certain. It appears from Bender and Gruber-Wendlandt's (1977), Keil's (1979) and Price's (1979) follow-up studies, all conducted more than a year after the original elicitation of ostensible PKMB, that the majority of adults experiencing PKMB as a result of exposure to Geller do not maintain a PKMB capability.

But Cantor's findings (Cantor 1979) strongly suggest that once stabilised, PKMB ability is retained over long periods, some of these now adult subjects are known to have kept their ability for 9 or 10 years to date (Hasted 1984). Although definite data is not available on all of Cantor's interviewees the suggestion is that PKMB ability may persist in all of the individuals he visited.

There seem to be two relevant variables which may complicate this picture. Both the Bender and Price surveys revealed that more than 75% of respondents believed Geller to be essential for the occurrence of the phenomena.

Both found an apparently higher incidence of children claiming a continued PKMB capability than the adults, almost as if the adults were content to have simply observed some PKMB, ascribing its occurrence to Geller, whereas the children needed to be able to possess the "magic" PKMB ability themselves. In Batcheldor terms the children showed much less ownership resistance than did the adults.

This may have been possibly as a result of less deep enculturation to psi-antagonistic social norms, or possibly as a response to the need to have an ability which conferred some attention, status and possible power upon them. In Cantor's study, several of the children stated that they had seen Geller on television and had thought to themselves that they could do as well as him (Cantor 1979).

An attitudinal difference between children and adults would seem to exist. If adults consider themselves unable to produce PKMB without Geller's involvement they will, on Batcheldor's and Stanford's views, be unlikely to exhibit the ability in the absence of Geller. This does not mean that they may not possess the capability, but that its elicitation in performance may be impossible to achieve in the absence of contact of some form with Geller.

The largely null results achieved by Price and Bender with their child subjects suggests that they were either making false claims or that they are readily inhibited under test conditions. Bender's finding of attempted cheating in 5 of 6 child subjects followed up (1977) is consistent with the Collins and Pamplin study (1975) and suggests that children subjected to high levels of demand will frequently attempt to cheat in preference to failing. This implies that unchecked self reports of PKMB ability tendered by children should be viewed with caution.

On the other hand, Osborne's finding that the majority of screenees passing his severe tests were children, and the fact that all of Cantor's child PKMB interviewees had succeeded in producing ostensible PKMB to the satisfaction of Taylor or Hasted (Cantor 1979) suggests that at least some child claimants of PKMB ability appear to be genuine.

In the absence of Geller, some other PKMB eliciting manipulation of screenee's states would appear to be necessary. From the comparison of Smukler's reported rate of ostensible PKMB deriving from the use of a photograph of Geller with the results reported by Houck and Isaacs it would appear that participation in group meetings where deliberate use of putatively PKMB favourable manipulations is made is more effective. This may be explicable in terms of differences of mood, belief states and the mediation of PKMB eliciting suggestions.

Very severe (ie potentially inhibitory) tests of PKMB can be performed only by a small (5%) minority of those claiming ostensible PKMB events, apparently, suggesting that within the group possessing PKMB ability, the ability itself may vary as also may the individual's proneness to inhibition. This would appear to be an area which might repay the investment of research effort.

Finally, the question of the incidence of PKMB ability remains essentially unanswered. Millar's estimate of the incidence of psi stars is 1 per 1000 population (Millar 1979). The findings of Isaacs (1981) and Houck (1982) appear to indicate a much higher figure of between 5 and 1 per 100. But Isaacs has screened groups which are likely to include a higher frequency of psi stars than the general population and Houck's figures are as yet not definite. Because of lack of follow-up studies using a secure PKMB task neither of the estimates from these two sources are certain.

Additionally, it is possible that both Isaacs and Houck may be disguised psi stars who may either bias attendanceship at their screenings or else contribute some component to the PKMB performances of their screenees.

The uncertainties in the estimates of the number of individuals exposed to Geller in the surveys prevents any even tentative estimate of the incidence of PKMB from being derived from those sources.

However, all of the above mentioned investigators with the exception of Keil and Smukler have seemingly managed to find ostensible PKMB agents who were available for further experimentation.

The important point seems to have been established that groups wishing to conduct intensive studies of limited numbers of ostensible PKMB agents can reasonably expect to be able to obtain a supply of these individuals in any areas containing substantial populations.

CHAPTER FOUR

THE LEARNING HYPOTHESIS AND SOME PILOT STUDIES

4.1.1 The Context of the Present Research

The research reported here and in later chapters derives from an analysis of some of the long term needs of parapsychology, a critique of the present state of PK research, contact with Batcheldor's theory of PK induction and a construal of the significance of directly measurable PK effects which may differ from the accepted view within parapsychology. Since this analysis largely determined many of the decisions made regarding the research topic, the methodology and general orientation of the studies reported here, it should be explained.

4.1.2 The Need for a Theory of the Physics of Psi

An overriding need within parapsychology is for a physical explanation of psi effects. The absence of a well constrained physical theory is one of the factors which currently prevents parapsychology from being accepted by the scientific community. Whilst psi phenomena are still seen as conflicting with current physical theory there will always be a tendency for the physical science community to prefer to write off psi phenomena as non existent or impossible rather than contemplate any far reaching modifications or additions to physical theory from this source.

The complementary aspect of this situation is that since psi phenomena are currently anomalous with respect to present physical theories the development of a physical theory of psi is clearly of importance for the advance of our general understanding of physics, as psi phenomena could be argued to imply that our concepts of time and space may require possibly far reaching revisions.

Important changes in the estimation of human powers and capacities are also implied by psi, which in turn may dramatically alter the concept of human identity. It is not surprising that psi phenomena are difficult to reconcile with present knowledge and have encountered sceptical opposition because the implications of psi seem to promise a radical revision of several important areas of our knowledge of the world.

Central to this endeavour is the accumulation of data which may contribute towards the construction of a theory of the physics of psi.

Whilst ESP research can contribute greatly to this project, since current theories of the physics of psi have consequences which predict certain characteristics of ESP (eg Walker 1975), it would seem reasonable to expect that a major contribution of relevant data should derive from PK research. Psychokinesis offers the opportunity for paranormally caused physical processes to be monitored and detected as they occur in inanimate systems. The difficulties of monitoring probably subtle paranormally created physical interactions within living tissue may well prevent gathering of data from ESP research which could be incisive for the physics of psi, leaving PK as the principal field for the gathering of the necessary data.

4.1.3 A Critique of the REG as PK Detector

The electronic random event generator (Schmidt 1969) is now the predominant device used to detect PK effects in experimental studies of PK. It has eclipsed all other methods of PK detection in use for research of psychological characteristics of PK. The REG has given good service in this role and its ability to produce digital outputs makes it convenient to interface with computer systems which can then be programmed to run experimental trials and perform the subsequent statistical analysis.

However, the REG as a PK detection system has a number of features which it will be argued may be responsible for limiting the progress of PK research in areas relevant both to physics and the psychology of PK. The universal use of randomly behaving probabilistic PK detection systems (dice and REGs) may have led parapsychology into a construal of the nature of PK which is artificially limiting because it is subject to the instrinsic limitations of this type of target system.

One limitation is that although the REG is suitable for certain types of physics-relevant PK experiment, such as exploring the effects of observation of the output of a PK target system, an area of great relevance to the observational theories of psi, (Millar 1978) it does not lend itself to investigation of PK mechanisms.

Indeed, the use of REGs has led some parapsychologists to regard PK target systems as being "black boxes" about which questions of mechanism should not be asked (Schmidt 1975). While it may be true that PK operates entirely teleologically, without need of intervening physical mechanisms of any sort, a discovery of this type can only be made through experimentation, not by fiat. Research is in too early a stage for the search for PK mechanisms to be abandoned. Other forms of PK target than the REG, of which instances are the metal targets of PKMB action, may yield a much richer harvest of data relevant to the elucidation of PK mechanisms, if they exist.

But the use of REG PK target systems has also had a subtle effect upon the methodology and the emerging conceptualisations in the field of the psychology of PK which may also drastically limit research.

The features of the REG which are responsible for this situation are its intrinsically probabilistic type of output, the low rates of hitting achieved on it, the fact that the REG scores of groups of subjects can be summed and the fact that the REG does not detect fluctuating PK effects efficiently (Schmidt 1977).

REGs are usually configured to produce discrete output states at predetermined rates. As the random event generator's name suggests, ideally, the output states are random in frequency, distribution and sequence. Current REGs conform closely to the ideal and their outputs in the absence of subjects appear to be truly random. The presence of a PK effect is detected as a bias imposed on the frequency of the target state by the subjects in the experiment.

The hit rates usually encountered in experimentation are of the order of 3% bias, that is, for a 2 state device instead of an approximately 50% incidence of hit and miss output states the ratio may be 53% of hit states versus 47% misses. Over thousands of trials this low percentile bias can produce highly significant statistical odds against chance (eg Schmidt 1973).

Feedback of the output states is usually given to subjects via a visual or auditory display which has as many states as the output of the REG, although recent developments include the use of REG based PK games where feedback is given in video form (eg Schechter, Barker & Varvoglis 1982).

However, since the hit rate produced by subjects is so low, for any hit observed by them, the chances are very much more in favour of it being due to the natural spontaneous random activity of the REG than that it was caused by their PK. The problem can economically be described by stating that with REGs the PK "signal" is lost in the background "noise" of their normal random behaviour.

Given this situation it becomes impossible for the subject to discriminate hits due to PK from hits due to chance. If this cannot be done, the feedback signal cannot be used as a cue upon which to base learning.

By this argument, which assumes that cues provided by feedback from the PK target system are essential in order that subjects may learn, learning effects ought not to happen in REG studies.

The implication deriving from this analysis, that across-sessions inclines should not appear, seems to be extremely well proven by the absence of reports of inclines in the parapsychological literature on PK (Rhine 1970, Stanford 1977). If experimenters found statistically significant inclines in REG data they would be certain to report them.

This situation has had the effect that parapsychologists do not expect to find PK to be improved with practice. Rather, in the literature of the statistical detection of PK using various probabilistic PK detection systems (dice, counters, water drops etc prior to the use of REGs), the decline of scoring rates within and across sessions has been almost universal (Rhine 1970, Stanford 1977). REG results seem not to show such marked (ie statistically significant) declines as the earlier dice based work, and this has been hypothesised as possibly due to the immediate feedback provided by electronic REG systems (Tart 1983).

The absence of learning effects in PK data has led most parapsychologists to accept that experimentally elicited intentional PK effects will always only be detectable as small, and in practical terms, rather insignificant biasses upon systems. As subjects cannot learn to produce larger scoring rates on REGs their performance is viewed as essentially static, as given, although psychological factors present in the test situation are naturally seen as determining the degree to which the subjects' fixed PK ability gains expression in performance.

However, the fact that the results from individual subjects in REG experiments can be pooled has meant that statistically significant results can be obtained from groups of subjects none of whom is capable singly of producing a statistically significant result over a moderate number of trials. This has been an important determinant in the acceptance of relatively low levels of PK performance from individuals. Subjects are recruited for limited, often single psi performances and are not regarded as individuals, but as a mass resource. Since experiments can be run without individuals showing spectacular performances there has been little reason for parapsychologists to show interest in high levels of PK performance or in the possible training of PK.

4.1.4 Macroscopic PK Effects

Large scale (macroscopic) PK effects may be more fruitful phenomena for physical study than REG PK because the PK mechanisms involved may be more readily accessible to detection and monitoring. Performance at macroscopic PK tasks may also be subject to learning effects as is discussed below. EEG studies conducted upon PK agents accomplishing macroscopic tasks may provide valuable information regarding the neurophysiological basis of PK performance (eg Dierkens 1978).

However, macroscopic PK studies largely remain (excepting PKMB) at the somewhat primitive stage of attempts to validate the phenomena. The principle reason for this is that macroscopic PK effects cannot be summated across a group of unselected subjects in the way which is possible using probabilistic PK target systems such as the REG. This feature forces would-be investigators of macro PK phenomena to depend upon finding individuals showing relatively high levels of PK performance who are essential for the execution of this type of research. Yet in spite of some interest in this type of PK, very little has been done effectively to address the problem of developing efficient methods of finding such subjects or of increasing the abilities of those subjects showing some PK capacity of lower level. For example, the telekinetic abilities of the Russian ostensible PK agent Kulagina have been examined several times by Western parapsychologists (Pratt, Ullman, Keil & Herbert 1976), but this has not led to the initiation of studies of telekinesis with American or European subjects (apart from Honorton's brief preliminary study of an American ostensible Kulagina-style PK agent (1974)). Few other individuals claiming telekinetic ability seem yet to have volunteered for research.

Parapsychologists have also occasionally remarked upon the fact that the physical mediums of the past who produced a wide range of macroscopic PK phenomena seem no longer to exist. The causes of this situation seem to be regarded as obscure and somewhat inscrutable, as if there were inexplicable fashions in PK.

Such an attitude might seem to ignore some important historical and social factors which provide important clues. In the days of the seemingly widespread occurrence of ostensible macroscopic PK (so called "physical phenomena") many physical mediums emerged from protracted periods of "development" in home circles (Inglis 1977). The existence of an active spiritualist movement provided a social context in which the presence of large numbers of spiritualist home circles and development seances gave widespread opportunity for individuals with latent macroscopic PK gifts to be identified and possibly learn to produce effects of a larger magnitude and greater variety. A small minority of these individuals then became available for scientific research. With the decline of spiritualism and the reduction in numbers of spiritualist seance groups due to many causes the older spiritualist "development" tradition has faded away.

The decision of Rhine to utilise dice for investigations of PK led to the rapid development of methodologically sound and sophisticated experimental research employing probabilistic PK target systems, of which the REG is the latest example (Stanford 1977), but at the cost of the implicit acceptance of the intrinsic limitations of statistical methods of detecting PK.

A consequence of Rhine's decision has been that the outlook on PK bred by the use of randomly behaving statistical detection systems has led to an acceptance of the status quo regarding the non appearance of gifted macroscopic PK subjects.

PK ability is seen as fixed and unalterable because it cannot be trained using probabilistic REG type PK targets. This has led to the growth of very passive attitudes towards the "gifted" PK subject.

If subjects are regarded as either "gifted" or not, then the most that it seems possible to do is to wait, more or less passively, for the spontaneous appearance of individuals with the requisite PK abilities. Since subjects having well developed macroscopic PK ability do not in general present themselves, this field of PK research has tended to languish.

But this attitude ignores the strong suggestion from the history of physical mediumship that even if individuals are born PK-gifted, the development of their abilities may be necessary before their potential becomes realised. This is not to deny that instrinsic differences in PK ability may and probably do exist, but most so-called gifted subjects who have entered research have had to develop their PK gift by themselves before entering research. In some ways this seems a peculiarly irresponsible and uncurious attitude on the part of parapsychologists and, most importantly, this situation seems not to be acknowledged at present.

It is as if the training of PK skills is regarded as being somehow the subject's job, an informal process which is not the responsibility of the parapsychologist. However a few past investigators of physical mediumship (Bisson 1914, Schrenck-Notzing 1933) have sometimes undertaken the training of individuals showing ostensible macroscopic PK ability, but this tradition seems now to be moribund. Undoubtedly social factors are relevant to this situation, since the REG offers a clinically tidy and relatively unproblematical methodology compared to the difficulties inherent in the unmodified seance room investigatory methods. REGs offer an acceptable computer-based modern technological image which is in stark contrast to the suspect events of the darkened seance room which bear the old fashioned marks of "ectoplasm" and fraud.

The difference between the approach advocated here and the customary parapsychological attitude towards macro PK subjects could aptly be marked by redescribing PK agents as "skilled" rather than "gifted", since skills are trainable, whereas the label "gifted" emphasises intrinsic, genetically determined ability. This is not to deny that the skilled PK agent may not have been gifted above the norm with PK in the first place, but it is to emphasise that even the gifted may not initially be capable of a PK performance which exceeds marginal levels without training and protracted practice. The situation may be analogous to that with other high level human coordinatory skills, such as musicianship, archery or shooting. By only accepting fully trained macroscopic PK agents into their laboratories parapsychologists may be denying themselves a potentially fruitful source of powerful PK agent subjects.

The attitude of contemporary parapsychology towards the recruitment of gifted subjects seems to have been passive and the possibility that PK ability may be trainable has been virtually ignored, apart from the honourable exception of some of Morris's work on subject PK elicitation strategies used in influencing REG's (Morris & Harnaday 1981, Levi 1979). In the context of REG PK being seen as the paradigmatic example of PK this attitude is not surprising.

Because of its early stage of evolution macroscopic PK research is seen as essentially non-instrumented, cumbersome and primitive compared to REG PK, so that research effort has not been directed to it. The process has established a vicious circle, where the primitive stage of the field has deterred those who might lead to its development from becoming involved. This has contributed to an attitude of fatalism regarding the scarcity of suitable subjects.

4.1.5 Directly Detectable PK - A Class of Learnable PK Tasks ?

Because the view being advocated here is at variance with current parapsychological orthodoxy, terminological problems arise when attempts are made to define the type of PK effects which are thought to be in principle learnable, or at least likely to be subject to improvement with practice. It is hypothesised that there is a large class of PK tasks which potentially are learnable.

This type of PK effect, which may (as with uPKMB) involve the detection of microscopic changes of state of the PK target could be termed "directly detectable" PK, as contrasted to macroscopic PK which by definition excludes microscopic effects, although all macro effects fall within the class of directly detectable effects. The "directly detectable" nomenclature specifically distinguishes such effects from those which are only detectable using statistical means of evaluation (PK bias effects on dice, counters, water drops, REGs - any form of randomly behaving system with an indeterminate, spontaneously fluctuating output).

The directly detectable PK approach is quite general and not limited to PKMB. The general principle of the approach is that an instrinsically stable PK target system be monitored and the signal derived from it fed back to the subject in some easily discriminable form. PKMB represents only one of a potentially large class of directly detectable PK effects most of which have not yet been exploited in experimentation.

Examples of already used directly detectable PK effects are the "thermistor PK" studies of Schmeidler (Schmeidler 1973), the use of a superconducting magnetometer as PK target by Puthoff and Targ (1975), Hasted's work on paranormal electrical effects (see appendix 1), the use of infra red occultation equipment pioneered by Osty (1931), independently repeated by Hope (Hope et al 1933) and recently replicated by Gregory (1983), the use of light beams and photocells as PK targets (Herbert 1974), the use of the discharging of an electrically charged capacitor as PK task (Wells & Watkins 1975) and the use of a Fabry-Perot interferometer as PK target by Jahn and his group (Nelson, Dunne & Jahn 1982). This list is by no means exhaustive. Other tasks have been used and many other possible types of directly detected PK effects may be available by the use of suitable instrumentation.

If the PK target system is intrinsically stable, the resultant electronic signal derived from it (using suitable instrumentation) will also be stable in the absence of PK. Changes of state of the PK target system will then potentially be detectable with good signal to noise ratio, in complete contrast to REG outputs which by design are subject to a dominating random fluctuation.

The good signal to noise ratio of such systems may also allow very small PK induced changes of state to be detected, so that PK performance at low levels can be detected, perhaps allowing initially relatively modestly gifted PK agents to learn to produce macroscopically observable effects.

The approach advocated here predicts that instrumented macroscopic PK targets ought to provide outputs with a good enough signal to noise ratio to enable subjects to improve both the magnitude of the effects they create upon them and the reliability of their performance. Such targets may also provide useful systems for use in studies of the physics of PK.

4.2.1 The Choice of uPKMB as PK Training Task

It is believed that the approach outlined in the previous sections will prove a realisable research objective. The principal hypothesis is that directly detectable PK effects provide PK tasks which will be subject to learning effects if subjects are allowed to perform series of training sessions with them under certain psychological and feedback conditions. The general approach has been outlined because it would be seriously misleading to consider that the use of instrumented PK target systems for PK training purposes is necessarily limited to PKMB.

Instrumented PKMB was chosen as the PK task of choice because the advent of Geller and the mini-Gellers had demonstrated the possibility that ostensible PKMB agents may exist in the general population in much larger numbers than had been thought possible for gifted PK agents. The author's (Isaacs 1981) experience of mass screening for uPKMB and macro PKMB agents had also led to the expectation that subjects found in the Midlands would be available in sufficient numbers to enable experiments to be performed.

Hasted had also demonstrated the feasibility of the elicitation of uPKMB under controlled conditions (1976a) which meant that a secure PKMB task existed.

The macroscopic PKMB effect appeared to be so prone to inhibition if performed without touch that it would not be suitable for experimental purposes unless exceptional subjects could be found. If subjects were allowed to touch metal specimens this would impose the difficult task of finding a method where this could be allowed without either breaching standards of security against artifact and fraud or else incurring the risk of non performance because of inhibition.

Additionally, the fact that electrical outputs were available from uPKMB equipment meant that in principle the effects could readily be quantified, a task which would appear to be very much more difficult for the macroscopic effect. Instrumental detection of PKMB would also allow immediate feedback to be given to subjects which ought to provide cues for learning purposes.

4.2.2 Initial Decisions on Methodology and Instrumentation

It was decided initially that uPKMB training sessions would be based upon Hasted's method of working, whereby subjects would be presented with a metal strip specimen as target for their PKMB. Strain gauges would be used as transducers and records of training sessions would be obtained by means of a chart recorder.

The fundamental paradigm would be the use of immediate feedback, in an analogous fashion to that used in biofeedback training. Rather than simply allowing the chart recorder pen noise to act as an auditory feedback signal to the subject as Hasted had, it was decided to explore different types of visual and auditory feedback in an effort to optimise learning performance.

It was clear from Hasted's early work (1976a) that subjects performed well in their homes. According to Hasted subjects perform optimally in areas which they construe as being in some way in their own possession (1981a) and subject inhibition seemed likely to be lowest in their own home. It was therefore decided that training sessions would be held with subjects in their homes. Although use of the subjects' homes necessitated careful inspection to select suitable rooms for experimentation, it was felt that the psychological advantages of the familar setting would outweigh the disadvantages involved.

The fact that it would be the experimenter who would have to do all the travelling meant that possible problems incurred by asking elderly or busy subjects to travel fairly large distances across the West Midlands connurbation (which is 60 miles across) could be avoided. It was also felt that subjects would be more reliably contacted for training sessions if the experimenter had to travel to them rather than if they had to travel to him.

It was realised that the development of suitable uPKMB training devices would take considerable time and effort to perform. At first it was unclear whether visual or auditory feedback should be produced by the training instrumentation.

Early pilot experimentation was therefore directed towards developing the experimenter's experience with the training session format and to the evaluation of different types of feedback systems.

As the work progressed, the input of time and effort into electronic development became very much greater than originally planned, leading eventually to the experimenter himself having to develop, design and construct all of the equipment used in the reported studies. This became an unavoidable task because it became apparent after more than a year's preparatory and pilot work conducted whilst waiting for suitable equipment to be developed that the only way in which suitable equipment would be developed would be for the experimenter to build it.

One problem which greatly affected the development of the instrumentation was that after each modification had been made which might have some effect upon the relationship of subjects to the equipment it was necessary to go back to the subjects in order to test it. It was essential to find a device which in every aspect would be felt congenial to work with by subjects.

4.2.3 Pilot Work with Mark, Simon and Justin J

The J family are relatives of the author. Mrs J and her daughter have each reported one spontaneous non intentional macroscopic PKMB event. Since the author initially tested many friends and relatives for uPKMB ability the three J brothers Mark, Simon and Justin were tested.

This work was performed very early on in the research. Some of the earliest sessions, which were conducted with Mark J as subject, utilised an amplifier donated by Hasted. The series of sessions held with Justin J used a strain gauge based device built by a friend. This instrumentation provided an audio frequency sine wave output which was frequency modulated by the uPKMB signal, inceases in strain gauge output causing increases in pitch.

As no dummy channel was employed all the results obtained with the J brothers must be regarded as purely exploratory and not validated, because it is possible that mains borne electromagnetic transients could have been responsible for some or all of the results. This is felt unlikely to be the case but no more definite claim can be justified. The equipment also exhibited considerable noise and thermal drift, which helped to identify the problem of drift. Many of the results, especially with Justin J, were of such low amplitude that the claim that they be regarded as PK rather than noise must be regarded as doubtful. However, an important finding was made during the Justin J series which led to the development of some of the signal processing techniques used in later studies.

Three exploratory sessions were held with Mark J. It was found that apparently he could create uPKMB effects by tensing the muscles of his hand in the vicinity of the metal strip specimen. Unfortunately the chart records of these informal sessions were not kept. Mark J is a professional sculptor, so that his orientation to the uPKMB task as if it were a difficult-to-form scuptural object was interesting. He had seemed to be worth testing for uPKMB ability because he had a history of finding things prone to "fall apart in his hands" for no very obvious reason, a trait which the author's PKMB screening activity had led him to believe was possibly diagnostic of latent PKMB ability. Mark J's professional comitments prevented him from being able to participate in further experimentation, but the finding of the first subject who showed a fairly definite ostensible uPKMB output was taken as an encouraging sign.

Simon J was not interested in serious participation as an experimental subject but was present during some of Justin J's sessions and asked to be allowed to attempt uPKMB. It appeared that Simon J could produce uPKMB effects from several metres distance, principally at instants when his gaze fell on the uPKMB target (a steel strip with two electrostatically screened strain gauges mounted on opposite sides), although the effect was not reliable or fully under his control. At the beginning of Justin J's 7th training session, before Justin's attempt, Simon created three ostensible uPKMB pulses which exceeded the 0.2 mv criterion and were larger than most of Justin J's ostensible uPKMB signals. However as both Justin and Simon were present the ownership of these signals is not certain.

Justin J had not participated in Mark J's sessions and was interested to see whether he too could produce uPKMB effects. It would probably be correct to guess that Justin wished to join the family "club" of ostensible PKMB agents since at 15 years old he was the youngest of the three brothers (Mark was 34, Simon 17) and the two elder brothers had produced ostensible uPKMB effects at their first attempts, whereas he had not.

After several very short and casual preliminary attempts ten chart recorded sessions were held with him. Many additional later sessions were conducted which were not chart recorded. These later sessions used an oscilloscope with a long persistence screen to provide feedback. At various later times Justin provided a useful service in being prepared to try out different uPKMB detection and feedback systems as they were developed.

The sessions were held in Justin's bedroom which served as his "den". This room was at the top of a three storey house situated in the coutryside. The steel strip uPKMB target was suspended by rubber bands from a wooden frame which was placed on a desk at which Justin was seated. The floor was composed of a thin layer of concrete on top of floorboards. Although experimenter and subject did not move around during trial periods, the slight shaking of the top floor of the house when the wind blew probably contributed to the relatively high level of noise recorded on the chart recorder trace.

Sessions varied in length but averaged about 45 minutes. During the session the subject was self paced and usually trial periods lasted approximately 10 minutes, with inter-trial rest periods being between 5 and 20 minutes. Several distances between subject and uPKMB target were tried, as were several different psychological orientations to the uPKMB task.

The results were very marginal early in the practice series (which includes all chart recorded sessions). What events did occur tended to favour the condition where the subject was sitting at the desk on the top of which the specimen holder was situated.

The results are shown in figure 1, and suggest a decline, although the events were so marginal that it cannot definitely be claimed that there was any PK registered in this series. Perhaps the decline was due to boredom since the early excitement rapidly faded as most of the chart results were so marginal and because the audio feedback output from the instrumentation never indicated a shift due to uPKMB.

The results have been computed by measurement of the chart record. The short term noise level was estimated as being 0.2 mv peak to peak, although the very much slower thermal drift was several times this figure. Only signals of fast rise time were considered as possible uPKMB - the pen trace had to be horizontal, or very nearly so, for the event to be considered as possible uPKMB. Only signals which were 0.2 mv larger than the largest peak of the immediately neighbouring background trace were counted as possibly being uPKMB.

At the end of the ten sessions I suggested to Justin that we use an oscilloscope to view the ouput waveform of the strain gauge amplifier. This would enable the amplitude/time characteristics of the

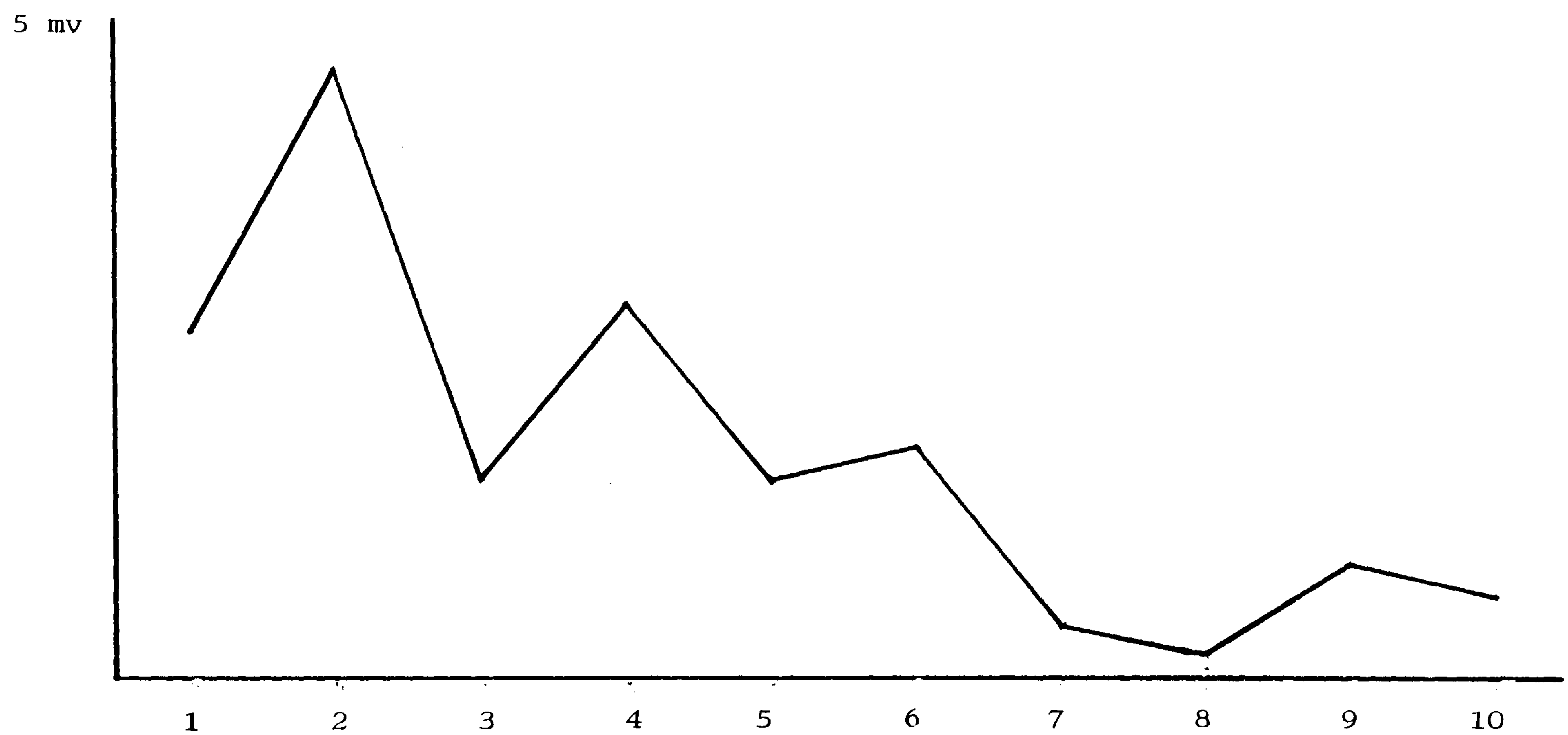

Figure 1. Justin J Pilot Series : Summated Possible uPKMB Per Session

uPKMB signals to be carefully examined and might also provide a more interesting means of feedback for him, since his boredom with the chart recorder system had become evident.

Results with the oscilloscope were most revealing. The subject responded with immediate interest and uPKMB signals several times larger than those previously chart recorded were seen. Signals increased in frequency. The oscilloscope also showed that most uPKMB signals were of only a few milliseconds or tens of milliseconds duration. These signals were not registered on the chart record at their correct amplitude and also, most importantly, produced no audible change in output of the feedback tone (which had a resting frequency of about 440 Hz, uPKMB signals should have made the pitch increase).

Most signals appeared to occur at moments of the subject lapsing in his concentration on the task, such as when distracting events occurred in his vicinity, or before the start of the formal test period, or just at the cessation of effort. Although the chart records show a decline (if they show anything atall), the later oscilloscope sessions appeared to suggest that given a quite large total practice time (23 hours overall, including chart recorded plus oscilloscope sessions) improvement in uPKMB output could occur.

Justin had started off showing no signs of uPKMB output (in the earliest sessions where the chart record was not retained), but by the end of the 23 hours of practice sessions had started to produce macroscopically bent cutlery, although it was not deformed under controlled conditions. Justin himself was extremely cautious in the claims he made and rather than adopting a boastful "psychic star" attitude tended to be very modest and doubting of his ability. It is felt extremely unlikely that he attempted any form of fraud in producing the bent cutlery, although the amount of normal force he used was not measured or monitored.

4.2.4 Conclusions From The Justin J Series

Several conclusions were drawn. First, it appeared that if uPKMB signals were of only a few milliseconds duration, some form of signal processing would be essential to enable them to become audible to subjects. They would have to be lengthened so as to be audibly discriminable.

But the problem created by fast signals also extended to chart recording. Since the chart recorders in use were of slow rise time (70 - 100 ms fsd) it would be essential to lengthen pulses so that they could be accurately recorded.

Although the oscilloscope display was apparently acceptable and attractive to subjects it had several important drawbacks which led to the decision not to use visual feedback. Several informal trials of the oscilloscope for uPKMB feedback to a variety of putative uPKMB agents were made - these results were largely negative and the trials were carried out purely to assess its acceptability and its possible effects.

It appeared that looking at the oscilloscope screen tended to induce subjects to adopt too effortful an orientation to the task. It tended to produce a very vigilant state and to prevent the subjects from being able partially to withdraw their attention from the PK task. It also tied them to a specific position so that they could see the screen and obviously would not allow them to close their eyes whilst attempting uPKMB or else immediate feedback would be lost.

The 440 Hz tone tended to become objectionable after long periods of exposure to it and it also seemed likely that a very much lower frequency would enable changes in absolute frequency to be detected more easily.

The thermal drift and noise characteristics of the strain gauge uPKMB detection were unacceptable. Although a noisy uPKMB trace was of benefit from the point of view of Batcheldor's theory of PK induction because it allowed the subject to construe themselves as just starting to succeed in producing uPKMB signals before they became of sufficient amplitude to be considered as definite uPKMB, the resulting chart record would not allow small uPKMB events easily to be differentiated from noise. An improved system would be needed.

In order to exclude airborne or mains borne electromagnetic transients from being undetected and possibly being incorporated into the chart record some form of extra circuitry would be necessary to detect potential electrical interference.

A much less certain conclusion was that perhaps subjects without very pronounced uPKMB ability produced shorter duration signals than more powerful subjects.

Finally, Justin had shown no PKMB ability beforehand and his chart recorded results were marginal. Future subjects should therefore be chosen who had already shown PKMB ability in order to maximise the possibility that they would produce non marginal uPKMB signals.

4.3 Development of Instrumentation

A long period of electronic instrumentation development was then initiated. Several different types of strain gauge based uPKMB detection systems giving different types of output were evaluated. Since it had originally been hoped to loan subjects small uPKMB detection and feedback devices for home use to practise uPKMB this consideration entered the design criteria. It was during this phase that the experimenter decided to undertake the design and building of suitable equipment himself, since other demands on technician time meant that the pace of development of the new equipment was unacceptably slow.

One of the design requirements for home-use uPKMB training devices was low battery consumption, and strain gauges demand the use of a fixed quantity of bridge current in order to function. It was decided to evaluate the use of piezo materials as transducers for uPKMB.

The experimenter had earlier been told by Hasted that piezo materials were of no use for detection of uPKMB. Hasted's conclusion was based on his brief evaluation of piezo elements made from organic materials. As a result of this advice the experimenter did not consider the possible use of piezo materials for some time. Eventually he obtained some samples of PZT ceramic piezo material manufactured by Mullard (now part of Phillips). The material is a lead zirconate titanate ceramic which is a good insulator but has excellent piezoelectric sensitivity. This rapidly proved of potential and piezo electric multimorph strip was obtained from the same source. The multimorph strip is approximately 2 mm wide by 1 mm thick and consists of layers of piezo material. The strip is more compliant than the solid crystal discs and bars and it was rapidly appreciated that this would be very suitable as the transducing element for use in uPKMB instrumentation, assuming that subjects would be capable of producing effects upon it.

Having decided upon the use of piezoelectric multimorph strip as uPKMB sensor, conditioning circuitry was then designed and built. One persistent and difficult problem which consumed much time in its solution was the decision over how to lengthen uPKMB signals to enable them readily to be heard when converted to frequency changes of the audio frequency output circuit. Several options were possible. One would be to use peak-holding circuitry the output of which would be raised to the maximum voltage level of an incoming uPKMB waveform and then stay there. This solution was unacceptable because it would mean that successive closely spaced signals would not be recorded if they were of lesser amplitude than the first signal.

Another approach would be to use a peak-holding circuit which had a high "droop rate", whereby the peak would only be held for a relatively short time. This circuit would allow well spaced signals to be separately registered. However because the decay in voltage stored would be exponential it would be unsuitable because a droop rate slow enough to give a satisfactory hold period at the highest level of voltage input would necessitate the droop rate being too slow near the zero voltage input end of the range, so that small input signals would not be responded to.

After considerable time and effort had been expended on the evaluation of different systems it was decided to go back to the original slow droop rate peak-hold system, but instead of it being manually reset to zero volts, an internal electronic clock would be used to provide regular periodic automatic zeroing at a preset time interval. This was tried and found very suitable.

Fast incoming signals could be held for determinate periods, after which the automatic reset function would once again make the instrumentation sensitive to small signals near the zero volts level. Addditional circuitry detected when an incoming uPKMB waveform was greater than a predetermined level so that the reset clock was itself delayed whenever a pulse above the threshold was detected, making satisfactory chart recording and audio feedback of the event certain, whatever the time of its occurrence within the clock cycle. Without this facility, uPKMB events occurring near to the end of a clock cycle would be cancelled out by being reset to zero before adequate time for registration and perception had occurred. Refinement of the automatic resetting circuitry reduced the noise contributed by it to the signal trace to the point that the final model shows effectively zero short term noise, since the noise amplitude is smaller than the width of the pen trace.

The audio feedback facility was found to be apparently least disturbing to subjects and probably most easily discriminated when set to produce square wave outputs of resting frequency in the 1 to 5 Hz range.

It was decided that instead of using a dummy channel for detection of mains transients it would be more effective to monitor the mains supply directly. The mains could be expected to conduct transients which are of too low an amplitude effectively to be broadcast, so that superior sensitivity to transients ought to be achieved by using direct monitoring rather than the dummy channel technique.

Circuitry was developed which provided broad band monitoring of the mains live and neutral lines. Since the range of transients was expected to be large, a semi logarithmic amplification stage was incorporated to enable a wide range of transient voltages to be registered within the span of the chart recorder. The same problem regarding registration of fast events as with uPKMB events is posed by mains transients so that the same periodic automatically reset peak-holding technique was used. The mains monitoring channel was found very effective in practice, clearly detecting transients which were of too low an intensity to break through into the uPKMB channel.

Threee proving trials of these systems were held. The first was with Stephen North, Hasted's subject, fairly early on in the development of the piezo based system, when a prototype home use device was used to investigate whether uPKMB signals could be detected with PZT transducers. The results were encouraging, so development continued. The second trial, with a more sophisticated but essentially very similar system, was held with Paul McElhoney. A mains monitoring channel was used in both sessions. These sessions are described immediately below.

The session with Paul McElhoney revealed that the piezo uPKMB transducer was now so sensitive that loud impulsive noises or vibrations of the support on which the stand holding the PZT sensor system was placed would produce recorded outputs in the uPKMB channel. The noise level of the previous strain gauge systems had been sufficient to prevent this degree of sensitivity from being attained.

It was therefore decided that an ambient sound and vibration monitoring channel should be used, providing monitoring of possible sources of sound and vibrational interference by means of a microphone and amplifier system. This was developed and used similar peak-holding circuitry to the mains monitoring channel and uPKMB channel. The three channel device was used in the study reported in chapter 6.

The sessions with Stephen North and Paul McElhoney were conducted with a uPKMB sensor which consisted of a small spoon onto the back of which was bonded a strip of PZT multimorph. Since it was important to utilise standard sensors which must show similar characteristics it was decided to abandon the use of metal specimens and to adopt the practice of using the PZT strip alone, without a metal substrate. This type of sensor has been used for all subsequent studies.

4.4.1 The Stephen North Session

Three uPKMB sessions were held to evaluate the proposed final prototype equipment with individuals whose uPKMB abilities could presumably be relied upon. For the first session Stephen North was chosen as subject because he was at that time the only uPKMB agent "in training" as he was regularly attending experimental sessions with Hasted at Birkbeck College. Two later sessions were held with Paul McElhoney who claimed powerful PKMB ability.

The first session was held in the living room of North's house on the 2nd of July 1981. Only Stephen and the experimenter were present. Two uPKMB devices were present, a prototype of the home-use machine and the experimenter's proposed machine for his own use in training and testing uPKMB agents which was at that stage equipped with two channels, one being the uPKMB channel, the other the mains monitoring channel. Both devices used small spoons as substrates, with strips of PZT multimorph being bonded to the backs of their necks.

Just as the equipment was being set up before the formal start of the session the experimenter watched as the spoon attached to the home-use uPKMB detection device slowly bent before his own eyes. The device was within 1 metre of the experimenter and North was several metres away and had never touched any of the equipment (particular care was taken that he did not touch any of the equipment prior to or during the experimental session). The deformation took place during about 5 minutes as the equipment was set up by the experimenter.

The spoon wired to the experimenter's uPKMB device also bent slightly during this period, although the bending was less marked and was not fast enough to be perceptible to direct observation.

The mains monitoring channel was set to produce a 1 volt output in response to a 1000 volt mains transient. The chart recorder channel recording the mains monitoring channel output was set at 1 volt full scale deflection (fsd). Signals in the uPKMB channel were discounted if theyoccurred simultaneously with a mains transient which registered 60 mv or more on the chart record.

The chart recorder sensitivity of the uPKMB channel was set at 1 volt, such a low level of sensitivity being used because North was known to be a powerful PKMB agent. The total gain of the uPKMB channel was 22 across an effective frequency range from 4 kHz to 15 kHz. The noise level of the uPKMB channel as estimated by measurement of the chart record is essentially zero, because of the extremely reduced sensitivity of the chart recorder setting used. The noise level delivered by the same sensor, uPKMB amplifier and chart recorder operated in a very much more acoustically and vibrationally noisy environment was estimated from the chart record of McElhoney's second session reported immediately below as being 2 mv maximum peak to peak. It was therefore unmeasurable on the chart record from the Stephen North session, since the thickness of the pen trace was equivalent to approximately 15 mv.

To simplify analysis all putative uPKMB signals of less than 60 mv were discounted in the analysis of the chart record. It is not known whether a significant data loss was incurred by use of such a low chart recorder sensitivity. If there had been large numbers of small signals generated the loss of their summated amplitudes may have been considerable. The stability of the pen trace suggests that a few large uPKMB events occurred, rather than many small ones. For this early test the experimenter simply wanted to see if very large signals which were of sufficient magnitude unquestionably to be not due to electronic or acoustic noise could be recorded with North as subject.

Two trial periods were performed, separated by a 34 minute rest when experimenter and subject played handball together. North appeared to be slightly nervous at the start of the first trial period which was begun as soon as the equipment was functioning. During both trial periods the position of North and his hands relative to the uPKMB sensor was very carefully witnessed by the experimenter. North remained seated at some 1.5 metres from the sensor. At no time were any suspicious actions seen to occur. The uPKMB sensor was in full view during the occurrence of all uPKMB events and was carefully examined to exclude the possibility of threads etc being attached.

The frequency of occurrence of signals showed a steep decline within each of the two trials and between the first and second trial of the session. Figures 2 and 3 show the summed amplitudes of the uPKMB signals occurring within each three minute period of each trial. The first uPKMB signal appeared only 50 seconds after the equipment was switched on. As can be seen from the graph (fig 2) the most productive period occurred at the very start of the session, the uPKMB output falling to zero in the third period of three minutes and continuing at that level until period 7 and 8 during which a subsidiary peak in output occurred. The first trial period was continued with no further output for a further 15 1/2 minutes after which a rest period was instigated. During the 34 minute rest period the experimenter and subject played handball in the garden of the subject's home.

A second trial session was then started (figure 3). A similar pattern of steep decline in uPKMB output occurred in the second session, with the difference that the second, rather than the first 3 minute period was the most productive. After the fourth 3 minute period no further uPKMB events were registered, although the trial was extended a further 30 minutes.

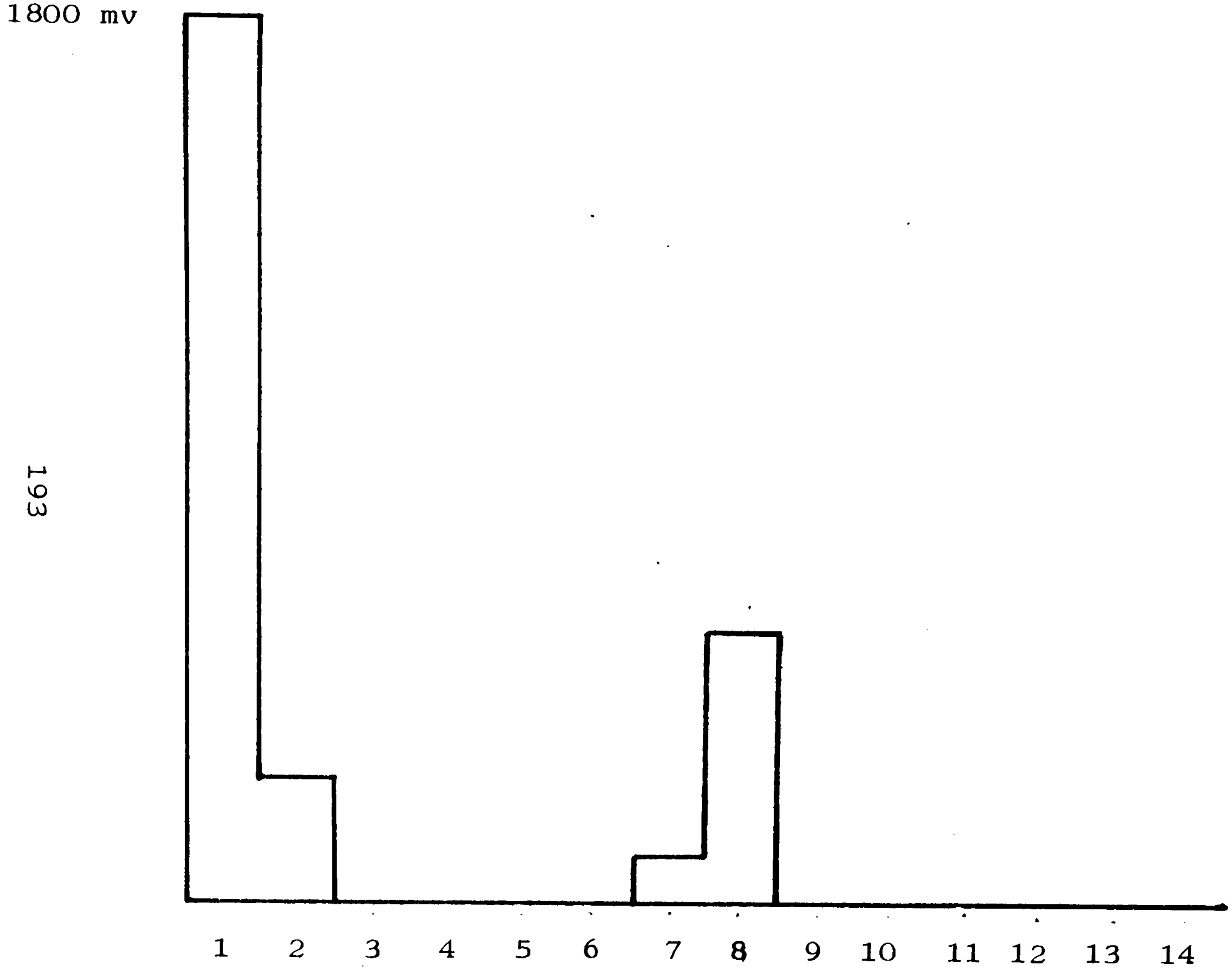

Figure 2. Summated uPKMB per Three Minute Period. First Trial of Stephen North

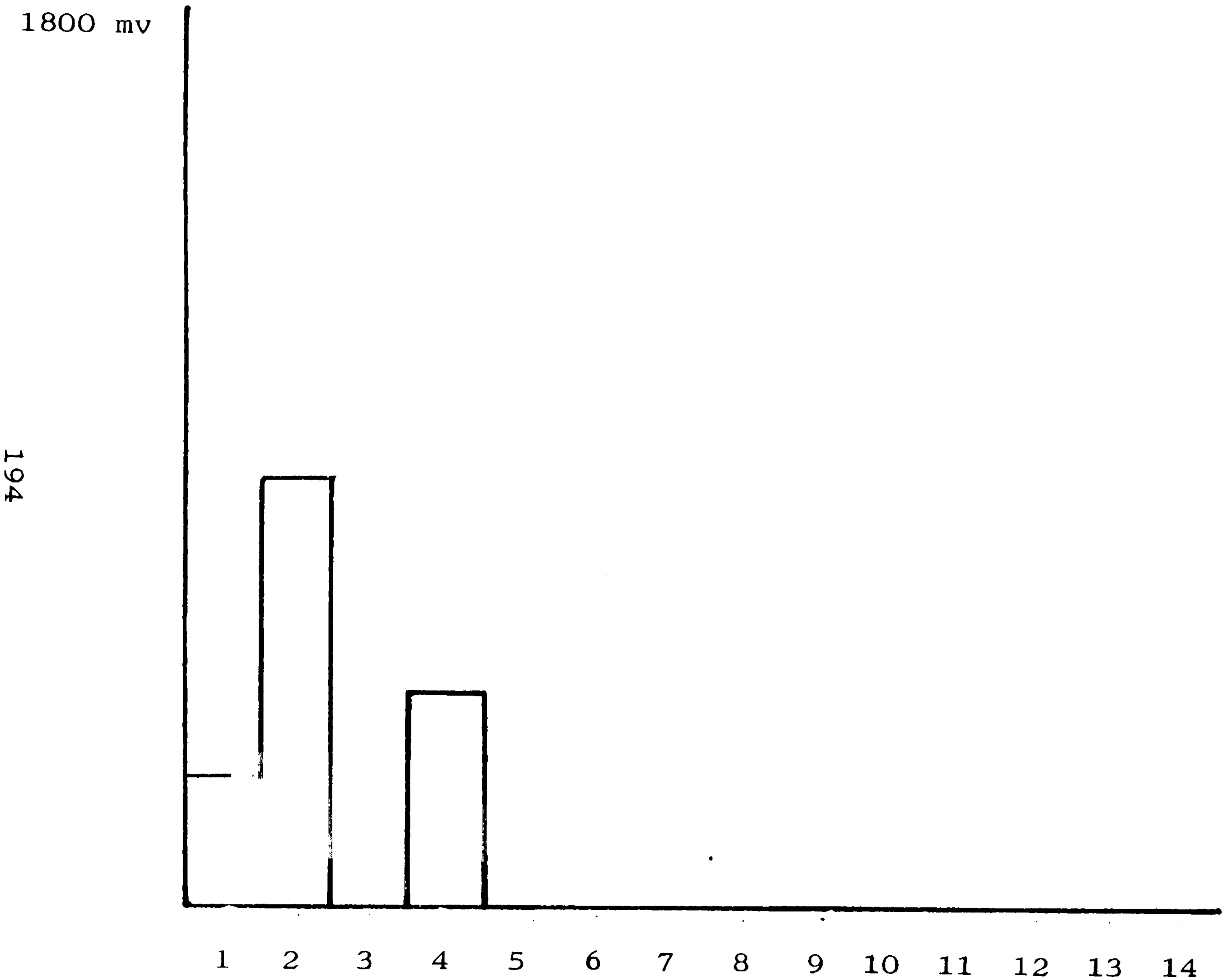

Figure 3. Summated uPKMB per Three Minute Period. Stephen North Second Trial

The results obtained with North were notable in two ways. First, in apparent contradiction to Hasted's reported finding (1981a) that North's usual pattern of uPKMB performance showed within-session inclines of uPKMB output, in this session very marked declines were shown.

It is tempting to speculate that the high level of motivation created by anticipation of the visit by a relatively unfamiliar experimenter may have precipitated the immediate burst of large amplitude events, followed by the decline. North showed considerable frustration at the decline of the effects during the latter parts of each trial session which may have reinforced an over striving orientation. He is well aware of the inhibitory effects of over striving but may have been inhibited by his desire to produce a good performance for the new experimenter.

The second striking feature of this session is the unusually large amplitude of effects which were generated. The total summed output for the session was 3,200 mv. This output was produced from only 22 uPKMB events, 14 of which were of 100 mv amplitude or greater, the mean being 145.5 mv. By contrast, in Paul McElhoney's first (and better) session his total output was 1448 mv achieved with 38 uPKMB events. Only 3 of the 38 events were of 100 mv or larger amplitude, the mean being 38 mv.

4.4.2 The Paul McElhoney Sessions

Two exploratory sessions were held with Paul McElhoney as subject. McElhoney claimed PKMB ability and stated that he had developed his PKMB ability as a result of daily practice during he lunch hour at work. He claimed a variety of PK abilities and was at the time of the uPKMB sessions also holding regular seances for ostensible macroscopic

PK effects.

The two sessions were held under very different conditions. At the first session McElhoney's wife and a friend were present in addition to the experimenter and the atmosphere was relaxed and relatively undemanding for the subject.

At the first session one channel of the chart recorder was set to a sensitivity of 100 mv, another being set at 1 volt. The mains monitoring channel was set to 1 volt fsd. The same uPKMB sensor, amplifier system and mains monitoring system was used as had been used with Stephen North. The subject's behaviour was carefully witnessed by the experimenter and it was ensured that no contact between them and the uPKMB sensor took place. Most signals occurred when the nearest part of the subject's body was more than 100 mm from the uPKMB sensor, some being obtained at distances of 2 metres. The subject was not permitted to approach nearer than 100 mm to the PK target.

The criterion below which signals in the uPKMB channel were excluded from consideration as possible PK was 14 mv. The noise level estimated from the chart record was 2 mv. As figure 4 shows, a large burst of uPKMB activity took place during the first two 3 minute periods. There was then a pause of some 12 minutes which was followed by another 6 minute burst of activity. The final burst of activity occurred after another pause of only 3 minutes and lasted until within 3 minutes of the termination of the session. As remarked in the account given of the Stephen North session, McElhoney's effects were more numerous (38 events versus 22) but smaller (mean of 38 mv versus 145.5 mv) than North's. There appeared to be a persistent background of smaller signals which were probably of paranormal origin because they are of too great an amplitude (around 10 mv) to be noise or due to ambient acoustic transients.

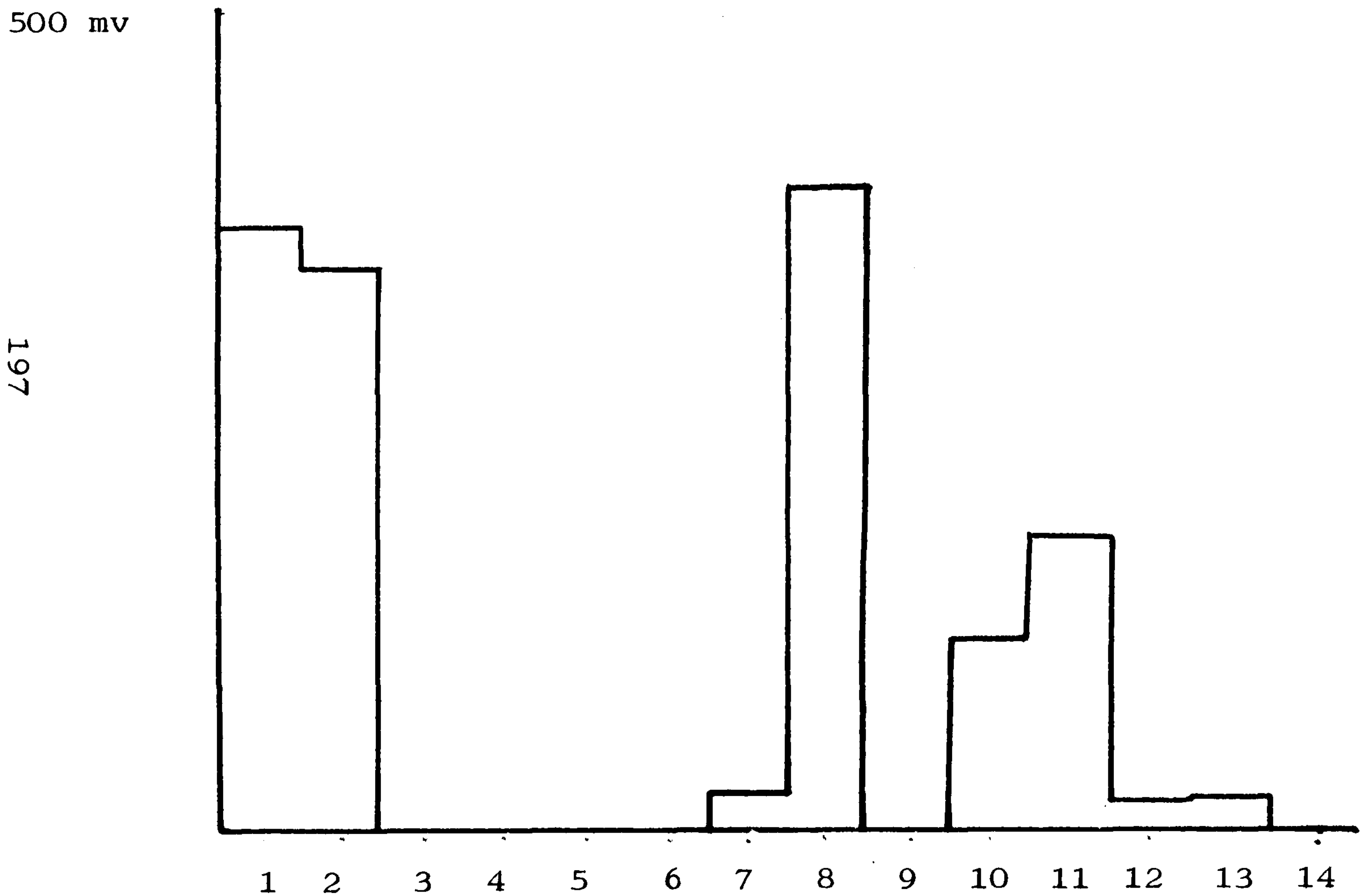

Figure 4. Paul McElhoney First Visit : Summated uPKMB per Three Minute Period

At the second session Dr Anita Gregory (parapsychologist and ex honorary secretary of the Society for Psychical Research) was present, but no other witnesses other than the experimenter. Several different types of macroscopic PKMB task were attempted at this session, including some exploratory videotaped macroscopic PKMB validation attempts and some of the uPKMB events at this session were also videotaped as they occurred. The atmosphere at the second session was much less relaxed than during the first. McElhoney had participated in PKMB experimentation during the morning and afternoon of the previous day with the experimenter. In addition, he had been up writing until 2 am on the morning of this second day of experimentation. McElhoney appeared visibly tired at the second session.

The same equipment was used as had been employed for the first session. The two uPKMB channels on the chart recorder were set at 10 mv and 100 mv, the third channel being used for the mains monitoring channel at a sensitivity of 1 volt fsd. The noise level was estimated at 2 mv maximum peak to peak and a criterion of 3 mv was used in evaluating the chart record below which no events were counted as possible uPKMB. The noise level was increased above its intrinsic level of 0.4 mv because the sensor's stand was placed on the window sill which was subject to vibration arising from the wind gusting immediately outside it. The subject was witnessed carefully by both the experimenter and Dr Gregory. The subject was not permitted to bring his hands closer than 100 mm to the uPKMB sensor and the gap between his hands and the sensor was under continuous surveillance.

As is displayed in figure 5 a total of 6 short trial periods were performed. The trial periods were terminated by the experimenter. This procedure was utilised in an attempt to forestall decline effects by termination of the trial period before decline had become apparent.

Figure 5. Paul McElhoney Second Visit. Summated uPKMB per Three Minute Period

The subject showed quite a small total summed output for the session (452 mv, 43 events, mean event amplitude of 10.5 mv). The smaller total output compared to McElhoney's first session (1448 mv) may have been due to his tiredness, the presence of another unfamiliar witness and the videotaping of part of the session. However the subject showed an impressive degree of control over the onset of the effects, since in 5 of the 6 trial periods the first uPKMB event occurred within 20 seconds of the attempt starting.

The apparent success of limiting trial lengths suggested that at least with some subjects the use of short trial periods might enable decline effects to be avoided and might result in a greater number of events being produced in sessions. McElhoney commented that he had changed his attitude towards uPKMB since his success in the first session and now felt more confident. Batcheldor's theory would predict improved performance resulting from McElhoney's increased belief in his ability to perform well.

The degradation of the noise level of the uPKMB detection system was noticed and led to an increased awareness on the experimenter's part of the need to use vibration free surroundings for uPKMB testing, although this factor would only be of crucial importance in the case of marginal uPKMB signals of small amplitude. In the case of this session the proportion of such marginal signals was fairly low - increasing the criterion level from 3 mv to 5 mv would reduce the summated score by only 10%. However it became clear from the sessions conducted with McElhoney that the only certain method of controlling for artifact due to noise and vibration would be to incorporate another channel dedicated to monitoring for noise and vibration. It was therefore decided that a noise and vibration monitoring channel would be designed and built.

4.5.1 The Juliet B Pilot uPKMB Training Series

Juliet B was reported by her parents as having macroscopic PKMB ability. She discovered this as a result of apparently successfully attempting PKMB after attending a talk given by the experimenter. She was a 15 year old schoolgirl at the time of the pilot study. Since Juliet lived quite near to the experimenter and was willing to participate in a training study she was chosen as subject for the study even though her macroscopic effects were not such as to suggest that she was a very powerful PKMB agent. It was decided to hold weekly training sessions at which the subject would be largely self paced. Since the series was expected to be exloratory in a number of respects, new instrumentation was utilised as soon as it became available. By the end of the series standardised instrumentation and procedures had been developed.

Two locations in the house were used for sessions, both of which were at ground floor level and had stone or concrete floors. The old, solidly built house was situated in a quiet location in a country village. The ambient acoustic and vibrational noise level of the environment was very low. Sessions were conducted with only the subject and experimenter present in the room except for periods in some early sessions when Juliet's father was present. Although a shy girl, Juliet showed considerable interest in uPKMB and proved easy to relate to.

At the start of the study the ambient acoustic noise and vibration channel (henceforth referred to as the "microphone" channel) was still being developed and it was used only from the third session onwards. The microphone channel employed a crystal microphone insert and an amplifier gain of 20. In use the microphone was firmly fixed to the uPKMB sensor's stand so as efficiently to detect vibration as well as acoustic noise. In sessions three to six the microphone channel chart recorder sensitivity was set to 1 volt fsd. From session seven it was set at 100 mv fsd.

Two types of uPKMB sensor were used. In the first three sessions the same spoon with its bonded strip of PZT multimorph was used as in the sessions with North and McElhoney. Subsequent sessions used a uPKMB sensor assembly which had as its transducer a 20 mm strip of PZT multimorph, insulated and electrostatically screened with a metallic silver based paint and secured to the lowest point of a 60 gm pear shaped lead fishing weight which was suspended compliantly from a wooden frame. The PZT strip was mounted within a transparent plastic tube which was open at its lower end (details are in appendix 1).

The amplifier and signal processing unit was the same as used in the sessions with Stephen North and Paul McElhoney and had the identical gain of 22. The noise level of the uPKMB channel as measured on the chart record was 1 mv maximum peak to peak for the first six sessions but was reduced by slight circuit modifications before session seven and again prior to session eight so that by session eight the system instrinsic noise was at the level of 0.4 mv. In the evaluation of the chart record a criterion level of 2 mv was used, signals below this amplitude being discarded. The three channel chart recorder was set to a sensitivity of 10 mv fsd for the uPKMB channel. From the fourth session onwards a separate single chart recorder was also used which was set to a sensitivity of 100 mv, expanding the range of accurate measurement up to 100 mv. The mains monitoring channel was set to a sensitivity of 1 volt fsd.

During the first session Juliet's father was present for about half of the time. A very surprising result achieved in the first session was that when the subject imagined pushing the PZT strip, negative pulses were registered by the chart recorder. In principle it would have been impossible for negative-going pulses to be registered because the output from the uPKMB sensor was full wave rectified, making all signals positive-going. As is shown in the graph of the summated uPKMB per session for this series (figure 6) the uPKMB output per session increased from session one to session six. Even though Juliet's output in the first session was low compared to either North's or McElhoney's the fact that she had produced what seemed to be definite uPKMB signals was presented to her as a very encouraging sign by the experimenter.

The uPKMB score in the second session was approximately double that of the first, although the number of events was comparable (13 as compared to 10 for the first session), indicating an increase in average signal amplitude (3.2 mv versus 1.9 mv). During the second session several interesting events occurred. The first uPKMB pulse occurred just as the subject released her effort and stepped back from the uPKMB task, as did the seventh. These pulses appeared not to be caused by the sunject's movements since other similar movements were performed at that distance from the sensor by the subject and no further uPKMB signals were registered. Two pulses occurred during conversation, one while the possibility of Juliet's home being haunted was being discussed, the other occurred while attitudes towards uPKMB were discussed, the event occurring just as Juliet stated "of course it can happen" (referring to uPKMB). One small pulse occurred as the subject and experimenter were walking around the garden of her home during a rest break.

Two instrumental changes were made in the third session. A second chart recorder was used from then onwards. It was set to a sensitivity of 100 mv. The vibration and sound detecting channel was first used in this session, the chart recorder sensitivity for this channel being set to 1 volt.

A pulse of 8.8 mv occurred at the beginning of the session prior to its formal start, as Juliet was remembering how she had once picked up a log and had been stung by a concealed bee hidden within it. The pulse happened just as she remembered being stung. During this uPKMB event she was seated approximately 5 metres from the uPKMB sensor and equipment. The feature noticed in the first session of negative-going pulses being produced continued in this session, 15 of the total being negative-going, 8 being positive-going and 4 being bipolar. The number of pulses in this session increased from 11 to 27 compared to the previous one, although the average pulse amplitude was similar (3 mv versus 3.8 mv). The distribution of pulse amplitudes in this session is shown in figure 9 (i).

From the fourth session onwards the new sensor employing a strip of PZT multimorph without a metal substrate was used. During part of the fourth session a 6 x 6 x 50 mm PZT block was used as PK target but no signals were recorded from it and the multimorph sensor was used for the rest of the session. The first part of the session was conducted using a prototype home-use uPKMB training device which had been loaned to the subject for her evaluation. No pulses were recorded using this device.

During the session a total of 18 pulses occurred, 12 of which happened as the subject was situated at 6 metres from the sensor. The distribution of the pulses is shown in figure 9 (ii). The summated output was larger than the third session (113.2 mv) as was the average pulse amplitude (6.3 mv).

The fifth session summated output showed a fourfold increase

(403.2 mv) compared to the previous one. Pulse number (16) was comparable to the fourth session so that the increase in summated signal was contributed by a fourfold increase in mean pulse amplitude to a value of 25.2 mv. This change in output is shown by the pulse distribution, figure 9 (iii), where it can be seen that pulses of very much larger amplitude than those occurring in previous sessions are scattered across a range of pulse amplitudes which exceed 100 mv.

Several interesting events happened during this session. In order to prevent Juliet from striving at the PK task she had been given a cartoon joke book to read as a subsidiary task. A total of 7 pulses occurred while she read the book, 5 of which happened just as she appreciated the point of some of the jokes. This suggests that a distraction effect may have been operating. While the experimenter and subject were walking in the garden 3 pulses happened. It was estimated that at the time of their occurrence Juliet had been sitting on the garden seat thinking about the uPKMB equipment. Only Juliet's parents were present in the house during this period and they stated that they had not entered the room. One pulse happened as Juliet was looking out of the window, just as she suddenly started thinking of the uPKMB sensor.

During the sequence of sessions Juliet had been aware of the increase of uPKMB occurring in them. Most of the uPKMB events seemed to happen when her attention was not directed primarily towards the PK task, although some occurred in response to her deliberately attempting to produce them. The impression was gained by the experimenter that she showed an increasing ability to produce effects intentionally. The chart records were analysed after each session and the steep increase in summated output led the experimenter to approach each session feeling confident that the next would see a further increase in output.

Juliet reported after the sixth session that she had felt that it would be very successful. Given the history of the preceding sessions this was hardly surprising, but Juliet claimed that she had felt that she was in an especially psi favourable state prior to the sixth session and that she had felt excited but relaxed prior to the session. The experimenter was also in a happy and relaxed frame of mind just prior to this session. Juliet also stated that she had practised uPKMB with her home-use machine several times during the week prior to session six although her practise results had not been very successful.

The sixth session summated PK output was six times the magnitude (2,419 mv) of the fifth session. The mean pulse amplitude was slightly lower than session 5 at 22.4 mv but the number of pulses was the highest in the series at 108. The distribution of pulse amplitudes of this session shown in figure 10 includes 8 pulses of more than 100 mv. Due to the full scale value of the single channel chart recorder being set to 100 mv this represents an unknown loss of signal so that the total output was above the figure cited since the 8 over-scale events were counted as being 100 mv in the summation of output.

Nearly half (46) of the uPKMB events of this session happened while the subject was situated at 4 metres from the sensor and other instrumentation examining a photograph album in company with the experimenter.

The seventh session saw a virtual disappearance of uPKMB compared to the previous session, a score of only 27 mv being achieved with 4 pulses. Several possible exlanatory factors were present. Juliet's sleep pattern had been disturbed on several preceding nights. Her normal timetable was to go to bed at 22.00 hrs and rise at 7.30.

However on the immediately preceding Thursday night she had retired at midnight and had risen on Friday at 7.15. On the Friday night she had attended her parent's firework party and had drunk quite a lot of punch and not gone to bed until 2 in the morning. On the Saturday she had got up at 8 and had again drunk quite a lot of wine at her parents' dinner party that night and had not risen until 9.45 on the Sunday morning. She reported having a headache for the whole of the session and clearly had a hangover. The uPKMB session was started at 10.45 in the morning.

Juliet's sleep deprived and hung-over state was probably sufficient explanation for her lack of performance in the seventh session. However a new uPKMB sensor was used at first, although it was identical in design to that used previously. Strong subject preferences might have been present since many other subjects have appeared to establish a relationship with particular uPKMB sensor assemblies (see chapters 6 and 7).

Batcheldor has speculated (Batcheldor 1984) that her behaviour in putting herself in a position where her PK performance was seriously affected may have been a response of resistance to PK. He hypothesises that the steeply increasing PK performance of the earlier sessions may have led to the prospect of results in the seventh session being threatening. While this is possible, given Juliet's relative lack of experience and young age it seems more likely that she over imbibed simply as a result of inexperience.

Juliet's PK performance never recovered to its previous level. In session 8 the summated output was 3.6 mv, and in session 9 it was 12.4 mv. The relationship between the experimenter and subject seemed to be very much as before and no procedural or instrumental changes were made.

In session 10 Juliet's tendency to produce bipolar signals reemerged in a very striking fashion. The session was characterised by a very large number of bipolar signals which occurred in prolonged continuous bursts, of a character quite different from the usual single unipolar pulses associated with "normal" uPKMB production. Very few normal uPKMB signals were produced.

The form of the bipolar signals was of roughly triangular shape and their amplitude varied from being just perceptible in the normal noise of the pen trace to signals that were of almost full scale (10 mv) amplitude. The massive number and bipolar nature of these signals made estimation in the normal way meaningless, but measurement of the chart record showed that the bipolar signals lasted for 38 minutes of the 110 minute session, some 35% of the total time. This was an unusual PK display and careful checking of the equipment at the time revealed no obvious fault or loose connection. The equipment worked perfectly when checked by the experimenter in the afternoon, away from the subject and has never again produced a similar output. Some bipolar signals were recorded while the experimenter and subject were in the garden of the subject's home.

The bipolar signals were unique, in the sense that no other subject has ever produced similar signals since. It was impossible to tell whether the locus of action was upon the electronics of the amplifier or chart recorder or whether it was a direct mechanical effect upon the pen of the chart recorder. The fact that the normal signal from the uPKMB signal amplifier and processing unit was rectified made it most unlikely that the signal derivedfrom the uPKMB sensor. The fact that no similar signals have been produced by any other subject tends to add to the impression that the locus of their PK action has indeed been upon the uPKMB sensor, rather than upon the electronics or chart recorder system.

No uPKMB output was recorded for session 11 and session 12 only produced an output of 5.6 mv. Since it appeared that, at least in the short term Juliet's PK output was not going to recover it was decided to terminate the series at that point.

4.5.2 Conclusions

The series with Juliet B had been promising but also highly frustrating. Her output in the first half of the series had increased in a dramatic fashion, culminating in the sixth session where large numbers of signals were recorded under conditions where fraud by the subject seemed to be excluded. Either learning or some form of deinhibition process had presumably occurred. The increase in her output certainly strongly suggested that uPKMB performance could be improved with practice.

If some undetected local source of artifact had been responsible for results it would be curious that it could show an increase across sessions, yet disappear when Juliet was suffering from a hangover. No heavy machinery, radio transmitter or high voltage electrical equipment was present nearby. The dependence of the effects upon obviously psychological factors, such as Juliet's suddenly thinking of the sensor causing an effect, or uPKMB events occurring at the instant of her perceiving the point of a cartoon joke seemed to identify her as the causal agent responsible for them.

The reduction in striving and attention towards the task caused by her being given an undemanding secondary task to perform seemed to facilitate her PK, as it may have done for Hasted's subject Nicholas Williams (Hasted 1981a). She had produced anticipation effects, release of effort effects and distraction effects. In addition she had shown that at times she could produce effects on request.

However, after the seventh session her failure to achieve her previous levels of performance was inexplicable. Even had she started slowly, if she had maintained a consistent incline in performance from session 8 onwards, by session 12 it could be anticipated on the basis of her earlier performance that she would show an appreciable output, yet it remained at a tiny fraction of that of even her second session.

Clearly it would be reasonable to hypothesise the continued existence of her potential ability. Given this hypothesis it therefore followed that at some level an inhibition was operating of which the subject (and experimenter) was apparently unaware. It might be thought that the events of session 7 could have caused a loss of faith in her PKMB ability, but this did not appear to be the case. It must be admitted that only speculative hypotheses can be offered as to why she failed to resume her previous level of performance. Perhaps Batcheldor was correct in speculating that either for subject or experimenter (assuming that he would be capable of influencing the results, which is itself very unclear) the PK of session 6 represented a sufficient threat to cause a virtually complete inhibition of subsequent effects.

Batcheldor has noted the seeming occurrence of "catastrophic expectations" in sitter group practice (1984) where the sitting following a sitting where exceptionally dramatic and powerful PK is frequently barren of PK. Yet superficially at least Juliet seemed not to experience any fear of the PK she produced, so that the imputing of a fear reaction to her remains highly speculative. Extensive informal interviewing of her produced no further leads as to the possible source of the inhibition.

Certain procedural lessons were learnt from the series which were applied to the 12 session study reported in the next chapter. The use of the microphone channel had demonstrated over more than ten hours' running of the equipment that it was effective in responding to environmental noise and vibration. The chart recorder sensitivities were standardised at 1 volt for the mains monitoring channel and 100 mv for the microphone channel. The PZT multimorph strip uPKMB sensor had proved acceptable to the subject and had suffered no apparent damage from its exposure to uPKMB. However the fact that a large range of uPKMB signals had been encountered, some of which had exceeded the upper limit of the 100 mv sensitivity chart recorder suggested that the answer to the accurate recording of a wide range of uPKMB signals could not lie in the use of further chart recorders since this represented a significant addition to the equipment which had to be light and portable for carriage to subjects' homes. It was therefore decided that a digital meter circuit with a manually reset peak hold facility would have to be developed. The excellent stability of the structure of Juliet's house and the concrete and stone floors alerted the experimenter to the need to avoid vibration prone wooden floors as points of support for the uPKMB equipment.

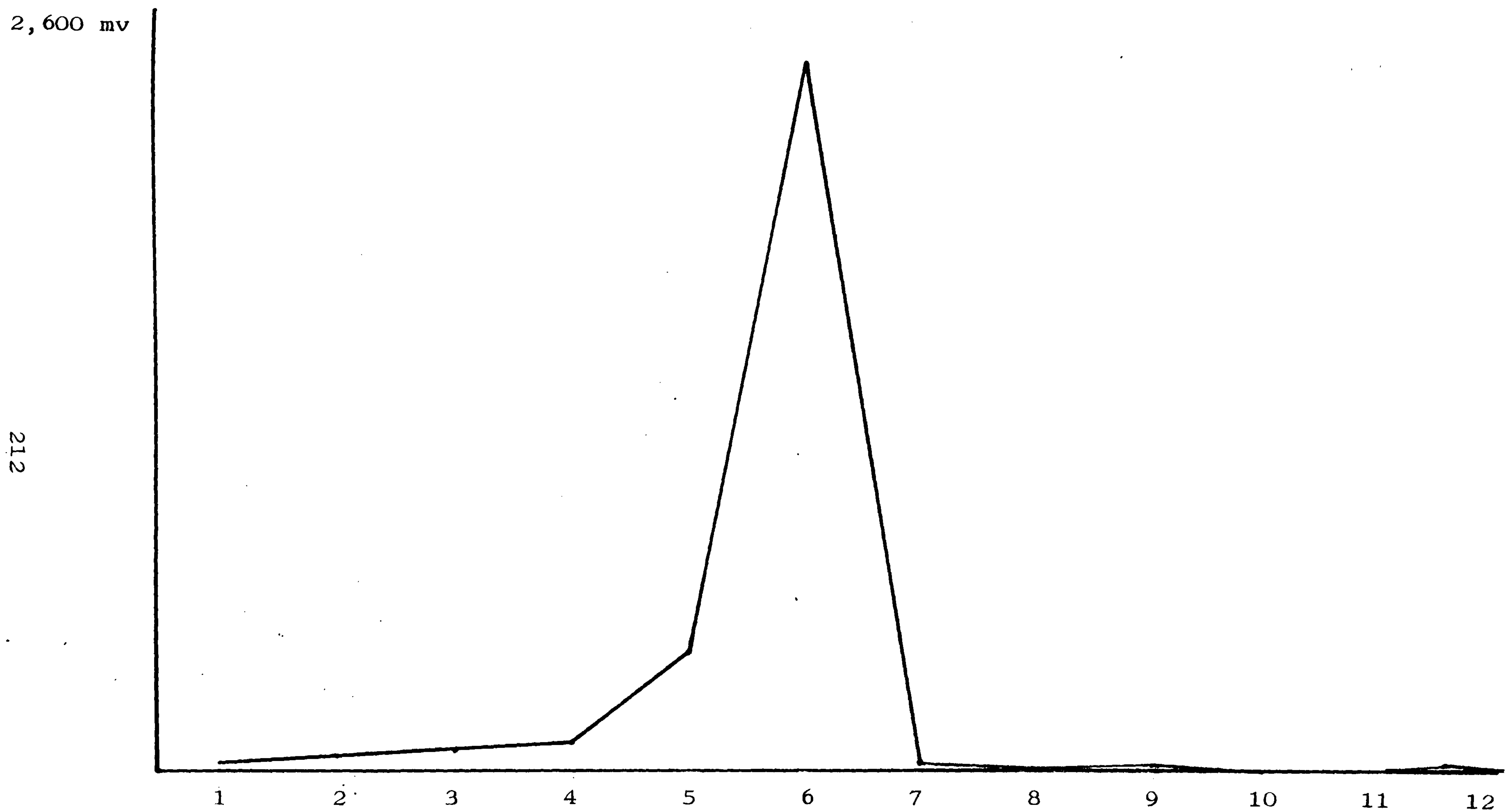

Figure 6. Juliet B Summated uPKMB Per Session

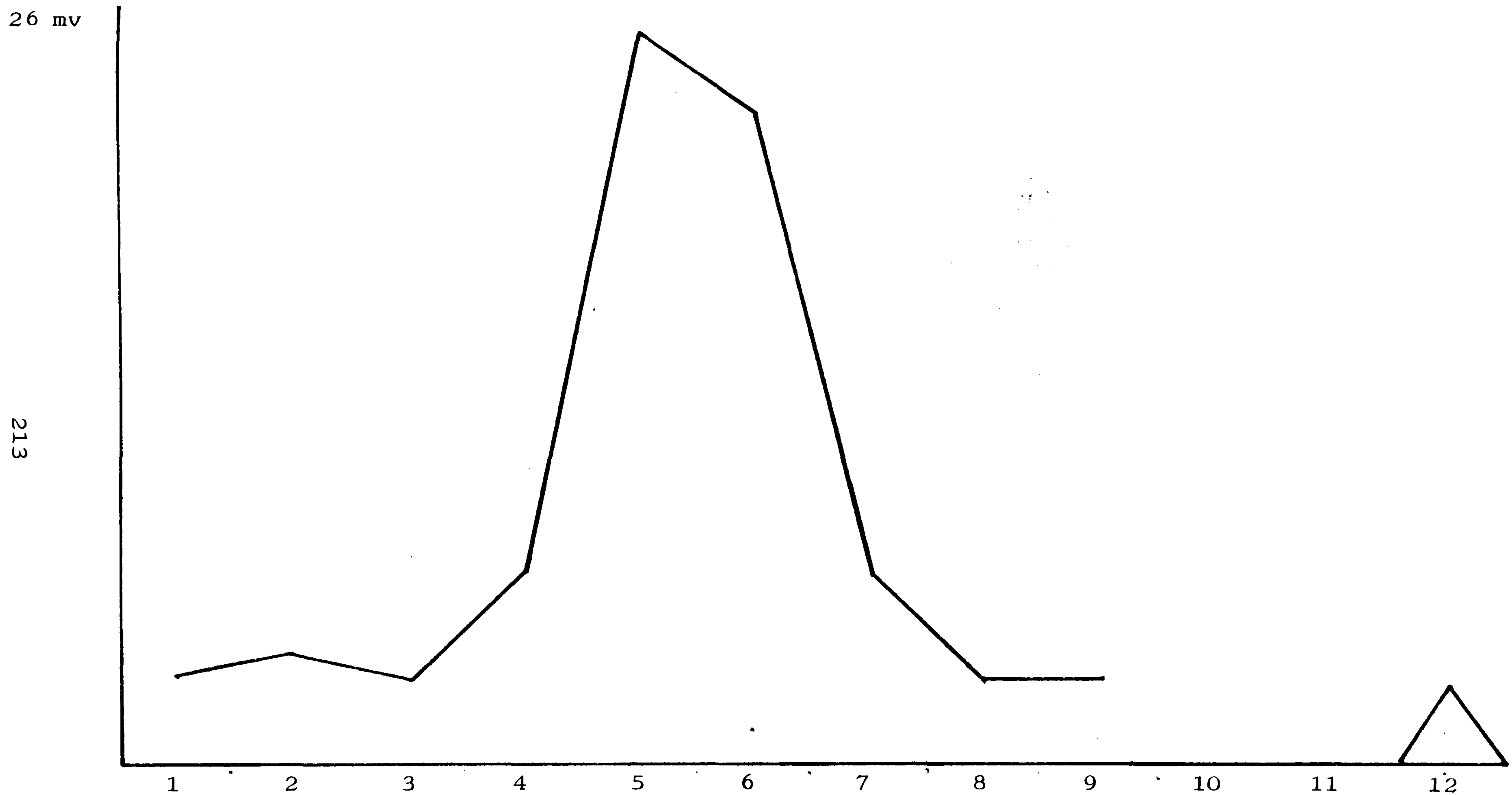

Figure 7. Juliet B Average Pulse Amplitude per Session

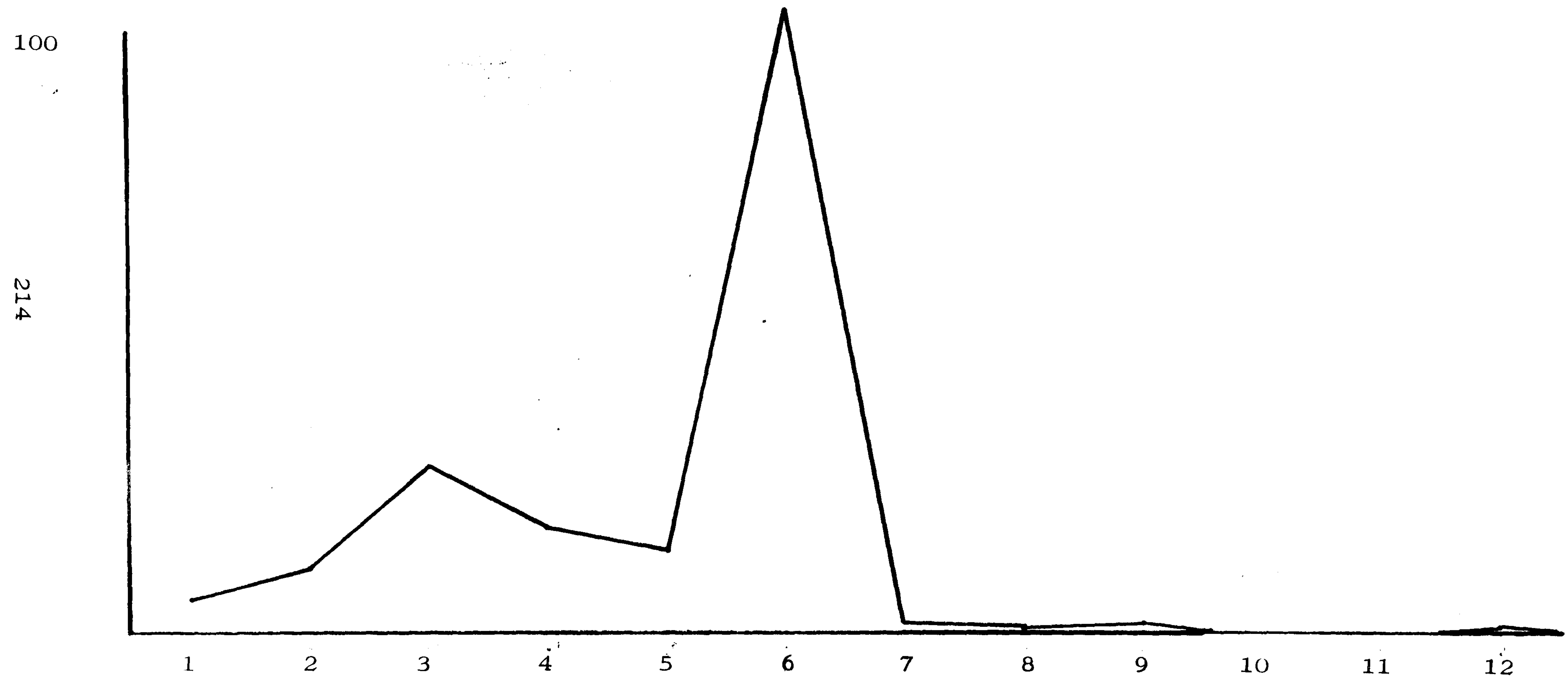

Figure 8. Juliet B Pulse Number per Session

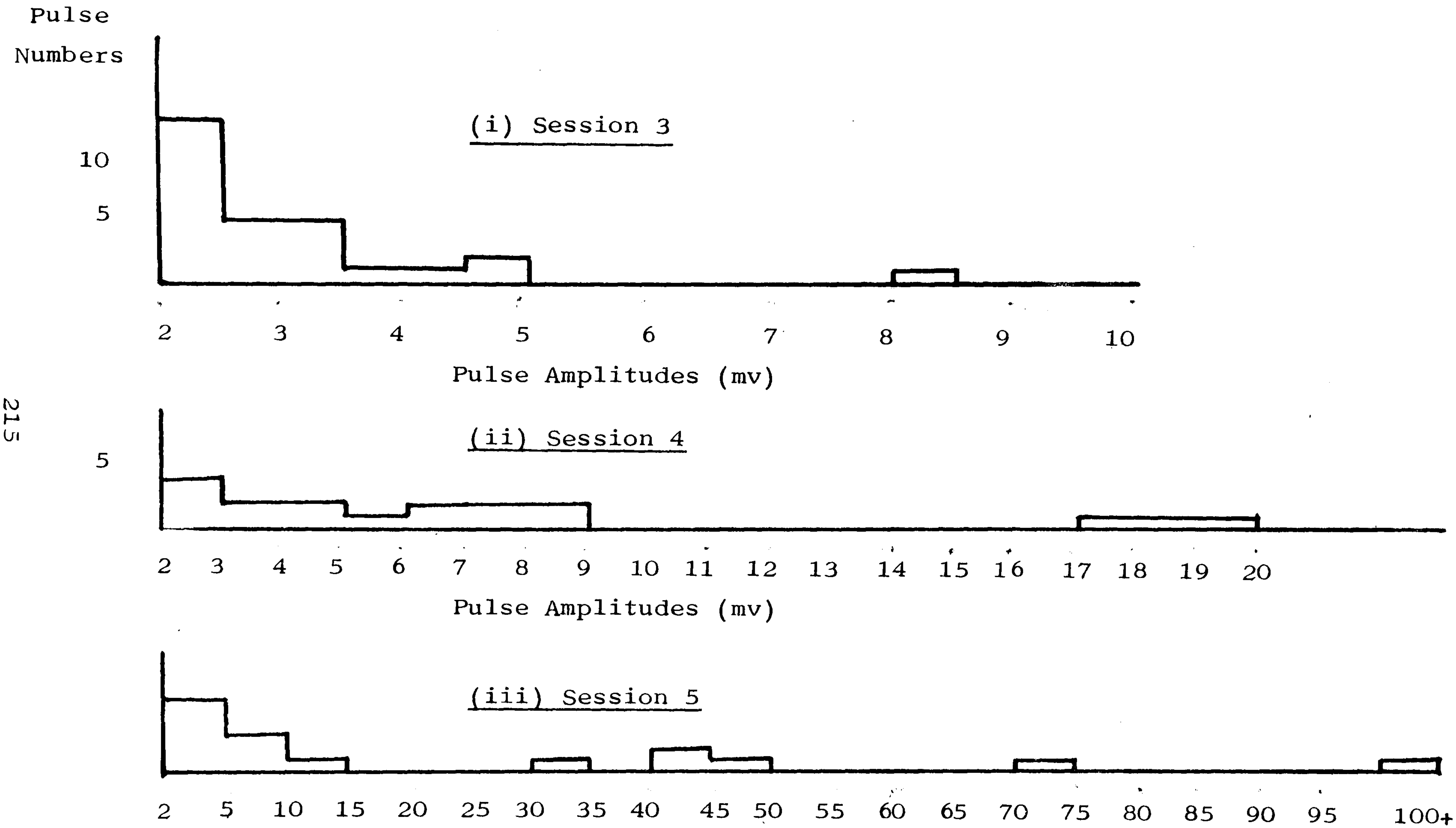

Figure 9 (i, ii, iii). Juliet B Pulse Amplitude Distributions per Session

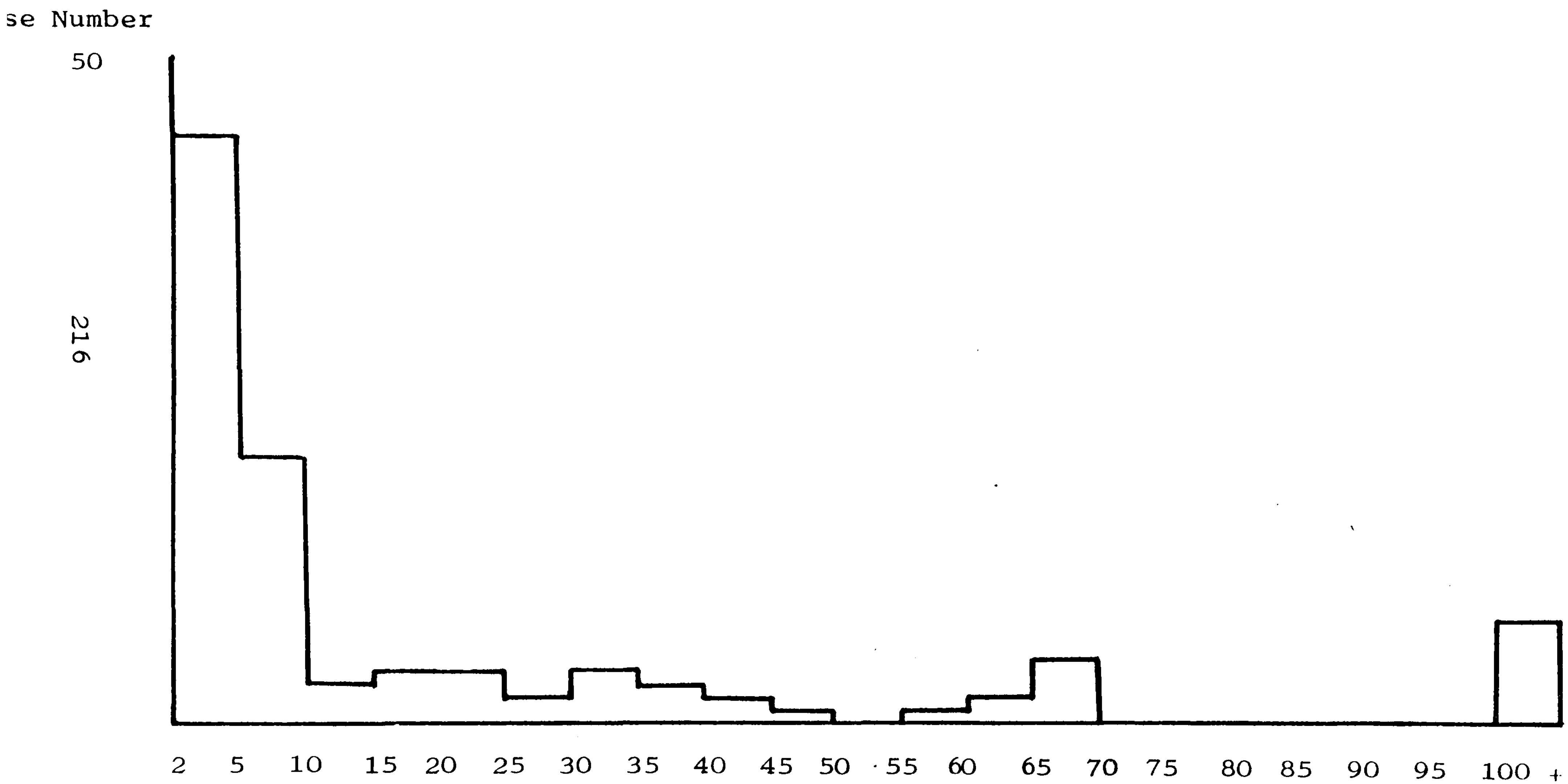

Figure 10. Juliet B Distribution of Pulse Amplitudes : Session Six

CHAPTER FIVE

THE TWELVE SESSION STUDY

5.1 Experimental Hypotheses

The pilot studies had suggested a number of hypotheses which could be tested in addition to the major hypothesis that improvement of uPKMB performance would be shown. It was decided to utilise a twelve session series of once weekly 45 minute training sessions for the first fully formal study. Each session would employ three conditions, "near" uPKMB trials, "distant" uPKMB trials and rest periods, explained below. Both subject and experimenter would complete pre and post session questionnaires which were intended to measure psychological factors thought to affect uPKMB performance. The hypotheses to be tested in the study were that :-

1. Subjects will show an increase in total uPKMB output and pulse number per session (collapsed across the three conditions) over the series of training sessions. The planned test of this hypothesis was to be by a comparision of scores of pulse numbers between the first half (sessions 1 -6) and the second half (sessions 7 - 12) of the series of sessions. Statistical evaluation of the difference would be performed by means of the Chi square statistic. Linear regression would be performed for the subjects' results and the correlation coefficients calculated would when evaluated by t test be significant at the 0.05 level (single tailed). Slopes of the regression lines would be non zero and positive in value.

2. Comparison of summated uPKMB scores and pulse numbers occurring in trial periods versus those for non trial periods will show a first half-series to second half-series increase in output for trial periods. The difference would be statistically significant at the 0.05 level (single tailed) when evaluated by Chi square statistic. This is the first hypothesis regarding control. It implies that subjects will selectively increase their output in the intentional (trial) condition.
3. Comparison of summated uPKMB scores and pulse numbers occurring in non trial (rest) periods will show a decrease between the first and second halves of the series. The difference will be significant at the 0.05 level (single tailed) when evaluated by Chi square statistic. This is the second hypothesis regarding control. It implies that subjects will selectively inhibit their uPKMB output in the non trial condition.
4. More uPKMB output will occur in the "near" condition where the subject is nearer to the uPKMB sensor than in the "distant" condition when they are further from it. The difference would be significant at the 0.05 level when evaluated by Chi square statistic.
5. Anticipation effects will be encountered so that uPKMB effects occurring in rest periods will tend to cluster within a 10 second period just before the start of trial periods.
6. Release of effort effects will occur so that uPKMB effects occurring in rest periods would tend to cluster within a 10 second period of the end of trial periods.
7. Individual differences between the performances of the subjects will be shown.

8. A number of hypotheses were incorporated in the design of the questionnaires. These will be discussed in section 5.8. dealing with the questionnaires.
9. This hypothesis was not tested quantitatively or formally. It was predicted that subjects showing higher levels of macroscopic PKMB would exhibit larger increments in output over the series of sessions.

5.2 Experimental Design

As Juliet B had shown an increase in her uPKMB output over six sessions it was decided that a total of twelve sessions ought to allow most subjects sufficient practice to enable them to improve their uPKMB performance if this was possible. In order not to impose unacceptable demands on the subjects' time the training sessions were set at 45 minutes.

A difficult decision was taken regarding the pacing of the subjects' trial and rest periods. As will be recalled, both the Justin J series and the Juliet B series employed self pacing by subjects. From the point of view of optimising subjects' performances it was suspected that self pacing might be superior compared to pacing from an external source. However the use of external pacing would enable the subjects' performances to be compared very much more directly than if they were allowed to pace themselves so that it was utilised in this study.

A cassette tape giving instructions defining trial and rest periods was used. The experimenter's voice was used to issue timing instructions. The time periods in each condition are shown in table 1 overleaf.

Table 1. UPKMB Training Session Timing Schedule

Condition	Duration (Minutes)
Rest 1	7
Near Trial 1	1
Rest 2	2
Distant Trial 1	2
Near Trial 2	2
Rest 3	4
Near Trial 3	2
Distant trial 2	2
Rest 4	5
Distant Trial 3	1
Near Trial 4	1
Rest 5	5
Near Trial 5	1
Distant Trial 4	1
Rest 6	5
Near Trial 6	2
Rest 7	1

It will be noted that a total of 17 separate periods were used. The rationale for the use of this large number of periods was that it was expected that in conformity with hypotheses 4 and 5, many uPKMB effects would occur at the moment of change from rest to trial or from trial to rest. The rest periods became longer during the session whilst trial periods shortened. This design was used because it was expected that it would minimise decline due to subject fatigue.

It was decided that three conditions would be used. One of these would be the "resting" condition where subjects were allowed to rest, relax from the PK task and talk to the experimenter if they wanted while the timing cassette played relaxing classical music at low volume. Subjects were encouraged to adopt a particular chair as their seat whilst resting, to maintain the constancy of their distance from the PK sensor during both rest and distant trial periods as the same seat was used for both.

Two trial conditions contrasting the distance between the subject and the PK target were used because the literature on the macroscopic effect and Hasted's results with Stephen North (1981a) suggested that differences in performance would probably occur in response to differences in distance between the subject and the uPKMB sensor. Since this is a fundamental variable it appeared to merit testing in the first study and was incorporated as hypothesis (4).

During both trial periods subject and experimenter did not speak, except sometimes when the experimenter briefly made encouraging remarks after uPKMB events. The "near" condition was that whereby the subject was to be seated near the uPKMB sensor apparatus and was allowed to place her hands to within 50 mm of it. During near trial periods the experimenter exercised vigilance to ensure that accidental or deliberate contact with the sensor did not occur. Care was taken to ensure that under this condition the experimenter had a clear view of the gap between the subjects' hand(s) and the sensor.

The "distant" trial condition was that where the subject was positioned at least 2 metres from the uPKMB sensor. During distant trials the subject sat in her rest chair, allowing direct comparision between her resting uPKMB output and that produced during distant trial periods.

Great care was taken in the selection of the room in which sessions were held. In every case a room having a stable floor was used, each location being on the ground floor. All of the rooms except that used for subject Sheila D were in quiet locations.

Sessions were held with only the experimenter and subject present. This was essential in order to avoid possible inhibition due to the presence of other people. The presence of other individuals in the sessions would also have created another possible source of variation in conditions since the other person would have to have been present for every single session or else a further uncontrolled element would have been introduced.

5.3 The Subjects

The five subjects were all female. The choice of female subjects was not deliberate but was caused by the non availability of male subjects. It had been hoped to incorporate a sixth male subject but it proved impossible for him to participate after only three (non scoring) sessions. Similarly a seventh female subject withdrew from experimentation after only two (non scoring) sessions.

Four of the five subjects (all except Sheila D) had been identified as possible PKMB agents at mass screenings held by the author from several months prior to the study to two years prior. All had produced ostensibly paranormally deformed cutlery at the screening they attended. Each of the four subjects had attended spiritualist churches in the West Midlands and each had participated in spiritualist "development" circles. All four claimed to experience spontaneous ESP. Helen H (H.H.) Monica B (M.B.) and Mary H-W (M.H-W.) claimed frequent ESP experiences and Helen H claimed spontaneous PK events.

The fifth subject Sheila D (S.D.), was the wife of an acquaintance of the experimenter's. She reported the single spontaneous ostensibly paranormal deformation of a car ignition key while she was holding it at her place of work. She had not intended to bend it and had been quite disturbed by the event. She reported no spontaneous ESP and although interested by the paranormal seemed to be somewhat frightened of it. She was not a spiritualist and had never attended spiritualist churches.

5.4 Procedure

The experimenter usually spent a short time talking to subjects prior to and whilst setting up the apparatus. Once the apparatus was functioning satisfactorily the timing cassette was started in the player and the first period initiated. During this first rest period the subject and experimenter completed the pre-session section of the questionnaire, the subject sitting in her rest chair. The first period was designated a rest period to allow for the questionnaire to be completed and also so that anticipation effects could be detected prior to the first formal trial.

The cassette tape then instructed the subject to change their seating position so as to be in the near position, when the first trial would start.

During all sessions the experimenter attempted to behave in as friendly and encouraging fashion as feasible. The subjects responded by being surprisingly self revealing and open.

Subjects were encouraged to construe themselves as having succeeded in producing uPKMB effects even though it had often to be acknowledged that the effects were slight and did not count formally as PK. An effort was made to prevent subjects from perceiving sessions as having been failures, although sometimes in spite of the experimenter they clearly exercised their own judgement regarding the outcome of sessions.

5 .5 Apparatus

The sensor was the same as that used in the later sessions of the Juliet B series, employing a 20 mm strip of PZT multimorph. The sensor was suspended by means of a 160 mm length of thin elastic bands from a wooden stand which was placed on a stable base. The uPKMB channel amplifier gain was the same (x22) as used in the Juliet B series and the microphone and mains monitoring channels were the same as used in the Juliet B series.

A new feature in this series was the introduction of a solid state digital millivoltmeter and manually reset peak holding circuit which was used to obtain the amplitudes of signals in excess of 10 mv. Where the signal was smaller than this amplitude the chart recorder amplitudes were used to compute scores as for small amplitude signals.

5.6 Evaluation of Signals

The records of sessions were in the form of chart recordings. The identity and start of each period during the session was recorded at the time on the chart record. Three channels were used, one being the mains monitoring channel, set at 1 volt sensitivity, another being the uPKMB channel, set at 10 mv sensitivity, the third being the sound monitoring channel, set at 100 mv sensitivity. The chart speed was set at 1 mm per second. The positions of the pens relative to each other were calibrated by simultaneous signals being generated on each.

In the evaluation of the chart records, the noise level of the uPKMB channel was estimated to be 0.4 mv maximum peak to peak. A criterion level of 2 mv was applied, any signal below this level was not considered as candidate uPKMB. This excluded all the noise signals except artifacts caused by loud impulsive sounds, direct touches of the uPKMB sensor or banging of the uPKMB sensor support. The sound and vibration monitoring channel intrinsic noise level was estimated at 1 mv. Any signal arising in the sound monitoring channel of amplitude greater than 8 mv occurring simultaneously with signals in the uPKMB channel was taken to invalidate the signal in the uPKMB channel. This represented a wide safety margin, since signals in the sound channel of greater than this magnitude did not cause any measurable response in the uPKMB channel. Any signal in the mains monitoring channel greater than 60 mv was taken to invalidate any simultaneous signal in the uPKMB channel, although very many large (>500 mv) signals occurred in the mains monitoring channel which did not create any measurable response in the uPKMB channel.

A small number of larger signals in the mains monitoring channel (>1 volt) did create signals in the uPKMB channel, but these responses were negative-going. Since all uPKMB signals were positive-going, occasional artifacts in the uPKMB channel due to the ingress of electromagnetic transients were easily recognised as being of opposite polarity to the uPKMB signals independently of the response of the mains monitoring channel, providing a double protection against artifact due to electromagnetic transients.

The uPKMB scores were computed by measurement of all uPKMB pulses over 2 mv amplitude which did not occur simultaneously with invalidating outputs in the electromagnetic artifact monitoring channel or the microphone channel. The uPKMB score for each period during each session was then computed by addition of the valid pulse amplitude values for that period. Summation of the values for each condition allowed analysis by condition for each session.

Addition of the numbers of pulses occurring in each period provided the "pulse number" measure for that period. Chi square computations were performed exclusively on the pulse number figures rather than the summated amplitude results since these satisfy the requirements of the test more exactly. This decision has probably led to a more conservative estimate of the effects being made than if summated pulse amplitudes were used. However since the summated amplitudes do convey information they have been included in the tables and graphs of results.

The summated total outputs per session for each subject are shown in figures 11 to 16. Since it was anticipated (hypothesis 6) that strong individual differences would be shown and since the subjects' performances did differ from each other the analysis of the results will be started by examination of the individual session by session performance of each subject.

5.7.1 Results : General Overview

Subject Sheila D was a teacher in her mid forties. She produced no scoring session in the series. This may have been due to her not being very PK-talented, which may have also been shown by her lack of experience of PKMB, since she had reported only one spontaneous PKMB event. This would tend to confirm hypothesis 8, since her macroscopic PKMB performance was certainly the least of the group. She had tried several times to produce macroscopic deformations of cutlery and had failed, whereas all the other subjects could apparently produce macroscopic deformations more or less as they wished when they made the attempt whilst unwitnessed on their own. She had also shown fear of paranormality. A contributory factor may have been that she was the only subject to be employed at the time of the experiment and sessions were held with her a short time after she returned from her demanding teaching job.

Her result was a good test of the uPKMB detection system's ability to reject both electromagnetic and acoustic artifact, since the test site was by far the noisiest of all those used, being the subject's kitchen in which were located a freezer, central heating boiler, refrigerator and washing up machine. The constant switching of these nearby automatic systems and the hard wall, floor and table surfaces maximised environmental acoustic and electronic noise.

Additionally, if some fault instrinsic to the equipment had existed, or if the presence of human bodies near to the equipment produced artifactual outputs they should have shown up under these conditions, since the subject's overt behaviour closely matched that of the other subjects. Since all the subjects were run during the same weeks, possible periodic effects producing artifacts in later sessions should also have produced effects in Sheila D's sessions. Her results can therefore be seen as an unintentional control run.

Phyllis W's session by session summated scores are shown in figure 11. Mrs W was in her mid fifties. It will be seen that in the first session she produced one pulse of 2.4 mv amplitude. Between this session and the seventh she produced a gradually increasing level of non scorable uPKMB (ie no pulses of 2 mv or larger) and started scoring again in the seventh session. Her performance was irregular, scores being achieved in the ninth, tenth and twelfth session. Since she had performed well in the twelth session the sessions were continued. A thirteenth session using the timing cassette was run, then sessions fourteen to sixteen were conducted with the subject being allowed to pace herself. The most successful session was session twelve as can be seen from figure 11. It should also be noted that virtually all of the uPKMB recorded occurred in the latter half of the series.

Figure 12 shows the session by session summated output from the subject Mary H-W. Mrs H-W was in her late fifties. The output early in the series is similar to that of Phyllis W, scoring in the first session being followed by a series of non scoring sessions until the sixth.

Although her score in the eighth session is the greatest of the series this has been caused by one pulse in the twelth session being discounted as invalid due to a simultaneously occurring electrical interference pulse in the mains monitoring channel. This pulse is probably valid (because larger transients have had no effect) and if counted would bring the score in the twelth session to 11.4 mv, slightly larger than that of the eighth session (10.4 mv). A self paced trial was performed by Mary H-W after the formal end of the twelfth session where she scored almost half as much as she had achieved in the foregoing session.

The experimenter was feeling depressed in the week of the eighth session. However he made every effort to conceal his state from the subjects. At Mary H-W's eight session during the period prior to the first trial a series of uPKMB events occurred and the experimenter thought that the session would probably be very productive. But as soon as the experimenter sat near to the subject at the start of the first trial period the subject immediately remarked that she could feel the experimenter to be surrounded by a dark cloud. She then proceeded to give an accurate description of the experimenter's feelings. She then declared that she would not be able to produce any more uPKMB that session, and no further signals were produced in that session. The score for session eight therefore derives exclusively from the first time period.

Scoring only recommenced in the twelth session. Whether the absence of scorable uPKMB in the sessions between resulted from the apparent inhibition in the eighth session cannot be certain. The subject suffered from back pain during the latter sessions which may also have been inhibitory. Because of her modest uPKMB performance and back pain it was decided only to hold one session with her after the first twelve.

The performance of subject Helen H is shown in figure 13. She was the youngest subject, being in her late twenties at the time of the experiment. Her uPKMB performance in the first twelve sessions was fairly modest. As can be seen from figure 13 she started to score in the third session and achieved her largest score of the series of twelve in the seventh session. She reported, as did all the other subjects that she found the cassette tape timing instructions inhibitory.

In discussion with her she showed far more annoyance and irritation with the timing tape than the other subjects. It was felt that her performance should have been very much better than was actually achieved in the twelve sessions because during the period when the study was being performed (although not in sessions with the experimenter present) she produced, whilst witnessed by her husband, ostensibly paranormally deformed cutlery which showed quite extreme bends.

Four additional sessions were run with her after the end of the twelve sessions. These used the timing cassette and no scoring occurred. It was then decided to abandon the timing cassette and three further self paced sessions were performed. As can be seen, her output in two of these three sessions was far superior to her output during the cassette timed sessions. It was this subject's change in performance as between self paced and experimenter paced sessions which led to the decision that future studies would be self paced.

From examination of her results in table 4 below it will be seen that her output was predominantly involuntary, occurring unintentionally during rest periods rather than during trial periods. She also differed from the other subjects in producing small numbers of very large pulses rather than larger numbers of smaller ones, which can be seen from figures 14 and 15 which show that her increase in output in the self paced sessions was produced by increased pulse amplitude rather than pulse numbers relative to her best performance in the experimenter paced sessions.

Helen H became pregnant simultaneously with or very soon after the start of the training series and by the nineteenth session was ill because her normally quite severe allergic reaction to foods had been made worse by her pregnancy. It is interesting that her entire score from the session conducted during the nineteenth week was contributed by one massive pulse of 172 mv amplitude.

Monica B (M.B.) was a widow in her mid sixties at the time of the study. As can be seen from her summated session by session output in figure 16 her performance showed a very much more consistent increase across sessions that did that of the other subjects. Her performance differed from all the other subjects in other ways which are discussed below in section 5.7.6. The increase in her output was contributed by increasing pulse numbers per session as shown in figure 17, the mean pulse amplitude remaining fairly constant.Mrs B showed far more control over her uPKMB output than did any of the other subjects, as can be seen from tables 3, 4 and 5 below (this will be discussed in section 5.7.2 and 5.7.3).

5.7.2 The Learning Hypothesis

As has been seen from examination of figures 11 to 18, only M.B. showed a fairly consistent increase in her uPKMB output across the series of sessions. However all subjects show a large increase in both summated uPKMB output and pulse number per session when the series is dichotomised into first and second halves. This is shown in table 2 below where summated uPKMB output and pulse numbers are collapsed across all three experimental conditions.

The summated uPKMB amplitudes were calculated by addition of the amplitudes of all valid pulses of more than 2 mv amplitude. Pulse numbers are shown within brackets. The same method of displaying summated amplitudes and pulse numbers will be used for other tables. All of the Chi square analyses presented below and in other sections were performed upon the pulse numbers and not upon the summated uPKMB amplitudes. Calculations were performed with a Commodore S61 statistics calculator. All powers of ten superscripts are shown in brackets after the ten, hence for example two times ten to the power of seven would be shown as 2 x 10 (+7).

Table 2. UPKMB per Half Series

Subject	First Half	Second Half
P.W	2.4 (1)	59.8 (15)
M.H-W.	5.4 (2)	24.8 (8)
H.H.	2.0 (1)	86.0 (19)
M.B.	19.3 (6)	300.8 (71)
Totals	29.1 (10)	458.4 (113)

The totalled score for all subjects split across the first and second half of the series shows that the experimental hypothesis (1) has been confirmed. Chi squared for the difference in pulse number pooled across all subjects between first and second halves was 85.2 which with 1 df yields a chance probability of 2.4 x 10 (-10).

All of the results are in the same direction. Results of the first half to second half split of total pulse numbers for three of the four subjects are independently significant (Chi squares of 12.2, 16.2 and 54.8 for subjects P.W., H.H. and M.B. which with 1 df gives p values of 0.0005, 6.0 x 10 (-5) and 2 x 10 (-10)).

A linear regression analysis was performed for every subject's series of sessions, using session numbers as values of the x coordinate. The summated uPKMB totals per session for each subject were used as the value of y. Summated outputs were chosen because it was felt that these more closely represent the true magnitude of the subjects' outputs than their pulse numbers per session, since in terms of total PK effect, large pulses must surely be considered as "more PK" than small pulses, data which cannot be conveyed by pulse numbers. The results are shown below in table 3. A t test analysis of the probability of the achieved correlation coefficients being due to chance was performed. The probabilities shown for the t test are one tailed since the experimental hypothesis was that the slope would be positive.

Table 3. Analysis of Results by Linear Regression

Subject	Slope	Correlation	t	p
P.W	+1.6	0.62	2.5	<0.025
M.H-W	+0.2	0.19	0.6	ns
H.H	+0.4	0.09	0.29	ns
M.B	+8.3	0.79	4.0	<0.005

From the first half to second half comparisions of pooled data for all subjects it is clear that the learning hypothesis has been confirmed for the group as a whole. The Chi square analyses of individual subjects' first half to second half difference in scoring could be regarded as fairly crude measures of the increase in their PK, without regard to the consistency of their performances. The regression analysis is sensitive to consistency and order effects, so that the position of the subjects' more successful sessions within the sequence of training sessions becomes a relevant factor. It could therefore be argued that the regression analysis is a more sensitive measure of the subjects' gaining of control over their output through the series of training sessions. Only two subjects of the four (Phyllis W and Monica B) achieved significant results in this test. As will be discussed below in the section on individual differences (5.7.6), Monica B's performance emerges as clearly superior and arguably of a different class from the other subjects because it has several characteristics which distinguish it from the other subjects' performances. Here it should be noted that in the regression analysis the value of the slope for her result is markedly different from that of all the other subjects.

5.7.3 Control Over Occurrence of Effects

Hypothesis (2) states that the increase in uPKMB output between the first and second halves of the series will be due to an increase in intentional effects produced during trial periods. Hypothesis (3) states that non intentional effects produced in non trial periods will decrease over the series.

Table 4 shows subjects' uPKMB outputs dichotomised between intentional and non intentional outputs for the first and second halves of the series. The scores for the intentional condition were obtained by pooling those for distant and near trials, since in both conditions the subjects intended to produce effects. The scores for the non intentional condition were those occurring during rest periods.

Table 4. Intentional Versus Non Intentional UPKMB

Subject	Intentional		Non Intentional	
	First Half	Second Half	First Half	Second Half
P.W.	2.4 (1)	11.2 (5)	0.0 (0)	48.6 (10)
M.H-W.	5.4 (2)	4.2 (2)	0.0 (0)	20.6 (6)
H.H.	0.0 (0)	4.8 (2)	2.0 (1)	72.6 (17)
M.B.	2.4 (1)	268.8 (66)	14.5 (5)	32.0 (5)
Totals	10.2 (4)	289.0 (75)	16.5 (6)	173.8 (38)

The results listed in table 4 show two differences between Monica B and the other subjects. The first was that she was the only subject to show an independently significant increase in her PK output (measured as pulse numbers) between first and second halves of the series in the intentional condition (Chi squared of 63 with 1 df giving a p value of 2 x 10 (-10)). The second difference was that she did not show a large increase in her non intentional PK output from the first to the second half of the series.

A linear regression analysis of her pooled output in the two intentional conditions across the twelve sessions was performed, using the summated output in each session as y value and session number as x value. Since the majority of her output was produced in the trial conditions, the regression results are very similar to those shown in table 3 (section 5.7.2). The slope was 8.3, intercept -31.1, the correlation coefficient was 0.77, giving a t value of 3.9 yielding a p value of less than 0.005 (one tailed). The reason for choosing summated uPKMB values for this analysis has been explained in section 5.7.2.

Regression analysis performed for the intentional PK scores of two (P.W and M.H-W) of the other three subjects revealed essentially zero slopes (0.09 and -0.039 respectively) and very low, non significant correlation coefficients (0.186 and 0.116 respectively). Subject Helen H produced only one intentional uPKMB event in the series of twelve sessions so that a regression analysis could not be performed in her case.

The pooled difference in pulse number between first half and second half for all subjects in the intentional condition including those of Monica B is of course significant because of the size of her result, the pooled Chi square being 59.2 which with 1 df yields a p of 2 x 10 (-10). Hypothesis 2, that there would be an across series increase in intentional uPKMB is therefore formally confirmed, although the data strongly suggest that two subject groups were involved, one group being composed of Monica B, the other being comprised of the other three subjects.

This impression is reinforced when table 4 is examined with respect to hypothesis (4) which predicted an across series decrease in involuntary uPKMB output. The data of table 4 permit the rejection of hypothesis (3). All subjects except Monica B show an increase predominantly in involuntary output from the first half to the second half of the series, rather than an increase in intentional PK or the decrease predicted by hypothesis (3). The increase is independently significant for subject H.H. (Chi square of 14.2, 1 df, p value 0.00016). The pooled result for these three subjects gives a Chi square of 45, with 1 df producing a p value of 2 x 10 (-10)). The first-half to second-half increase in the pooled pulses for all subjects in the involuntary condition has a Chi squared value of 26, 1 df giving a p value of 3.2 x 10 (-7).

Although a post hoc finding this result strongly suggests that the uPKMB was produced more effectively when these three subjects were not intentionally trying to produce effects, which is in agreement with the other data on PKMB reviewed in chapter 1 and elsewhere. However Monica B's performance emerges as clearly different since she alone could be argued to show voluntary control, her effects being concentrated in the intentional conditions and the slope of the regression line of her intentional output being strongly positive.

5.7.4 Distance and UPKMB

Hypothesis (4) states that more uPKMB will be produced in the near trial condition than in the distant trial condition. The hypothesis is formally confirmed by the pooled results, the Chi square for the difference in pooled pulse numbers between the near and distant conditions being 56.8, with 1 df, giving a p value of 2.5 x 10 (-10). However, all of this effect is contributed by subject Monica B whose uPKMB output appeared to be greatly inhibited in the distant condition relative to her output in the near trial condition. Monica B's difference scores between the near and distant conditions are independently significant, the Chi square being 63, with 1 df giving a p value of 2.2 x 10 (-10).

If Monica B's score is excluded and the results are pooled for the other three subjects the difference between the near and distant trial conditions is non significant by Chi squared test.

Table 5. UPKMB By Condition

Subject	Near	Distant	Rest
P.W.	4.6 (2)	9.0 (4)	48.6 (10)
M.H-W.	9.6 (4)	0.0 (0)	20.6 (6)
H.H.	2.6 (1)	2.2 (1)	72.4 (18)
M.B.	268.8 (66)	2.4 (1)	48.9 (9)
Total	285.6 (71)	13.6 (6)	190.5 (43)

Table 5 shows the summated ouputs per subject by condition. The striking feature of table 5 is that all subjects except Monica B showed greater scoring in the rest condition than in the other two conditions. Pooling the results from these three subjects in the two intentional conditions and comparing the pooled total with the pooled total in the resting condition gives a Chi square of 10.5 with 1 df giving a p value of 0.0011 for the difference between intentional and non intentional conditions. This result reflects the finding in section 5.7.2 that the increase in the three subjects' PK output occurred in the rest condition, not in the two trial conditions.

Since the rest condition involved the subject being at the same distance as during their distant trials it represents another type of distant condition, one in which they did not make any intentional effort to generate PK.

Direct comparision can therefore be made between their intentional output at a distance from the uPKMB sensor and their unintentional effects upon it from the same distance when resting. The difference in the pooled scores for the distant trial condition and the (distant) resting condition yields a Chi square of 27.9, with 1 df giving a p value of 1.2 x 10 (-7).

Although this is a post hoc finding, it strongly suggests that the distances involved in the experiment did not decrease the uPKMB outputs of the three subjects, but that some feature associated with the subjects intending to create effects did produce inhibition. This interpretation is reinforced by the fact that the near intentional condition shows a similar level of inhibition relative to the rest condition (the difference between the near and distant intentional conditions being non significant at the 0.05 level).

5.7.5 Anticipation and Release of Effort

Hypothesis (5) predicts that anticipation effects will occur in the 10 second period during rest periods before trials. This hypothesis was intended to test the finding from some of Justin J's and Juliet B's sessions and from Hasted's work that anticipation effects occur with uPKMB. Although uPKMB (43 events) did occur during rest periods no uPKMB events occurred within 10 seconds of the start of any trial. Since it is not possible to derive an a priori probability for the occurrence of the effects no statistic can be offered with regard to this result. The hypothesis would certainly appear not to be supported however.

Hypothesis (6) stated that release of effort effects were predicted to occur within 10 seconds of the start of rest periods after the end of trials. Only one uPKMB event occurred which fulfilled this description, so that this hypothesis too appears to be contradicted by the data since a total of 43 uPKMB events occurred during rest periods. Similarly to anticipation effects no statistic can be computed here since the a priori probability of release of effort events cannot be derived in this experimental design.

5.7.6 Individual Differences

From the analyses presented in the preceding sections it is clear that the subject Monica B differed in several clearly measurable ways from the other subjects.

Monica B was by far the most productive of the subjects. Table 2 shows that the absolute level of her output in both the first and second halves of the series was greater than that of any other subject. The difference between her pooled output for the complete series and the next most productive subject (Helen H) is significant, the Chi square being 31.8, with 1 df giving a p value of 1.6 x 10 (-8). This difference seems unlikely to be due to chance because it is so large and because Monica B differed in other ways from the other three scoring subjects.

She showed a far greater level of control over her PK. She was the only subject who learned to produce uPKMB effects in conformity with her intention to do so. In table 4 (section 5.7.3) the increase in her uPKMB output in the intentional condition was far larger than any other subject and was independently significant (Chi square of 62, with 1 df giving p value of 2.6 x 10 (-10). The regression analysis of her scores shows a far steeper positive slope (8.26) than any of the other subjects and a significant correlation coefficient. None of the other three subjects achieved a statistically significant increase of their uPKMB in the intentional condition.

It could be argued that this control was also manifested in the relative inhibition of non intentional output she achieved in the resting condition. The other three subjects increased their output in this condition, to the point that the increase in their pooled output between first and second halves of the series was significant (Chi square of 28.1, with 1 df giving a p of 1.1 x 10 (-7)) with one of the three, Helen H, achieving an independently significant increase in non intentional PK (Chi square of 14.2, 1 df giving a p of 0.00016).

In sharp contrast to the other subjects Monica B's first and second half non intentional uPKMB output was the same in pulse number and only about twice as large in the second half as the first in terms of summated uPKMB amplitude (14.5 mv first half versus 32 mv second half). The increase in her corresponding summated uPKMB amplitude in the intentional conditions between first and second halves was nearly sixteen times (19.3 mv first half versus 300.8 mv second half).

However, since the experimental design was such that inhibition of effects due to control of unintentional output and inhibition of effects due to psychological inhibition produced by distance from the uPKMB sensor were confounded, it is not possible to decide whether Monica B showed an inhibition of output in the resting condition due to deliberate control, or whether the inhibition was due to the distance. Had she produced a large uPKMB output in the distant trial condition the case for regarding her relative absence of non intentional effects in the resting condition as being due to deliberate inhibition of output would be far stronger. As it is the interpretation of this result must remain unclear.

The other subjects also differed from each other. In terms of absolute output, Sheila D was the only subject to produce no single scoring session. Whereas Phyllis W and Helen H produced comparable total outputs over the series (62.2 mv in 16 pulses and 77.2 mv in 20 pulses respectively), Mary H-W produced only 30.2 mv in 10 pulses.

Table 6 shows the mean pulse amplitudes for each subject over half series and whole series. The means appear to be surprisingly uniform between subjects, not reflecting the differences found between Monica B and the other subjects found for other measures of performance.

Table 6. Mean Pulse Amplitudes Per Half Series

Subject	First Half	Second Half	Both Halves
P.W.	2.4	3.9	3.88
M.H-W.	2.7	3.1	3.02
H.H.	2.0	3.9	3.86
M.B.	3.2	4.2	4.15
Group Means	2.9	4.0	3.98

5.7.7 The Self Paced Sessions

As all of the subjects other than Monica B had expressed varying degrees of irritation with the timing schedule used to control trials it was decided that after the end of the twelve sessions, where possible, several self paced sessions would be held with all subjects except Sheila D. These sessions were conducted as an exploratory series so that subjects were permitted to perform unequal numbers of sessions. The data from the self paced sessions is of course not directly comparable with that from the previous twelve sessions because of the change to self pacing. The intervals between sessions were also irregular to some extent due to the illness of three of the four subjects. The series had to be terminated with three of the subjects because of their increasing ill health. Work with Helen H was terminated because she became incapacitated by her reaction to her pregnancy, being hospitalised at the end of the series. Monica B's heart condition worsened acutely at the end of her series and she too was taken into hospital. Mary H-W became unavailable owing to domestic commitments and she also increasingly suffered from back pain.

Phyllis W performed a thirteenth session using the timing schedule and as can be seen from figure 13 produced a lower scoring session than her twelfth. Sessions fourteen and fifteen were performed with the subject pacing herself. In session fourteen her score was well above that of the thirteenth session but her performance dropped again in session fifteen.

Mary H-W performed a self paced trial at the end of session twelve during which she produced two pulses which together were larger (7.8 mv) than the total previous output for the session (5.0 mv). One further completely self paced session was conducted with her where she achieved no scorable output, although some small ostensible uPKMB signals were generated. This last session was conducted a month after her previous (twelth) trial and she was suffering from back pain at the time. The lack of regular practice or her illness may possibly account for this result.

The evidence for Helen H's macroscopic PKMB ability was found sufficiently suggestive that a further four sessions using the timing cassette were held with her before self pacing was adopted. She achieved no score in any of the extra cassette paced sessions but this situation changed dramatically when self pacing was adopted, as can be seen from examination of figure 13.

In the first self paced session she produced her second highest score to date and in the second self paced session achieved a score far in excess of any other she achieved in all sessions. Unfortunately by the next (and last) session she was very unwell but was prepared to perform a brief session. In this session she produced no effects in the first two trial periods but produced a single massive pulse in the third trial.

As can be seen from figures 14 and 15 she achieved large outputs in her self paced sessions principally by increasing the amplitude of her effects, rather than their numbers. This is in some contrast to Monica B's performance in her self paced sessions where the pulse amplitude remained essentially constant but the number of pulses produced increased greatly.

Since Helen H's self paced sessions had been conducted just before Monica B had reached the end of her series of twelve sessions it was decided that the sessions performed with her after the formal series of twelve would all be self paced. Accordingly a brief self paced trial was performed immediately after the end of the final formalperiod in the twelfth session. She produced a score in this single self paced trial (58.2 mv 17 pulses) which was about half of that produced in the entire session (113.4 mv 33 pulses). In the thirteenth session she again maintained a high output (116.9 mv 34 pulses) and in the fourteenth session she produced her highest score (244.3 mv 58 pulses). Unfortunately in the fifteenth session she was feeling ill because of the worsening of her cardiac condition but achieved a score of 30.4 mv (6 pulses).

Self pacing seemed to facilitate the performance of the best subjects. It is of course impossible to make any certain claim that their performance in their self paced trials was not due simply to the extra practice. However, the fact that Helen H both expressed marked annoyance with the timing schedule and also performed much better under self paced conditions is very suggestive. All subjects expressed a preference for self paced trials.

The implications of the self paced sessions seemed to be that self pacing may add a salient motivational factor, because the subject feels in control of their situation. The subjects certainly reacted as if they felt more in charge and seemed able to relax and concentrate more freely.

This factor of control by the subject has been cited by Robinson (1981) as being an important potentially PK facilitating factor. She argues that inhibition of intentional PK performance under trial conditions may result from the association of high motivation with excessive striving. Usually, increasing motivation appears to be associated with increased striving. However increasing the degree to which the subject feels in control of the situation is advocated by her to decrease their striving whilst not lessening motivation.

Another possibly relevant change introduced by self pacing is that the subjects had as much time as they needed to reach a PK facilitating state. Helen H, for example, took 10 minutes of trial time to produce her first effect in her first self paced trial. The longest trial period in the timing sequence on the cassette was three minutes. Perhaps the large difference in Helen H's performance between self paced and cassette paced sessions was due to her needing more time to reach a psi state than allowed in the formal timing schedule.

It was decided that all future studies would be conducted using subject self pacing. Although this would make it impossible completely to standardise conditions acrosss subjects, if it resulted in superior PK performance this price would be acceptable in return for the acquisition of the larger amount of data resulting from better PK performances.

5.8.1 The Questionnaires

It was hoped that the pre and post session questionnaires completed by subjects and experimenter at each session would yield a number of factors which would relate to the uPKMB score. A standard attitude questionnaire was not used because it was felt that a specialised set of questions would be needed in order to measure the specific factors felt to be relevant to uPKMB performance. In the event the questionnaire data proved disappointingly inefficient at predicting uPKMB performance.

At this very early stage in the research of PK of this type only very speculative hypotheses can be offered in an attempt to explain the poor performance of the questionnaire. It may have been due to PK performance being independent of introspectible states, or to the questionnaire not measuring relevant factors, or to a lack of reliable association between the subjects' responses to the questionnaire and the states which it was attempted to measure (there is evidence of rigidity of response to the questionnaire on the part of some subjects, (particularly for Phyllis W see below). Possibly the decision to conduct the analysis of the questionnaire answers on a factor by factor basis rather than by grouping factors may have reduced the reliability of the measures.

One certain contributor to the lack of correlations was the small database represented by there being only four subjects who performed a total of 48 sessions and by the very meagre and scattered nature of the data generated by the PK performances themselves. Of the 48 sessions held with subjects who scored atall, only 23 were scoring sessions and as can be seen from table 7 below for three of the four subjects non scoring sessions outnumbered scoring sessions.

Table 7. Scoring and Non Scoring Sessions by Subject

Subject	Scoring	Non Scoring
P.W.	5	7
M.H-W.	5	7
H.H.	4	8
M.B.	9	9
Total	23	25

5.8.2 The Subject's Questions

The subjects' pre session questionnaire consisted of 9 scale questions where the subject was required to mark a position on a 100 mm line between two extreme descriptors in order to represent their state. Each of these questions was hypothesised to predict uPKMB performance in the session. Questions 1, 2, and 5 were based on Batcheldor's theoretical predictions, the other questions were based upon observations from the Juliet Booker series, on the observation of other PKMB agents' performances, the observations of Hasted and on the experimenter's interpretation of the general literature on PK.

The factors it was attempted to measure were the subject's belief in their success in producing PK (Q1), their level of relaxation (Q2), the degree to which they felt distracted by thinking of serious concerns external to the PK training session (Q3), the facility with which they felt that they could concentrate (Q4), their general mood (Q5), their degree of fatigue (Q6), level of wakefullness (Q7), their motivation to produce PK in that session (Q8) and their level of physical wellbeing (Q9). In addition to the scale questions one question (Q10) requested details of any current illness the subject may have had. Another (Q11) requested details of menstrual phase (irrelevant to all subjects except Sheila D since three were post menopausal and the fourth was pregnant). Three binary answer (yes/no) questions asked whether the subject had experienced disturbances in sleep over the past two nights (Q13), whether the subject had taken any alchoholic drink in the past two days (Q14) and whether they had taken any form of medication in the past two days (Q15). If the answers to any of these three questions was yes, the subject was requested to fill in separate sections of the questionnaire requesting details of the sleep loss, intake of alchohol or medication (the questionnaires are reproduced in appendix 3).

In the post session questionnaire all 8 questions were scale questions. The subject was asked how far she had concentrated on producing the effects when they occurred (Q1).

They were also asked how many of the PK effects they sensed as they occurred (Q2), whether if they did sense the effects they did so purely mentally (3a), with a bodily sensation (3b) or in some other way (3c). The answers to these questions were debated to some extent with the subjects through the series and in the end the data recovered from them (Q3a,b,c) was thought probably to be so ill defined and unreliable that it was not analysed.

Question 4 asked whether the subjects felt that they had predicted the occurrence of their PK effects, 5 asked how satisfied they felt with their performance, 6 asked whether they had obtained more or less PK than they had previously anticipated, 7 asked them how confident they felt about producing PK in the next session, and the final question (Q8) asked how easy they had felt it to relate to the experimenter for that session.

5.8.3 The Experimenter Questionnaire Question Set

It was felt that since the subject and experimenter had to work closely together in each session the state of the experimenter was as important to measure as that of the subject. In addition it seemed worth including questions which would reveal whether the experimenter's estimates of the subject's performance and predictions of their next session performance were accurate.

All but one of the experimenter's 20 questions were scale questions (12 pre session, 8 post session), the exception (Q2) being a statement of the number of PK sessions performed previously that day. This was included because it was felt that the experimenter's effectiveness in facilitating the subjects' PK might decrease as a result of fatigue with the experimental situation if he had run several training sessions in one day. However although it was anticipated that variable numbers of sessions might be performed by the experimenter prior to meeting the subjects in fact the answers to this question were so constant that analysis was not performed for this question.

The subjects were visited in a fixed order, two visits being paid per day. Phyllis W was visited on one fixed day in the week before Monica B and Mary H-W was visited on another day before Helen H. The order of visiting may possibly have introduced order effects but it was strongly felt that the subjects' PK performances would be negatively affected by changes in routine so that this possiby disturbing effect was avoided.

In the pre session questionnaire question 1 attempted to measure the experimenter's fatigue, 3 measured relaxation, 4 related to distracting concerns (analogously to Q3 on the subject pre session questionnaire), 5 asked how far the experimenter felt like conducting the session, 6 asked about the experimenter's mood, 7 asked for a prediction of how well the subject would perform in the current session, 8 asked how well the subject was expected to perform compared to the preceding session, 9 asked how sociable the experimenter felt, 10 asked how easy it was to relate to the subject, 11 asked how motivated was the experimenter that the subject should perform well in the current session and 12 asked how physically well the experimenter felt.

In the post session questionnaire the experimenter was asked (Q1) how harassed he had been by technical problems in the session, (Q2) how much rapport he felt he had achieved with the subject, (Q3) how satisfied he was with his conduct in facilitating the subject's PK performance, (Q4) how far the subject's PK output had compared to the experimenter's expectations, (Q5) how well the subject was expected to perform in the next session relative to the one just completed, (Q6) how fatiguing the session had been, (Q7) how much of the subject's output had seemed to be in response to voluntary effort, and (Q8) how far the subject's PK had been inhibited by distance.

5.8.4 Analysis of Questionnaires

It was decided that since the subject Sheila D had given no sign of producing PK her questionnaire data would be excluded from analysis. It was felt that she was clearly not comparable to the other subjects and that including her questionnaire data would merely dilute what relationships there might be between the questionnaire scores and the PK obtained.

Measurement of the questionnaire scale data was performed by a person other than the experimenter and then checked by the experimenter. Only very minor discrepancies were found. Where tied scores were obtained the questionnaires were remeasured blind by the other estimator to a greater degree of precision.

Since fewer than half of the sessions had produced scoring outputs and since no assumption of normal distribution could be made regarding the responses to questions it was decided to conduct three types of analysis of the questionnaire data all of which would employ non parametric tests. For every analysis the summated uPKMB output pooled across the three conditions in each session was used as the PK measure. The argument in favour of construing summated uPKMB scores as a more accurate measure of uPKMB output has already been cited in section 5.7.2. However it should be noted that the rank order so derived matches exactly the rank order derived using pulse number as the measure of PK except where ties in pulse numbers occur. In every cae but one (M.B. sessions 1 and 4) the tied score on pulse number was broken by consideration of summated amplitudes. In the remaining single case the tie was broken by the toss of a coin.

The first analysis took the question as its unit of analysis. This procedure embodies the hypothesis that subjects show similar reactions towards the same factors, in terms of correlation with uPKMB output. Since only 48 replies per question were available it was decided that the questionnaire scores for each question would be dichotomised about the mean into low or high scores. The sessions were divided into scoring and non scoring sessions and Chi square computed for the 2 by 2 contingency combinations so produced. The predictive questions (Q1 of the S's pre session, Q7 of S's post session, Q7 of the E's pre session, Q5 of the E's post session questionnaire) were matched against their appropriate outcome situations.

Only a single trivial statistically significant relationship was produced by this analysis when applied to all questions (scale and binary) in the four questionnaire parts (subject pre and post session, experimenter pre and post session). This was for question 4 in the experimenter's post session questionnaire which asked how far the subject's PK output compared with the experimenter's expectations. The Chi square for the question was 9.57 giving with 3 df a p value of 0.023. The principal contribution towards the significance of the score was a deficiency in the upper left hand cell, representing a tendency of the experimenter not to estimate the PK output as below expectation when the session had been a scoring one.

A second analysis was then performed to detect correlations between question scores and PK output within the data of each subject considered individually. Only the data from scoring sessions was used. The rationale for this analysis is that if a subject's response to a question correlates with their PK performance then for a series of sessions the ranks of the question scores should tend to match the ranks of the sessions when they are ranked according to PK output.

An important feature of this analysis is that it does not make the assumption which underlay the previous Chi square analysis of the questionnaire data that the subjects' performances will all respond similarly to the same factors, so that individual differences should be detectable. The cost of this feature is of course that the available data per question is reduced by a factor of four.

A Spearman rank correlation of the ranks of the question scores with the ranked PK scores was performed for all scoring sessions of each subject. The analysis could not be performed for all of the questionnaire data because for some questions some subjects (particularly Phyllis W for her post session questionnaire) persistently produced tied extreme scores of 100 or 0. Tables 8a and 8b show the significant correlations produced by this analysis.

Table 8a. Rank Order Correlation of Scoring Sessions

Subject Questionnaires

	Pre Session		Post session	
Subject	Question	P Value	Question	P Value
M.H-W.	4	0.05	no correlation	
M.H-W.	5	0.05	for any subject	
H.H.	9	0.05	on any question	

Table 8b. Rank Order Correlation of Scoring Sessions

Experimenter Questionnaires

	Pre Session		Post session	
Subject	Question	P Value	Question	P Value
P.W	8	0.05		
H.H	9	0.05		
M.B	1	0.05		
M.B.	5	0.05	3	0.05
M.B.	12	0.01	7	0.05

It should be noted first that the total number of questions on both questionnaires was 26 and the number of subjects was 4, so that some five correlations of p value 0.05 would be expected by chance. Ten correlations of p value 0.05 were found by the analysis. About half of the observed correlations may therefore be artifactual.

With this proviso in mind, the correlations can cautiously be interpreted. One of the problems in evaluating the correlations is that as the question set was originally formulated in order to detect what were felt to be relevant factors, any correlations found will all tend to be more or less equally feasible from the perspective of the viewpoint underlying the composition of the questionnaire items.

Dealing first with Phyllis W, question 8 on the experimenter's pre session questionnaire asks the experimenter to predict the subject's PK performance in the session. The correlation suggests an above chance ability of the experimenter to predict her performance. The experimenter was not aware of being more accurate in predicting her performance than those of the other subjects. No similar correlation was shown for any other subject, suggesting that the experimenter could not predict their performance. This was the only significant correlation present in this subject's questionnaire data.

Two significant correlations were present in Mary H-W's pre session questionnaire. One was for question 4 which asks the subject how easy it is to concentrate and question 5 which asks the subject what their mood is. The correlations suggest that Mary H-W's PK performance was better when she was in a good mood and felt she could concentrate easily.

Subject Helen H's pre session questionnaire produced one significant correlation, between her feeling of physical wellbeing and her PK performance. This is an interesting and suggestive result since for nearly all sessions she was suffering from ill health to some extent, (having chronic multiple food allergies and a particularly strong lactose intolerance) so that the influence of her physical state could be expected to be an important factor in her performance. One significant correlation was present in the experimenter's pre session questionnaire for Helen H, which was between the degree to which the experimenter felt sociable and her PK performance.

The experimenter's pre session questionnaire for Monica B produced three significant correlations. Since she produced approximately double the number of scoring sessions compared to the other subjects the greater number of significant correlations is to be expected. The three factors were those of the experimenter feeling well rested, wanting to conduct the session and feeling physically well. This cluster of factors could be expected to correlate with the experimenter behaving in a supportive way towards the subject.

Two measures in the experimenter's post session questionnaire were also significant. A correlation was shown between the experimenter feeling satisfied with his performance in facilitating the subject's PK, which is an indirect measure of the accuracy of his judgement as to how much PK was produced in each session. The second factor was the experimenter's estimate of how far the PK events were under the voluntary control of the subject. Since as has been shown in section 5.7.3 Monica B did show far more control than any other subject this correlation is indicative of a correct perception on the experimenter's part.

The third analysis took as its hypothesis the possibility that some of the factors addressed by the questionnaire items might legitimately be viewed as measures of consistent underlying traits within subjects which determined their PK output and which would be detected by a between subjects analysis of differences in their habitual responses to the questions. A similar hypothesis was tested regarding consistent differences in scores on the experimenter's questionnaire as they varied between subjects.

Only the questionnaire data from scoring sessions was used in this analysis, although there is clearly a case for using the questionnaire data from all of the sessions. However it was felt that perhaps the scoring sessions might represent situations where there were larger characteristic inter-subject differences than in non scoring sessions. For each scoring session the mean for each subject's score on each scale question was computed. The subjects were then ranked according to their total PK output in the whole series and the ranks of the means of their responses to each question compared to the ranks for PK. A Spearman rank order correlation was performed on the ranked scores on questions and PK but no significant correlations were produced.

A similar procedure was adopted for the experimenter's questions but again no significant correlation was produced.

5.9. Conclusions

The twelve session study succeeded in showing that for this group of subjects at least, improvement in PK scores as a result of a series of practice sessions did occur. The unambiguous confirmation of the original hypothesis motivating all of the work reported here was therefore very welcome. Due caution must of course be shown towards the generalisation of any result from such a small group of subjects.

However, three of the four subjects could not be argued to have developed true voluntary control, since the overwhelming majority of their output occurred non intentionally. This finding is consistent with reports of PKMB performance from several sources. The experimenter could therefore be seen as having been over sanguine in hypothesising that subjects would develop true voluntary control over their uPKMB output.

Subject Monica B emerged as the only subject to show voluntary control, and also as being far more productive in PK output than any other subject. An intangible factor that was felt to be very relevant to her performance was that she had married a man very much older than herself whom she claimed had been extremely demanding. Quite early in the marriage she had consciously taken a decision not to allow her feelings of annoyance and frustration at her husband's behaviour to affect her mood. It was felt by the experimenter that her having learnt control over her responses to a difficult and potentially annoying and frustrating situation in her domestic life may have paid dividends when she was faced with learning to produce uPKMB to order, because she may have been exceptionally competent in remaining serene and confident in the face of apparent or relative failure in the early stages of PK training. Her behaviour was certainly consistent with this interpretation. She was also sufficiently serene to accept good results without any apparent signs of fear.

In the experimenter's two screenings in her area which she attended she produced ostensibly paranormally deformed cutlery and in fact was the first person to produce a bending event in the first macroscopic PKMB screening that the experimenter had conducted. She also claimed to be in more or less continuous touch with the feelings of her daughter's family via her own ESP and claimed a high level of spontaneous ESP. She therefore presented (informally and with due modesty) the classic profile of the gifted "psychic" and had attended spiritualist "development" circles for a number of years.

It should be recorded that the experimenter particularly enjoyed the company of this lady and that of the subject Helen H. It therefore remains an open question whether the results showed the effects of experimenter preferences.

It is particularly interesting that although Monica B was obviously a gifted subject as far as PKMB was concerned, nevetheless it still took more than a dozen practice sessions before her output showed any real sign of reaching a ceiling (and it is uncertain that it did). this suggests that despite initial talent, practice is still necessary.

Similarly, Helen H also emerged as another possibly multi talented psychic, because she too claimed a large amount of spontaneous ESP. However she also claimed spontaneous PK and some informal attempts were made to record some of these spontaneous telekinetic events. Some unwitnessed results were obtained although it should be stressed that no real security against fraud was employed in these informal tests.

Helen H showed such a large differential between experimenter pacing and subject pacing that she led to the adoption of self pacing in the design of the "accelerated start" study described in the next chapter. It should also be noted that Monica B's output in her self paced sessions showed a similar level of improvement over that from her experimenter paced sessions, although the explanation for this difference is not clear (as it could be due simply to increased practice).

The finding that the only subject to produce no output was also the only subject not to be found by the experimenter's mass screening procedure was suggestive, although no more than this.

Phyllis W had approached the uPKMB task as an opportunity to establish some form of contact with her dead son, whom she was still mourning. This strategy was adopted by her independently of the experimenter. She would habitually approach the uPKMB task inwardly requesting her son to produce effects as a sign of his presence. Several times after an event had occurred she had mentioned that it had done so in response to her request immediately beforehand. However since she was probably making these requests very frequently the degree of correlation cannot be estimated.

What is interesting about this situation is that it conforms to the description given by Stanford (1977) which he claims describes an optimal PK elicitation strategy. Although Phyllis W was the only other subject apart from Monica B to achieve a statistically significant correlation coefficient in the regression analysis of her result, her output was not comparable to that of Monica B nor Helen H in her self paced sessions. It would appear that a supplicatory approach is not be a sufficient condition for outstanding PK results.

The finding that none of the questionnaire items produced significant correlations across all of the subjects probably reflects the early stage of research into this type of PK. The small database involved undoubtedly contributed to the insensitivity of the tests to detect correlations so that weak correlations or correlations with grouped factors might still be present but undetectable with such a small database.

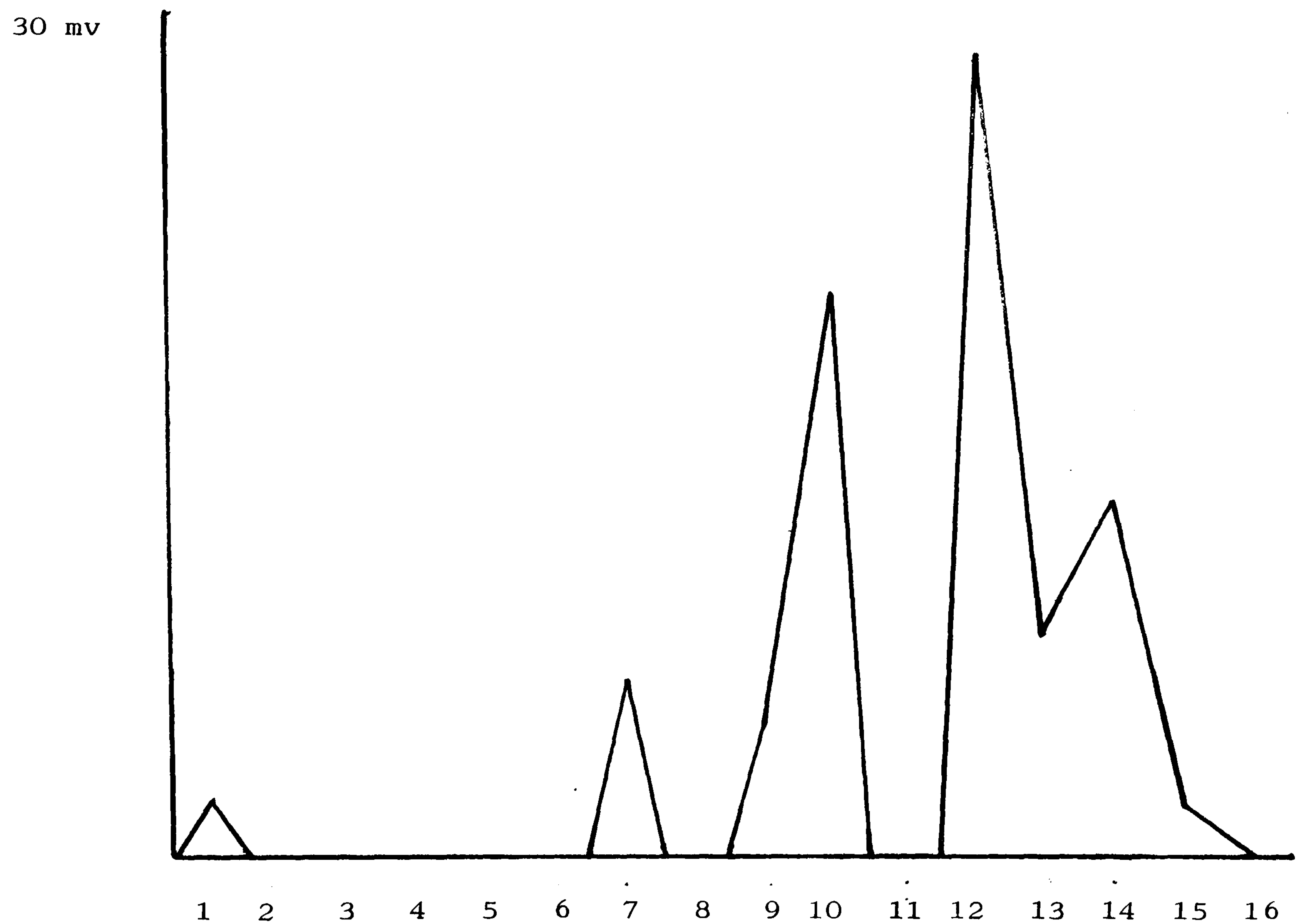

Figure 11. Phyllis W Summated uPKMB per Session

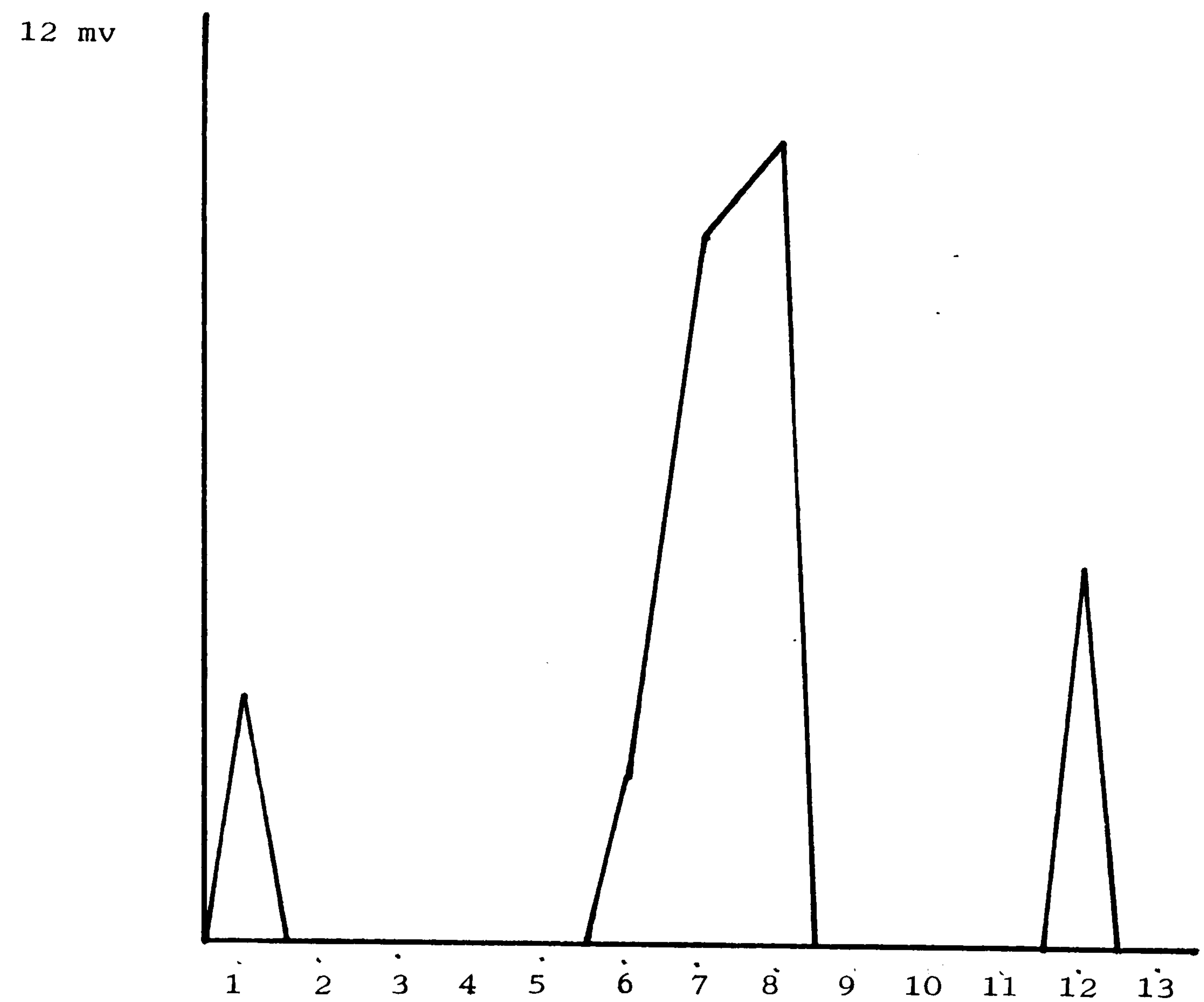

Figure 12. Mary H-W Summated uPKMB per Session

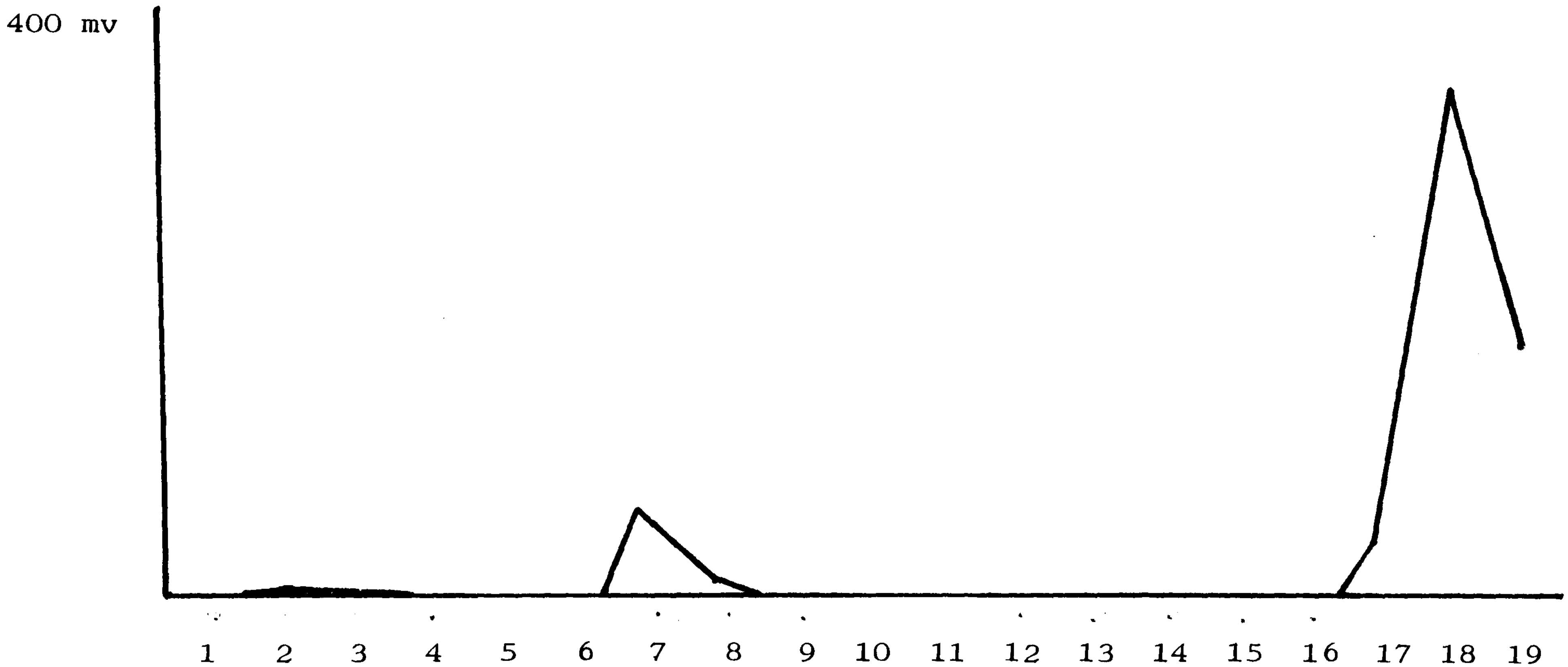

Figure 13. Helen H Summated uPKMB per Session

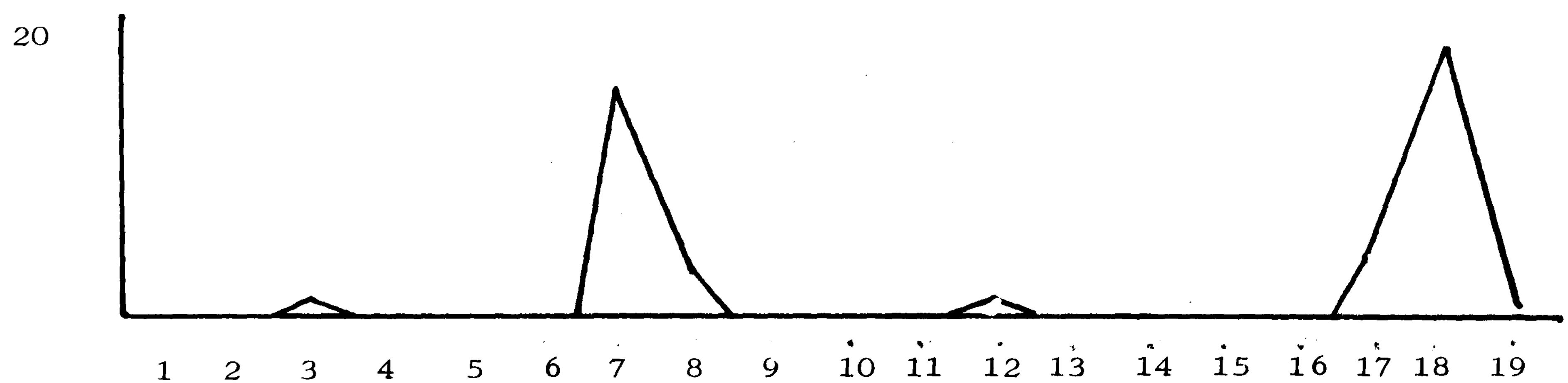

Figure 14. Helen H Pulse Number Per Session

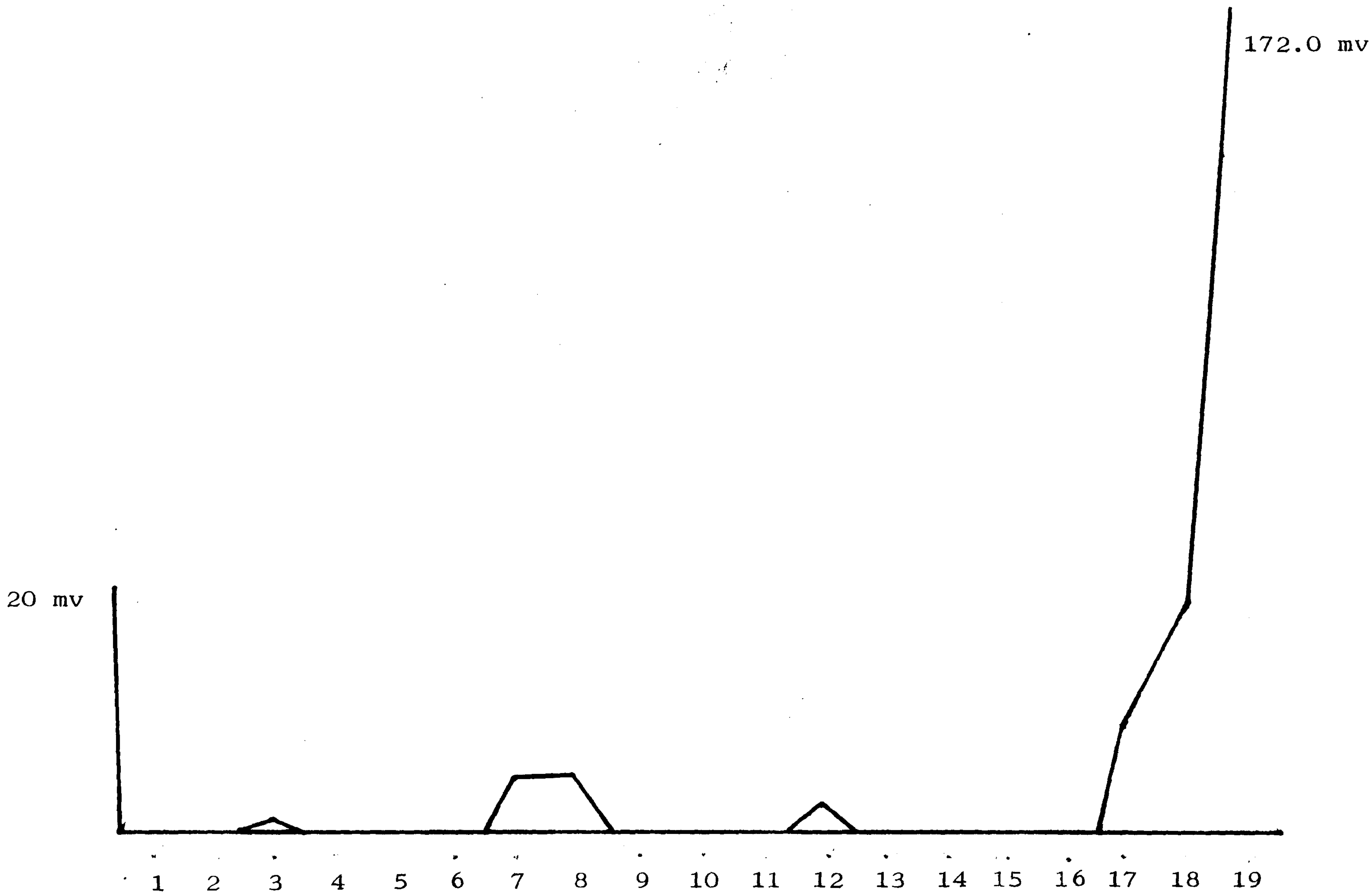

Figure 15. Helen H Average Pulse Amplitude per Session

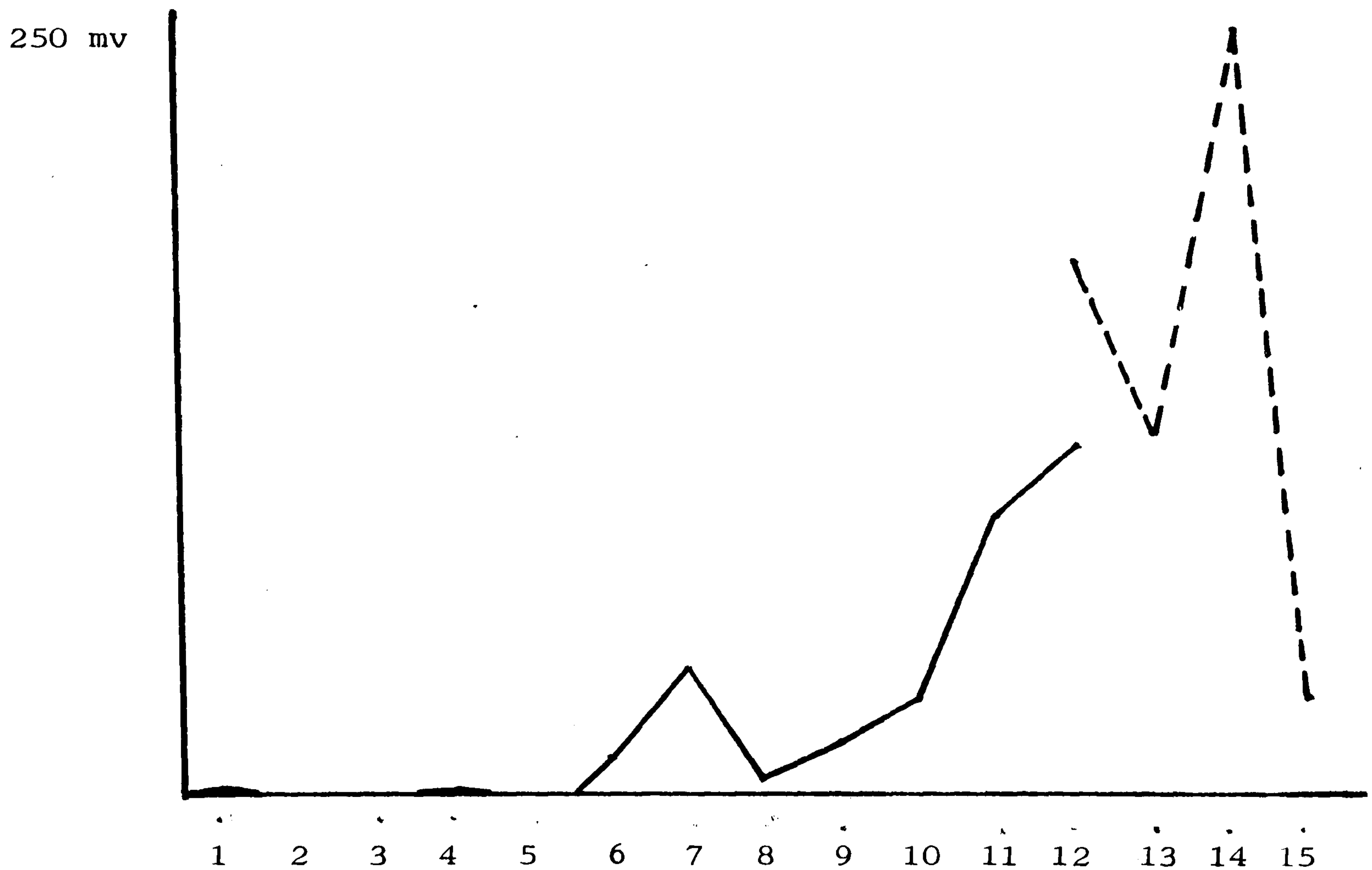

Figure 16. Monica B Summated uPKMB per Session

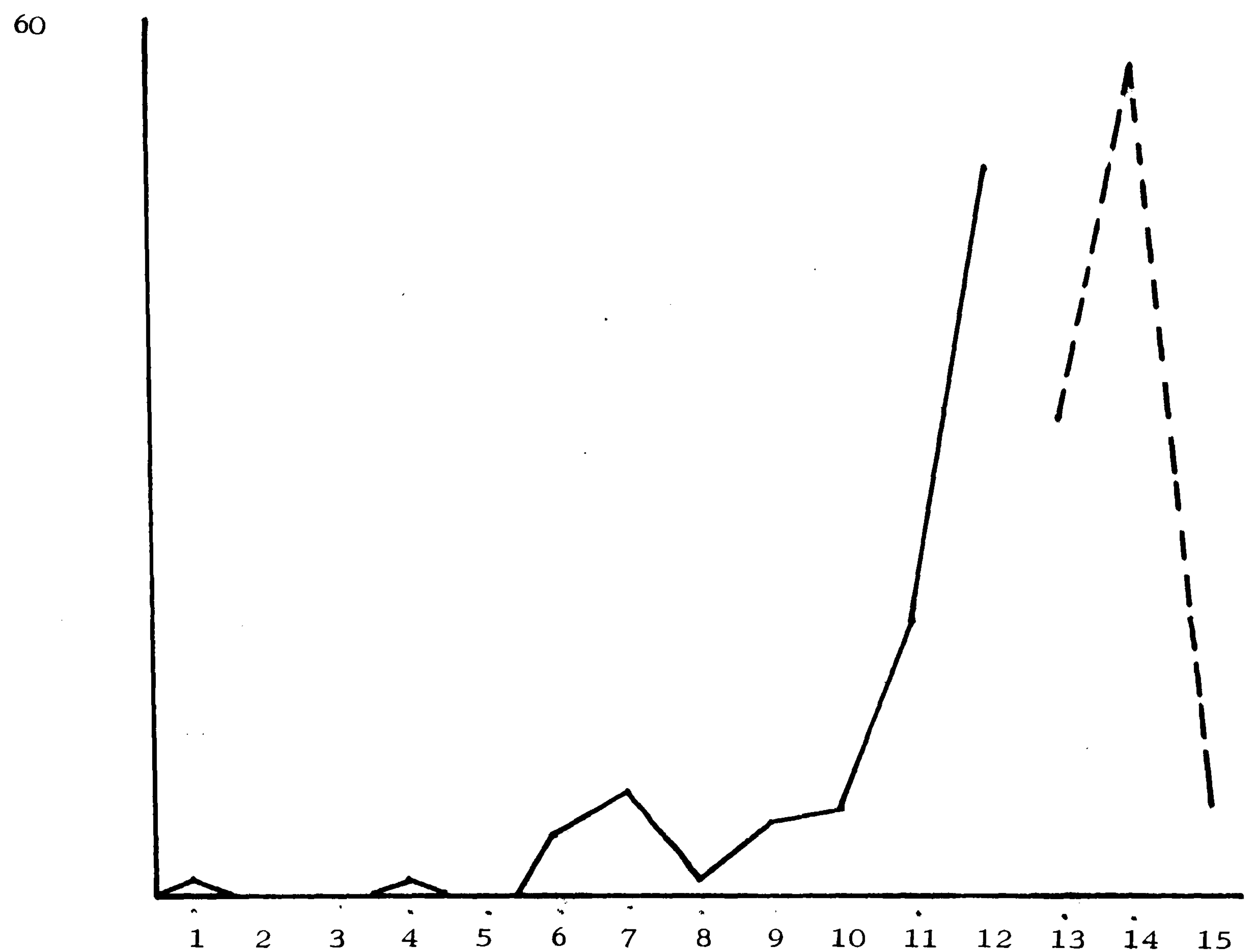

Figure 17. Monica B Pulse Number per Session

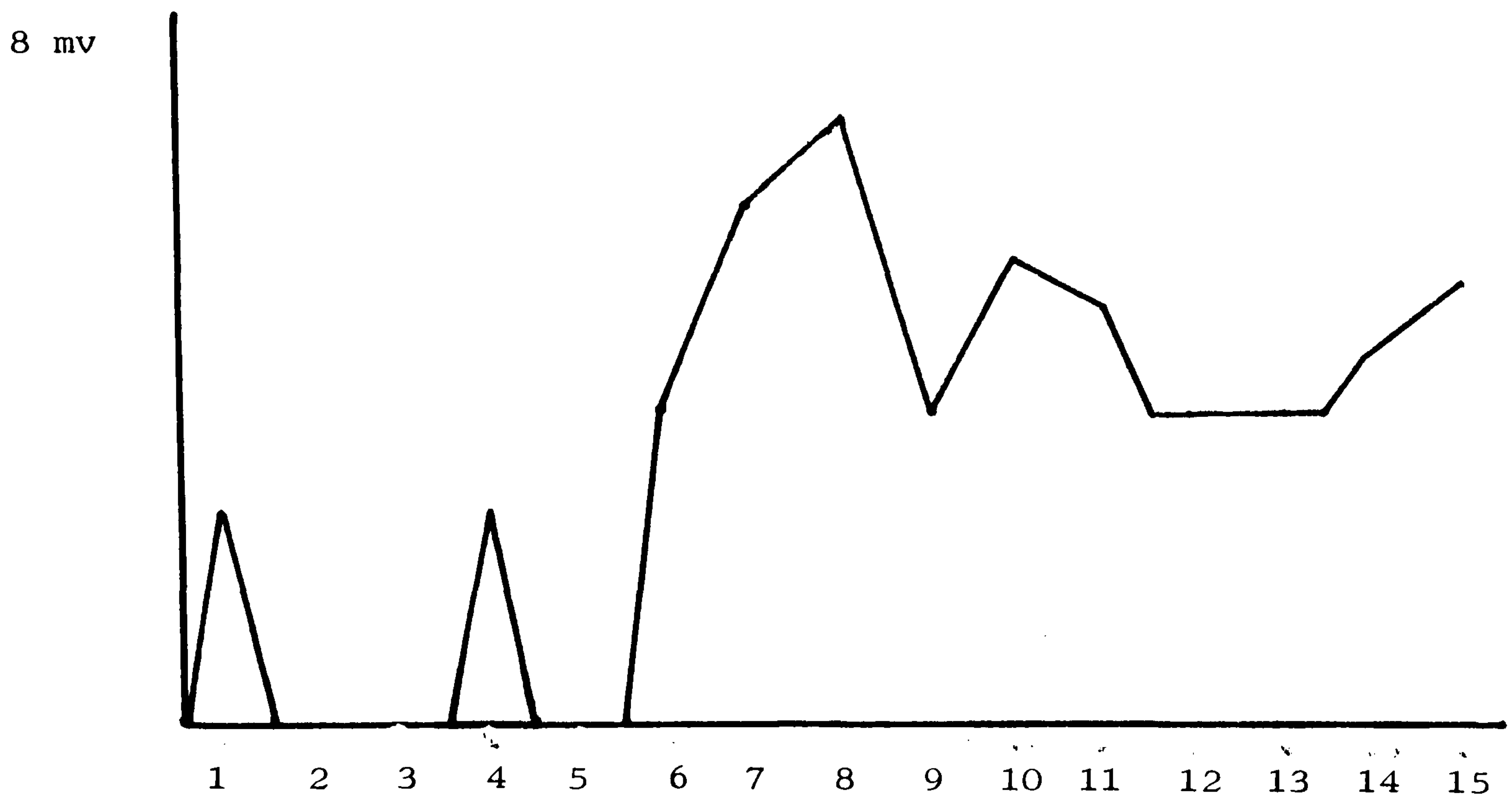

Figure 18. Monica B Average Pulse Amplitude per Session

CHAPTER SIX

THE ACCELERATED START STUDY

6.1 Experimental Design Decisions

Several factors emerged from the first longitudinal study which suggested improvements that could be implemented to increase the efficiency of the uPKMB training procedure. Some of these were incorporated into the second formal longitudinal study which was termed the accelerated start study because it involved an early period of intensive practice for subjects.

The first change introduced was that all sessions would be self paced. The sessions would last a minimum of 45 minutes and a maximum of 90 minutes, at the discretion of the subject. Trial and rest periods were to be decided by the subject and experimenter together. It was felt that the decision could not completely be left to the subjects since in some informal sessions subjects had protracted trial periods to the point that it seemed that inhibition was likely to result from the fatigue caused by the length of trial period. As far as possible however, the decisions would be left to the subjects.

Since Sheila D in the first study had unnecessarily consumed considerable experimenter time it was decided that if subjects had not achieved a single scoring session by the end of the first eight sessions in the new study and if no signs of PK had occurred in any session then they and the experimenter would be free to terminate any future training sessions, thus conserving experimenter time. This option would only be taken by the experimenter if the subject's sessions produced no sign of PK.

If non scoring but fairly definite uPKMB occurred then the experimenter would continue the series since it was felt important to investigate whether with protracted practice subjects with apparently rather low intrinsic PK ability might nevertheless improve their output over a longer period. It was therefore decided that even if a subject produced no scoring session up to session twelve, they might still be included in a further series of sessions in order to check the hypothesis that a protracted series of training sessions would produce scoring, the decision to continue depending upon the subject's willingness and the experimenter's discretion. The protracted series of sessions conducted after session twelve was therefore possibly to include non scoring subjects as well as the successful ones. The question of whether protracted training would eventually produce PK in previously non scoring subjects was felt to be important enough to merit the adoption of a formal hypothesis within the design of the study.

Most of the scoring uPKMB sessions in the first study had occurred after the sixth session. It therefore seemed worth exploring the possibility whether if the first six sessions were conducted very intensively the transition into scoring sessions could be made very much more rapidly. It was decided that the performance of three experimenter monitored sessions per week for two weeks would probably be the maximum rate of intensive training which the subjects would be prepared to tolerate since they would obviously have many other day to day concerns and duties to fulfill. The use of the intensive sessions, if successful, would mean that four weeks would be subtracted from the time necessary for most subjects to achieve scoring sessions.

The subjects would be split into two groups. Since the principal hypothesis under test was that a two week intensive period of training would enable the subjects to start scoring by its end, both groups could be given the intensive period of training (hence speeding up all subjects' development), but at different phases in the complete series of sessions.

The principal hypothesis under test (apart from the learning hypothesis fundamental to the use of longitudinal training series) was that the group (A) who started the intensive phase right at the beginning of their training series would perform better for the series as a whole, measured at weeks eight and twelve, than the group (B) who would start their intensive phase at session three of the study. This hypothesis was formulated because the previous study had shown that scoring became more frequent after the sixth session, so that the two further sessions after session six that would still be available to the A group should enable them to achieve higher scores by sessions eight and twelve than those achieved by the B group.

In addition it was felt that six sessions conducted in a relatively short period might produce accelerated learning relative to six once-weekly sessions because of increased motivation and possibly less decay in the memory of PK associated states or internal cues. Any change in their confidence regarding their own PK ability caused by a successful session in the intensive phase could also be capitalised upon because of the decreased inter session period preventing the memory of the successful session from decaying and becoming considered irrelevant by the subject. Both groups should therefore show learning at a faster rate than that shown by the three less able subjects in the first study.

Initially it was planned that in order to demonstrate the superior efficiency of the accelerated start procedure the control group (group B) would be treated in the same way as the subjects in the first study as far as experimenter time was concerned and would receive only one training session per week for the non intensive first two weeks. At the end of the first two weeks group B would then perform their block of intensive training (three sessions a week for two weeks) so that by week eight both groups would have performed the same number of sessions counterbalanced in order (six intensive plus two non intensive sessions). Table 9 shows the initially planned schedule of training sessions.

Table 9. Initial Practice Schedules of Groups A and B

Week Number	1	2	3	4	5-8
Group A	3	3	1	1	1/week
Group A	1	1	3	3	1/week

It was then decided to incorporate another feature into the experimental design which it was thought might very greatly improve the efficiency of the training procedure. Incorporating the new feature would have the effect that neither group's performance would be directly comparable to that of the subjects in the first study. However a new and possibly important variable could be evaluated in the same design used to test the accelerated start hypothesis.

The modified design arose from the realisation that if subjects could be loaned uPKMB detection instrumentation with which they could practice uPKMB at home in their own time this could greatly increase the total practice time of the group at little cost in experimenter time.

Accordingly a very large expenditure of experimenter time and effort was invested in the design of small, portable, simple to operate battery powered uPKMB practice machines. After many months of design, development and construction work a dozen devices were finished. The sensor assembly was identical in type to that used in the experimenter's equipment. The devices produced an audio output which was effectively identical to that used in the experimenter's apparatus, the state of the uPKMB target being signalled by the rate of clicking of the device, PK inputs causing increases in click rate. The gain of the home use devices (x47) was approximately double that of the experimenter's apparatus (x22) in order to detect low level PK inputs. The devices were equipped with simple manually reset meters which gave approximate indication of pulse amplitudes.

No formal data would be gathered from the solo practice sessions, since they would be unwitnessed and the instrumentation was not as sophisticated as the experimenter's and was therefore potentially prone to register artifactual signals. However the limitations of the home use devices would not seriously matter provided the practice sessions conducted with them were effective in improving the subjects' performances.

The devices were to be loaned to subjects for them to practice with three times a week. Table 10 shows the modified training schedule incorporating the subjects' solo training sessions. The intensive phase was made still more intensive by the subjects being requested to practice three times per week under solo conditions in addition to their thrice weekly experimenter monitored sessions held during the intensive phase.

Table 10. Modified Practice Schedules of Groups A and B

	Type and Number of Sessions by Week Number				
Week Number	1	2	3	4	5 - 8
Group A	3E + 3S	3E + 3S	1E + 3S	1E + 3S	1E + 3S
Group B	1E + 3S	1E + 3S	3E + 3S	3E + 3S	1E + 3S

Experimenter Monitored Sessions = E : Solo sessions = S

The experimental hypothesis remained unchanged because under the new schedule the A group received an even more intensive initial training treatment, so that their performance should improve even more relative to the B group's PK performance (assuming that motivation and interest were maintained, which from the response of the first group of subjects seemed likely this early in the series).

It was realised that differential effects arising from the possibly different effectiveness of solo training sessions versus the experimenter monitored sessions might arise. If sessions monitored by the experimenter were more efficient than solo sessions in promoting uPKMB performance as seemed likely because of possible effects on subject motivation or other effects of the experimenter's treatment of the subjects this too would tend to increase the performance of the A group relative to the B group.

By session eight the two groups would each have performed eight experimenter monitored sessions and twenty four solo sessions. After session eight all subjects would revert to a training programme consisting of three solo sessions per week and one experimenter monitored session per week. It was planned that after session twelve the best subjects would continue once weekly experimenter monitored training sessions in a further study where they would attempt more complex uPKMB tasks requiring greater levels of control. Some non scoring subjects would probably be prepared to continue their sessions beyond the twelfth and would be requested to do so if their performance seemed to merit it.

6.2. Experimental Hypotheses

The formal hypotheses to be tested in this study are listed below.

1. Both subject groups would show significant increases in uPKMB output as measured by first half to second half series comparisions of pulse numbers using the Chi square statistic. Some subjects

would produce outputs which when subjected to linear regression analysis would show a positive slope and a significant (by t test) correlation coefficient.

2. The A group would perform better than the B group when their total uPKMB output for the series was pooled at week 8 and at week 12. Comparision would be by Chi square statistic on the pooled pulse numbers for each group.
3. Individual differences in the performances of subjects would be demonstrated.
4. Questionnaire scores would predict uPKMB performance to a significant extent using the Spearman rank correlation measure within the series of each subject's sessions.
5. Subjects showing uPKMB scores of 1 mv or more, but less than 2 mv (formal scoring criterion) in the series to session 8 would by session 14 show scores of more than the 2 mv criterion in at least one session.

6.3 Subject Recruitment

Since each subject was to perform six intensive sessions it was essential that they live within a short journey time of each other so that several subjects could be visited each day and preferably they should live near to the experimenter's home. This requirement very greatly restricted both the numbers and quality of the subjects recruited, because no really good macroscopic PKMB agents had been found in the immediate locality of the experimenter and the requirement for groups of subjects to live near to each other was also difficult to meet.

Nevertheless two groups were recruited, one based in Leamington and Coventry and the other based in or near Walsall in Staffordshire.

The local group was recruited as a result of screenings performed at a Coventry and a Leamington spiritualist church. The distant group was recruited as a result of the experimenter having held a mass screening near Walsall at which several possible PKMB agents had been identified. The Walsall group attended a local spiritualist church at which the screening was held.

The memberships of groups A and B are shown in table 11 in section 6.5 below.

6.4 Apparatus and Procedure

Essentially the same apparatus was used as in the first study, the difference being that the noise level of the uPKMB channel had been reduced further and all the electronics were incorporated into the same box. Three channels (mains monitoring, sound monitoring and uPKMB) were again used. All amplifier gains were identical to the first study, as was the uPKMB sensor. A different and more portable design of stand was used to suspend the uPKMB sensor assembly. A digital millivoltmeter accurate to 5%, + or - 1 digit was used in conjunction with a manually resettable peak hold circuit in order to enable peak pulse voltages up to 199 mv to be recorded with precision of 0.1 mv.

Training sessions were held in the subjects' homes as in the first study. The choice of room for the sessions was made carefully and in every case the environment was suitably quiet. The timetable of sessions as set out in table 11 was adhered to as far as possible but there were some unavoidable minor changes due to subject or experimenter unavailability due to illness etc. Warm trusting relationships were developed with all subjects who participated. The subjects appeared to enjoy their participation in the experiment.

Rest and work (trial) periods were clearly marked on the chart record (3 channel) of sessions. The subject and experimenter pre session questionnaires were completed prior to the first trial period, but while the equipment was running. Post session questionnaires were completed after the equipment had been switched off at the termination of the session. Trial and rest periods were timed because it was wanted to examine work patterns in order to formulate hypotheses to be tested in future studies.

An important feature of the subjects' behaviour was that none of them performed the requested number of solo sessions. Subjects reported rather little success in their solo training sessions. It had been expected that the subjects might report better results in their solo sessions than in the experimenter monitored sessions because of their including responses from the home use machines which were due to artifactual sources (sound, vibration and electrical transients). However the evidence seemed to point the other way, very few ostensible uPKMB events being reported.

It was impossible to order subjects to practice in an authoritarian manner within the context of their voluntary participation in the experiment. The impression was gained that even from the start of the study some subjects did very few practice sessions, and those completing more than two per week were very rare. Some subjects performed no solo sessions in up to half of the weeks of the study. Precise figures for solo practice sessions cannot be given because the subjects themselves proved very difficult to discipline to keep satisfactory records of their solo sessions.

It was strongly felt that if the experimenter was not present, the subjects tended to forget the study in the light of more urgent and pressing demands from their immediate domestic life. This group did not have the leisure time available to them that the older, retired group in the first study had. This may have been an important factor affecting both the frequency of solo sessions and their ultimate uPKMB performance.

6.5.1 Results : Non Scoring Subjects

The results were computed by measurement of uPKMB pulse amplitudes on the chart records. Analogously to the first study, simultaneously occurring pulses in the microphone chanel of more than 8 mv invalidated uPKMB signals, as did mains transients of more than 60 mv amplitude.

Only one subject in this study produced scoring sessions. Since 7 of the first set of 8 subjects did not score, more subjects were sought and inducted into the study. As a result of this process, unequal numbers were recruited into the A (6) and B (5) groups before the study was terminated. In view of the lack of positive results this is unimportant. The number of experimenter monitored sessions completed by each subject are shown in table 11 below.

Table 11 : Experimenter Monitored Subject Sessions

	Group A
Subject	Sessions Completed
Lynne T	1
Dorothy T	8+
Janet P	9
Marion M	12
Nora D	12
Sybil W	21

Table 11 : Experimenter Monitored Subject Sessions

Group B

Subject	Sessions Completed
Mrs W	2
Anita S	13
Joan W	14
John E	16
Judy E	16

The lack of positive results for 10 of the 11 subjects was surprising to the experimenter and made it impossible to conduct most of the planned analyses. It cannot be pretended that the reasons for the lack of scoring on the parts of most subjects can be known with certainty. Many hypotheses are indicated by their behaviour but these remain essentially speculative.

However, some of the factors which seemed to be responsible were thought likely to apply generally to subjects undertaking this type of PK training. The problems encountered in this study seem clearly to illustrate general problems which need to be considered in any general view of the prospects for the PK training of large numbers of subjects. Each subject and the factors thought responsible for their poor performance will therefore be discussed individually but briefly here.

Lynne T was the daughter of Dorothy T and was 12 at the time of the study. She was not really interested in participating despite having freely agreed to do so.

Mrs W was the mother of Anita S. A strange event occurred in her first trial whereby a pair of large pulses were registered but it was not felt certain by the experimenter that they were not artifactual and caused by the sudden slippage of the microphone from its point of attachment to the uPKMB sensor stand. This problem did not occur with any other subject. Her results were discounted because of this factor. She produced no further effects in her second session.

She withdrew from the study because she found her two sessions very fatiguing. This response had been found once before when a productive Japanese female subject refused to participate in a formal study after having performed one informal pilot session. It was felt that this response occurs as a result of the subject adopting too effortful an orientation towards the uPKMB task. Despite the experimenter's trying to encourage the subject to adopt a more relaxed orientation to the task this subject persisted in effortful striving to achieve effects.

Janet P was in her late thirties and was a friend of Dorothy T and was visited immediately after Dorothy T (they lived within easy walking distance). Janet P was thought at first by the experimenter to be a likely good performer because she claimed an active and broad ESP functioning and performed as a platform "clairvoyant" sometimes for her local spiritualist church. She had produced quite good (unwitnessed) deformations in cutlery in the screening held at Coventry. However her experimenter monitored sessions were devoid of any real signs of PK, she reported extremely few solo events and performed very few solo sessions in the entire series (estimated 6 solo sessions total). The experimenter's conclusion was that she was simply not a gifted PK agent.

Dorothy T was forty at the time of the study and was very much more conscientious than Janet P in performing solo sessions (estimated 16 solo sessions). She expressed considerable lack of confidence in her likely PK performance, and her bent cutlery produced at the screening in Coventry was only marginally deformed. Unfortunately for reasons which are unclear, a large fraction of the chart rolls and questionnaires for Dorothy T were found to have been lost. Records for 8 sessions exist, but she performed probably 20 or so experimenter monitored sessions and an estimated 30 solo sessions, since despite her lack of success she was keen to continue in the study. At the very end of the series (for which the data is lost) she started to produce very slight possible uPKMB effects. It was felt that she was indeed correct in her own self estimation that she was not particularly talented with PK, because she showed no other signs of functioning spontaneous psi.

Nora D was in her early thirties and had been selected as the last subject to enter the study. She had experienced ostensible mediumistic communication phenomena some years before and produced a fairly clear ostensible uPKMB pulse when tested at a Leamington screening. The conditions of the screening were very bad however, as it was conducted in a tent outdoors and in an environment with a fair amount of wind and traffic noise. Its results were regarded with caution.

Nora D performed few solo sessions (estimated at 5 total). She reported not enjoying solo sessions. She had recently given birth to her 6 month old daughter who proved extemely demanding of her mother's time and energy. Nora D's sleep was frequently disturbed and her lack of ostensible uPKMB output over the series might be ascribable to her frequent state of fatigue and lack of sleep due to the nocturnal demands of her baby.

Sybil W lived in the same town as the experimenter (Leamington Spa, Warwickshire). She was the president of the local spiritualist church and had run several spiritualist "development" groups for a number of years. However she had always felt slightly frightened of allowing herself to develop full mediumistic trance. At both of the screenings that she attended she produced ostensible uPKMB pulses. Since she and the experimenter related well to each other and since she lived so locally it was decided that a protracted series would be performed with her even if she did not produce any scoring session in the twelve first sessions.

The early sessions with her were performed under difficult conditions. Mrs W did not feel free to allow the sessions to take place at her home at first because of the presence there of her chronically sick husband (she was in her sixties and her husband was somewhat older). Sessions therefore took place in one of the rooms of the Leamington spiritualist church. This had been agreed by the experimenter because it was felt that this environment ought to have been sufficiently familiar to the subject not to be inhibitory. Unfortunately the period of the study coincided with a long period of particularly cold weather and the unheated church was glacially cold, although the room used for sessions was gradually warmed up through each session. It was felt that this cold start to the series may have been responsible for the lack of relatively early success. After session 12 further sessions were performed in a room at her home.

Despite the change of location Sybil W's PK performance did not improve. The hypothesis that very long protracted sessions would produce scoring outputs in subjects who failed to score by session 12 was not supported by her result.

Anita S was in her early thirties and was divorced, living with her daughter in their home near Walsall. She was still to some extent mourning the end of her marriage and apparently found participation in the study a welcome change in routine. She related in a friendly manner to the experimenter. Although she practised more consistently than some of the other subjects (estimated solo session total of 15) she reported no results atall during her solo sessions.

In the sessions conducted with the experimenter present there were very slight signs of possible uPKMB fairly early on (sessions 4 and 5 for example), but her performance did not improve.

A possibly important feature of her sessions which could in future prove problematical with some other subjects was that in the visualisation exercises she used in attempts to elicit PK emotionally disturbing images would sometimes occur spontaneously. One particularly disturbing image was that of a hooded monk without a face. At one session the monk appeared with a skull as face, and was seen as engaged in roasting the experimenter !. Interestingly, this was on the day before the experimenter developed a high fever due to influenza, although the precognitive status of the incident of course remains unclear.

Images of this sort only occurred with this one subject and were thought by the experimenter to reflect the emotionally stressed state of this subject. The male status of the experimenter was possibly of ambiguous meaning, given that her previous husband had abandoned her for another woman. Since the training sessions themselves were valued by this subject it was decided to continue them despite these signs of latent conflict. No scorable results were obtained.

It seems reasonable to conclude that subjects for PK training should be avoided who have recently suffered any form of significant stress because of the possibly disturbing effects of the encouragement of regressive behaviour which may be helpful or even necessary in PK facilitation with non conflicted subjects. Internal conflicts in subjects might also reasonably be hypothesised to cause blocking of PK responses because the enactment of hostile, destructive or agressive (or self destructive) impulses by means of uncontrolled spontaneous PK would represent a possible threat to them. This theme was illustrated further by the remaining unsuccessful subjects.

Joan W was reported by her husband to have caused the paranormal deformation of a house key twice when she was angry. She reported extensive spontaneous PK of a mildly poltergeist nature occurring in her presence when she was a child. At the time of the study she was in her mid forties and was coping with an extremely demanding role as mother of her family, which included a problem teenager and her elderly father in law. Although she was careful not to express her resentment with certain aspects of her situation it was clear that she found her position in the household to be very stressful.

In session 4 she started to produce small but fairly definite uPKMB pulses. Just before the start of session 5 she had been reading some material connected with an important legal dispute in which her husband was involved. She stated that she had felt emotionally disturbed during the first half of the session (when nearly all of the PK had occurred). During session 5 she produced definite uPKMB effects, although none that were scorable. This session represented a marked improvement upon any of her previous sessions in terms of its uPKMB content. The experimenter expected her performance to continue to increase but instead, less PK was obtained in session 6 and by session 7 it had all but died out. No further session saw any sign of uPKMB. It appeared that emotional stress was necessary to elicit PK and that in its absence a powerful inhibition was effective in supressing it.

In conversation with Joan W she admitted that she was frightened of possession of PK ability because she feared that she might unconsciously use her ability for destructive purposes. She accepted that the childhood PK effects had been due to herself and was worried that these events might repeat themselves in a more destructive way. The experimenter visited her once more several months after the end of the experimental series in order further to discuss this when she confirmed that this had been an important consideration for her.

Joan W may represent an important and interesting class of potential PK agent, because there seem to be distinct parallels between her situation and that involved in the classical form of poltergeist outbreak. She was thought to illustrate rather clearly the potentially dangerous and problematical aspects of PK ability when associated with persons who are either heavily conflicted or who are in social situations which create conflict. The moral for the experimenter would seem to be to avoid this type of subject by careful subject selection techniques ahead of their possible recruitment into experimental studies. Further consideration of this important issue is conducted in the chapter on possible future PK training research (chapter 10).

6.5.2 Judy and John E's Results

John and Judy E were first encountered at the screening near Walsall where they both produced ostensibly paranormally bent cutlery. They were in their late twenties and had two children.

The E's reported that both their children could produce bent cutlery but the experimenter did not test this claim since he believed the children likely to have caused their effects by normal force. Their son (the eldest) was given one short uPKMB trial early in the series but produced no effects.

They lived in a small council house on an estate in Walsall. At the first visit an immediate rapport established itself between both subjects and the experimenter which lasted through to the end of the long association with them (they took part in the audio experiments described in the next chapter.

John E at first seemed likely to perform nearly as well as his wife, as at first he seemingly produced some very slight possible uPKMB effects, but over the long (16 session) series conducted in this study he produced no scoring session. Although regrettable this null result provided an unplanned control series, since if there were an environmental factor responsible for Judy's results it should have shown up during John E's sessions (the order of testing was not predetermined and subjects were tested in both orders in roughly equal numbers).

In discussion with John E he stated that he had felt frightened at the implications of possession of PK ability. During the audio series he appeared to overcome some of this fear but his PK performance never approached that of Judy. Despite his lack of scoring sessions he was maintained in the series in order to contribute towards the testing of hypothesis 4. It was also appreciated both that his series of sessions would provide a control series for his wife's and that to refuse to continue working with him might complicate the experimenter's relationship with both of them.

In her trial periods Judy E customarily sat on the floor in front of the uPKMB sensor with her head approximately level with it and at a distance of 400 mm from it. Her hands were placed in her lap. The holder for the sensor was placed on a window sill which provided a stable base for it. The gap between the subject and the PK sensor was constantly monitored by the experimenter and Judy's face was plainly visible at all times.

6.5.3 Judy E's Results

Judy E was the outstanding subject in this study. She showed slight but definite signs of uPKMB from the first session onwards. This built up fairly consistently until she commenced scoring in the 7th session. Since the noise level of the equipment as measured from the chart trace was not readily measurable in the absence of external acoustic noise, being less than the width of the chart recorder pen trace, two records of the data for the scoring sessions are shown in appendix (6). One is based on the 2 mv criterion (used for all statistical calculations) and one on a 1 mv criterion in order to show the difference in scoring levels if the smaller pulses are included within the dataset.

Figures 19 to 21 show her output per session. As can be seen her summated uPKMB score per session increased over the series. From figure 20 it can be seen that her best performance (session 13) occurred as a result of a larger pulse number being produced rather than larger pulses. Her mean pulse amplitude per session remained faily constant except for sessions 10 and 11 in which it became almost double that achieved in the other sessions.

Looking at the sequence of her summated ouputs per session (figure 19), the lowered score in session 12 was thought to be due to her feeling ill in that session. Judy E suffered from lactose intolerance and multiple food allergies. The experimenter advised her on possible changes to her diet in session 12 and from then onwards ill health due to her allergies decreased, although she soon became ill again due to other causes.

There is a strong case for regarding Judy E's series as being split at session 14. For several reasons session 14 marks a change in the series. This session was held at Aston University in the

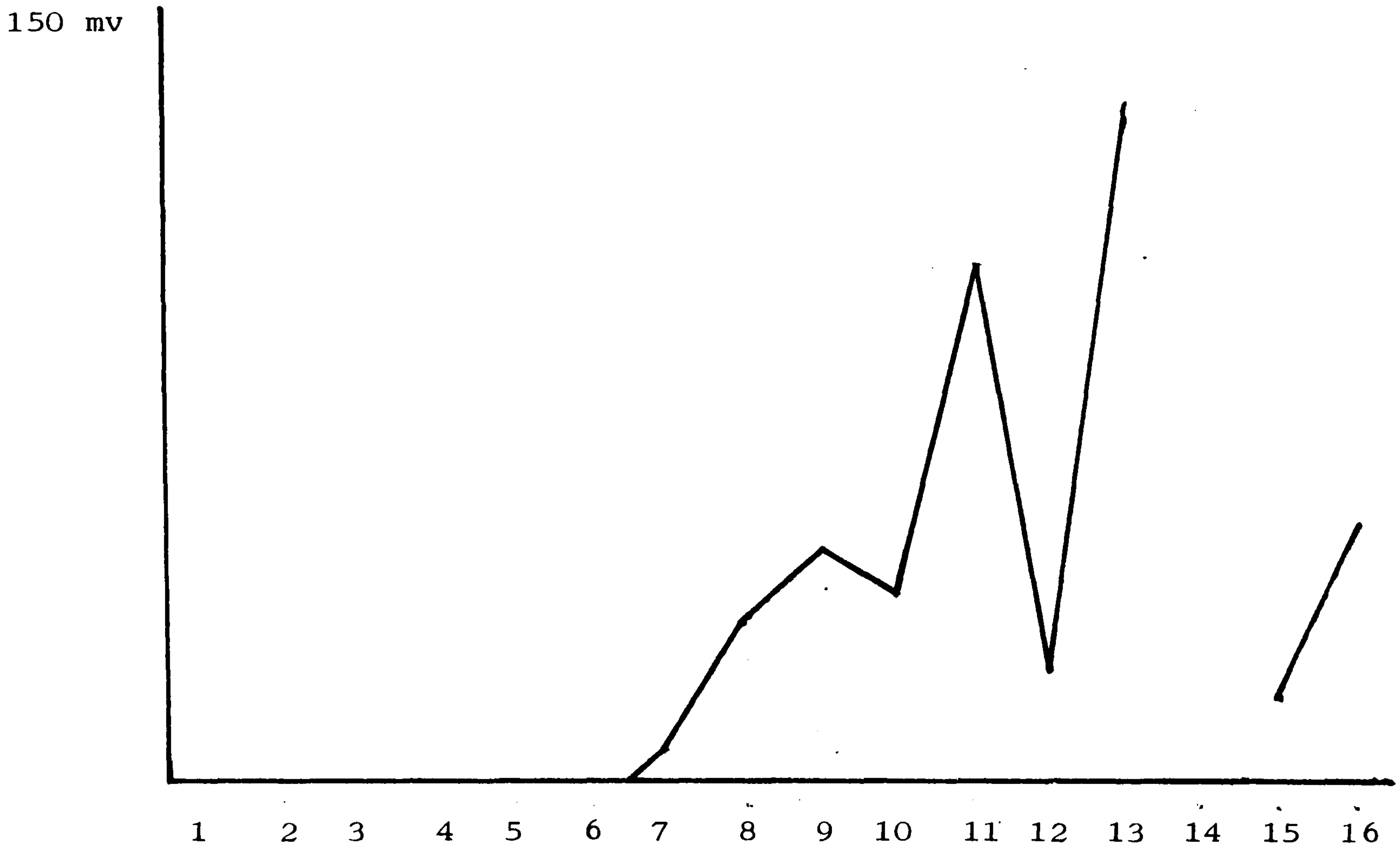

Figure 19. Judy E Summated uPKMB per Session

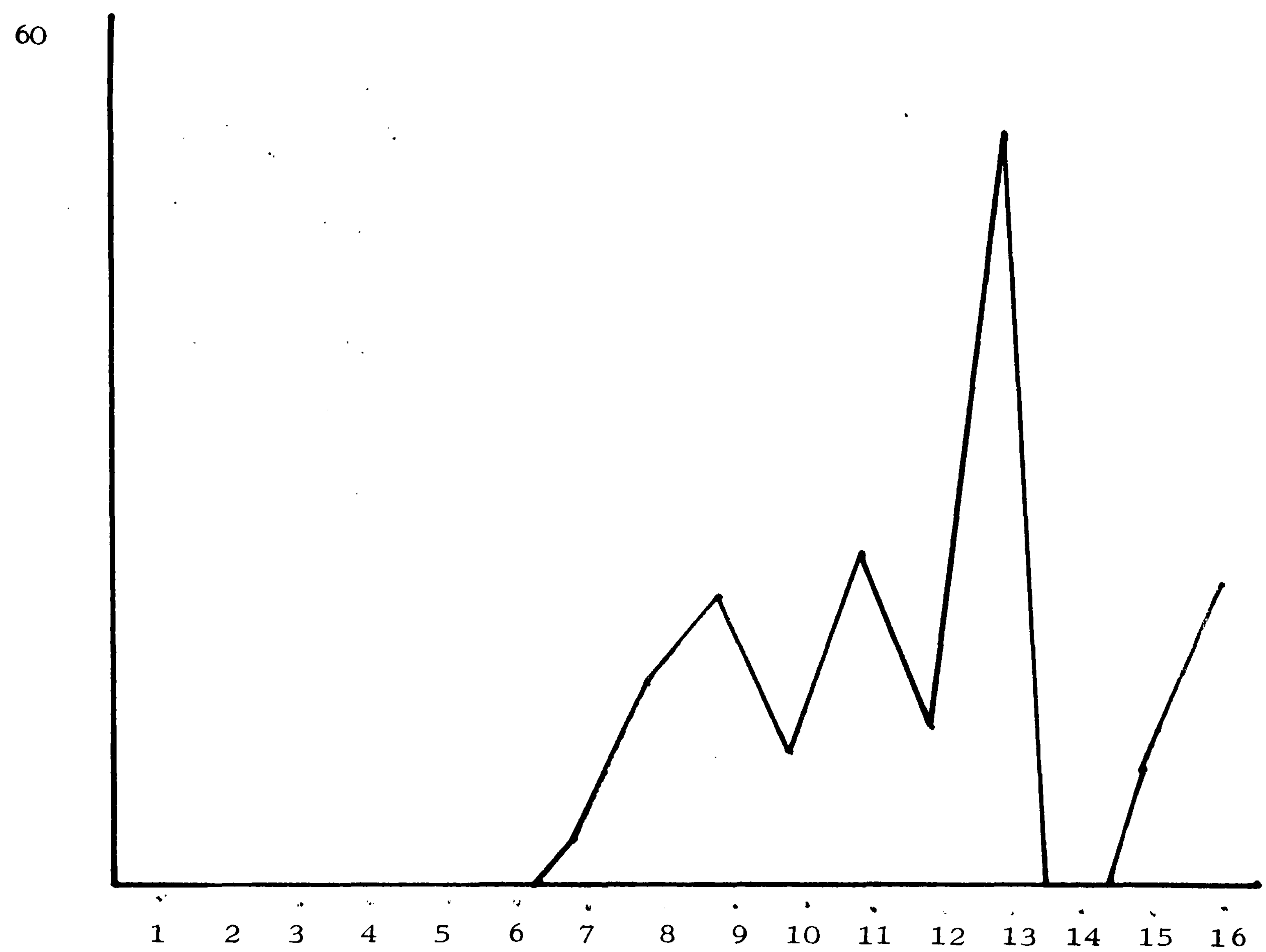

Figure 20. Judy E Pulse Number per Session

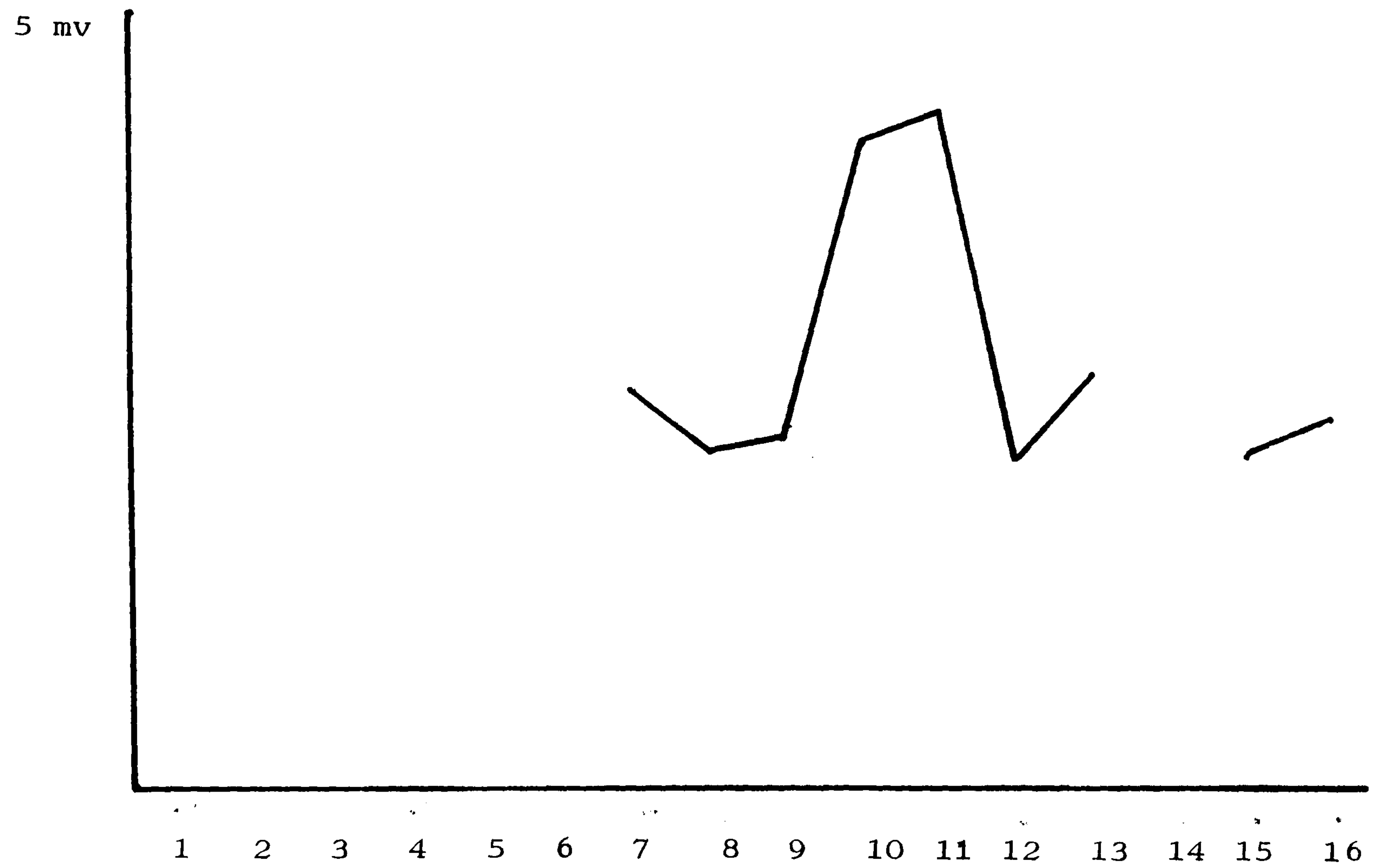

Figure 21 Judy E Average Pulse Amplitude per Session

experimenter's room. It is therefore not comparable to the earlier sessions since there is good evidence that changes in location can inhibit uPKMB (Hasted 1981a). Both subjects completed one session there, neither obtaining a score. The session had been set up in order to check whether it would be feasible for them to work from then onwards at the university. It became clear that it was too difficult for them to be able to free enough time to be able to do this so that the idea was dropped.

However the bad session at Aston was thought responsible for depressing Judy's scores in sessions 15 and 16. This may appear to be post hoc special pleading in an attempt to explain the apparent decline. However, Batcheldor's theory specifically predicts that reverses of this kind will tend temporarily to depress PK output (Batcheldor 1984). In the subsequent audio training study Judy E's performance was at times excellent, so that no systematic decline occurred.

Another possible contributory factor, which in fact stimulated the development of the later audio studies was that it became apparent that to Judy E the endless week by week production of chart recorded effects was losing its interest for her by the end of the series. This may also have been partly responsible for the lowered scoring.

The two last chart recorded sessions were conducted while Judy was quite ill. She suffered from an internal infection which eventually necessitated brief hospitalisation. In session 17 she achieved only 2 pulses and in session 18 she was unable to stand and attempted without success to influence the uPKMB sensor which was in its usual position whilst she was lying in the garden. The E's did not have a telephone and had not informed the experimenter that her condition had worsened prior to his arrival at this session. After the condition was cured, as remarked above, she recommenced scoring at a high level in the new audio PK study described in the next chapter.

For the reasons stated the series will therefore be regarded as being of 13 sessions, since this run of sessions was conducted without interruption under identical conditions throughout. Since all of the scoring occurred after session 6 a first half to second half comparison of scoring is somewhat academic. However, to complete the analysis according to the specifications described in the experimental hypothesis, there were 0 pulses in the first 6 sessions and 64 in sessions 8 to 13 (session 7 was excluded since 13 is an odd number). Chi square for this difference is 64, with 1 df giving a p value of 1.9 x 10 (-10).

The linear regression performed on the summated uPKMB amplitude scores pooled across the rest and trial conditions for the first 13 sessions yields a slope of 8.86 (similar to the 8.2 slope of Monica B's regression line), an intercept of -32.0, and a correlation coefficient of 0.77. A t test on this coefficient gives a t value of 4.06 and a p value of less than 0.005 (single tailed).

Similarly to Monica Bliss, the majority of Judy E's output occurred in the trial condition (61 pulses) rather than the rest condition (6 pulses), showing voluntary control and suggesting learning rather than progressive deinhibition as the cause of her increased performance resulting from practice. Chi square for this difference is 45, giving with 1 df a p value of 2.3 x 10 (-10).

The questionnaire used in the accelerated start study was a shortened and modified version of that used in the first study (see appendix 6). Analysis by Spearman rank correlation of the scores from the scale questions revealed only two significant correlations between PK performance and questionnaire answers (sessions 1 to 13 were submitted to analysis).

One correlation appeared on the subject's pre session questionnaire, question 2 which asked how tired she felt. The correlation was between her feeling less tired and better PK performance, the correlation being significant at the 0.05 level (one tailed). This correlation is meaningful in the context of her very demanding role as mother of her family.

The second correlation was present in the experimenter's questionnaire, question 4 which asked how easy the experimenter had found the subject to relate to. The correlation was between it being felt easy to relate to the subject and better PK performance. It was significant at the 0.05 level (one tailed). This too was a meaningful correlation because there were sessions where Judy's external concerns distanced her from the experimenter, and also sessions of considerable shared closeness with her.

These two correlations seem meaningful in the context of the experimental context. However the subject's questionnaires (pre and post session) contained a total of 9 questions and the experimenter's (pre and post session) a total of 9 questions, so that it is by no means outside the bounds of chance that both correlations should be spurious.

6.6. Conclusions

The accelerated start experiment had demonstrated several important points. The first was that prolonged training of subjects showing no early PK does not seem to produce later scoring. The clear implication was that the efficiency of uPKMB training studies would be greatly increased by the dropping of subjects who showed no early promise.

Although the success of the single subject meant that her results could not be regarded as generalisable, the fact that she started scoring in session 7 suggested that the intensive phase certainly did not decrease her performance relative to the group in the first study. The use of intensive periods of training was not counter indicated by this result, even though it could not be regarded as having been confirmed.

Another implication was that the initial selection of subjects ought to include a very comprehensive and careful interview to detect both current social stress or psychological dysfunction and to identify possible fears or other blocks which would be mobilised by the subject's being confronted with the possibility of their gaining an enhanced PK ability.

Complementary to this approach could be the possible use of counselling techniques to free subjects from blocks and fears which could prevent them from reaching their potential. Obviously this potentially could create ethical problems which would have to be anticipated as far as possible and careful guidelines drawn up before any studies incorporating this feature could be executed. But some of this counselling could undoubtedly be of a very down to earth and practical type, such as making the subject aware of the literature and research findings regarding any possibly strange psi related experiences to which they might be prone (such as precognition in the case of Marion M) so that subjects could regard their psi functioning as a more normal and less frightening feature of their lives.

The study showed, as had the first study, that there are very great differences between subjects. Judy E seemed in her PK performance to resemble Monica B to quite a great extent. It was interesting too that she suffered from multiple food allergies and was allergic to lactose, since this is a fairly rare condition and Helen

Hare had shown a very similar syndrome.

The use of the home training uPKMB devices in the study could not be regarded as successful. The implication from the manifest reluctance of the subjects to use them was that they did not find the experience rewarding. Partly this may have resulted from their lack of success, but other factors may have also been relevant. Indeed, the lack of success may have been a result rather than a cause of the subject's lack of interest in solo training. Solo use of the machines was felt by some subjects to be essentially rather pointless unless something meaningful or useful could actually be done with the PK. Equally, the subjects clearly enjoyed the social contact with the experimenter during sessions and participation in a common project. This suggested that solo practice may have been unattractive because no social contact was involved.

Finally, it became clear that although the chart recorder and frequency modulated feedback technique was effective with some subjects in promoting learning, once a satisfactory PK performance had been attained the best subjects would probably need some further challenge or use to which their PK could be put. This perception motivated the experimenter to develop an extension of his approach to uPKMB which was first explored in another study with Judy and John E described in the next chapter.

CHAPTER SEVEN

TWO AUDIO PK SERIES

7.1 Experimental Design Considerations

Several convergent lines of thought led to the adoption of a slightly different approach to uPKMB training in the third and fourth studies. The first two studies had strongly suggested that amongst any large group of recruits to uPKMB training studies there would probably be found a very much smaller number of individuals who could legitimately be termed star subjects whose potential for controlled uPKMB production would substantially outrank that of the rest of the subjects.

Once these star subjects had to some extent realised their training potential by reaching the stage where their performance of uPKMB became productive and moderately reliable not unnaturally they might seek further challenges to their ability and if they were kept on the same training regime their performance might suffer due to declining interest and motivation. Any new uPKMB task must be interesting and acceptable to the subjects and must be more interesting than the standard task used to date.

Closely allied to the question of retaining the star subjects' interest was the issue of the meaningfulness of the PK task. The experimenter was quite happy to continue using the standard task since the purposes of data collection could be fulfilled adequately by use of the standard task and the potential for useful studies offered by this task had only just been tapped. But subjects would need a task which offered some form of output to them which would be rewarding.

Considerable thought was applied to this question. One important clue was provided by Judy E's own self developed PK elicitation technique. She had personalised the PZT strip in the sensor assembly as "Mr Crystal" and visualised it as a sort of cartoon character with whom she went on imaginary adventures.

She had also developed a technique of treating it almost as if it were a baby and played "peek-a-boo" games with it, pretending that one side of the PZT strip could not see her until she rested her eyes upon it whereupon uPKMB signals would be registered as "Mr Crystal" reacted to her inward (and silent) utterance of the surprise "boo" as she looked at its blind side. This behaviour may seem bizarre or inappropriate when applied to an inanimate object, but it certainly seemed to be effective.

Essentially Judy E was attempting to establish a social relationship with the PZT strip as she would with a baby which was in the pre linguistic stage of development. The clue was that the core of all of this activity was the establishment of a social relationship whereby the crystal's sole role was to communicate back to the subject. It appeared that the species specific human drive to communicate socially could be applied to uPKMB. Some form of communication format would therefore be used.

Another important determinant of the approach was that the reception of this type of research by the scientific community would obviously be more likely to be favourable if the capacity to create the effects over long distances could be achieved. This is a logical long term goal for the approach to directly detectable PK tasks as a whole, as outlined in the last chapter. The communication format would provide a natural context for the move to long distance attempts at uPKMB.

Two considerations led to the narrowing of the choice of PK task to its specific form as used in the first audio PK study. One was the persistent impression that despite all of the precautions taken to ensure that the effects were not due to electrical interference, sceptical onlookers would always tend to suspect the chart recorded effects as being due to the reception of some sort of probably high frequency electromagnetic interference. Direct evidence to contradict this view should be produced by the new approach.

The second consideration was very different and derives from an important and continuing set of issues concerning the nature of PK which are germane to PK training. The laboratory research into statistical PK has created the now widely accepted idea in parapsychology that PK is goal directed (see eg Stanford 1977).

The exact meaning of this assertion is frequently unclear within the literature on PK, and there is not space here for the extended philosophical analysis needed to deal adequately with this set of conceptual issues, but one interpretation of this view could be that PK is (a) independent of the complexity of the task but dependent purely on the a priori probability of the intended outcome (a view espoused by Schmidt for example 1975) and (b) does not require that the PK agent should know anything about the internal workings of the PK target system but has merely to intend the outcome event to occur for that outcome to become more probable than it would be according to its uninfluenced a priori probability.

These two positions might be taken to imply that uPKMB subjects could produce highly complex uPKMB outputs (because of the hypothesis that task complexity does not affect PK success) provided that the probability of the basic physical events caused was not too low to permit the effects to occur atall. Now since uPKMB outputs from the crystal were known to occur since their occurrence was the basis of the research, these considerations suggested a study whereby subjects should learn to produce very complex outputs from the PZT strip.

The communication context and the need to demonstrate that the output from the PZT strip was not caused by electromagnetic interference led to the idea that instead of the output from the strip being processed electronically as had been done with the chart recorded first two studies, it should be amplified and recorded directly, and the subjects should listen to the crystal output directly via headphones. The communication aspect could be encompassed by setting the subjects the task of making "Mr Crystal" talk - literally, by creating audio frequency vibrations directly upon the PZT strip which it would then transduce into an electrical output which could be amplified and fed to the subjects. If the hypothesis regarding the independence of PK from task complexity was really true it would not matter that such a task would on a physical level presumably be very complex.

The idea of the direct feedback uPKMB target system was developed from these thoughts. To reinforce the communication aspect of the new study it was decided that speech communication by uPKMB between John and Judy E would be attempted. This would presumably have the advantage that there would be a strong social component to the experimental format which ought to add variety and interest.

7.2 Apparatus

It was decided to build two independent units which could be interconnected by cable, the cable being long enough to allow the two units (which could now conveniently be termed "stations" since in a sense they consituted separate work stations) to be separated sufficiently for the subjects to be out of direct earshot of each other.

Each station would have its own uPKMB sensor assembly, stand and electronics unit. In order to monitor for environmental acoustic noise which might cause effects on the uPKMB sensor it would be essential for there to be a microphone monitoring channel to be used at each station. Four channels of information would thereby be created, one uPKMB channel from each station and one microphone channel. All four channels would be recorded using a four channel reel to reel tape recorder.

Additionally, the microphone channels could be made to facilitate the social aspect of the experiment because if their outputs were mixed and fed to both subjects, there would then exist a normal telephone-like speech link between them so that both subjects could always hear what each was saying and themselves, as well as being able to directly hear the output of both crystals.

The PK aspect of the study was planned to be that the subjects would first listen to their own sensor and learn to produce speech like signals on it locally, then they would attempt to produce the same effects upon the remote sensor. Once reliable two way communication by means of PK on local and remote sensors was achieved, the use of the telephone link could be discontinued, although it would provide an essential component of the early phase of training.

It must be carefully noted that despite the experiment being presented to the two subjects in terms of the description just given, the experimenter was inwardly very doubtful whether the production of speech directly by uPKMB in this manner was possible. The experimenter's true expectations were that it would probably take an enormous amount of practice to achieve this goal even assuming it possible in principle, which was by no means clear, and that it might well not be achieved by these two subjects.

However the idea was worth trying because the hypothesis of the independence of task complexity of PK was worth testing and if any effects were produced atall they would supply valuable data concerning amplitudes and frequencies of the uPKMB signals which would enable the hypothesis of electromagnetic interference to be rejected conclusively. The study would also allow the experimenter to evaluate the effectiveness of the use of an explicitly communication based format in motivating the subjects.

7.3 Procedure

Since it was important to first establish the feasibility of the basic concept at close range all sessions except an early pilot session were conducted using only one device at a time. This allowed the very much more convenient cassette recorder to be used to record two channels, one being from the PZT crystal, the other being from the microphone channel of the station. The reel to reel four channel tape recorder was a large heavy machine and did not fit well into the small living room in the E's house, so that there were obvious additional social reasons why the early work should be conducted using one work station and the much smaller cassette recorder.

Somewhat to the experimenter's surprise the subjects (John and Judy E) did not like practising together in the same room and neither had yet developed a distant uPKMB capacity (and John E had not produced a scoring session in the accelerated start study).

It was decided that the sessions would therefore be modelled at first upon the usual pattern, with the subjects attempting to create effects upon a uPKMB sensor placed at its usual distance from them (the sensor was identical in design to that used in the earlier studies). For each subject a C90 stereo cassette would be recorded, but the subjects could opt to end the session before all of the tape was recorded. Self pacing was used as before.

7.4 Results

The subjects continued to perform as before. John E produced no really convincing signs of uPKMB whereas Judy produced a large number of events.

For reasons explained below, only five sessions were held using the apparatus, of which one was the early pilot 4 channel recorded one, one was not recorded (in order to attempt to lessen possible inhibition caused by recording) and the other three were recorded on stereo cassettes.

The effects varied in audibility. They were uniformly of very low frequency. The frequency response of the cassette recorder was checked and found to be within 3 dB down to 15 Hz, the roll-off below that frequency being sufficiently slow that 10 Hz signals could still be recorded without great loss (-10 dB), although some distortion was introduced.

The uPKMB signals sounded exactly like the crystal had been very lightly and delicately brushed with something very soft. It should be added that the usual careful witnessing of subjects was maintained in these sessions, together with checking that the sensor assembly was not being blown upon. When played at approximately ten times the recorded speed the similarity of the sounds to brushing noises was retained.

The uPKMB events were clearly not fast events of electromagnetic origin and the existence of the simultaneously recorded microphone channel ensured that room noises could be excluded as explanations of the effects. The hypothesis that the uPKMB events were disguised electrical interference could therefore be rejected. It should be pointed out too that the coupling of low frequency electromagnetic events of frequency 10 Hz or lower with electronic equipment is very poor because the wavelengths involved demand that to act as aerials wires must be appreciable fractions of the wavelength. The short experimental series and construction of the apparatus was well worthwhile if only to establish that the events were definitely not electromagnetic artifacts.

The number of uPKMB events produced per session was very variable and seemed to reflect both the state of the subject and the presence of inhibitory factors. During the first trial at the first session Judy produced 17 events which were detectable in the chart record and 19 that were heard when the tape was played at high speed. The chart recorder sensitivity was set at 10 mv for this tape.

In the second trial of the first session John and Judy attempted together to produce PK. Four events from this trial can be heard, and five show on the chart record (the events were very close together in time). The inhibition of output in the combined trial was clear and Chi square for this difference is 6.5, with 1 df giving a p value of 0.01.

The next session was not recorded as it was thought that the inhibition produced when the subjects worked together during trials might be decreased by the session not being recorded. Few certain uPKMB events occurred and no detailed record was kept as the non recorded session was regarded as being pilot work.

The third session took place at Aston University and no uPKMB events occurred. It was felt that the inhibition had been caused by the unfamiliar environment and by the fact that a chart recorded uPKMB session had been held first which had been unsuccessful (session 14 in the chart recorded series). The fourth session was conducted while Judy was ill and was chart recorded as well as being tape recorded (session 19 in the chart recorded series).

The final session with the direct feedback device was highly productive of uPKMB. An oscilloscope had been connected to the device so that the waveforms could be seen and photographed. Unfortunately the quality of the long persistence display was too poor in optical terms for the photography so that the photographs did not show the waveforms. However it was clear from inspection that the events lasted from 50 to about 150 milliseconds.

From the cassette tape of this session 88 events can be detected from the chart record, of which 63 were audible to the experimenter at normal playback speed and 83 at fast playback speed. The amplitudes of the recorded uPKMB signals were very much greater than those of the first session so that the chart recorder sensitivity was reduced by a factor of ten to 100 mv for the fast replay of the tape. The PK output of the subject was most impressive in this session and provided good evidence that the events were relatively slow in character and were not due to electrical or acoustic interference. This session seemed to establish that the use of direct feedback per se did not appear to be inhibitory. However no sign of any other type of signal except the soft low frequency brushing noise was encountered.

7.5 Long Range Direct Feedback Trials

Several other subjects were tried out with the direct feedback device. Two subjects had participated in the accelerated start study (Nora D and Sybil W) and two were new (Martin G and Danny D - close friends who attempted PK trials together). None of these subjects produced unequivocally paranormal effects. Martin G seemed to produce some marginal noises from the sensor but no other subject produced even this much output.

However, since the experimenter was interested to see whether effects could be obtained over extreme distances it was decided that the E's and Martin G and Danny would be invited to see if they could cause effects on the direct feedback device while the experimenter was briefly on vacation in west Wales. No clear results were obtained but there were suggestions of possible marginal effects in Martin and Danny's tape. The subjects were replayed the cassette on the experimenter's return to the midlands. Another long range trial was performed when the experimenter went on vacation to Portugal. Again no clear results were obtained.

It was realised that delayed playback of tapes would make the results ambiguous because they could be interpreted as being due to a retroactive form of uPKMB created at the time of feedback but effective when the tapes were recorded, or as due to a contemporaneous PK effect which was due to the efforts of the subjects actually at the time of the recording of the tapes. Subjects were carefully informed of the date and exact time at which the recordings would be made. Since no definite effects occurred the question is not important, but the vague and ambiguous nature of the recorded data from the direct feedback device when used at a distance was the stimulus to the further development of the approach.

7.6 Conclusions Regarding Direct Feedback

The two successful sessions with Judy E had established that the attempt to explain uPKMB events as due to electrical or acoustic artifacts was not supported by the evidence.

However, she had shown no signs of producing anything other than the usual low frequency brushing noises so that it appeared that if even the most effective subject was limited in this way it would be unlikely that any other less talented subject would produce voice like noises.

In addition the two-way use of two stations as communication posts appeared to be impossible unless two similarly gifted subjects could be found. There also appeared to be problems involved in attempting to get two subjects to work together. Judy E had expressed the opinion that uPKMB production was such a private matter that when her husband and myself both listened to her effects as she produced them she felt as if we were listening directly to her mind, and she felt this as an invasion of her personal space. The training of two subjects to work together looked as if it would require not just two equally talented subjects but a long period of familiarisation of each with the other to prevent members of each dyad from inhibiting each other.

Finally, the recorded quality of the signals was a problem because of its frequency being so low that it was neither very readily recordable nor very easily discriminated because of the restricted low frequency performance of cassette recorder and earphones, coupled with the falling sensitivity of human hearing at very low frequencies. Probably the fundamental frequencies of the events were inaudible and it was only irregularities in the envelopes of the uPKMB events which were being heard in any case. The indications were clear that a different approach would have to be tried which would retain the benefits of the communication format but without either demanding that pairs of subjects be used or that the audio effects be of very low frequency.

7.7 The Four Note Device

Since voice effects were apparently impossible to obtain, perhaps a feasible alternative might be to opt for some form of musical output to be generated by the uPKMB target system. The subjects would presumably find the generation of musical tunes of interest, and the specification of the production of various types of complex sequences of notes would represent a sufficiently complex task to enable measurements to be made of the performance of the subjects faced with tasks of differing complexity. The creation of musical notes at a distance would also presumably represent an interesting challenge and the tape recording of such frequencies would be non problematic.

Accordingly it was decided to construct a device which would respond to incoming uPKMB signals by producing a series of four notes. The uPKMB sensor assembly was to be the same as used in the previous studies. The pitch of the notes would represent the amplitude of the uPKMB, four separate amplitude levels being used to switch on four separate note generator circuits. The lowest note was to be produced at the equivalent of the 2 mv criterion level used in the chart recorded studies, and the subsequent notes were triggered at the equivalent of 0.5 mv amplitude intervals above the 2 mv level. Below the amplitude of the bottom note a rushing noise would be generated which it was hoped would act as an encouragement to subjects that signalled that their PK effects were approaching the threshold where the first note would be produced.

An important departure from the previous design practice was incorporated in the four note device. The time constant of the input circuit was deliberately made very much longer than was used for the previous studies. In the first twelve session study the time constant had been 0.25 ms, that used in the accelerated start study was about

20 ms, whereas that used for the four note device was 100 ms. If subjects placed their cupped hands within an inch or so distance from the PZT strip, the heat from their hands would be capable of slowly producing a rising voltage which would after a few seconds make the device produce an output. Placing the hands at six inches or further from the device would not allow enough infra red radiation to impinge upon it to cause this reaction.

The purpose of designing in this deliberate capacity to produce artifactual outputs was to allow subjects to obtain effects by normal means as a method of encouragement to them. It was planned that the subjects would be instructed by the experimenter as to when they were to place their cupped hands near to the device and when not. According to Batcheldor's theory the artifactual induction of effects would act as an effective stimulus to real PK, so that the use of the hands' heat would provide subjects with a psychological crutch which could be discarded when their PK took over. It would be made clear to subjects that trials where the hands were placed near to the sensor would not be counted in the data, so that the deception of subjects would be limited. Since the device was a prototype and intended for research rather than true music, the pitches of the notes were chosen arbitrarily, so that they did not fall on the tempered scale.

7.8 Four Note Device Trials

The unforeseen eruption of marital problems between John and Judy E cut short the intended series of four note trials conducted with them. This forced the abandonment of the series before Judy had demonstrated selective control over her output on the device and whilst the sessions, although held formally, were regarded as partly exploratory. However the six sessions that were held nevertheless provided some very useful data.

The first session proved the most successful of all. Judy E appeared to be delighted with the response of the machine, produced a large number of intentional effects (41 uPKMB events) and a large number of spontaneous events (17). It was as if in her delight with the novelty of being able to create musical sounds her PK responded to the abrupt increase in motivation and spilled over into the resting condition. For the experimenter it was an exciting experience to see the hypothesis that subjects would respond positively to a more interesting and challenging PK task seemingly vindicated by this immediate effect on Judy's PK performance. This response immediately suggested to the experimenter that a more complex device which would enable true music to be produced would be worth constructing because the "music by PK" concept appeared to be powerfully motivating for at least one gifted subject.

The E's son had a child's electronic organ which had a range of nearly two octaves complete with sharps and flats (twenty four notes in all). After consultation with a musician it was decided that a device spanning a range of twenty notes would allow sufficient scope for simple tunes to be adequately rendered.

The planned new study using the twenty note device was to be based upon the use of the child's organ upon which the subject was to learn a tune, then the PK task would be to reproduce the same tune on the twenty note device which was tuned to exactly the same scale as the organ. In this way precise comparisons between the intended note sequence of the tune and its reproduction by PK on the twenty note machine would be possible. It was hoped that the use of twenty notes tuned to the musical scale would allow very much more scope for the interest and amusement of subjects than was possible with only four notes which it was feared might become boring in a prolonged series of sessions.

The new twenty note device was constructed over a period of weeks. It was based on the four note device but incorporated various improvements and extra features including switchable time constant input circuitry which would allow the artifactual response to be switched in or out. In addition for the first time since early on in the Juliet Booker series modification of the uPKMB sensor assembly was attempted. The new sensor assembly proved unsatisfactory and eventually the by now standard form of sensor was substituted and proved superior.

Trials with the twenty note machine were held in sessions five and six. Since no effects were created on the twenty note device during these trials, due presumably to the inhibitory nature of its sensor it tended to create frustration, disappointment and a change in atmosphere which was not present in the other four sessions.

Not all of the sessions with the four note device were comparable with each other because of the tests of the new device within some of them. Since from the start of the four note series with Judy E it was intended that she perform a major series with the twenty note device, her completion of questionnaires was not carefully monitored during the four note series, as the series with the four note device was expected rapidly to give way to the longer series with the twenty note device. As a result questionnaire data was gathered only for two of the six four note sessions.

The performance of the subject in this series is shown in figure 22. The scoring system used was to count the highest note achieved in a given attempt as the score for that attempt - the four notes were then assigned their voltage values (2, 3, 4, and 5 mv respectively) and the summated scores were computed for each session by adding the scores of all notes together which were produced without the subject putting their hands closer than 300 mm to the uPKMB sensor. The uPKMB event numbers were computed by adding the number of events together without regard to the value of the topmost note reached. Events were defined as the occurrence of at least the bottom note. The scores for "with hands" attempts during each session represent the number of times that an attempt was made to produce a note with the subject's hands being placed nearer than 300 mm. None of the effects produced in the "with hands" condition were counted as valid and their data was not incorporated into any of the measures of uPKMB.

In fact the use of the subject's hands to produce effects was very much an all or nothing affair. Either she cupped them closely around the sensor or else they lay in her lap about at least a meter from the sensor. During several of the sessions spontaneous effects occurred while she sat at more than two metres distance from the sensor.

As can be seen from figure 22 her output over the series of sessions starts with the most successful session after which session two shows a large decline, the subsequent sessions seeing a consistent incline.

In session two the subject reported that she had found it impossible to sleep that week and had as a result taken the sleeping pill Mogadon for three successive nights prior to the session. Since she was not habituated to this drug it was thought that her relatively poor performance in session two may have been due to the after effects of the Mogadon. She reported feeling after-effects from it.

However the chart recorder had been used in this session for the first time after a long period and Judy thought that its presence

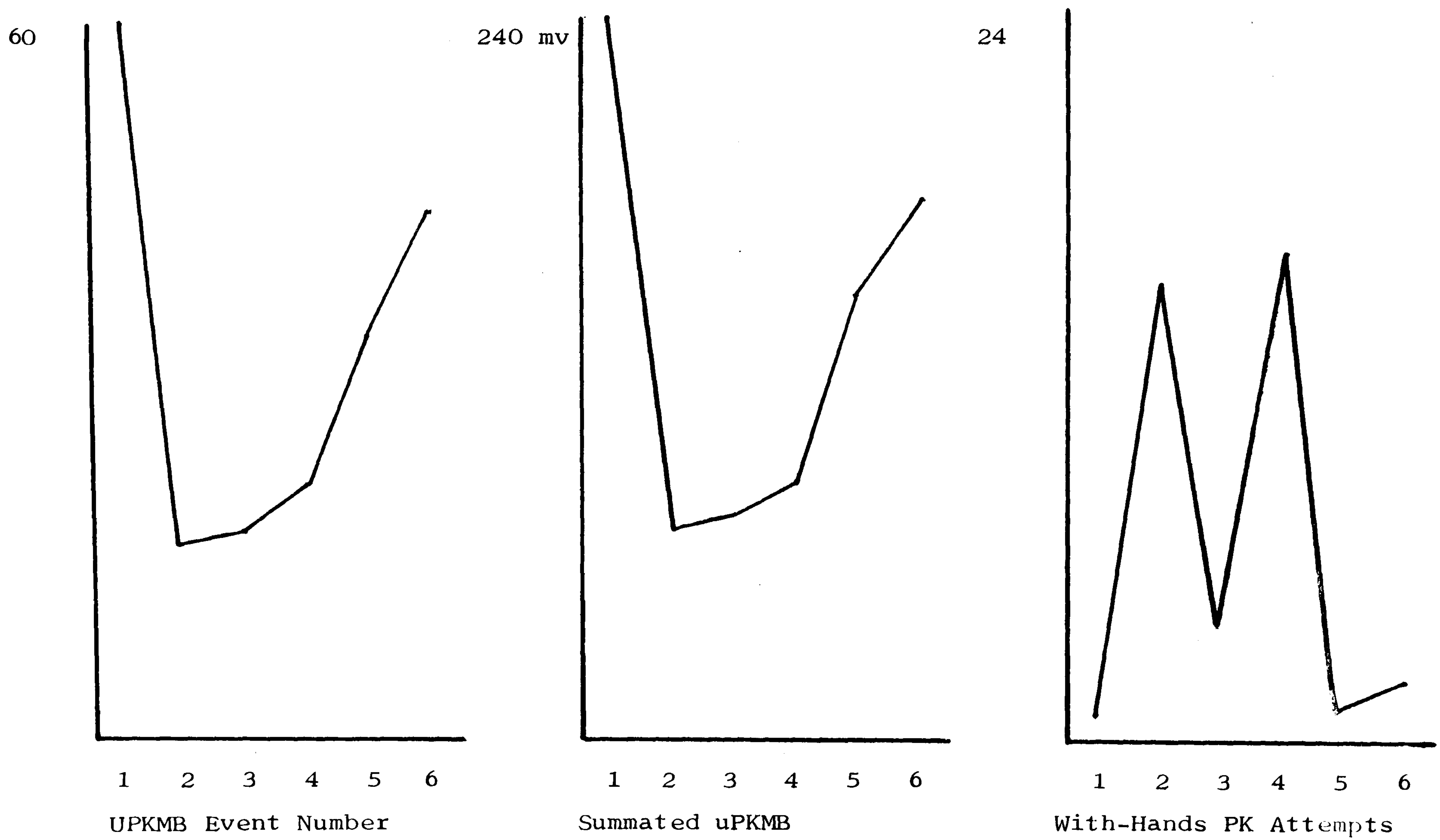

Figure 22. Results of Judy E Four Note Sessions

could have been inhibitory. As soon as it was switched off several spontaneous effects occurred and her intentional performance improved. Clearly this improvement could easily have been due simply to her belief that a source of inhibition had been removed.

In the next (third) session she reported having a headache and of feeling sleepy. It was often noticed that performing PK made her feel sleepy and in retrospect the experimenter realised that this was a very frequent response in this subject and wondered if she tended to approach an incipient trance state as a result of producing PK effects.

In the fifth session a large proportion of the time was taken up in discussion of the problems of her marriage and in talking about her own feelings of rejection by her mother and other members of her family. This was the first time that she had revealed this aspect of herself although the experimenter had intuited the existence of conflicts in the E s marriage some considerable time before but had not realised that they had reached a critical stage until told of it by both E s. Judy E appeared to be glad to be able to discuss her problems with someone unconnected with her immediate family and the improvement in PK may have reflected this fact.

In session six the experimenter felt that the closeness and trust generated by the discussions of the week before possibly helped Judy to perform better.

Judy's control over her PK output increased through the series, so that her scoring was all in the trial condition in sessions three to six, session one seeing a large spontaneous uPKMB event count (17) relative to her trial output (41 events) as remarked above, and session two seeing a smaller total output divided about equally between spontaneous (7 events) and trial events (9). This resumption of control was felt to offer an interesting insight into both the genuineness of the events as being PK (if an artifact why should the subject gain control and why should she produce a large spontaneous output when excited) and into the facilitating effect on PK performance of elevated mood and novelty of PK task.

The series was terminated because it became clear in discussion with the E's together that an important factor causing problems in their relationship was a lack of leisure time spent together so that the experimenter felt that he could not lay claim to further experimental time from them as this might contribute to the problem.

7.9 Conclusions

The provisional conclusions reached on the basis of the four note series conducted with the Es was that the original idea of using a communication format was sound and that the production of tunes by PK would be likely to be found to be acceptable and interesting to the majority of subjects.

The use of a deliberately artifactual means of producing an apparent response to PK by the four note device had appeared successful, although it was realised that in the absence of a formal controlled study to test this hypothesis such a conclusion could only be regarded as a working hypothesis until firmer confirmation or rejection could be obtained. Judy's use of her hands to produce the arifactual effects declined in sessions five and six, whilst her PK output increased, suggesting that the use of the "with hands" condition did not establish a rigid dependency upon the technique, which was a possible problem in the use of the with hands technique that the experimenter had wondered might arise.

It was extremely unfortunate that such an excellent PK agent as

Judy E should become unavailable for further experimentation. However she had certainly demonstrated that it was possible for subjects to obtain large numbers of quasi-musical events from the four note device. The incline in her performance after the initial sharp decline was suggestive that learning with the new device would be possible, although this conclusion was very tentative.

Since the series had been largely exploratory it had been thought prudent not to insist upon the subject learning to produce a definite note sequence. It was feared that this might prove very boring, given the restrictions that only four notes were available. It was hoped that a future study would enable this goal to be achieved.

CHAPTER EIGHT

THE EXTENDED FOUR NOTE AUDIO SERIES : A CASE STUDY

8.1 Objectives and Hypotheses

Since the experimenter's only PK agent had become unavailable, some considerable effort was expended in attempting to find local subjects. This was unsuccessful and no new subjects appeared. Although various mass screenings were held, the small numbers of participants and the unsuitable environments which had to be used for their screening as well as the unpromising (from the point of view of potential PK agents) nature of the groups invited to the screenings prevented any more new subjects from being found.

However, the experimenter had been put into touch with a person in Leamington who had reported poltergeist phenomena to the Society for Psychical Research some years ago. The case had originally been investigated by John Randall, a parapsychologist also living in Leamington and the experimenter had some years later been told by him of the existence of the presumed poltergeist focus, Mr Kenneth R (usually known as Ken R) and had accordingly visited him several times in connection with his reported spontaneous PK. Mr R was in his early fifties.

Mr R proved to be in many ways a very unusual person and was by far the most difficult subject to deal with that the experimenter had ever encountered. Since the subsequent extended series of audio sessions performed with Mr R involved a prolonged and not conflict free relationship between the subject and the experimenter, the context generated by the personality and situation of Mr R is relevant to the results. The extended series of audio sessions is best regarded as a case study. The problems in the experimenter's relationship with

Mr R were unique in all of the work reported here, since with every other subject the subject-experimenter relationship had been relatively uncomplicated and unproblematic.

Mr R had been hospitalised for long periods in his early teenage years owing to spinal injury. This had led to his missing much of his formal education and had also possibly resulted in his suffering some apparent deficit in the acquisition of social skills. Mr R was to a great extent a "loner". Events in his childhood and teenage years had apparently conspired to place him in a situation where he was subject to feelings of inferiority. Presumably in an effort to assuage these feelings Mr R was prone to a habitual tendency to fantasise and to boast. This had reinforced his problems of relating successfully to colleagues when he was employed and in his social life.

His social problems were rendered more difficult because of his homosexuality and consequent liability to involvement in relationships with young men who would subsequently reject him at the termination of the relationship. Mr R was exceedingly frank in communicating his situation to the experimenter because to some extent he was in awe of the mantle of "scientist" which he had spontaneously and unbidden awarded the experimenter, despite the latter's attempts to evade this categorisation.

In addition, part of Mr R's claims to fame were the poltergeist case and various other putatively paranormal events with which he had been involved. He saw himself as a potentially very gifted psychic and made very many claims regarding his contacts with deceased personalities etc. Mr R liked to talk about himself, endlessly, often to the annoyance and boredom of his listeners, but his compensatory behaviour tended to be reinforced by his intuition of the consequent feelings of rejection on the part of his audience, so that to some extent his behaviour could be seen as subject to a vicious circle effect.

The experimenter was aware of these features of Mr R's situation very early on in his acquaintanceship with him and had therefore decided previously not to recruit him into a study. An important additional factor was that the experimenter is a non smoker and Mr R was a compulsive chain smoker, so that prolonged socialisation was found to be stressful by the experimenter. However, when it became clear that no other subjects were available, Mr R was reevaluated as a possible subject.

Mr R had reported frequent spontaneous PK effects in his home and the experimenter had conducted some exploratory and tentative attempts to obtain evidence for their occurrence. The results obtained indicated either that Mr R was capable of deliberate or unconscious fraud or else that he might have some genuine PK ability.

Two brief chart recorded sessions with him were held several months before the extended series and although not definitive, their results strongly suggested that Mr R probably had uPKMB ability. He was therefore a possible subject. He also had several other helpful features as a potential subject. He was unemployed and kept house for his mother. He had no marriage to go wrong, although his relationships with male friends were likely to create emotional upsets for him during the course of the experiment. However, he had few demands on his time other than his aged mother. He was very keen to participate in experimentation and wanted to see whether his presumed latent PK ability would develop.

One question amongst the many unanswered by the accelerated start study was whether very intensive and protracted experimentation would result in continued increases in PK output per session by the subject (assuming a scoring subject in the first place). It would be possible to run sessions nearly every day with Mr R for a lengthy period and this was a great advantage offered by his participation. Since it was hypothesised that the twenty note device would demand a large amount of subject practice time before the subject would be able to produce carefully modulated outputs with it, it would be necessary to gain access to a subject having a great deal of free time to use over a long period. Mr R was therefore a good candidate for two series, one using the already functioning four note device, and a second using the twenty note device when it became available (its complexity would demand a long construction time). Mr R was therefore chosen for an extended series which it was anticipated would be essentially a case study, since no other subjects were forthcoming and the time was approaching when experimentation would have to stop to allow the already completed studies to be written up.

The effect of the long intensive series was expected to be that the subject's output, although not perfectly consistent, would nevertheless show an underlying upward trend.

It was expected that the subject would at first freely make use of the "with hands" artifact-induction technique. The subject would be encouraged to develop the ability to cause (genuine) uPKMB signals from a distance without the use of his hands, but if in any session the subject appeared to become discouraged by lack of success, or if he specifically requested to be allowed to place his hands in the near (within 300 mm) "with hands" position, he would be allowed to do so. It was expected that the "with hands" attempts would decrease through the series as the subject's genuine PK ability became stabilised in its performance.

If the sessions had to be cancelled for any reason for an appreciable length of time (over one week) it was expected that the subject's performance on resuming sessions would be below that at the end of the previous sequence of sessions, but would eventually increase to surpass the previous performance. Since the likelihood of a break of this sort was expected to be quite high during a series which it was intended would at the least be thirty sessions long, the hypothesis was incorporated into the formal set.

In addition, since the experimenter felt strongly that problems in his relationship with the subject might at times develop, it was decided that an important variable within the questionnaire data would be the subject's scores on the question (Q 9) relating to how easy the subject felt it to relate to the experimenter. It was therefore specifically included within the set of formal hypotheses brought to the series.

As the subject had tried and failed to produce visible deformation in cutlery, it was hypothesised that his performance would be likely to be inferior to that of Judy E or Monica B, both in terms of absolute output per session, and also in terms of the rate of improvement shown. The experimenter's prior knowledge of this subject helped enable a rather specific set of hypotheses to be formulated which are listed below.

1. The subject's output would show an increase over the series of sessions. Two measures of this would be used, one being a first half series to second half series split in uPKMB event numbers, evaluated using the Chi square statistic, the other being analysis by linear regression. The regression line's slope would be non zero but less than that of Judy E and Monica B (8), and the correlation coefficient would be significant at the 0.05 level (by t test). Within the first twelve sessions the subject would not

achieve a larger score in any session (measured as summated uPKMB score than Monica B had in her twelfth session.)

2. Any period of cancellation of sessions of longer than one week would be followed by a temporary decrease in uPKMB per session. Since the decrease would be temporary, its measure would be computed by comparison of the pooled uPKMB event scores for the two sessions immediately previous to the interruption with those pooled from the first two sessions immediately after the resumption of the series of sessions, testing being by the Chi square statistic.
3. The use of artifact by the subject would decline through the experimental series. Artifact is defined as the use of the hands placed within 300 mm of the uPKMB sensor in order to make the four note device respond. The measure used would be a first half to second half comparison of the numbers of "with hands" (artifactual) PK attempts, pooled for each half series, the comparison being evaluated by Chi square statistic.
4. Amongst other relationships predictive of PK in the subject's questionnaire question 9 (how easy did you find it to relate to the experimenter ?) would show a significant correlation with the subject's PK performance. The questionnaire data would be evaluated using Spearman rank correlation analysis of the ranked scoring sessions against the questionnaire scores. However, if the subject produced an unbroken string of scoring sessions once he started scoring the Spearman rank correlation analysis would be performed on the ranked departures of the subject's scores from the values predicted from the regression equation (see section 8.3).

8.2 Procedure

Training sessions were held in the subject's own room. Mr R started the series feeling depressed but welcomed his participation as being a diversion from his state. After a few sessions his mood became very much more elevated.

Two sessions were held without the subject being specifically instructed to place his hands in the near position. The artifact induction mechanism was thus deliberately not used for the first two sessions.

There were three reasons for this. First, the experimenter wished to establish a baseline condition whereby it was well proven that the subject simply sitting near the sensor would not produce artifactual signals. This was satisfactorily established, since no notes were produced in the first two sessions, although there were signals produced which were identical in character to the thuds and softly muffled brushing noises produced by Judy E. These cannot be produced by thermal artifacts which are of very much slower rise time. This was an encouraging sign.

Signals occurring as a result of thermal artifact rise very slowly, so that the slowly rising input voltage causes a prolonged period of "threshold noise" - the rushing noise created as the comparator actuating the lowest note switches in and out of conduction very rapidly as the signal from the input remains in its switching window voltage range. The threshold noise also occurred for shorter periods when valid effects were produced (without the use of the hands) and its occurrence was construed as very encouraging by the subject as he knew that his effect on the device was approaching scoring level (ie the lowest note).

Second, the experimenter wanted to avoid immediately creating a dependency upon the "with hands" technique in the subject, and desired firmly to establish that it was expected that results would be forthcoming without use of the hands. Third, it was wanted to check whether the subject would spontaneously ask to be allowed to use his hands (he did not).

At the third session, in order to avoid his becoming non confident he was requested to use his hands "as it was easier" in this fashion to produce PK. As can be seen from fig 26 the subject's use of his hands increased steeply in the next session. But some genuine (without-hands) uPKMB signals (one in the third session, five in the fourth) then appeared, and the subject was established as scoring in every session from then onwards. The use of the with-hands artifact PK induction technique decreased to zero over the series.

Clearly an independent groups design (using "with hands" and non "with hands" groups) will be necessary to establish that the onset of scoring is indeed speeded up by the use of the "with hands" artifact induction technique, but the fact that an above threshold uPKMB signal was produced in the third session with Mr R is extremely encouraging. The experimenter's previous acquaintanceship with the subject may well have been contributory towards this outcome however.

The series was now properly underway and the subject was visited nearly every day. The uPKMB sensor was suspended from the mantlepiece over an empty fireplace in the subject's room (there was no fire in the grate). The sessions were recorded in stereo on a miniature high quality cassette recorder (Sony TC 310), one channel being dedicated to the uPKMB sensor, the other to a microphone which detected ambient sounds. Trial periods were held in silence.

The four note device had an output to earphones which were worn by both experimenter and subject. This enabled the uPKMB thuds and brushing noises to be heard in addition to the four notes, which was believed to be encouraging to the subject since uPKMB signals too small to activate the switching on of the notes could still be heard by subject and experimenter. All of the equipment was battery powered, to avoid possible mains artifacts.

Sessions were modelled on those run in the accelerated start study, being self paced, a minimum of 45 minutes long, with a maximum of 90 minutes. Most sessions were 90 minutes long, and the habit gradually established itself of the experimenter and subject taking a long break of 20 minutes or so in the middle of the session and going for a stroll at this time. The relationship between subject and experimenter was cordial, and both parties were pleased with the subject's progress. As can be seen from Mr R's summated uPKMB output (figure 23) it exhibited an upward underlying trend, although considerable fluctuation was shown. Pulse numbers per session also showed an upward trend (see figure 24).

An interesting feature was the appearance towards the end of the series of spontaneous effects which took place in rest periods whilst the subject was more than two metres from the uPKMB sensor. Trials were held successfully at these distances if the subject seemed to be performing well enough to merit it. This tendency culminated in one session with the twenty note device where effects were obtained whilst the subject and experimenter were sitting in the adjoining room (see section 8.5).

A total of twenty six sessions were held without a significant break. A break of fifteen days then occurred, and two further sessions employing the four note device were held. The twenty note device was then ready and a further series of ten sessions was then held using the twenty note device (see section 8.4 below).

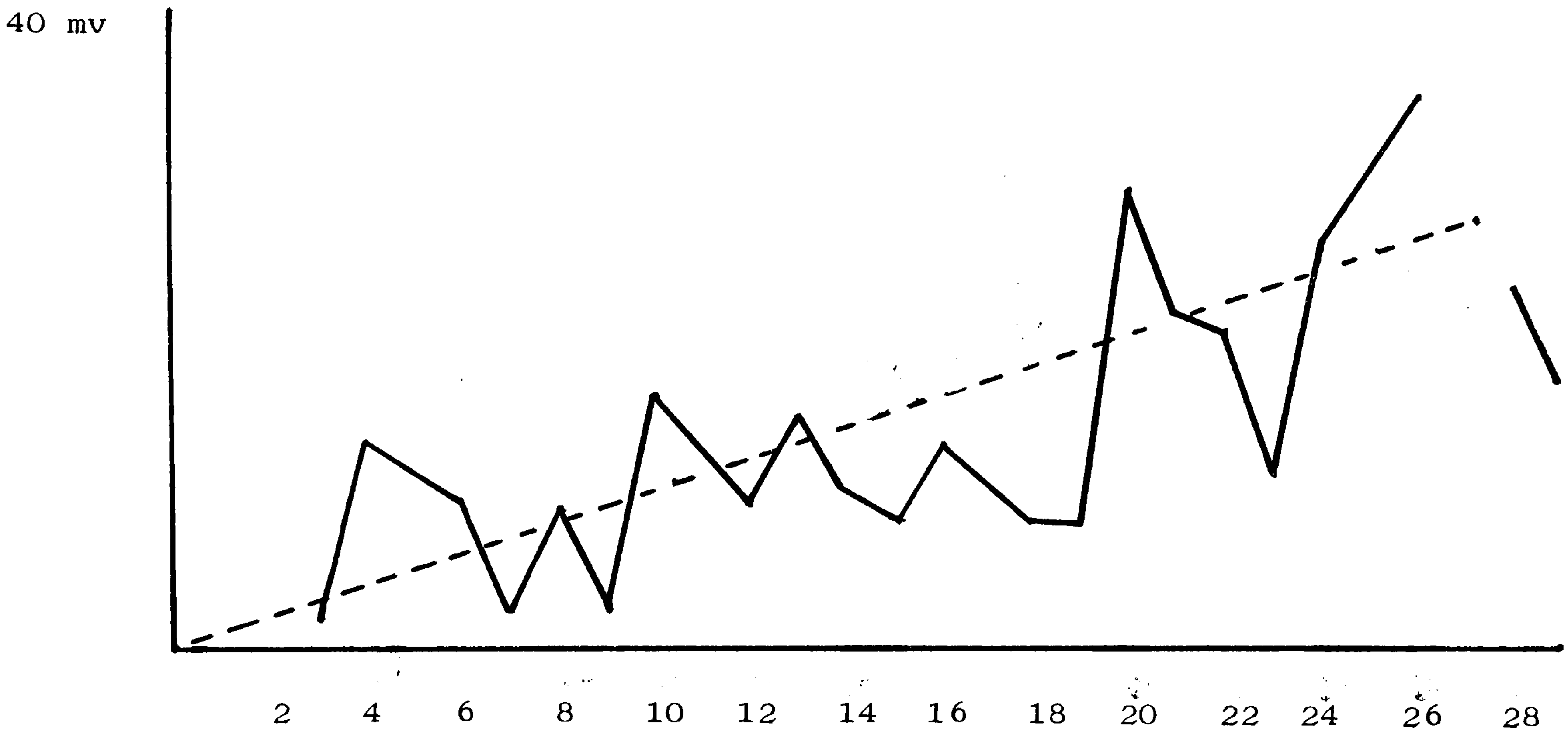

Figure 23. Kenneth R Four Note Sessions Summated uPKMB per Session
Regression line is shown as dotted line.

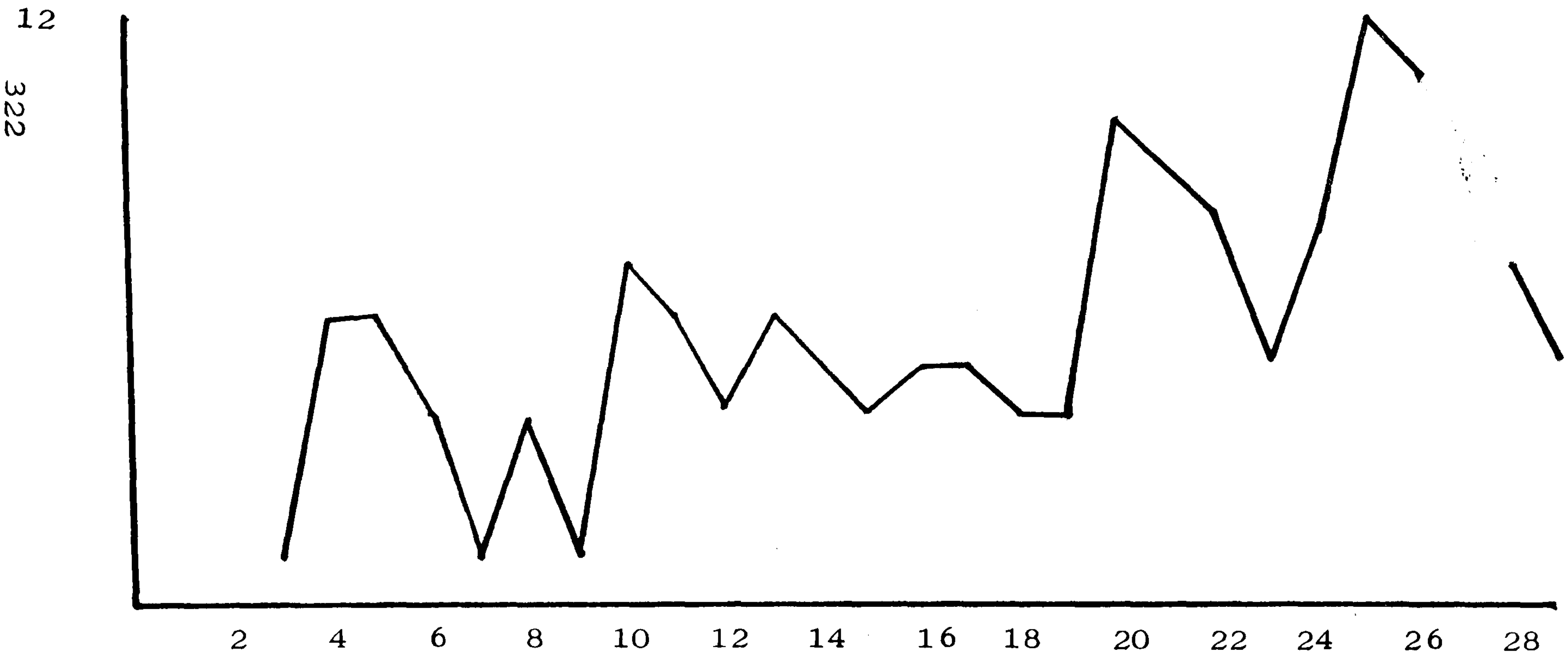

Figure 24. Kenneth R Four Note Sessions uPKMB Pulse Number per Session

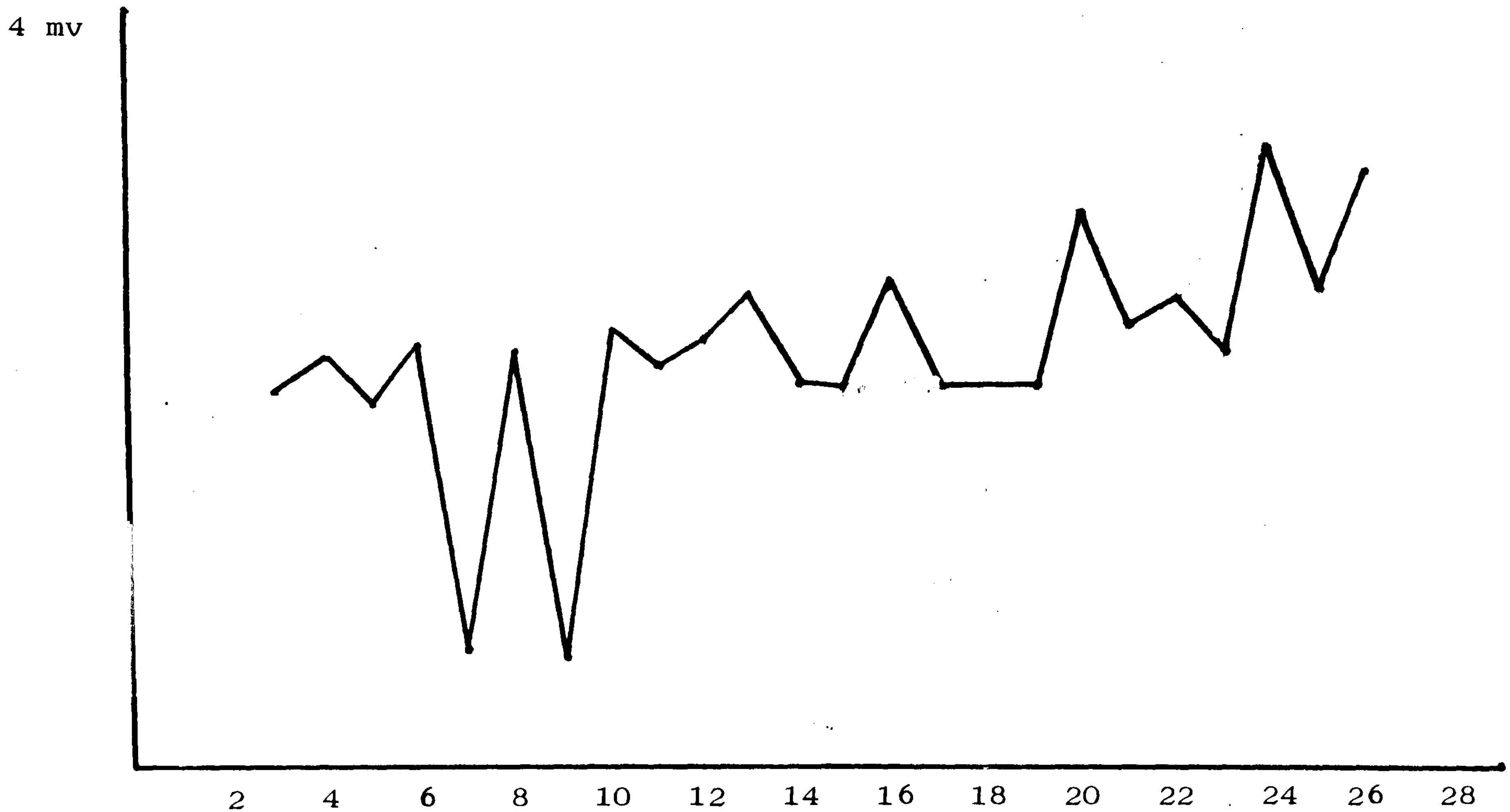

Figure 25. Kenneth R Four Note Sessions Average Pulse Amplitude per Session

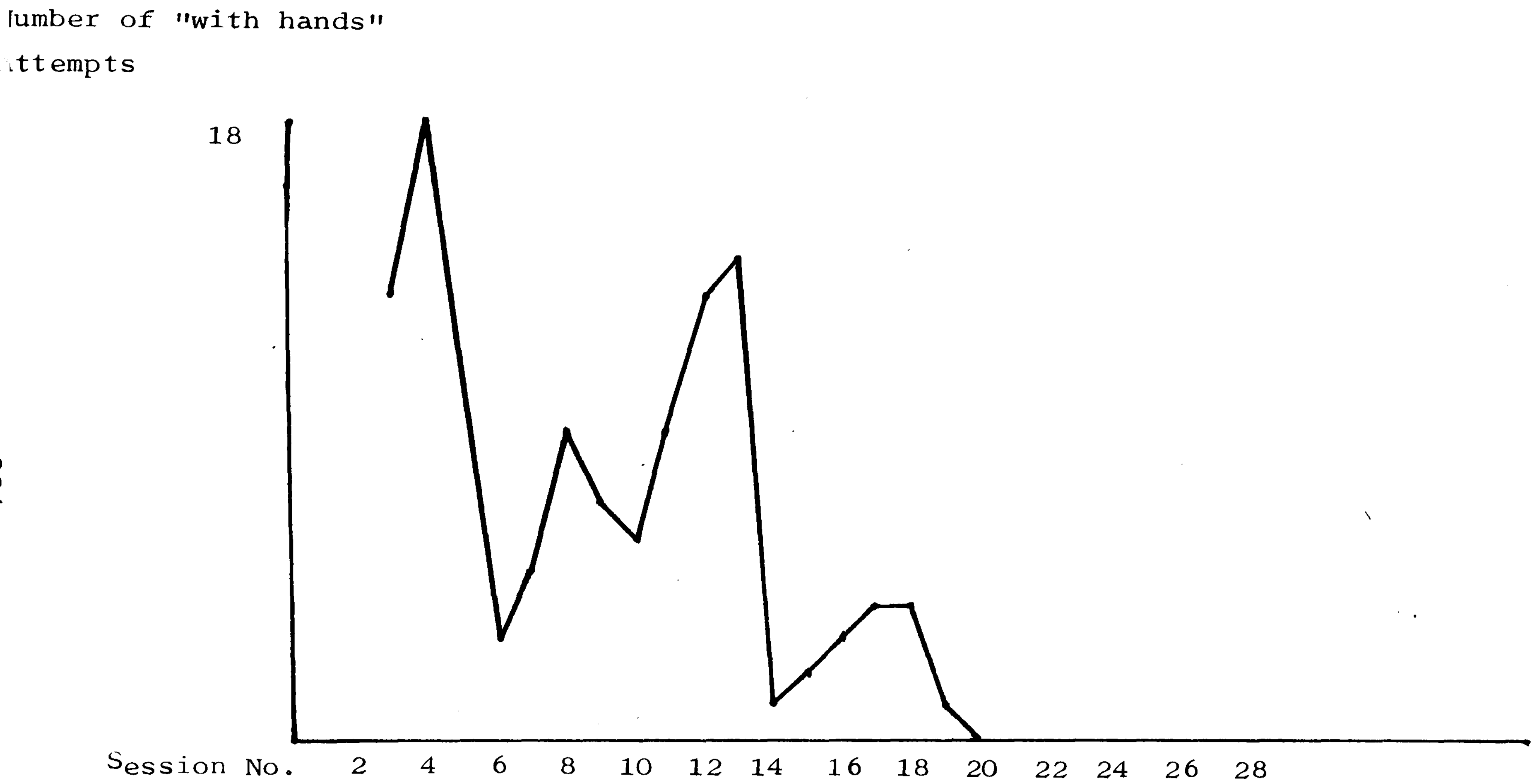

Figure 26. Use of the "with hands" artifact induction condition

8.3 Results

The learning hypothesis (1) was confirmed. The first half second half series difference in pulse number (46 uPKMB events in first half versus 90 in the second half) yielded a Chi square of 14.2, with 1 df giving a p value of 0.00016. A linear regression analysis performed on the summated uPKMB scores over the unbroken series of twenty six sessions produced an intercept value of - 0.32, a slope of + 0.96 and a correlation coefficient of 0.77, yielding a t value of 5.9, giving a (one tailed) p value of 0.0005. No session of the subject's produced a score as large as that of Monica B, and the slope was less than that of Mrs B.

The gap between sessions twenty six and twenty seven was fifteen days, so that the pooled scores for sessions twenty five and twenty six (twenty three uPKMB events) compared to sessions twenty seven and twenty eight pooled together (twelve uPKMB events) should have been significant. Evaluation of the difference by Chi square statistic yielded a Chi square of 3.4 which was non significant. Hypothesis two was not formally supported, although the scores were in the predicted direction.

Hypothesis three, that the use of artifact would significantly decline across the series, was confirmed. The graph of use of the "with hands" artifact shows a clear decline (figure 26). The decline is shown by the first half to second half series comparison of with hands attempts. It should be noted that the figures given here are only for with-hands attempts which produced notes, other with-hands attempts which only produced threshold noise (see section 8.2 above) were not counted since scoring data was confined to signals exceeding the 2 mv bottom note threshold. The hands were used on 105 occasions in the first thirteen sessions, and on 15 occasions in sessions fourteen to twenty six. This difference yields a Chi square of 14.2 which with 1 df gives a p value of 2.3 x 10 (-10). Clearly the with-hands procedure was discarded once the subject's PK performance improved.

8.4 Questionnaire Results

The questionnaires were evaluated according to a method which should be more powerful than that used previously. The rationale for the evaluation method is as follows.

If one assumes that the subject's learning contributes an underlying trend to their PK performance, but that the output scored in each particular session is also partly determined by the factors associated with the state of the subject which fluctuate randomly from session to session, the subject's performance could be regarded as fluctuating above and below that which the underlying upward trend would predict. The regression line of figure 23 clearly shows this occurring for Mr R's summated uPKMB score by session, with some scores being above the line and others below it.

If the subject's questionnaire scores do indeed relate to PK relevant factors associated with their state and which determine the direction and extent of the fluctuations of their scores above and below the underlying trend, the questionnaire scores should fluctuate above and below their mean values in a similar manner to the way in which the PK agent's session by session PK output fluctuates above and below the value determined by their underlying learning process.

The establishment of the underlying upward learning trend in the subject's PK scores in this study was performed by the finding that the correlation coefficient for his regression line was statistically significant (p of 0.0005) and that the slope of the regression line was non zero and positive. The underlying trend can be regarded as the regression line itself.

Predictions of the PK score value for each session, based on the regression line were computed. The actual scores for each session were then compared with the predicted values. The differences were then ranked, having regard to the algebraic signs of the differences, thus the highest ranked scores would be those of greatest positive magnitude, whilst the lowest would be those of greatest negative magnitude. The ranking was regarded as permissable because except for the two first sessions, all sessions were scoring sessions, so that a continuous series of difference values was obtained.

The ranking allowed the sessions to be ranked according to how far above or below the predicted PK output the subject's actual PK output was scored. This ranking would not be likely to be identical to that produced by ranking all sessions simply according to the absolute value of PK produced in each session, and in fact differed considerably from it. The increased sensitivity of this procedure derives from its independence from the absolute magnitude of each PK score.

The method which was used for the other studies was more conservative than the present one since the assumption of learning was not made, but the absence of this assumption ought to make the rank correlation of PK scores and (in fact correlated) questionnaire scores less reliable since it ignores the possible contribution made to subjects' scores simply by increasing session number (due to learning) which may be independent of the state of the subject.

The questionnaire scores for the ranked sessions were ranked and their rankings compared to the session rankings using the Spearman rank correlation statistic. Every scale question of the subject and experimenter questionnaires was analysed in this way.

Three questions yielded significant correlations, and one approached significance. On the experimenter's pre session questionnaire the question requesting the experimenter to predict the subject's PK performance came out as nearly significant (p of 0.06). The three significant correlations were all present in the subject's post session questionnaire. No other questions were correlated. The three were (Q 6) how far the effects were felt to be under the subject's control (p of 0.05), (Q 7) how far the PK had exceeded or been below the subject's expectations (p of 0.01) and (Q 9) how easy the subject had found the experimenter to get on with (p of 0.05 - all probabilities are one tailed).

The first two correlations represent only the findings that the subject thought he had more control when he produced more PK and that he tended to think his PK had exceeded his expectations when it was indeed above the regression predicted value (an interesting check that the subject's perception of his PK output accorded with reality).

The third correlation is however confirmatory of hypothesis four, that there would be a significant effect on the subject's PK made by the state of his relationship with the experimenter. Whether this was due to a direct effect of the subject experimenter interaction which was independent of the PK output or simply due to the experimenter becoming more friendly when the subject did well and less friendly if the subject produced little PK is not clear. The experimenter was not aware of becoming hostile if less PK was produced, although he felt that he probably became more enthusiastic and friendly when an unusually highly scoring session was performed. This ambiguity would have been resolved by the use of this question in the pre session questionnaire, which was completed prior to any PK being elicited, but the ssession would then have had to include a period at the very beginning which provided sufficient time for the subject to arrive at an estimate of the quality of his relationship with the experimenter at that session, which would have prolonged the already 90 minute session still further.

8.5 The Twenty Note Series

The twenty note device was being constructed concurrently with the performance of the extended four note series. At the twenty fourth actual session nearly the whole session was devoted to a test of the twenty note device's acceptability to Mr R. At this point the unsatisfactory sensor assembly was still in use and no uPKMB signals were recorded. Since this session was quite different from the others in the series, it was excluded from the data, and session twenty five in the entire series was counted as being session twenty four since it was indeed the twenty fourth session with the four note device. All other references to session numbers exclude the actual twenty fourth session in this way.

The twenty note device was thought to be functioning satisfactorily and was introduced in session twenty seven and used exclusively from that session onwards. A total of ten sessions were held with the twenty note device. Unfortunately a fault was discovered in it between sessions thirty three and thirty four. In one state, with the "note extend" switch in the on position a slight offset was introduced into the input circuitry which meant that incoming signals would need to be of smaller amplitude than the formal criterion (equivalent to the 2 mv criterion used in the other studies) before they started producing the lowest note. The note extend function lengthened the period of note playing so as to enable incoming fast uPKMB signals to produce arificially extended notes. This meant that for sessions twenty nine to thirty three the scores would have been artificially inflated by the bias present in the device. Rather than attempting to compensate for this bias it was felt to be methodologically superior simply to discount the data from these sessions from formal evaluation.

An interesting trend was apparent in the discounted sessions because progressively more effects occurred when the subject was at a distance of several metres from the uPKMB sensor. Some of these distant effects occurred spontaneously during conversation but were clearly not caused by the conversation since they would continue during pauses. However some of the distant effects occurred during trial periods in response to the subject intending them to occur.

Four further sessions (sessions thirty four to thirty eight) were held with the twenty note device after the fault had been corrected. The device's performance had been carefully checked for other possible faults when the note extend fault had been corrected and it was known to be working satisfactorily from then onwards and was checked once again after the end of the whole series when it was found to be satisfactory.

Unfortunately due to the experimenter's car having been stolen on the day of one of the four sessions, only three questionnaires were completed for the last four of the twenty note series, so that no questionnaire data evaluation can be offered. However, one event of potential importance occurred which since the series with Mr R was essentially a case study should be described.

The events occurred in session thirty six. The experimenter and subject had naturally noticed the increasing incidence of uPKMB events taking place while the subject was three metres from the uPKMB sensor.

During a conversation about the possibility of obtaining PK signals from the adjoining room (the sitting room), spontaneous uPKMB signals occurred.

This was interpreted by the subject as being an indication that the experiment should be tried of moving next door and attempting to obtain uPKMB signals upon the device from that distance. Accordingly, the equipment was left running and the cable to the headphones was taken through to the other room. Mr R's home was a terraced house. Only his mother, her cat and Mr R occupied the house and the front door was locked. The curtains of his room were drawn and the subject and experimenter went and sat with Mr R's mother and the cat in the sitting room. The door to his own room was closed and the door to the sitting room was closed. The uPKMB sensor was therefore separated by a distance of some six metres and two closed doors from all of the people in the house.

The experimenter suspected that similarly to the events of the first (twelve session series) study it would probably prove impossible to obtain effects in the trial periods because of the inhibition due to distance, but that spontaneous events might take place in response to the subject being distracted from the task during rest periods. This proved to be the case and four events occurred which were clearly uPKMB events rather than artifacts.

The microphone of the cassette recorder had been left with the uPKMB equipment, so that the retreat of the experimenter and subject from the subject's room can be clearly heard, as can their muffled conversation from the next room (at times Mr R talked very loudly to his mother since she is deaf). On the cassette tape it can be heard that at the times of occurrence of the uPKMB events there is quiet in the room containing the uPKMB equipment, not even traffic noise being present.

This was felt to be an exceedingly important event, since one of the major future objectives to be accomplished in the study of this type of effect is the obtaining of uPKMB signals when the subject and uPKMB detection equipment are separated by large (tens of kilometers) distances, and it was felt that the obtaining of effects from the next room was a significant step in this direction.

Three more sessions were held, but the circumstances of Mr R's life had suddenly taken a turn for the worse and he did not perform as well. Additionally, one of these sessions was held on the morning after the night that the experimenter's car had been stolen. The experimenter, predictably, was not in a mood likely to stimulate the subject into his best form. At the final session there was a slight altercation between subject and experimenter and the decision was taken to terminate the series. Subsequent contact with the subject has confirmed that the regard for each other of subject and experimenter had not been affected by the disagreement.

Mr R was later asked to perform some experimental sessions in London at Birkbeck College with Professor Hasted and apparently performed well, with the parapsychologist John Randall being present as a witness. No details of these sessions are yet available however.

This was a most satisfactory conclusion to the extended audio series since one of the motivating factors behind the decision to investigate PK training was the intention to develop methods whereby subjects could be trained for participation in studies conducted by other experimenters.

8.6 Conclusions

The extended audio series had demonstrated several points. It had provided yet another confirmation of the basic learning hypothesis. The use of intensive almost daily sessions had seemed to be facilitating, although comparison between independent groups would clearly be necessary to establish this point.

The extended series had shown that the use of artifact based PK induction was certainly not inhibitory, even though it could not prove that it was facilitating. The use of the artifact induction technique by the subject had declined to zero during the course of the study, showing that a rigidly unbreakable dependency upon artifact induction had not been created.

Effects had been obtained from increasing distances, despite the experimenter's rating of the subject's PK ability as probably being substantially below that of Monica B, Helen H and Judy E. The creation of effects from the adjascent room was a most encouraging sign that the development of a truly distant PK capacity might be possible, given continuation of training. The decrement in performance after a break in the series had been shown, although the effect was not strong enough to reach statistical significance.

The new method of questionnaire data evaluation had produced two correlations where they might have been expected, and one for the question (Q 9) which the experimenter had predicted would be particularly likely to relate to performance, given his knowledge of the subject. The experimenter's (pre session) ability to predict the performance of the subject had just missed being statistically significant, which was an encouraging sign, since informal identification of aspects of the subject's state could in future serve as a basis for hypothesis formation in the development of new questionnaires.

Finally, the successful participation of the subject in experimentation conducted several months after the termination of the extended series had shown that for one subject at least, the training sessions appeared to have developed a capacity for uPKMB production which was stable over a period of months.

CHAPTER NINE

SOME CONCLUSIONS

9.1 The Learning Hypothesis

The central question which the work reported here was directed towards answering is that of whether uPKMB can be learnt, or at least improved with practice. Of the seventeen subjects who performed series of sessions which lasted long enough to enable their data to be evaluated using the formal measures, ten failed to show any signs of uPKMB exceeding the scoring threshold in any session.

Six other subjects whose output exceeded the scoring threshold in at least one session (Juliet B, Monica B, Helen H, Phyllis W, Judy E and Kenneth R) all showed statistically significant increases in PK output when their pooled scores for the first and second halves of their series were compared. However the degrees of consistency in scoring and in the improvement in scoring with practice through their series of training sessions varied greatly.

The best of the scoring subjects (Phyllis W, Monica B, Judy E and Kenneth R) produced sufficiently consistent scoring for the correlation coefficients of their regression lines to be statistically significant. The slopes of all the regression lines of this subset of the scoring subjects were positive and non zero, although their value varied greatly from a low of 0.9 (Kenneth R), through one intermediate value of 1.6 (Phyllis W) to the high values of Monica B (8.6) and Judy E (8.86). Clearly there were large differences in learning rates between subjects.

Was this learning . The tentative answer seems to be yes, although it is still possible to argue that for the subjects whose increases in output were due to the increase in their unintentional PK produced while resting that the process involved was due to some sort of deinhibition rather than true learning, since the effects were not under voluntary control. This question is discussed further in section 9.2.

The resultant ability developed by training produced performances which were still easily subject to inhibition and which fluctuated presumably as a result of the operation of factors which were not identified in the reported experimentation because of the poor predictive performance of the questionnaires.

One firm conclusion surely must be that improvement in uPKMB output is possible with certain individuals. The principal hypothesis brought to the experimentation must therefore be regarded as having been confirmed by the overall results of research.

This does not foreclose the question of how far similar results could be obtained with other individuals acting as experimenter, but even if only a limited number of other experimenters attempting replication of this work are successful it means that parapsychology is not faced with an unalterable situation regarding the PK performance levels of at least some subjects. The PK output of some subjects, at least for this specific task, can be improved with practice. Some of the implications of this for parapsychology as a whole are addressed in the next chapter.

9.2 Control Over UPKMB

It is clear that subjects may produce a large number of PK events, but have very little control over them in operational terms, and no feeling of control in experiential terms. Reviewing the successful subjects in chronological order, Juliet B clearly had very liitle control over her output which appeared to create events quite independently of her volition. In the twelve session study the increase in output of three of the scoring subjects all occurred principally in the resting condition while they were not attempting to create effects.

However a very different picture is shown by subjects Monica B, Judy E and Kenneth R. The output of these subjects was concentrated in the trial condition and very much lower levels of scoring occurred in the non trial condition, although this too fluctuated. While Monica B showed a very consistently low level of spontaneous output, Judy E showed considerably more, especially in her first session with the four note device. Kenneth R started by showing virtually no spontaneous output in the extended four note series (2 events in the entire series of twenty eight sessions), but over the twenty note series his spontaneous output which occurred at a distance from the device (because rests were taken at three metres from the sensor) increased, as did his capacity to create intentional effects at a distance. For the pooled events of the six valid sessions of the twenty note series his spontaneous output was concentrated in two sessions but totalled the same as his trial outputs for the series of six sessions (15 trial uPKMB events, 15 spontaneous events).

For these three subjects it could therefore be argued that since the increase in their uPKMB output occurred in the trial condition principally, they showed the acquisition of a true voluntary uPKMB capacity, so that learning was definitely shown. For the other subjects it is possible to argue that a progressive deihibitionof a latent but unlearned capacity was effected by prolonged exposure to the training situation which merely allowed the capacity to manifest itself because the self imposed inhibitions of the subjects were gradually removed. To decide whether this view or the learning hypothesis is true will take very much more research.

In terms of fine control, the onset of the first uPKMB event in each trial could be considered a measure, on one view, but although this might be a candidate it must be regarded as a very gross measure, so that no analysis was performed on this factor. The onset time tends to ignore the characteristics of control represented by the possible modulation of the effect whilst it is in progress. The four note machine was designed with this type of measurement in mind, with the subject asked to produce a specific note sequence. This was not achieved clearly by Judy E, although parts of defined note sequences did occur, but separated by intervals. Since these attempts were informal they have not been reported in detail, but the impression gained was that this degree of control was not immediately available, so that if it were possible for it to be developed, extended practice would have been necessary at this task for Judy E, an opportunity denied by circumstances.

Kenneth R was less interested in the musical possibilities of the four note device and preferred to try to produce "Morse Code". He was successful in producing long strings of on-off sequences of the bottom note, but the temporal definition of the members of the sequence was so vague that no attempt to decode the "messages" so produced has been attempted and it seems highly unlikely that true Morse Code signals were produced. Certainly in listening to the tapes no clear sequences are audible. It was disappointing that in the twenty note sessions Kenneth R did not produce any tunes. Partly this was because of his lack of interest in musical production, but also because his Pk was very much more limited in amplitude and he produced many less events per session that Monica B or Judy E - his regression line it will be remembered, had the lowest slope of all the subjects whose regressions produced significant correlation coefficients, so it is not surprising that he did not show great control over the modulation of his output.

9.3 The Onset of Scoring

Rather definite conclusions can be drawn from examining the number of sessions necessary for subjects to complete before their uPKMB will reach the scoring (ie 2 mv) level. In every case successful subjects produced scoring sessions on or before their seventh session. One subject (Kenneth R) scored first in his third formal session, but this is probably exceptional and may have been due to his prior acquaintance with the experimenter. Every one of the scoring subjects showed signs of definite but non scoring uPKMB output by session four, and the best subjects showed signs of uPKMB from the first session.

Equally definite data was generated regarding the performance of subjects who did not score by the seventh session. In every case they failed to score in any subsequent session, even though some subjects (eg Sybil W and Dorothy T) performed extended series of more than twenty sessions.

9.4 Distance and UPKMB

Distance appears to be a significant inhibitory factor for intentional uPKMB. In the twelve session study the scoring in the distant trial condition was slight for all scoring subjects. Judy E performed no distant trials in her sessions in the accelerated start series nor in her audio PK series. This was because she thought that she would not be able to succeed over a distance. None of the tapes recorded in the two extreme distance pilot trials showed any definite sign of PK.

An exception to this record was provided by Kenneth R who in the later stages of his four note series and for some sessions of his twenty note series did succeed in producing a few intentional effects from three metres distance. Intentional PK on distant systems appears difficult.

However the picture completely changes for spontaneous uPKMB effects, where the majority of the outputs of three of the scoring subjects in the twelve session study were produced at a distance, unintentionally, in the "resting" condition. Judy E also produced a few spontaneous uPKMB events from a distance and Kenneth R was unique in being the only subject so far to produce spontaneous uPKMB events from a different room than that in which the equipment was located. This finding suggests that the inhibitory factors which prevent intentional effects from occurring do not operate in the non intentional condition, which invites further reseach devoted to explaining why this should be the case. Batcheldor's emphasis on belief factors could be relevant to this finding, since his theory would predict the absence of intentional PK over distance, but arguably would not explain the occurrence of spontaneous effects in the non intentional condition.

9.5 Subject UPKMB Elicitation Strategies

Although a large amount of informal data was collected concerning the self reports of subjects attempting to produce PK it is with great caution and reservations that any statements are made about subject's inner strategies in attempting to stimulate themselves to produce effects.

This is because the evidence collected shows a diversity of approaches, frequent shifts in approach and a host of other variables which make it difficult to draw conclusions. Many descriptions were very vague too. Probably there are interactions between subject related personality and cognitive style variables and the effectiveness of different types of elicitation imaginitive or visualisation strategies used for eliciting uPKMB.

The great diversity of the self reports has been the price paid for not imposing rigid externally applied elicitation strategies on subjects. The decision was taken before any formal work had been started not to impose specific elicitation strategies on subjects since this would introduce one more variable into the situation, and, most importantly, the choice of strategy might have inhibited latent uPKMB abilities which the more permissive approach would have allowed to develop. Obviously the controlled evaluation of specific elicitation strategies is a task for future research using independent groups designs.

If one looks first at the strategies used by the most productive subjects, seemingly meaningful patterns emerge. Monica B approached the PK task in an extremely confident serene and calm fashion. She found that her attention narrowed down to exclude everything but the uPKMB sensor and the space between herself and the sensor. The withdrawal of attention from the environment was very extreme because she became unaware of noises or events in the room or outside during her uPKMB attempts. She described her awareness as being drawn into a sort of bubble in which only she and the uPKMB sensor existed, the bubble being about 300 mm in diameter. There is one very suggestive piece of evidence that her narrowing of attention was as extreme as she claimed. At one session she had a bad cold and was coughing almost continuously except during uPKMB trials when she did not cough once. This suggests a very great degree of control over her attentional processes. She also described her approach as being completely effortless.

Judy E developed a relationship with "Mr Crystal", where the PZT strip was characterised as a sort of cartoon character and Judy and Mr Crystal would embark on imaginary adventures which involved Mr Crystal either getting very hot, or else performing some very vigorous action (such as rowing a boat, disco dancing etc), the idea being that the flexure of the imaginary Mr Crystal would cause the flexure of the real PZT strip. She also developed a peek-a-boo game with the PZT strip whereby she "surprised" it by looking at a part of it which could not see her when she moved her eyes away from it. But it must be stated that Sybil W used very similar techniques, going on various excursions with "Crystal" (a feminine characterisation), but never produced any PK, so that the PK output was certainly not guaranteed by the strategy.

Kenneth R transited through several strategies, as did many of the subjects. The typical progression was from instrumental imaging (eg seeing the crystal being affected by beams of light, heat, energy, "vibrations" etc projected from themselves, or imagining exerting force on it) to goal directed imaging (seeing the crystal flex, imagining the crystal being bent in a vice, imagining the audio tone going up). Many of the scoring subjects found out by experiment that results occurred most easily when they ceased to attend directly to the task so that, for example, Helen H closed her eyes and daydreamed about the holidays that she had had and this proved highly successful during her self paced sessions.

It must be admitted that it is difficult to trust the accounts given by subjects of their experiences whilst attempting to elicit PK because it is difficult to gauge the intensity and stability of imagery. Clearly this too is open to questionnaire techniques devoted to the analysis of imagery characteristics, but whether the imagery used bears any relationship to results remains obscure.

The strongest suggestion emerging from the accounts of the subjects was that those subjects who achieved the most close and intimate relationship with the uPKMB sensor achieved the best results, and that striving by subjects was strongly inhibitory. The best subjects did not strive and seemed effortlessly to achieve closeness to the sensor. Monica B's accounts sounded at times as if she were experiencing a merging of identity with the PZT strip, and Judy E developed a very loving relationship with it, as if it were a child in the pre-linguistic phase of development.

9.6 The Home Use Devices and Differential Responses to UPKMB Tasks

Since only two subjects (John and Judy E) experienced long chart recorded series of sessions and performed a series with the four note device, only their testimony is available concerning the responses of subjects to differences between the two tasks. The verdict was very emphatic and unanimous. The musical and creative possibilities offered by the four note device were very strongly preferred to the less interesting chart recorder task, even though the latter still offered an audio output (it will be recollected that the rate of clicks increased with PK inputs to the system).

Only Kenneth R used both the four note device and the twenty note device and expressed a preference for the latter. He certainly performed better with the twenty note device but preference effects are confounded by the learning effects due to the use of the twenty note device right at the end of his training series. It sems reasonable to expect subjects to prefer the twenty note device since it offers a further extension of creative scope relative to the four note device that the latter does towards the chart recorder format.

One of the biggest disappointments of the work was the finding that no subject enjoyed working with the home use devices, nor did they obtain good results with them. The reasons for this are still not very clear. The most likely explanation would seem to be that solitary uPKMB trials are not enjoyable and seem to lack point. This suggests, by inference, that one of the ingredients of success which was unwittingly manipulated by the experimenter may have been the socially rewarding nature of sessions as perceived by the subjects.

9.7 The State Measures

It was expected that certain of the questionnaire factors would emerge as correlations holding across subjects. Obviously the individual differences between subjects would contribute error variance to these correlations, but it was disappointing to find that not even a single factor emerged as significant across even the majority of subjects.

The explanations for this finding are diverse and it is impossible to avoid speculation in attempting to account for the absence of effective correlations. Clearly here too there is scope for much further research.

There could have been an intrinsically low association between the states of the subjects and their self reports as produced on the questionnaire scales. The questions could have been directed towards factors that were irrelevant to PK production. Perhaps, just as individuals probably cannot introspectively estimate such internal factors as details of blood chemistry etc it is unreasonable to expect subjects to show introspective awareness of states which are specifically associated with successful PK production.

The small amount of data and the choice of an analysis conducted on each factor separately may have made the analysis insensitive to correlations which may have been present. It is possible to think of further reasons for the relative lack of predictive success of the questionnaire.

However some apparently meaningful correlations did emerge, all at the 0.05 level of significance except one. In the first study on Mary H-W's pre session subject questionnaire the measures directed to her ability to concentrate (Q5) and freedom from distracting concerns (Q4) were both significant. She was a very busy lady with many responsible voluntary work commitments in the community and she also complained of having a "butterfly" mind, finding it difficult to slow or stop her interior monologue, so that the correlations on these two questions seems reasonable.

Equally, Helen H's health was of considerable importance to her because of the exacerbation of her chronic allergies by her pregnancy, so that the correlation of her PK scores with the answer to the physical health question (Q9) is reasonable. The experimenter's treatment of this ailing subject may have partly depended on how sociable he was feeling, so that the experimenter's single pre session correlation for her sessions on the question directed to the measurement of his feelings of sociability (Q9) seems reasonable.

The only subject uhose PK performance was correctly predicted was Phyllis W, no other correlations of her subject or experimenter questionnaires being significant.

Monica B's subject questionnaires produced no correlations, but it is interesting that her experimenter questionnaire produced four correlations. This would suggest that it may have been the absence of enough scoring sessions which reduced the correlations found for the other subjects. Two of the correlations related to factors related to how well the experimenter felt (Q1, how rested do you feel ?, Q12 how physically well do you feel ?) while the other related to the experimenter's degree of motivation (Q5 how much do you feel like conducting this session ?). Two post session questions were significant for the experimenter, one of which could be regarded as of trivial significance (Q3 how satisfied were you with your performance in facilitating the subject's PK?), the other of which was the question (Q7) of how far the subject's PK seemed to be produced by volitional control. As was shown in the analysis of her data, Monica B showed exceptionally good voluntary control of her output in the near condition.

The two correlations obtained with Judy E, one on her subject pre session questionnaire (Q2) relating to her level of fatigue, and the other on the experimenter's questionnaire (Q4) referring to how easy the experimenter had found it to relate to her also seem not unreasonable correlations to emerge, given her heavy familial duties.

Finally, the three correlations found with Kenneth R, two on his post session questionnaire asking (Q6) how far he had felt the PK to be under his control and (Q7) whether the PK had exceeded or fallen below his expectations are an interesting apparent confirmation of the correctness of his estimation of the events of the session. That the question (Q9) on the experimenter's post session questionnaire asking how easy it had been to relate to the subject had been specifically predicted to be significant and indeed proved so was an encouraging indication that the quality of the subject-experimenter interaction was a part determinant of the PK outcome, although the reservations regarding interpretation of this correlation must be borne in mind. More PK from the subject may have warmed the relationship so as to cause the correlation, rather than particularly friendly sessions causing better PK performance, although possibly the most realistic view is that the interaction of the two was probably involved.

Perhaps, given the type of data and the early stage of evolution of the state measures it was overly optimistic to assume that common factors between subjects would emerge in the questionnaire data. Certainly those factors which did emerge generally appeared to relate fairly specifically to the individual and their particular situation, but clearly the development of more sensitive and reliable PK predictive state measures would be valuable. It seems likely, as will be discussed in the final chapter, that there should be an interaction between personality factors and state factors in the production of PK.

9.8 The Non Scoring Subjects

Why did the non scoring subjects fail ? Clearly no definitive answers can be given and those tentative ones which could be offered are all subject to the usual criticism of being speculative and formulated post hoc. Nevertheless since these attempted explanations are a basis dor hypothesis formation in further enquiry it may be worthwhile reviewing the experimenter's cautious and informal conclusions.

The first and most obvious explanation could be that the non scoring subjects did not have PK ability, which might be assumed to be a rare capacity, like perfect musical pitch. In which case the non scoring subjects found by screening must be part of the subset of apparently successful screenees who (perhaps without knowing it) created deformations by normal pressure. All but two (Sheila D and Joan W) of the non scoring subjects were found in various screenings.

The second hypothesis is that somehow the experimenter reacted differently with the non scoring subjects so as to prevent their PK from manifesting. There was certainly no awareness of this and the experimenter particularly liked two subjects (Sybil W and Dorothy T) who performed long but unsuccessful series.

Perhaps the non scoring subjects simply did not care enough about producing PK to make whatever effort might be appropriate. Only one subject, Janet P would be judged by the experimenter as likely to fall into this category.

Perhaps some physiological factor might have been responsible which also had psychological effects, such as fatigue or ill health. Only Sheila D and Janet P seemed to be subject to a very demanding day of activity before their sessions.

A factor thought possibly more relevant than those above is that of the PK elicitation strategy and orientation towards the task on the part of some non scoring subjects. Subjects Janet P, Dorothy T, Sybil W all seemed to the experimenter to take an overly effortful orientation towards the PK task. Perhaps these subjects fell foul of the paranormal equivalent of the Yerkes-Dodson Law. But then Phyllis W also seemed to resemble these subjects in this regard.

Finally, the factor which the experimenter favoured as explanation in many cases was a fear of paranormality in general, PK, or PK associated phenomena. Even if there is an intrinsic PK ability which exists distributed approximately normally in the population, and only individuals from one tail of the ability distribution are capable of PK production in measurable quantities, the inhibition of PK output seems to account for the failure of some subjects in these studies. The explanation is supported by the self reports of the subjects, which although obviously subject to possible bias from the experimenter, still seem to contain an important element of truth.

Subjects Joan W, Sybil W, Jmhn E, Nora D and Marion M all either clearly manifested fear of the paranormal or gave clear indirect indications of such fear. Joan W was aware of feeling frightened of what her PK might do if she vented her anger on people by using PK to externalise her grievances. Sybil W was frightened of losing control in order to go into mediumistic trance and may have associated PK production with a similar self induced (to her) vulnerability. John E was quite frank in admitting that he had started by thinking PK fun, then had stopped to consider the implications of the owning of a powerful PK capacity and had felt frightened of its implications. Nora D had had the frightening experience a few years previously of having experienced apparent "messages" from a deceased young man which invaded her consciousness uninvited and in an increasingly distressing way, to the point that she had decided tm shut off her psychic talents. Marion M had had the upsetting experience of a series of precognitive visions of disasters which had disturbed her sufficiently to make her too decide to shut down her psi abilities. The strange and sudden disappearance of Juliet B's PK was also interpretable as a fear created inhibitory reaction to the catastrophic expectations caused by the massively increasing PK output in the two sessions before its disappearance.

Given this type of testimony the experimenter could not ignore the possible fear of the paranormal as being a potentially powerful unconscious (or conscious and deliberate) inhibitory factor in these subjects which generalised sufficiently to prevent their showing PK when it mattered. On this model, these subjects might show PK at a screening, where the PK was apparently contextually bound to a situation out of which the subject would move on departure from the screening. But to create PK effects in their own homes in a situation where their attention was closely focussed upon it may have been more than these subjects at some level were prepared to stand.

9.9 The Role of the Experimenter

The experimenter saw himself as essentially a male midwife helping his subjects to give birth to their PK ability. His role was therefore to be as supportive, friendly and sensitive to his subject's needs as it was possible to be, subject to the overriding demand to secure valid data.

This view of his activity should have made him behave in a friendly, sociable and supportive manner. The experimenter's role was therefore self perceived as being to arrange the psychological factors and situation involved in the training sessions to be as facilitating as possible to the emergence of the subjects' PK.

The experimenter also wanted his role to stop short of contributing any psi effects to his own data. Specifically, he did not want to create uPKMB effects additionally to the subject. The experimenter has never performed a session as a subject with another experimenter running the session, but has on innumerable occasions tried to influence the uPKMB sensor and has failed on every single occasion to obtain voluntary effects in the trial period. Only involuntary effects have occurred in the experimenter's presence when other than known uPKMB agents were present, other, possibly PK-capable individuals were present on all these occasions, and in no case when alone with the apparatus have spontaneous uPKMB events occurred.

However the experimenter is unfortunately sufficiently aware of the perverse nature of psi to not be able to shrug off the possible responsibility for a psi input, even though the PK may very efficiently and systematically appear to belong to others. The true situation is that no certain estimate can be given of whether the experimenter contributed to the results by creating some of them himself.

If one takes this hypothesis to its extreme and proposes that all the effects were really due to the experimenter the explanation is then owed as to why only certain particular individuals should stimulate the experimenter to produce effects. This was one reason why a question constantly present in all versions of the experimenter's questionnaire concerned how close he felt to the subject, since it would seem a reasonable hypothesis that the experimenter should generate better results for the subjects he likes best. Only one subject showed a within sessions correlation (Kenneth R) on a question pertinent to this factor and the Chi square questionnaire analysis across subjects showed no correlation for this measure.

The diversity of the results across the subjects, and the consistency of the results within subjects also seem to exclude the extreme form of the experimenter psi hypothesis. The best subjects showed not only PKMB ability but also a more general syndrome of frequent spontaneous psi experiences including in some cases (Judy E, Helen H and Kenneth R) ostensible spontaneous PK of various sorts. A case exists for regarding these subjects as having shown PK well before contact with the experimenter.

A less extreme version of the hypothesis might be applied to some of the results. It was notable that in the first formal study, three of the four scoring subjects scored (very minimally to be sure) in the first session - whose PK was this ?. There is a case for regarding this as possibly due to the experimenter's excitement at starting a new and (for him) important experiment, since this was the first formal study. But the loading of responsibility for more than rather minimal direct contributions of PK onto the experimenter seems to do violence to the quite well established evidence counter to this interpretation of the results.

9.10 The Sceptical Response

The sceptic would seem to have four responses open to him in evaluating the data presented in this work. The responses are of course not mutually exclusive.

The results could be interpreted as being due to some form of artifact. In which case an explanation is owed as to why the artifact involved should appear in the presence of certain subjects and not in others. The increase in artifactual responses with those subjects as the sessions progressed must also be explained. Additionally, the differential in performance between Judy and John E must be explained, since exactly the same equipment in exactly the same place was used for both subjects and their behaviour was very similar. If the artifact was due to the presence of the subject, the results with Kenneth R when he and the experimenter were out of the room cannot be explained without hypothesising a second type of artifact. The correlation of the amount of artifact with psychological factors in the subjects is puzzling. Why should (in the twelve session study) the distant condition when the subjects were actually attempting to create effects have been so much less productive of artifact than when the same subjects sitting at the same distance from the equipment were in their resting phase and not attempting to create effects. If one presumes that some hitherto unsuspected covert behaviour was unknowingly being conditioned into the subjects, why were their attempts to produce effects at a distance so much less effective than when they did not try to produce effects ?

Subject fraud is difficult to propose because of the occurrence of effects when the subjects were at distances of several metres from the equipment. No subject was allowed to touch either the electronics, the chart recorder or the uPKMB sensor. Effects occurred when one subject (Kenneth R) was with the experimenter in the next room and the microphone would have detected all but a levitating accomplice who could open and close doors silently and whose breathing was inaudible. The subjects' behaviour was scrutinised very carefully and the possibility of their touching the sensor unnoticed was vanishingly small, especially since touching would immediately alert the experimenter because of the operation of the feedback system. One could view the uPKMB detection equipment as a burglar alarm or touch detector because of this characteristic. The sensor was frequently examined at very close range by the experimenter, so that secretly attached threads could not have been placed on it (nor were any ever found). The hypothesis of subject fraud must be discounted in the experimenter's opinion.

Fraud by the experimenter is a more difficult matter to deal with. Only part of one formal session was witnessed by an independent person (a police constable friend of Judy E's who saw her perform for about twenty minutes). Obviously the experimenter could have manufactured the chart records etc. But the results reported here are very likely to be greeted with a great deal of scepticism by members of the parapsychological community itself, since no other study of uPKMB training has yet been performed and the learning of PK in this study is believed by the author to be a so far unique event within the literature of experimental PK research. It would therefore seem reasonable for the experimenter to expect two events to occur which if he were reporting fraudulent results would be very likely to lead either to his discovery or else, certainly, to the rejection of the learning hypothesis which the results seem to support.

The first event is that it seems quite possible that an individual from the parapsychological community will request the original records in order to perform an independent analysis of results. If they are fraudulent the experimenter's expertise in covering his tracks must be such that this close examination would not disclose evidence of fraud. The experimenter does not feel confident that he could manufacture data to such a high level of perfection against discovery, even if he wanted to. The reexamination of the original data may reveal errors or slips (it is hoped that it will not), but these are expected to be minor even if they exist, and the experimenter feels absolutely confident that the central findings will not be affected by any subsequent reexamination.

The second event is that it is quite certain that attempts will be made to replicate these findings. It is not expected that all or even the majority of these replications will succeed, since psi effects do not replicate readily. However, for this research to have any significance it must to some extent be replicable. Once several replications of the work are performed the question of its replicability will have been tested.

If no group succeeds in replicating the work, the learning hypothesis will be rejected. If the results were manufactured by the experimenter it could be expected that all the replications would fail. Discounting the over paranoid hypothesis of some sort of widespread parapsychological conspiracy to pretend that replications were successful when in fact they were fraudulent, the certainty of replication attempts would make quite pointless the experimenter fraudulently making the claims made here since they would be certain to be rejected by the parapsychological community once several unsuccessful replication attempts were made. Experimenter fraud is therefore simply not a worthwhile strategy, since at best it would lead to fruitless replications, at worse to an exposure of the experimenter.

An additional factor here is that one subject (Kenneth R) has performed satisfactorily for another experimenter, Professor Hasted, so that the hypothesis of experimenter fraud must presumably be supplemented either by assuming Hasted fraudulent or else assuming successful fraud by the subject with both experimenters.

Perhaps the most satisfactory response to the sceptical reception of this work will be the next stage of research in this area which will be proposed in the next chapter. If this new work achieves its goal, the sceptic will be presented with a situation which will make it increasingly difficult for him to maintain his position.

CHAPTER TEN

REFLECTIONS, PROSPECTS AND IMPLICATIONS

10.1 Some Lessons Learnt

If the programme of research described in previous chapters were being started now, a very different approach would be taken towards the question of instrumentation. So much time was taken up in construction of different models of instrumentation and in its development and testing that the initial development of a highly flexible system would now, in retrospect, be the first priority.

Such a system is offered by the use of computer techniques. Future uPKMB detection and recording systems used for PK training purposes should be based on a microcomputer system. The inputs from uPKMB sensors, microphone inputs and mains monitoring channels etc could be conditioned by relatively simple input conditioning circuitry and then the signals derived from these front end circuits could be converted from analogue to digital form and input into the computer.

To avoid having to store massive amounts of data generated when no PK signals were being detected the input data generated when no uPKMB events were occurring (by far the majority of the time, even in high scoring sessions) should be put into a recycling store from which it could be transferred into permanent storage once some threshold was exceeded by the input from the PK channel. Suitable software would then allow feedback to be given to subjects in either auditory or visual form. Such a system could also be used for data analysis and would enable a generalised directly detectable PK detection, recording and analysis system to be developed which could be used for a wide range of possible PK tasks including uPKMB. μPKMB signals appear to be sufficiently slow and long lasting not to demand a very high speed analogue to digital conversion system, so that a relatively inexpensive microcomputer system would be sufficient.

The development of this type of system is the obvious logical next step to be taken in this area of research and once established it would enable replications readily to be executed using compatible computers and software. Using a computer controlled feedback system would permit the maximum flexibility, so that changes in the feedback information given to subjects would be rapidly accomplished without further modification of the hardware.

Using conventional single purpose hard wired instrumentation commits the user to rebuild equipment as soon as unanticipated modifications are required, which was the cross borne by this particular experimenter. This is an inefficient process and is unnecessary now that microcomputer prices are decreasing.

The second lesson learnt from the experimentation is that subjects should be interviewed and selected for participation in training series with considerable care, to detect hidden reservations about psi which subjects may be loathe to mention at first but which could prove fatal to their achieving any results. A very thorough and probing interview is necessary and perhaps even clinical types of test should be administered. The development of selection tests for potential PK trainees would be of utility and intrinsic interest. It would maximise the efficiency of training procedures by restricting the training intake to those individuals who showed a high probability of success. It would also be relevant to the study of the interaction of personality variables with PK function and ability.

The PK task must be made interesting and meaningful to the subject. There must be some rewarding end product from the elicitation of PK. Both of these imperatives should be regrded as only hypothese for testing. The inherent flexibility of computer systems would be very helpful in this regard since it would be possible in principle even to tailor some characteristics of the feedback system to meet the interests of particular subjects.

The use of counselling and other personal growth techniques in conjunction with the PK training programmes should be evaluated. This author has had personal experience of reevaluation counselling and has formed the opinion that it is, in the hands of competent and stable counsellors, a benign technique of potentially great positive significance for the future development of PK training techniques. Counselling and personal growth techniques might both improve the performances of good subjects and allow a wider intake of trainees because it might offer solutions to some of the problems created by fear of psi or conflicted social circumstances of subjects.

This area is clearly fraught with ethical problems since trainees must neither be taken over as if into a cult, nor promised unrealistic outcomes from either their PK training nor their counselling experiences. The use of counselling would have to be carefully supervised in its ethical aspects and conducted in partnership with established practitioners who would be acceptable to university psychology department ethics committees.

If PK is taken seriously, the development of powerful PK abilities in subjects should be undertaken carefully, in a manner mindful of the responsibility it places on the experimenter for the wellbeing of the subject. If PK could be used agressively or destructively, the individuals selected for development of their abilities must not only initially be stable and realistic people, but their adaptation to this possibly far reaching extension of their ability to affect the world should be facilitated and monitored in such a manner that they can more readily accept the extension of their abilities and feel safe that the possession of this extra capacity will not be threatening to themselves or to those around them. This is an important social issue which will recur in later discussion (see section 10.3).

10.2 Future Research Possibilities

Perhaps the most obvious ommission from the presently reported research is the personality dimension. Do the successful subjects share common personality characteristics, or do they fall into broad groupings, or are they indistinguishable from the normal non PK talented population ?. There is obviously a wide field of possible research in this area.

The model which seems to offer itself is that there might be complex interactions between the personality characteristics of PK agents, characteristics of the PK task and the elicitation strategy which is used. No work in this area has yet been performed using uPKMB tasks.

The use of artifact induction with the four note machine appeared to be successful, but the absence of subjects made it impossible to execute the comparative studies necessary using artifact and non artifact groups contrasting the learning behaviour of subjects with and without the artifact induction condition. Since it appears that artifact induction is facilitating to the improvement of uPKMB performance this type of study deserves a high priority.

The establishment of artifact induction as a PK facilitating technique will in turn help to shed light on some of the other aspects of Batcheldor's theory. In particular, the role of belief (in PK success) and its relationship to relaxation and task related striving and possible task related anxiety would be most helpful if it were to be explored in experimentation, since this is a central area of the theory. These issues would require the devotion of considerable time and resources to explore.

Perhaps physiological measures of arousal would provide a more objective means of estimating the striving being undertaken by subjects than their self reports as recovered by questionnaire answers. The simultaneous maintainance of high motivation and interest with low anxiety, effort and striving seems to suggest itself as a fruitful PK elicitation scenario. Both Robinson (1981) and the results of the use of the four note device suggest strongly that a helpful factor in this area is the subject's self perception of their exertion of control over some system by PK and their engagement in a potentially creative task producing a meaningful end product from their PK. This hypothesis requires testing by experiment. Here again the relevance of very flexible computer based PK feedback systems is obvious.

One of the most important areas of future exploration must be that of distant uPKMB. If uPKMB signals can be created on sensors that are tens of kilometers distant from the subject a major step forward will have been achieved, because the explanation of the effects as due either to subject fraud or some sort of subject produced artifact must surely then fail.

The present work has shown clearly that at first distant effects must be expected not to occur during trial periods when the subject is consciously intending to produce effects and is attending to them, but are much more likely to occur as the result of the subject being distracted by events during their rest period. The design of distant PK studies should incorporate this finding in order to maximise the chances of subjects being successful at distant PK tasks. Methods of slowly bringing such spontaneous effects under voluntary control must be developed before a distant PK capacity "on demand" can be produced. However much like science fiction this sounds at present, the present author feels this to be a realistic project and ought to be possible, given the apparent independence of psi from normal spatial limitations.

Such a capacity would help very greatly in the future study of the physics of psi because a variety of target systems could be utilised which when affected by PK allowed the appropriate feedback signal to be sent to the subject. An important issue concerns the question of how far PK ability is a multifunctional syndrome - could uPKMB agents produce a wide range of other types of PK ?. Could they be star subjects at REG tasks ?. Very basic questions such as these still need to be explored, an indication of the very early stage of research reached as yet in this field.

One obvious development of the distant PK target system would be to couple a computer based uPKMB target system to a telephone line and use a modem at the subject's end of the line to decode the data stream and produce the feedback signal locally.

This consideration leads naturally to the question of whether solo uPKMB training sessions will ever be effective. Since the obvious hypothesis is that a social interaction is necessary as a form of reward to subjects, this hypothesis should be given high priority to be tested by experiment because the investment of experimenter time in training sessions could be very greatly reduced if subjects could accept solo practice sessions.

An interesting three condition experiment suggests itself, using the dial-up telephone PK target system. Three different levels of social interaction could be used. Subjects would have to have developed the distant PK capacity first, although modifications of the experiment could employ local PK effects and involve the subject attending at the laboratory for solo or accompanied sessions. But the use of the remote uPKMB target system would have the great advantage that if successful, neither subject nor experimenter would have to travel. In the USA the cheaper telephone charges make such a dial-up uPKMB target system an attractive possibility.

In the experiment proposed, in one condition the subject is accompanied by a local experimenter who listens in to the session and provides some direction and much encouragement, in the second condition the experimenter is located at the PK target end but is in voice contact with the subject over the telephone link but no experimental personnel are with the subject at their home. In the third condition the telephone link is used without an experimenter being present at either the subject or the target's location to provide "live" social contact. The subject's likely feelings of isolation in the last condition could possibly be ameliorated by a recorded message being played to the subject down the telephone line just prior to their session by means of a telephone answering system.

If either the second or third condition proved viable as a PK training method it would save enormously on experimenter and subject journey time since subjects could dial up the PK target system any time they felt like a session and the results of each practice session would be highly secure against fraud or artifact, as the uPKMB target system could be housed in a secure isolated environment. Subjects could "log on" by voice, identifying themselves and reporting their state. The computer system could then automatically record their session and analyse the results. In this way large numbers of geographically scattered subjects could be trained economically.

A potentially crucial experiment which the author was extremely annoyed about envisioning at too late a stage to be able to execute it is the use of two uPKMB targets which generate contrasting feedback tones when affected by uPKMB. If subjects could learn to control the placement of their effects, which seems quite possible on the basis of Hasted's studies with Nicholas Williams (Hasted 1981a), although not of course certain, strings of binary digits potentially could be generated. The precision of generation of binary strings would serve as an excellent experimental task because it is so well defined, so could be a very valuable addition to uPKMB experimental methodology.

Once strings of pre specified binary digits could be reliably produced - especially if over a distance, then the argument that any sort of artifact is responsible for the effects would be clearly refuted by the evidence. The training of subjects to produce binary strings should be given the highest priority because if achieved, this capacity would enable encoded messages to be transmitted by PK, and sceptical objections to PK would entirely lose their force.

Sending messages by uPKMB ought to be an interesting task for subjects, so that it has the additional important merit of probably being intrinsically motivating as a task. It is very unfortunate that the presently reported experimentation developed to the point that amplitude modulation of uPKMB occurring to a single sensor was thought of as a research objective instead of the selection of the placement of effects between two uPKMB sensors, because the latter capacity would offer the final definitive evidence against alternative explanations of uPKMB as being artifact of some kind.

Many other research possibilities offer themselves, but perhaps one of the potentially most interesting and important concerns the neurophysiology of uPKMB. Is uPKMB cerebrally mediated, or might it be a whole-body effect or does it originate from the hypothetical non physical mind of the subject ? If it is cerebrally mediated, what is the nature of the brain function responsible and what physical laws control the physics of the interaction of brain chemistry with the remote uPKMB sensor ?

Some light on these issues might be thrown by extensive EEG studies of uPKMB agents. Since the uPKMB signals are readily localised in time they provide an infinitely superior form of PK for EEG and other electrophysiological studies than is offered by REG tasks. It would even be possible to time lock the EEG to the instants of occurrence of uPKMB signals and to compute the average transient for many uPKMB signals, which should allow the characteristic EEG function associated with the uPKMB signal to be identified. This might also allow the detection of the site of the crebral area generating the uPKMB signals to be pinpointed (assuming that degree of localisation).

If uPKMB is produced by subcortical, brainstem or limbic areas the use of EEG measures would be very much less rewarding. But the fact that there seem never to have been any examples of sub human species identified as poltergeist agents suggests that possibly the human cortex may be the source of PK effects, assuming them to be cerebrally generated.

If they are not, then the EEG results may be very much less easy to interpret. Suppose that no correlation were found between brain function and the uPKMB signals. Rather than hypothesise that the hypothetical non physical mind of the agent is responsible it would always be open to the experimenter to hypothesise that there was a cerebral origin of the effects, but that he had not yet found it. The EEG results reported with Girard do however suggest rather marked changes in EEG at times of PKMB action, although the interpretation of the changes is as yet wide open (see chapter 2).

Nevetheless the delineation of the EEG-PKMB relationship is important because uPKMB training might be usefully supplemented by biofeedback training of the EEG functions characteristic of successful uPKMB functioning. There are also some rather elegant tests of some of the fundamental hypotheses of the observational theories of psi which would be possible using EEGs in conjunction with uPKMB, but these highly speculative areas must await the outcome of future results.

10.3 Some Wider Implications

The prospects for parapsychological research of PK are very much improved if the work reported here can be replicated by others, and it is the earnest hope of this author that such replications be undertaken and proved successful. As has been argued in chapter 4, there are probably a very large number of possible PK tasks which fall into the class of directly detectable effects. Some or all of these may be improved with practice, so that if this work is replicable, the growth of directly detectable PK studies would seem to be a fruitful area of expansion and development within parapsychology. In its turn the expansion of this area should encourage the growth of the study of the physics of psi and of the neurophysiology of PK production, which address some central theoretical issues.

This seems likely too to focus attention on the question of whether ESP performance improves with practice. Although Tart's recent pioneering (1975) but much criticised and controversial (Stanford 1977a 1977b, Tart 1977) study of ESP training has not as yet stimulated replication attempts, the replication of the uPKMB training studies reported here will probably refocuss attention on to the possibility that ESP improves with practice. Targ and Puthoff have informally communicated their belief that remote viewing improves with practice, as has been reported by others active in remote viewing research (Spottiswoode 1984). The awakening of expectations that PK and ESP can be improved with practice will provide an important stimulus to parapsychology, because one's view of the future of parapsychology is certain to be different if on the one hand one believes that declines are inevitable (as has been the case within the typical Rhinean paradigm of forced choice tasks) or that future psi performances will be superior to those of the present. The view of the future of parapsychology can therefore be expected to change if the presently reported work proves replicable.

In order to try more fully to appreciate some possible implications of this research, let us make four assumptions. From the context of his present results all of these assumptions, although not certain, nevetheless appear to be perfectly realistic and reasonable.

The first is that this experimenter is not unique and that others replicate his findings. The second is that it is found that subjects can create accurate binary digit strings, and that more complex multi state outputs can be produced by some individuals after prolonged training. The third is that it is possible for subjects to create effects at very great, perhaps unlimited, distances from themselves. The fourth is that some subjects show a broad spectrum of PK abilities encompassing many different tasks. What then ?.

It seems to this observer that the broad research of PK would then become possible in a manner which is not shown at present. If many groups were successful in finding and training PK agents the growth of this research area, unless captured and controlled by government decree or the military, would then be assured. Many societal changes are implicit in this scenario.

If PK agents became prized components of well funded long term research they would tend to develop as a class of professionals, much as is now incipient with good ESP subjects used in the associative remote viewing studies of Puthoff and Targ (Spottiswoode 1984) who are paid for their remote viewing activities. Associative remote viewing has been used as a predictive system and a computer judged version of this system may enable stockmarket movements to be predicted sufficiently accurately to enable large sums of money to be made (Spottiswoode 1984).

The societal impact of these possibilities, if they are realised, will be independently of PK to establish the reality of psi in a rather tangible and irrefutable way. If either the developments in PK research occur which are outlined above, or if the associated remote viewing work develops into a reliable future prediction system, the move into public acceptance of psi and parapsychology is inevitable and will occur within a relatively few years.

The social implications of the official acceptance of psi as being real, effective and potentially accessible to a significant fraction of the population are in this observer's view, very great. The implications of psi are that the current concept of human identity and of the possibilities inherent in the physical universe are unnecessarily limiting. Physics will require extension, and the concept of human powers will need to be drastically revised to include possibilities which are not as yet even fully realised by parapsychologists themselves.

But would this sea-change be the opening of a pandoras's box brimming over with the individual, group and societal deliberate use of psi for destructive purposes ?. This depends upon the presently unknown limits of human PK and ESP ability. The anthropological data suggests that most if not all societies which believe in the existence of psi also believe it can be used for destructive and harmful purposes, even that it can be used to kill people.

This is a frightening prospect and it is not surprising that some sceptics may wish to deny the reality of psi because to accept it is to open the door to such frightening possibilities as are posed by the secret use of PK to kill people at a distance. If this is possible, the transition of western society into the post-acceptance phase will be fraught with danger, especially in the context of the present arms race and the growth of religious cults and occult groups. Many individuals can be expected irresponsibly to experiment with psi and to suffer great fear or worse consequences.

Governments may find PK training an important military matter because it may be possible to affect weapons or their associated computer systems at a distance. Geller is reported (Hawke 1976) to have erased the magnetic pattern in a Hewlett Packard programmable calculator program card. It is not a long step to imagine the iron oxide of military computer disc and tape memory systems being deliberately affected remotely by PK agents. The use of PK to produce completely secret information links secure from monitoring by conventional means may also prove possible. These developments represent a frightening and potentially militarily destabilising scenario.

If one thinks that the transition into the acceptance of psi and parapsychology is inevitable, what can be done to contain the negative aspects of that change ?. Clearly there will be many positive aspects, but it behoves one who has shown that a certain type of PK is trainable with practice to attempt to envision safety measures which could be instituted to prevent the worst outcomes of future PK training at destructive tasks.

An enormous problem is posed by the fact that there is no commonly accepted map of psi-land. Each faction or group (spiritualists, occultists, parapsychologists, religious groups) has its own conceptualisation of what psi is and how it works, but the scientifically tested view is not yet sufficiently developed (largely because of scepticism starving research of funding and because of the bizarre nature of psi when viewed from the normal worldview) to gain ascendance over other less enlightened views. While this situation persists, alternative explanations and cures for the ills produced by the negative uses of psi will continue to be available. Some of these may exacerbate the problems they are intended to solve.

One route which the present author hopes will supply some of the necessary answers will be the integration of counselling and personal growth techniques into PK training. If successful, this can be expected to provide further insight into the possible fears of psi and how they might be dealt with, and into the situations productive of negative uses of psi and their dissolution without such negative uses. The integration of counselling techniques will demand the application of effective methods of evaluating the safety and utility of such techniques, which itself will demand considerable research and resources, human and material.

The possession of powerful PK ability will have to be construed as an extra responsibility of the individual so endowed and their personal evolution and the resolution of intrapsychic and other conflicts will be an important goal to be reached in order to remove possible stimuli to the destructive use of their talent.

Solutions on an individual or group level are very much more easy of achievement than the prevention of institutionalised government sponsored use of psi for destructive purposes in military applications. This usage is almost inevitable, unless as may be possible, psi performance will be found to be so labile and unreliable under stressful conditions that its use for military purposes will be marginal. This remains unknown but this author hopes that this will prove to be the case. Certainly none of the individuals associated with the author's work would be likely to be able to show any PK performance under the stress of a battle situation.

But the final reflections should not be of such grim prospects. The possibilities for positive changes are equally as far reaching as those for negative. The use of paranormal healing techniques (the laying on of hands, or faith healing) in medicine promises to provide important diagnostic and curative possibilities which would be complementary to current medical practice. If PK can create effects at a distance in PZT crystal, it seems a logical step to construe paranormal healing as an applied form of PK. Parapsychologists are well aware of these implications of PK (see eg Ehrenwald 1977a & b).

PK might also have significant useful applications as the basis of personal communication systems. If reliable signals were obtainable not only in binary code, but in codes having more states, this might in conjunction with computer systems allow many types of communication to occur, such as selection of letters of the alphabet to form messages, or possibly even the actuation of voice synthesiser devices to provide a true PK "telephone". The use of PK as an emergency communication channel might even be possible in this way, although it is clearly impossible to do more than speculate in this area.

Many other applied uses of ESP are possible, and several are in use today (dowsing, medical diagnosis, associated remote viewing).

Probably the effective applied uses of ESP are as likely to cause the eventual acceptance of psi as is any laboratory research, no matter how well conducted and methodologically sound it might be. This would be especially so for any psi based communication system which could create a financial income (as perhaps associative remote viewing might) because the gaining of wealth is one of the ultimate touchstones of reality in the western societies. Once some aspect of psi becomes accepted, whether ESP or PK, the gradual acceptance of psi's other facets seems inevitable. It seems safe to predict, in this context, that the presently reported work will be seen as deriving from the early "steam age" of PK research. Would that we could know its future consequences now !.

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PHYSICAL ASPECTS OF PSYCHOKINETIC METAL-BENDING

A1.1.1 Validation of Micro-PKMB : Methodological Aspects

A diversity of approaches has been taken towards the exploration of the physical aspects of PKMB (Hasted 1981a, Crussard & Bouvaist 1978, Sasaki et al 1974, Franklin 1974).

Hasted claims (ibid) that some eighteen different groups have engaged in investigations of PKMB. However, most of these groups have only briefly been involved, many producing only brief preliminary findings and several producing no published output. Only four groups seem to have performed any sustained investigation of physical aspects of PKMB.

The groups are those centered around Sasaki at Denki Tsushin University in Japan (Sasaki et al 1974), Bersani at the University of Bologna in Italy (Bersani & Martelli 1983), Crussard and Bouvaist at the Pechiney Aluminium Company in France (Crussard & Bouvaist 1978), and Hasted at Birkbeck College, University of London. Most of the Japanese group's published output remains untranslated, as does the Italian group's work, but a good translation of the French group's study is available.

A primary division can be made between those studies using strain sensors to detect dynamic strain signals due to PKMB, and other analytical techniques which have frequently involved analysis of structural and metallurgical characteristics of the PK target after it has been submitted to PKMB action.

Since the largest single published volume of English language physics-based research into PKMB has been of instrumentally detected microscopic PKMB effects this will be reviewed first.

A1.2.1 Instrumentally Detected Microscopic PKMB

By definition, macroscopic PKMB must entail a change of form of the PK target which is visible to the naked eye. In contrast, uPKMB can usefully be conceptualised as a microscopic flexure or strain event within the PK target.

It is important to note that the strain event may take the form of a more or less localised extension, contraction or bending of part of the target object. The effects are by no means interpretable as always being purely bending (Hasted 1979a).

Most crucially, these events can be obtained without the ostensible PKMB agent touching the PK target. These "no-touch" conditions are standard in this type of study (Hasted 1976a). Microscopic strain events of this sort must be instrumentally detected. Two types of strain sensor have been used in studies of the effect, one being the resistive strain gauge, the other being various types of piezoelectric strain sensor.

The typical uPKMB target in this type of research is a strip of non ferrous metal, frequently aluminium alloy. Consider a thin strip of such material which is subjected to bending. The convex surface of the strip will experience an extension, whereas the concave surface will experience a contraction. In the center of the strip, along a "neutral" axis, no net extension or contraction will occur.

The resistive strain gauges utilised in most uPKMB studies consist of two components. The substrate is a thin plastic sheet, usually of about 10 mm length by some 3 mm width. On the surface of the substrate a thin electrically conductive track of metal is vacuum deposited. The track is terminated in two small pads, to which soldered connections are made. In use the strain gauge is bonded to the surface of a metal specimen.

Considering again the thin strip referred to above, strain gauges placed on the surface of such a strip will, if the strip is bent, experience extension or contraction. Extension or contraction of the metal track of the strain gauge will thin or increase the thickness of the track, leading it to either increase in electrical resistance or decrease in resistance. Use of a suitable low noise high gain bridge amplifier will enable these small changes in resistance to be converted to voltage changes which can be recorded using a chart recorder.

The basis of research of this type is that PKMB agents appear to be capable of creating short lived dynamic strains which can be transduced and recorded using the technique outlined above.

Piezoelectric strain sensors consist of blocks or sheets of piezoelectric material having electrodes deposited on their surface. In response to deformation, the piezoelectric material suffers a separation of charge which appears as an electrical potential difference between the electrodes. This process results in a much more efficient mechano-electrical conversion of strain into an electrical signal than is obtained from resistive strain gauges, but at the cost of the loss of performance for steady state deformations. Amplification of these signals and recording by chart recorder follow similar procedures to those used with resistive strain gauges. Piezoelectric crystal strips can be used without a metal substrate.

Most physics based studies of uPKMB have been conducted using resistive strain gauges, although Hasted has recently adopted the use of piezo based strain sensors (Hasted 1983).

A1.2.2 The Diversity of uPKMB Signals

A primary characteristic of uPKMB signals detected using strain gauge equipment is the great diversity of their waveforms (Hasted 1976a).

Most signals appear to be of relatively fast rise time, faster than the rather slow (50 ms approx) rise time of the chart recorders used (Hasted 1976a). Durations of such signals are highly variable, spanning the range from milliseconds to occasional periods of several seconds (Hasted 1981a), most being fractions of a second.

Polarities of signals are also variable, polarities frequently reversing for no obvious reason (Hasted 1981a). Reversal of polarity implies a reversal of strain from, say, extension to contraction or vice versa. Some signals are unipolar, others bipolar.

The magnitude of signals encountered by Hasted using Wheatstone bridge amplifiers of gain 300 has spanned a wide range of the order of 1 to 10,000, (1 mv to 10 volts) the lowest level being limited by noise (Hasted 1981a).

Inter-signal durations depend upon the productivity of the uPKMB agent and may vary from small fractions of a second to periods of hours. Since this parameter is more properly regarded as being controlled by psychological factors than physical factors it is discussed further in chapter 2.

Hasted reports having obtained uPKMB signals from strain gauges mounted on specimens of a wide range of materials including tungsten, brass, aluminium, copper, silicone rubber, wood, plastics, glass and fused silica (1981a). However, since he has also reported fracture of some strain gauges apparently due to direct action upon the strain gauge itself (ibid), it is always possible to question the interpretation of these results and to construe them as involving the creation of effects directly upon the strain gauge, or its epoxy resin bond to the substrate, rather than upon the substrate material (see section A1.4.4).

This argument loses force when the ostensible strain signals are accompanied by visible deformation of the PK target under no-touch conditions, as has happened to metallic targets. But where no microscopic structural changes or deformation or fractures of materials have occurred in association with ostensible uPKMB effects the alternative explanation for ostensible strain signals logically remains open, although it may not necessarily be a particularly attractive explanatory option if the strain gauge itself shows no sign of damage or deformation.

A1.2.3 Possible Sources of Artifact in UPKMB Data

Sceptical criticism of macroscopic PKMB studies has tended to center upon subject fraud as the major source of possible artifact (Randi 1975). It is thus noteworthy that sceptical critics have tended not to stress subject fraud as the major source of artifact in uPKMB studies, but have tended to favour the hypothesis of instrumental artifact as the primary source of possibly invalid data. Thus Taylor for example (Taylor 1980) has attempted to explain away uPKMB results as being due to the reception of transients due to static electricity.

Some critics have informally cited air currents as possible sources of artifact in uPKMB data (Randi 1982), whilst other have thought that ultrasonic sounds might be responsible for reslults (Merton 1981). Temperature changes have been suspected as causing artifactual responses in uPKMB detection equipment (Cornell 1983). Finally, there is the question of subject fraud.

Each of these sources of potential artifact will be considered in relation to Hasted's published studies employing strain gauges.

Hasted's work is chosen because it represents by far the largest single source of published material in this area. Also this reviewer has had continuous contact with this work since 1975, enabling much information to be gained which does not appear in Hasted's publications.

Al.2.4 Artifact from Electrical Sources

There are four principal categories of electrically generated potential artifact which might affect uPKMB detection equipment.

The first is internal oscillation or instability within uPKMB equipment. This can be prevented by good design and construction practice and circuit performance must be carefully monitored using an oscilloscope. Internal instability will be revealed in control running of equipment. All of Hasted's equipment has been subjected to analysis of performance by oscilloscope during the construction phase and long control periods of quiet running prior to experimental sessions have also been employed.

The second potential source of artifact is static electricity. There are three possible mechanisms by which static electricity might cause signals to appear in uPKMB equipment.

Hasted states (Hasted 1977a) that charging of the body by rubbing a man made carpet, followed by hand contact with a metal specimen bearing a strain gauge can cause signals to appear in the uPKMB channel, due to the discharging of the accumulated static charge down the screen of the cable connecting the strain gauge to the amplifier.

This is of course a very short range phenomenon, requiring touch, or extremely close proximity to the PK target since the climate in England is too humid to allow large electrostatic voltages to be built up in rooms which are not air conditioned (Hasted's laboratory is not air conditioned, nor were any of his subjects' homes).

In practice, the normal visual observation of subjects used to prevent touching would also be effective in preventing them either touching the specimen or placing their hands near enough to allow micro-sparks to transfer an accumulated electrostatic charge to the PK target.

Another mechanism by which static charges might cause artifactual signals is by dynamic electrostatic induction. Thus (Hasted 1981a), when Matthew Manning was allowed to execute vigorous windmilling movements of the arms near to an electrode mounted in air during some of Hasted's studies of ostensibly paranormal electrical phenomena (N.B. not strain signals) it was found that signals were produced upon the electrode by the normal mechanism of dynamic electrostatic induction, where movement of electrostatically charged objects can induce potentials on nearby objects.

It should be noted that Hasted's subjects are stationary during uPKMB experimental sessions. The electrostatic screening of strain gauges and their associated cables and the earthing of metal specimens eliminates this source of artifact because of the low electrical resistance to earth of exposed portions of the target.

The third electrostatic mechanism, which would be so unusual as to be virtually paranormal, would be if subjects could somehow control the electrostatic charge on their bodies to the point that they could spontaneously create high voltage electrostatic fields. There is some suggestive evidence that Geller succeeded in doing this during two sessions when he held a gieger counter tube (ibid p141) and appeared to have created a current flow in its steel cover. However Hasted's other subjects appear not to have been so ostensibly gifted in this regard and no-touch conditions were in use.

However, Hasted's studies of ostensibly paranormal electrical effects (Hasted & Robertson 1981b) created by others of his subjects does appear to suggest that they might be capable of producing bursts of electrical charge at a distance from themselves at or very near to a metal surface and in air.

The insulation and screening of exposed metal surfaces which are connected to his strain amplifiers might be expected to prevent this type of paranormally generated electrical artifact, but it should be noted that some of Hasted's intermediate work was performed with unscreened strain gauges (Hasted & Robertson 1980a).

Additionally, one subject, Matthew Manning, apparently was able to produce electrical signals inside an electrostatically screened ferrite ring bearing a toroidal winding, suggesting that screening may not be effective in excluding paranormally created electrical effects.

The situation in this regard remains unclear, but where ostensible uPKMB signals are associated with visible deformation of specimens it seems reasonable to conclude that strain events are the major source of signals in the absence of satisfactory evidence to the contrary, especially where insulation and screening of the strain gauge has been practised.

The fourth category of electrical sources of artifactual signals is electromagnetic in origin, and is by far the most practically important of all sources of artifact in strain gauge based uPKMB equipment.

When mains powered inductive loads are switched electrical arcing can occur for brief periods at switch contacts. Examples of inductive loads are devices containing electric motors or other mains energised coils, such as transformers, relays or solenoids. Refrigerators, deep freeze cabinets, washing machines and central heating systems are common domestic examples of such devices. High voltages, which cause the arcing, are generated by the collapse of the magnetic field surrounding the motor coils of these types of device when their current supply is cut off.

The brief electric discharges at switch contacts produce bursts of high voltage radio frequency electrical oscillation which can spread down mains wiring and be broadcast as bursts of broadband radio interference in adjacent rooms.

Since the normal changes in voltage across strain gauges are of the order of microvolts, high intensity airborne electromagnetic transients can enter strain gauge bridge amplifiers in sufficient strength, despite the electrostatic shielding employed, to generate spurious outputs in the uPKMB channel.

The fourth category is constituted by radio transmitters and powerful walky-talky radio sets which can have the same effect, although they are of much less common occurrence than the transients due to automatic equipment switching itself.

A1.2.5 Precautions Taken Against Electromagnetic Artifact

Hasted has employed two techniques to protect his uPKMB data from artifact created by the reception of electromagnetic transients. In early work he utilised long control periods of "quiet running " (Hasted 1976a) where equipment was left to function at the site of sessions prior to the introduction of the subject.

Given environments are usually consistent in their sources of electromagnetic artifact (because such sources as central heating or refrigerators show consistent periodic behaviour) so that control runs of several hours are adequate to provide checks against the possibility that a given room may be very prone to electromagnetic transients.

Nevertheless, although the control period is a valuable technique, more positive insurance is provided by monitoring for electromagnetic artifact concurrently with the detection of uPKMB signals, since doubts about the consistency of behaviour of the environment are thereby answered.

Hasted then adopted the "dummy channel" technique. An additional amplifier and chart recorder channel are used which are identical to that used for the uPKMB channel. However, the input to the amplifier is a passive resistor, or say, a temperature sensitive resistor instead of a strain gauge (Hasted 1981a).

This system will not therefore respond to dynamic strains, but if electromagnetic transients are present which are of sufficient magnitude to pass through the screening of the uPKMB channel, the same transients can be expected similarly to affect the dummy channel. In this way, if co-occurring signals are observed, it is presumed that interference is the source, whereas signals only appearing in the uPKMB channel can be presumed to be strains rather than due to electromagnetic transients. Hasted comments (ibid p59) that the dummy channel results show that most environments are electrically quiet.

It should be noted that in 1979 Hasted constructed a three sided screened enclosure at Birkbeck in which all subsequent exposure of PK targets has taken place. This has apparently excluded all electromagnetic artifacts from the later work, although a dummy channel is still used as standard practice (ibid p59)

A1.2.6 Air Currents

The explanation of Hasted's results as due to flexures caused by air currents is not tenable. The rigidity of the specimens used and the relative insensitivity of his bridge amplifier system (of gain 300 - see electronics appendix 2) mean that flexures due to air currents would not be detected. Only air currents powerful enough to cause swinging of specimens could create artifactual uPKMB signals due to the swinging action (Hasted 1984). The same argument applies also to attempts at fraudulent creation of signals by subjects blowing at the specimen.

A1.2.7 Ultrasonic Noises

One suggestion has been put forward that uPKMB results may be due to subjects unconsciously learning to produce ultrasonic noises

. Hasted has examined uPKMB strain signals using a digital storage oscilloscope and has found no evidence of ultrasonic components (Hasted 1984). He has also listened to uPKMB signals via headphones and has found them to be low frequency in character, probably not containing any components above 500 Hz (Hasted 1981a). Chapter 7 presents further evidence of the low frequency nature of uPKMB signals from the author's own researches.

The chart recorders used by Hasted (JJ Lloyd type 553) have low pass filters in their inputs which cut off their response from about 100 Hz (see instrumentation appendix 2) so that in any case ultrasonic signals would be removed by filtration of the incoming signal even if it were present in the strain gauge amplifier output. It thus appears highly unlikely that uPKMB signals can be explained away on these grounds.

A1.2.8 Audio Frequency Sound

The sensitivity of Hasted's uPKMB detection system is such that no response is produced by normal airborne acoustic noises.

A1.2.9 Thermal Artifacts

Hasted states that sudden changes of temperature are unknown in uPKMB experimentation (Hasted 1981a). Hasted has mounted thermal sensors on uPKMB target specimens but has never found any sudden change in temperature even during uPKMB strain events recorded by conventional strain gauges mounted neaby on the same specimen (ibid p133). Strain gauges are also temperature compensated - the alloy used for the resistive track has a low temperature coefficient of resistance (ibid p132).

Slow drift is displayed by the pen trace of Hasted's chart recorders, but this is probably due to thermal drift within the strain gauge amplifier. This type of drift can readily be distinguished from uPKMB signals because their fast rise times permit easy discrimination from the very much slower changes due to thermal drift. Allowing equipment to reach steady state temperatures before introduction of the subject much reduces thermal drift (Hasted 1984).

A1.2.10 Subject Fraud

The most likely method whereby subjects might attempt to produce uPKMB effects fraudulently is by physical contact with the target specimen, either by direct contact or by means of implements. However, the standard use of no-touch conditions greatly facilitates the prevention of fraud.

Witnessing is a very much easier task in the case of uPKMB studies than in macroscopic with-touch PKMB because of the separation of the subject from the PK target. A factor which powerfully assists the effective witnessing of uPKMB events is that since the strain pulses are discrete events which cause immediate audible feedback for subject and experimenter to be generated by the noise of the movement of the chart recorder pen, the exact instant of paranormal action can be precisely known. The subect's position and activities at these instants can be readily noted.

This poses a considerable contrast to the with-touch macroscopic PKMB effects which can often occur unnoticed, making it impossible to exactly identify their time of occurrence. Witnessing vigilance in uPKMB sessions is naturally increased at moments of action by witnesses hearing the pen motion of the chart recorder.

The central task of witnessing must be to ensure that the subject is unable to touch the PK target unobserved. Some of Hasted's reported studies have employed subjects who only produce effects over a few feet distance and who prefer to sit so that their hands are within a foot or so of the PK target specimen (Stephen North for example (Hasted 1981a)).

In this case witnessing of the subject has to be at a constant high level and it should be noted that many of the reported studies employing this type of subject used two experimenters, one of whom fully concentrated upon observation of the subject whilst the other attended at times to the equipment (Hasted & Robertson 1980a,b, Hasted & Robertson 1981a,b,c, Hasted et al 1984).

But other subjects such as Nicholas Williams (Hasted 1976a) consistently worked at more than four feet from the PK target, sometimes at distances of ten or fifteen feet and in these cases, assurance against fraudulent interference with PK targets is easily provided by witnessing by one person. In addition, many of the sessions with Williams and other subjects employed multiple PK targets and simultaneous effects were recorded as occurring to targets which were far more widely spaced than an arm's reach (ibid).

Deliberate shaking or jogging of the chart recorder or amplifiers has been cited by one sceptical critic as a likely source of fraud (Randi 1975). However, Hasted has always sited such equipment well out of reach of his subjects (1981b) and considers this source of fraud highly unlikely.

Hasted has also hinted that electronic devices could be constructed which could deliberately be used to generate artifactual signals by broadcasting random bursts of radio frequency oscillation (Hasted 1981a). This must also be regarded as an unlikely eventuality, since none of Hasted's subjects have had any electronics expertise nor do they seem to be aware of this possibility (ibid p59).

In sessions run with the dummy channel control for electromagnetic interference this source of artifact would rapidly be suspected because surreptitious radio transmissions would be detected by the dummy channel as well as the PK channel.

Hasted has commented in private communication (1984) that he has encountered no signs of subjects attempting to cheat at uPKMB tasks, although Stephen North did at one period tend to make involuntary movements towards the uPKMB target. But these occurred in response to the noise of a signal being registered by the chart recorder, after the event rather than simultaneous or prior to it.

A1.3.1 Validation of Micro-PKMB : Methodological Aspects

Only three studies have been presented by their authors as being specific attempts to validate the uPKMB effect (Hasted 1976a, Bersani & Martelli 1983, Mattuck & Hill 1977).

Hasted's decision not to expend effort on formal validation studies seems to originate from his belief that exploration of the physics of the phenomena is more important than protracted and probably futile attempts to convince sceptical groups who are actively hostile to the existence of psi phenomena. Much of relevance to the question of the validation of uPKMB can however be gathered by examination of Hasted's other published output.

Before considering these validation papers it seems worthwhile to attempt to outline the principal methodological requirements which should apply to validation studies of this sort. Prior consideration of these issues will create a context against which the published attempts can be more readily evaluated.

Ideally, controls on experimenter fraud should also be applied but as in the case of Hasted's paper lack of personnel and resources frequently prevent this. It should be noted that later uPKMB experimental sessions held by Hasted have sometimes involved several independent witnesses, although Hasted has shown a certain apparent lack of awareness of likely public and parapsychological response in not giving full details of these sessions (eg Hasted 1976a).

Two main requirements apply to validation studies as to any study of this type, namely freedom from instrumental artifact and freedom from subject fraud. The requirements are expanded and their principal methodological implications are listed below.

1. Known effective sources of instrumental artifact should either be excluded or if this is not possible should be detected independently of the response of the uPKMB channel.
2. Freedom from artifact introduced by the subject should be demonstrated by the running of control periods in the presence of the subject.
3. Control periods run in the absence of the subject should be performed to demonstrate the absence of instrumental artifacts.
4. Subject fraud should be prevented.

Although these requirements are desirable as methodological goals, the phenomenology of uPKMB makes the fulfillment of some of them difficult at times.

Requirement (1) is now routinely satisfied by Hasted's use of the dummy channel technique for detecting the presence of electromagnetic transients. Since 1979 Hasted has placed PK targets within an earthed screened enclosure in which the subject sits which has effectively removed this source of artifact from his data, although a dummy channel is still used (Hasted 1984).

Requirement (2) can be made very difficult by the lack of control shown by many uPKMB agents over their effects. Should they create uPKMB effects involuntarily during control periods it becomes unclear whether there is some form of subject-generated artifact present or whether they are spontaneously and unintentionally generating uPKMB effects. However, the use of subject rest periods interpolated between periods where they intend to produce effects can provide this facility and has been used routinely both by Hasted and in the author's studies reported later. Subjects differ greatly in their proneness to producing spontaneous effects in rest periods as is shown very strikingly by the results from the twelve session study (chapter 5).

Requirement (3) has been routinely satisfied by Hasted because quite long pre-session running (1/2 to 1 hour) of his strain gauge equipment is necessary for it to reach thermal steady state.

Requirement (4) is more complex. It is important to note that Hasted claims that he has not encountered attempts to cheat at witnessed uPKMB tasks (Hasted 1984) so that his precautions seem likely to have acted efficiently as deterrents to fraud.

It has already been noted that uPKMB methodology employs no-touch conditions as standard. A clear line of sight should always be available to the witness so that the gap between the subject and the target can always be seen. The distance between the subject and the PK target partly determines the degree of vigilance needed by witnesses, as also does the witness to subject distance. If the PK target is well beyond the reach of the subject, the movement necessary to reach it will tend to alert the witnesses automatically. The level of spontaneous movement shown by the subject is an important factor and subjects are normally encouraged to move as little as possible as this assists effective witnessing. Access by the subject to the PK target and electronic equipment should be prevented at all times, as this will prevent fixing of threads etc.

The screened enclosure used by Hasted is largely made from highly reflective aluminium sheets. These provide a system of mirrors encircling the subject which allows witnesses opportunity for unobtrusive observation of the subject (Hasted 1984).

A1.3.2 Identifying the Locus of PK

A systematic problem which affects any PK study employing more than very simple passive apparatus is that of identifying the locus of PK activity. In uPKMB studies the problem emerges in the form of the question of which part of the apparatus is affected by PK. Since uPKMB apparatus is most naturally divided into three sections, strain sensor, amplifier and chart recorder, the question arises of how the locus might be decided between these three components.

The standard approach which might be employed if PKMB were regarded as an essentially normal physical causal agent would be to use a dummy sensor to detect whether the PK were affecting the amplifier or chart recorder. If the strain sensor were found not to be the locus, two amplifiers could be used between which the signal were randomly switched (with the experimenter and subject being blind to which one was in use) to identify whether the amplifier or chart recorder were being affected by PK.

Hasted has adopted the dummy sensor approach (1981a) by using a resistive temperature sensor in place of a strain gauge and has never found signals appearing from it. This strongly suggests that the locus of the effect is not the amplifier or chart recorder.

Insulation and electrostatic shielding of the strain gauge in no way diminishes the signals, so that although paranormal electrical effects have been detected (see section A1.11), electrical effects might be thought to be excluded, so that the locus is firmly established as the metal target to which the strain gauge is bonded.

However, two problems beset this comforting view. The first is that Hasted has found evidence that the metal tracks of strain gauges seem sometimes to show evidence of attack by PK, suggesting direct strain action on the gauge itself (ibid p102).

The second is that there are some hints from the data on paranormal electrical effects suggesting that a possible PK mechanism may involve the direct injection of current into screened and insulated wires - teleportation on an atomic level (ibid p144).

If the latter mechanism is possible it makes pointless any except very elaborate attempts to define the locus of PK action using electronic equipment because the PK effects potentially could play capricious games in moving from locus to locus. Even so, a definitive identification of the locus may still not be possible.

The later work on paranormal conductivity (see section A1.11.3) suggests that temporary paranormal conduction paths could be created by PK which might cause significant effects on even medium impedance circuitry.

It should also be noted that in the area of PK experimentation which is currently most active, in which electronic random event generators (REGs) are used, the question of the locus of the effect is seen as largely irrelevant because the event of interest is regarded as a quantum reaction rendered macroscopically observable (Schmidt 1974). REGs are viewed in this way as being "black boxes". There is a case, for certain purposes involving psychological studies, for taking a similar view of uPKMB instrumentation. This will be discussed below (see chapter 5).

However since uPKMB targets used by Hasted have quite frequently shown signs of visible deformation the most parsimonious hypothesis is that the locus is indeed on the metal specimen rather than the equipment, although the logical possibility exists that multiple loci may be involved.

A1.3.3 Validation of UPKMB:Hasted's Study

The bulk of Hasted's (1976a) paper deals with methodological questions relevant to the validation of the macroscopic PKMB effect.

However, an account is given of an early uPKMB session which is presumably offered as evidence for the reality of the effect, although it is not clearly presented as an attempt at a formal validation of uPKMB. An account of the same session appears in Hasted's book (Hasted 1981a) and essentially similar conditions seem to have been in force for at least a subsequent eight sessions held with the same subject, Nicholas Williams, at his home. Details will be drawn freely from both sources, supplemented by information obtained by personal communication with Hasted.

Prior to the start of the experimental session Hasted arrived at the teenage subject's home. The subject left the house and did not return for more than an hour. The equipment was set up and allowed to perform a control run of more than an hour to demonstrate freedom from instrumental artifact.

The latchkey uPKMB target contained a well screened strain gauge which was situated in a slot in the metal of the key. The termination of the cable with the key was rigidly secured by epoxy resin. The key was suspended by its electrical lead from the mantlepiece opposite a sofa in the lounge, upon which Hasted and Williams sat during the session. The amplifier and chart recorder were positioned within a few feet of the key but well out of range of Williams' reach. There was no fire alight in the grate below the mantlepiece.

Upon the subject's return, he was introduced to the equipment and allowed manually to flex the latchkey in order to be shown that the chart recorder pen would respond to its deformation (it was the first time that Williams had seen the equipment). After this demonstration the key was checked to see that it was perfectly straight and was never again touched by Williams, although Hasted briefly touched it later when tracing its profile onto paper.

Hasted and Williams then sat alongside each other on the sofa which was situated about 2.5 metres from the mantlepiece. Hasted gave Williams pieces of cutlery to hold which became bent during the course of the session. His purpose in giving Williams the cutlery was twofold, partly to stimulate his PK and partly to ensure that his hands were full, providing a further safeguard against fraud. Williams did not leave the sofa during the course of the session.

In the initial stages of the session the chart recorder sensitivity was set at 100 mv (full scale deflection). Since only very small signals had appeared, after thirty two minutes Hasted increased the chart recorder sensitivity to 10 mV. During the next forty minutes the amplitude of the signals increased to the point where full scale deflections were frequently achieved. Hasted accordingly reduced the sensitivity of the chart recorder back to its original value of 100 mv but still full scale signals were recorded. After a further three minutes he reduced the chart recorder sensitivity still further to 1 volt but full scale deflections still persisted. Ten minutes later he reduced the sensitivity of the chart recorder to 10 volts. Some eight minutes later the chart paper ran out and the session was terminated.

The session had lasted a total of some two hours and during the later more violent phases observable deformations of the key had occurred. Hasted traced the key's profile, recorded the time and later measured the angle of the bends (Hasted 1976a). At 18.06 hr the angle was 10 degrees (all measurements are given as accurate to within 1 degree), at 18.11 it was 50 degrees, at 18.17 it was 12 degrees.

The decrease of bend angle revealed by the last measurement, although unexpected, provides further incidental evidence in favour of the validity of the recorded uPKMB signals, since between the 18.11 reading and the 18.17 reading, several very large signals in the reverse direction to the majority of the previous signals were recorded.

Hasted cites the great diversity of strain signals as evidence for their genuineness, since a fraudulent mechanism would presumably be unable to create the observed variety of magnitudes, polarities, rise and decay times and fine structure of the signals (ibid p374). Sections of the chart record produced from this session are reproduced in both accounts (ibid p372), although only those sections showing uPKMB activity are shown.

As accounts of a validation session, the descriptions published by Hasted are deficient in a number of respects because several pertinent details are missing. It was not explicitly stated that the control run had been performed, nor was it explicitly stated that no artifactual responses were recorded during the control run, although personal communication has established both of these points (Hasted 1984).

The accounts do not detail the movements, or lack of movements of subject and experimenter. Apparently Hasted and Williams were content to remain seated for two hours because Williams was intent upon relating to Hasted the series of ostensibly paranormal events which had happened in his home since Hasted had last visited (Hasted 1984). Hasted is certain that neither of them left the room during the session, and the only other occupant of the house, Williams' father, was not present in the lounge during the session (Hasted 1984).

Considering this account as supplemented by details obtained later, an evaluation of the evidence can be attempted. Several aspects of the evidence appear to favour a paranormal interpretation.

Firstly, the very large amplitude of the recorded signals is significant. When the key had been shown to Williams, and manually flexed, signals in the 100 mv range were created. During the ostensibly paranormal phase of bending, pen deflections representing several volts were recorded. If Williams were surreptitiously exerting normal manual force on the key of this magnitude his physical effort would have been obvious.

Secondly, there was a large gap between Williams and the key, so surreptitious manual interference does seem to be ruled out, especially in consideration of the fact that the PKMB activity as revealed by chart recorder was long lived and persistent. It is not as if events could be explained on the basis of there having been a single large fraudulent bend produced.

Explanation of the chart recorded signals as being due to electrical artifact of some kind, or any other form of instrumental artifact seems to be excluded by the fact that visible deformation of the key occurred.

What seems to be left is a clear choice between either assuming that Hasted's observational powers are drastically impaired in some unobvious way, or that he is fraudulent, or else that the events were genuine.

In the last of the series of eight sessions conducted with Williams at his home, a videotape recording was made of the latchkey PK target which shows it during periods when uPKMB strains were registered. In addition an independent witness was present. Other features of the series of sessions with Williams relevant to validation have been discussed in section 1.6.2.

A1.3.4 The Italian Validation Experiments

The Bersani and Martelli paper (1983) represents a relatively brief selection of material taken from their reported total of 194 planned experiments spanning the years from 1975 to 1978.

Unfortunately the main bulk of this material is not available in English translation nor has it yet been published in Italian. Bersani is a physicist working at the physics institute of the University of Bologna and his group's researches appear to have been directed principally towards validation of various PKMB effects and attempts at controlled observation of a fairly wide range of other putative PK phenomena. Their work seems to be mainly exploratory in character, little analytical investigation of physical effects having been done.

The authors state that the accounts included in this paper represent the best of their results obtained under the most satisfactory conditions of control that they managed to achieve (ibid p101). Their macro PKMB validation attempts are reviewed in chapter 1, section 1.6.4.

They cite two instances where visually observable bends were obtained with specimens which were equipped with strain gauges. Strictly speaking these are therefore macroscopic PKMB events, but since instrumental registration of the bends was obtained this work seems more logically reviewed in conjunction with other strain gauge based uPKMB studies than elsewhere.

The experimenters used no form of control procedure or dummy channel technique to exclude possible artifact due to electrical causes. However, the fact that observable deformation were obtained and the other circumstances of these events make it seem unlikely that the signals recorded were artifacts.

A positive feature of their methodology was the employment of two professional magicians as consultants whose comments are appended to the accounts of each test. Unfortunately the magicians were not present at the test sites or at the experiments themselves but were told of the circumstances of the experiments later by the experimenters. This is a weakness, since there may have been features of the environment or events which could have had a bearing upon the evaluation of the results which escaped the notice of the experimenters, or selective recall may have altered the accounts given.

There are several weaknesses in the descriptions given where relevant details are not provided. The account does not state explicitly that the magicians were allowed to examine relevant experimental equipment (such as the sealed boxes extensively used to contain PKMB target specimens), although personal communication with

Bersani (1984) has established that they were and has clarified some other points (see below).

Some of the magicians' comments imply an extreme degree of scepticism so that presumably their acceptance of protocols would not easily be gained.

Experiment number PE69 (also enumerated as experiment number 4 in their 1983 paper) was performed at the Physics Institute of the University of Bologna in 1975. It was conducted to investigate the rate of PK bending of a zinc strip of dimensions 60 x 9 x 1 mm which had a strain gauge bonded to its center along the major axis (details of the instrumentation are given in their paper). The strip was placed on the upturned legs of a "U" shaped support placed on a table. The strain gauge amplifier and chart recorder were placed on a separate table in the same room.

The experimental session started at 16.50 pm in the presence of the subject, Orlando Bragante and his mother and Bersani and Martelli. At about 18.30 Bersani left the room. After some time Bragante, who had been under close observation by the remaining experimenter Martelli, asked if he might take a short walk outside the room.

While he was outside in the corridor he suddenly complained of cardiac palpitations (a symptom occurring fairly often with this subject). Martelli and the boy's mother immediately went into the corridor where Bragante quickly recovered. Martelli immediately returned to the experimental room and found that the strip was bent and that the pen of the chart recorder had briefly gone off-scale and had then returned to a position different from the original baseline.

Martelli had observed the exact position of the pen immediately upon his return. From the rate of the chart paper travel and from the results of a control trial involving the rapid manual bending of an identical strip the experimenters calculated that no more than two seconds could have elapsed between the event and its discovery by Martelli (ibid p113).

At the moment of the event's occurrence both Bragante and his mother were therefore still outside the room, making direct fraud impossible. If Bragante's mother had surreptitously bent the strip whilst leaving the room the trace left on the chart record could not have shown the time of action that it did.

The magician A accepted the event as genuine, whilst the other, V.G. suggested that the event could have been random. This latter seems somewhat unlikely since if stable structures such as zinc strips suddenly were to bend for no reason this type of behaviour would certainly have been discovered before now by the physics community.

The second experiment, PE95 (number 6 in the 1983 paper) was performed in a laboratory connected with the Medicina Radiotelescope installation of the University of Bologna. Its purpose was the attempted validation of PKMB with strain gauge recording and videotape visual documentation.

The PK target was an aluminium strip (70 x 10 x 2 mm) which was supported on the upward pointing legs of a U shaped perspex support. This assembly was placed inside a rectangular perspex box having all but one of its sides glued together with acrylic resin.

The remaining end panel had had its edges chamfered at 45 degrees to fit the similarly chamfered ends of the sides, top and floor of the box. The end panel was secured so that its chamfered edges mated tightly with those of the box by means of tight loops of wire drawn through small holes in each of its sides and in corresponding positions in the mated panels, the four loops being secured with lead seals bearing non standard original impressions. A sealing tape was wound around the box including the detachable end panel and was sealed to the box by means of wax seals bearing original impressions.

Two electrical wires were taken from the strain gauge to a pair of contacts mounted on the detachable end panel. From these contacts a screened wire led the signal to an amplifier placed in a locked enclosure. The output of the amplifier was conveyed to the chart recorder located in a room on the floor below by means of two screened cables. Two chart recorder channels were used, differing in sensitivity by a factor of ten. The chart record included a time calibration signal provided by a quartz clock at one minute intervals.

The experiment started at 16.00 hrs and the subject, Orlando Bragante, asked that the video recording should not be used for his first attempt. After half an hour's trial he asked to be allowed to hold the strip for a while in order to establish psychological contact with it. The box was opened and the subject was permitted to handle the strip for ten minutes.

It was then taken from the subject, carefully examined, photographed, and placed back in the box which was then resealed. The strip was unbroken and perfectly straight at this stage.

Although this important detail is missing from the published account, Bersani kept the seals in another locked room within the building and the subject was unaware of which room this was. The old seals from the box were carefully kept under Bersani's control and the device which impressed the seals was kept on his person (Bersani 1984). Bragante could not therefore have obtained replacement seals nor impressed them.

The subject was left alone in the experimental room while the experimenter went and stayed in the room in which the chart recorder was located. At 17.05 pm the subject visited the experimenter and requested that he stay there even if signals should appear on the chart record. The subject then returned to the experimental room and at 17.06 a series of signals were recorded which lasted nearly two minutes. Two minutes later Bragante returned to the experimenter and said that something had happened.

When the experimenter arrived in the experimental room he found the perspex box intact but the U shaped support inside overturned. The aluminium strip was fractured into two pieces which were only held together by the strain gauge which bridged the fracture.

In their paper the experimenters interpret the chart recording as being a series of close negative and positive peaks looking almost as if the strip had been alternately bent first one way and then the other by a pair of invisible hands (ibid p117).

Inevitably this raises the question of whether Bragante had somehow been able to do this manually. However, careful examination of the relevant section of the chart record, which is reproduced in the paper (ibid p 119) reveals that it is by no means a record of simple to and fro bendings of the strip. The strain signals in every case are nowhere even approximately equal in amplitude in each direction, nor in most cases are the signals in one direction immediately followed by signals in the opposite direction. The authors' description is thus highly misleading.

The magician V.G. in his comments on the experiment questioned whether the box might not be openable without damaging the seals. The experimenters deny this and remark that at the time of writing the box is still intact and is available for inspection.

Magician A hypothesised that perhaps the strip had been broken at the time of Bragante's handling of it and that Bragante's unwitnessed shaking of the box could have produced overt breaking of the strip and the chart recorded signals. The authors comment that a fracture in the strip would have been observed prior to its replacement in the box. Unfortunately their photographs failed to come out, so that documentary proof of this is missing.

In conclusion, it appears that the events cited by Bersani and Martelli constitute reasonably good evidence for the reality of PKMB. Probably the first incident is more convincing than the second, because the subject and his mother were not in the same room as the PK target at the time of PK action.

A1.3.5 The Mattuck and Hill Validation

Mattuck and Hill (1977) have published an account of a validation attempt performed with Girard. Only one deformation event of several is claimed as highly evidential.

A bar of dimensions 250 x 20 x 3 mm was equipped with two strain gauges which were stated to have been bonded on to it with acrylic resin (probably cyanoacrylate - "superglue"). A polyester sealing compound had been spread over the strain gauges. One gauge was situated at the center of the bar, on the opposite side to a saw-cut (1 mm wide by 0.9 mm deep) made in it. The other was located on the same side but 53 mm from the central one.

Girard took the bar in one hand, lightly stroked it and it bent. The strain gauges were not connected to the amplifier during this period, but the outputs from the center strain gauge were different after the bend, which was of 6.7 degrees.

The change in the output represents a stretching, and it is this which establishes the paranormality of the event in the judgement of the authors. The center strain gauge was located on the concave side of the bend, so ought to have experienced compression. However, the reading given indicated a stretching and the polyester covering of the gauge showed no compressional wrinkles after the bend.

The authors tested similar bars and strain gauges and found that in every case, manual bending produced signals indicative of compression, and compressional wrinkles in the polyester sealing compound.

They then hypothesised that perhaps the acrylate bond holding the center strain gauge on the experimental bar had failed so that they conducted tests using three types of bonding, (i) a perfect bond, (ii) a poor bond and (iii) no bond. In every case compression signals were produced upon manual bending of the bar. They also varied the manner of bending, the time taken by deformation, the thickness of the polyester sealing compound and applied tension, heating and compression to the sealing compound.

With the electronic equipment in use it was found that these different conditions led to a range of recorded outputs from the strain gauge of between - 4 volts to - 0.3 volts. Heating reduced these figures by about 20%.

The change in output from the strain gauge before and after the ostensible PKMB event had been + 40 mv, corresponding to a stretching of some 0.001 mm (calibration tests had been performed on the bar prior to the validation attempt). Drift of this direction and magnitude in the amplification system seemed unlikely to the authors because it had shown no drift before or after the ostensible PKMB event.

The event was considered evidential by the authors because although only 8 kg applied 110 mm from the bending point was found enough to create the bend angle by normal means, which would have produced compression of the strain gauge, to stretch the bar by 0.001

mm would have required approximately 1 ton of tension.

The authors suggest that the action may have been caused by PK-induced softening of the bar accompanied by slight tension. This is a result strongly suggestive of genuine PKMB, because of the anomalous output of the strain gauge.

A1.4.1 Hasted's "Surface of Action" in PKMB

Hasted's approach to the conceptualisation of PKMB has been to propose the idea that PKMB could be regarded as being performed by a "surface of action". The surface of action concept has played a dominant role in Hasted's theorising about PKMB (Hasted 1981a). He defines this as (Hasted 1977a) :-

> "A geometrical surface over which paranormal bending forces are potentially exerted on solid specimens placed in that surface."

The concept was formulated in response to some early findings in the series of sessions held with Nicholas Williams, the first of which was presented as evidence for the validation of uPKMB and reviewed above in section A1.3.3.

The crucial finding which precipitated the formulation of the surface of action concept was that apparently synchronous strain events took place on widely separated latchkey uPKMB sensors. Hasted proposed that if synchronous strain events were experienced by separated sensors a surface of action must connect them, exerting strain on them simultaneously (Hasted 1977a).

Contradicting the simplest hypothesis that a spherical surface of uPKMB "action" propagates outwards in all directions equally with the subject at its center, Hasted found (ibid p586) that the most characteristic disposition of synchronous strain events appeared to occur in a vertical plane which spread out in only one horizontal direction radially from the subject at its center. Thus synchronisms would be found to occur to sensors positioned at different distances from the subject but lying on a vertical plane intersecting their body. This appears to be Hasted's most significant conclusion regarding these early sessions (Hasted 1977a).

In order to be able to conduct investigations into the configuration of the surface of action it was essential that the subject remain immobile in one position for extended periods. Hasted immobilised his early subject Nicholas Williams by placing him at a table at which he constructed model aircraft from kits during the course of uPKMB sessions (Hasted 1981a).

Five different uPKMB target configurations were used. Each took the subject as the nodal point of the configuration.

The opposite horizontal (OH) configuration employed PK targets being placed at equal distances from the subject on opposite sides, to front and rear.

The equidistance horizontal (EH) configuration involved PK targets being placed at points on the circumference of a horizontal circle around the subject.

The radial horizontal (RH) configuration involved placing PK targets on a line forming a radius extending outwards from the subject.

The vertical (V) configuration involved two targets being placed at the same horizontal distance from the subject, one being placed vertically above the other.

The radial horizontal vertical (RHV) configuration combined the RH and V configurations, two PK targets being placed on a line extending radially from the subject, whilst a third was placed vertically above the nearer of the two.

Except for the RHV configuration, only two strain gauge latchkey sensors were used in each configuration.

Distance from the subject to the sensors was approximately three meters (a feature relevant to the validation aspects of these sessions). Distances between sensors were usually just over a meter except in the CH configuration where the separation was about three meters. The maximum error of the chart recorder in showing synchronous signals as being simultaneous was estimated at about 0.2 seconds (Hasted 1981a).

Hasted's conclusions regarding the properties of the hypothetical surface of action must be treated with great caution.

He has intimated that he regards this construct as only an approximate and tentative model (Hasted 1977a) which may only hold for relatively large-scale features of uPKMB (Hasted 1979a).

Later work on localisation of uPKMB strains (Hasted 1979a) clearly showed that the concept breaks down over short (mm) distances and Hasted's use of the construct is not without possible internal contradictions or at very least an unacceptable degree of unfalsifiable freedom from self contradiction bought by further additional attributions of properties to the surface of action.

A brief critical review of some of the faults and limitations of Hasted's experimental methodology employed in his surface of action studies and of his use of the concept seems justified since these faults rather clearly illustrate some of the problems which quite generally affect some types of physics investigations of PK and which are inevitable in these areas.

A limitation specific to Hasted's studies is that only two or three PK targets were used. Although up to five sensors were used in a later repetition of this work (Hasted 1981a), such small numbers of sensors cannot be taken to define adequately planes extending several meters through space. In addition, the sensors were placed in a very limited total number of locations during these experiments.

In his tabulated results (ibid p70) the numbers of synchronous signals per configuration is in no case more than 10, and non synchronous signal numbers per configuration is 3 or less except for the EH configuration number of 13. These numbers are clearly too low to establish statistically significant relationships within the data. Any generalisation from this data must therefore be regarded as purely suggestive.

A quite general but severe and central methodological problem affecting any attempt to identify physical characteristics or mechanisms of PK events is the possible confounding of apparently physical features by uncontrolled psychological factors. This danger of confounding can only be avoided by experimentation which has been carefully formulated to avoid it.

Hasted appears to have disregarded this important potential source of bias in his data. Specific confounding factors are plentiful. First, neither subject nor experimenter were blind to the sensor configuration under test.

Secondly, from his account it is clear that the PK task as presented to the subject changed through the series of sessions. At first the subject was relatively uninterested in the patterns of uPKMB signals detected. As the series progressed he became increasingly involved with the task which became that of producing synchronisms. Thus both the task and degree of motivation also changed through the series (ibid p66).

Other possibly salient factors which might have caused differential responses are task preferences, perceived task difficulty, order effects, perseveration and compliance to the experimenter's beliefs about the phenomena.

Although there seems to be a trend in the data from the first series (ibid p71) which was maintained in the second, in which North was the subject, which suggests that synchronisms are most readily obtained in a descending order through the configurations RV, RH, EV the trend may only result from psychological factors rather than truly reflecting physical realities. Hasted states quite openly that by the end of the Nicholas Williams series he had learnt to produce synchronisms on pairs of sensors in any configuration (Hasted 1977a).

Hasted's preference for construing the surface of action as characteristically occupying a vertical plane seems therefore purely to be based on a willingness to generalise from his available data, which as has been seen is both insufficient in quantity and probably subject to multiple uncontrolled sources of error.

This view is reinforced by Hasted's noting of strong individual differences between his principal subjects Nicholas Williams and Stephen North (ibid p71). North conceptualised his effects as somehow originating from his hands and he could only reliably generate effects at up to about 1 meter from himself. Williams seemed not to conceptualise the effects as being associated with his hands and regularly created effects at 5 meters from himself and on one occasion created effects at 10 meters from himself (ibid p54). In the context of these striking differences between subjects any inference to underlying physical regularities seems premature because of the high probability that they will be overlaid by powerful psychologically derived biases.

Hasted was criticised in a review of his book (Stokes 1981) for apparently contradicting his original concept of the surface of action in his interpretation of a later experiment with Stephen North.

In the experiment a circular disc equipped with three strain gauges was mounted about 10 mm above North's forearm (Hasted 1981a). Another uPKMB target was sited in front of him about 150 mm in front of his hand (Hasted 1979a). The purpose of the experiment was to investigate the angular orientation of uPKMB strains in relation to North's forearm (as he conceptualised his uPKMB as somehow related to his hands) and to see if synchronous signals were received on the forearm and distant sensors.

No consistent angular relationship was found but an interesting temporal relationship emerged as signals on the rosette were seemingly consistently followed by signals on the more distant sensor (Hasted does not report the raw data demonstrating this relationship).

Hasted had been expecting synchronisms, in conformity with his earlier construal of the surface of action as occupying a vertical plane (which would intersect both forearm and distant sensors, causing synchronisms). But instead of interpreting this result as a contradiction to his hypothesis he talks of it suggesting that the surface of action was moving, although slowly (ibid p73).

If the movement is pictured as proceeding in a radial direction outward from the subject (as Stokes presumably did), this would be in direct contradiction to the original formulation of the concept. However, the vertical plane could be imagined as swinging slowly around with the subject at its center, which would prevent a direct contradiction, although at the cost of making an uncomfortably ad hoc assumption.

At one point Hasted states (ibid p73) that Stephen North may produce two surfaces of action, one originating from each hand.

From these uses of the concept of the surface of action, it is clear that it could be modified to fit virtually any results whatsoever. It seems to be implicit in Hasted's notion of the surface that it can be construed as having a relatively complex geometry, such as being bent or folded, and if it can move, then synchronisms (or lack of them) could be predicted for virtually any configuration of sensors (ibid p71). This situation is obviously a reflection of the very early state of research in this field.

Within the Nicholas Williams data many apparently permanent deformations were recorded which were not accompanied by visible bending of the specimen. This finding raised the question of whether the action were really bending or else might be extensions only.

Hasted accordingly equipped a strip with three strain gauges and found that two adjascent ones registered contractions whilst the third registered extension (ibid p77). From this early finding the concepts of the localisations of action and "regions of action" were developed.

Strain gauges were bonded to both sides of strips of different thickness. Monitoring of both sides allowed bending to be discriminated from extension or contraction, because bending would involve extension on the convex face and contraction on the concave, whereas pure extension or contraction would produce similar signed signals from both strain gauges. It was found that the ratio of bending to extension varied according to the thickness of the specimens, thin specimens (0.75 mm) showing nearly pure bending, whereas thick ones (6.5 mm) showed a preponderance of extension (ibid p80).

These results were interpreted as probably being psychological in origin. Thin specimens were seen as bendable, thick ones not (ibid p78). From a validation viewpoint it should be noted that the production by unassisted hands of extensions in 6.5 mm thick strips without production of significant bending is impossible.

The question of the distribution of dynamic strains through the entire volume of specimens was next addressed. Two specimens were used (Hasted & Robertson 1979a p10). One was constructed by the epoxy resin bonding of 9 aluminium strips of 0.78 mm thickness and 60 mm length into a thick multilayer bar. This specimen was paranormally fractured in its first use, so a second specimen was cast and machined which was composed of a bismuth, tin and cadmium alloy which had slots milled in it at two depths within its thickness. Each specimen was equipped with six strain gauges, one on each top and bottom surface and four located at intervals through the thickness of the bars.

The specimens were exposed to North under witnessed (by Hasted and Robertson) no-touch conditions. The six strain gauges were assigned to the six channels of two three channel chart recorders, so that no dummy channel was employed. Hasted states that hundreds of signals were obtained during the three sessions employing these specimens but his table (Hasted 1981a) only shows 119 signals.

The results were some of the most important found by Hasted because it appeared that changes of sign between gauges located at different depths were common. Changes of sign represent change from extension to contraction or vice versa.

The complex picture of strains so revealed could not be produced by manual bending of the specimen, so that again evidence for the validation of the effect is indirectly provided by these results.

For six gauges there are five values that the number of changes in sign between adjacent gauges could take - from no changes to four changes. The number of signals showing no change was 17, one change 31, two changes 30, three changes 33 and four changes 8 (ibid p82).

Hasted concluded from this that, rather than construing the action as metal bending, regarding it as attempted metal-churning would be more accurate (Hasted 1979a). This finding decisively contradicts the idea of PKMB as being a simple form of unidirectional bending and hints, as do the later findings on localisation (Hasted 1980), that the action may well extend down in turbulent form to much smaller dimensions, possibly to even molecular or atomic sizes.

It was this finding which forced Hasted to redefine the surface of action (Hasted 1981a) as :-

> "...only a macroscopic model, applicable over distances of several centimeters or metres and not necessarily valid on a microscopic scale. It still might be regarded as a sort of extension of the subject's arm, but it is more of a slab-like region than a surface."

Presumably the slab-like region contains much fine detail in order to account for strain gauge signals of opposite sign occurring in close proximity.

Strain gauges were then incorporated into solid metal spheres and cubes (ibid p83). Results were complex and only those with the sphere (of 23 mm diameter) were reported. the strain gauges were mounted within the sphere at orientations of 0, 60, 120, and 180 degrees with respect to the line joining subject and sphere. Respective summed signal strengths from these positions were in the ratio 501, 78, 46 and 1 (ibid p83). Hasted interprets these results as possibly showing the screening effects of very great thicknesses of metal, but psychological factors could equally as well be responsible. From a validation viewpoint the sphere results are valuable since manual squeezing produced no signals atall (ibid p83).

A1.4.2 Movement of the Surface of Action

As has been seen from the preceding section, postulation of movement of the surface of action is fraught with difficulties, because the path and geometry of the hypothetical surface cannot be known independently of the strain gauge signals which form the basis for estimates of direction and velocity. Hasted shows an awareness of this problem (ibid p85) but cites a speed range between 10 and 1000 mm/sec.

He goes on to cite other findings which he regards as being evidence relating to the speed of movement of the hypothetical surface of action. Principal amongst these is that complex inter-folded strip structures have been produced apparently without touch by some subjects.

Hasted relates an instance (ibid p88) where two thin (300 x 8 x 0.75 mm) aluminium strips were placed on a table in Nicholas Williams' bedroom. Hasted and Williams left the room and stayed outside the door from where they could hear scratching noises as if the strips were moving on their own. On re-entering the room the strips were seen to be interfolded, the free end of one of them being twisted.

Hasted interprets the action as involving the surface of action rotating about an axis in its own plane. The surface is hypothesised as being caught between the two strips and as it rotates it clings to them and causes them to form into folds.

Hasted recorded the speed of this folding indirectly by substituting a magnetised tinplate strip for one of the aluminium strips and detecting magnetic field changes caused by the folding by means of a fluxgate magnetometer placed near the table top which was connected to a chart recorder, producing a permanent visual record (ibid p88). As before, both Hasted and Williams were outside the room at the time of PK action.

Since there were simple proportional relationships between the numbers of folds or twists and the numbers of peaks in the chart record Hasted takes these results as reliable and indicative of rotation rates of up to three revolutions per second. This of course does not answer the question about possible linear rates of movement which remain largely unresearched.

A significant finding related to folding was that the pitches of the spirals produced in strips of different width (but identical thickness and alloy composition) indicate a constant magnitude of quasi-force as being applied (ibid p90). Thus wide strips have shallower spirals produced in them than narrow strips.

A1.4.3 Distance Effects and the "Region of Action"

Hasted states that he believes the mind of the PK agent to be the principal factor shaping PKMB phenomena, so that the fall-off of uPKMB signals with distance may be determined by psychological differences between subjects, rather than by some purely physical law.

He reports that analysis of the signals obtained in the radial horizontal configuration from Nicholas Williams showed a largely random relationship between distance and signal strength (ibid p92).

Whilst this result may appear surprising or even unacceptable from the viewpoint of conventional physics which is familiar with classical amplitude/source-distance relationships, it is consistent with other psi phenomena such as ESP which shows no apparent fall-off with distance (Rhine & Pratt 1962).

Nevertheless, Hasted concedes that PKMB does show some distance/amplitude relationships, because effects seem not to be obtainable across psychologically significant boundaries, such as between rooms or when the subject is outside the building in which the equipment is located (ibid p98).

Hasted performed several sessions with Stephen North in which the relationship between signal strength and distance was explored.

Rather than using isolated sensors at varying distances his approach was to utilise several strain gauges mounted at different positions along a long thin aluminium strip because synchronous signals are less commonly obtained on separated strips than on one long strip. Synchronous signals would prima facie appear to be better candidates as signals to compare in amplitude than non synchronous signals since synchronous signals could be regarded as all being part of the same strain event.

The degree to which dynamic strains might be transmitted as shock waves along the strip was checked by the creation of normal pulses at the position of one of the strain gauges. Hasted states that it was found that the other strain gauges did not show significant outputs (ibid p93). Calibration of the individual strain gauges with each other was performed by subjecting the entire strip to stretching and correction was applied for differences in sensitivity (ibid p93).

Strips bearing three, five and six strain gauges were exposed to North during several sessions. The strip bearing three strain gauges was exposed a total of eight times, some exposures being to two other PKMB agents (ibid p94). There were more than four sessions conducted using five gauges. Sessions employing five gauges also incorporated a dummy channel, the others apparently did not. The five gauges were separated from each other by 35 mm distances, the strip dimensions being 203 x 11 x 1.1 mm.

Hasted found the best conceptualisation of the resultant data was in terms of a "region of action" containing a "center of action". The amplitude of the strain was assumed to fit a Gaussian distribution about the center of action.

Three data points can always be fitted to a Gaussian distribution, so that the precision of fit for the series employing three strain gauges constituted no test of the distribution being truly Gaussian. Although the fitting of the data points to this distribution was less accurate for the five and six strain gauge measurements the distribution appeared to hold to a fair approximation (Hasted & Robertson 1980a). The region of action was estimated to be of about 200 mm width (ibid p383).

The position of the center of action was found to be variable. In the first session using three gauges the one nearest North produced the largest signals but for the rest of the three gauge series it appeared to be located in the middle of the strip (Hasted 1981a). In the series employing five strain gauges North was asked at one point to try to move the center of action further away from the end of the strip nearest to him, which he is reported to have succeeded in doing, moving it 114 mm further away (Hasted & Robertson 1980a).

The question as to how small a region of uPKMB action can be is an interesting enquiry implied by this approach. Unfortunately very little work has been addressed to this question.

A1.4.4 Localisation of uPKMB Events

The smallest spatial resolution of strain signals obtainable with strain gauge arrays mounted contiguously in line is obviously dependent upon the size of the strain gauge used in the array. Five miniature strain gauges of 2 mm width were used by Hasted in one session with Stephen North (Hasted & Robertson 1980a). The histogram of his results show localisation of the effects to dimensions of between 4 and 1.75 mm (ibid p383). A probable implication of this data is that localisation may occur down to yet smaller dimensions, but this has not yet been checked.

A1.4.5 The Orientation of Strain Directions in Specimens

A question that is relevant to the methodology used in Hasted's strain-gauge-and-strip approach to uPKMB is that concerning the orientation of strain vectors in relation to the placement of the strain gauges on the metal specimens used. If the gauges are not set oriented to the axis of the dynamic strains, signal strengths will be affected by the relative orientations of gauge and strain vectors.

The obvious assumption, given that long strips (relative to their width) are always bent at right angles to their length (ostensibly paranormally) and never bent into long tubes, is that the action occurs in or near to the direction of the major axis. This assumption naturally leads to strain gauges being bonded to strips with their long axis parallel to the long axis of the strip.

Seeking to check this assumption Hasted therefore used a shorter and broader strip than usual (Hasted & Robertson 1979a) of dimensions 135 x 18 x 7.5 mm and mounted a strain gauge across the width of the strip as well as one along the strip. Smaller signals were produced by the cross-breadth gauge than the gauge placed longitudinally. But when a wider strip was used, larger signals were generated on the cross-breadth gauge.

Hasted therefore decided to investigate systematically the orientation of strain vectors (ibid p13). Since psychological factors might produce strains in psychologically preferred directions on long strips he utilised a circular (37 mm dia) sheet specimen, hung vertically radially in front of the subject (North) or suspended about 10 mm above his forearm, and a square (50 mm/side) sheet specimen suspended vertically from one corner. Three strain gauges were mounted at the center of the specimens, two being orthogonal to each other, the third being placed on the 45 degree line bisecting the right angle between them. This configuration is adequate to resolve two orthogonal strain vectors (Hasted 1981a). The sessions were witnessed as usual by both Hasted and Robertson.

Normal strains produced by stretching in one direction produce a corresponding contraction in the orthogonal direction. It is therefore of interest that some 20% of extensions observed in the square were accompanied by extensions in the orthogonal direction and some 50% of all signals observed in sessions with the circular disc mounted on the subject's arm were of the same type (Hasted & Robertson 1979a).

The corresponding action represents at least two independent extensions in mutually orthogonal directions and may be more complex still. From a validation viewpoint this complex pattern of strain could not easily be produced by a single unassisted pair of hands.

The overall results obtained with the square target are stated by Hasted to show no predominant orientation of strain vectors either parallel to the sides of the square or in a horizontal or vertical plane (ibid p15). A histogram is reproduced (ibid p16) which apparently does show a clear preferred direction of strain, but although biasses of this sort were encountered in individual sessions, no overall predominant preferred direction is obvious, although statistical analysis of the results has not been performed (Hasted 1984). Similar results were reported for the disc suspended above North's forearm (ibid p15).

A1.4.6 Changes from Extension to Contraction

A consistent characteristic of the uPKMB signals observed in all of

Hasted's work has been the frequent change at the site of any one strain gauge between signals of positive and negative polarity. Changes in polarity represent changes from extension to contraction or vice versa. This prompted Hasted to develop measures of the frequency of polarity changes (Hasted 1981a). Rates of change in polarity varied but were usually in the region of once for every five signals (ibid p81). The observed changes in polarity were not found by Hasted to correlate with any obvious physical or psychological factors he could identify and seemed independent of signal amplitude.

A1.5.1 Hasted's Use of Piezoelectric UPKMB Sensors

Hasted has published only one paper reporting his use of piezoelectric materials for detecting uPKMB effects (Hasted 1983). The work reported in this paper is purely exploratory and most of the paper's content is devoted either to exposition of the properties of the piezoelectric materials used, the details of the instrumentation methodology or else psychological observations.

Hasted favours the use of low impedance amplifier inputs for piezoelectric strain sensors because this reduces their susceptibility to reception of airborne electromagnetic transients although it also greatly reduces their sensitivity to slower rise time dynamic strain pulses. However Kennedy's group has used the superior techniqe of charge amplification which gives both improved low frequency response and freedom from reception of electromagnetic artifact and appears to be the optimum form of input conditioning circuit for piezoelectric transducers (see below).

Hasted points out that the fundamental difference between piezoelectric strain sensors and resistive strain gauges is that the piezo voltage output is proportional to the rate of change of strain, rather than being proportional to the amplitude of the strain, as is the output of resistive strain gauges.

The results of comparison tests between strain gauges and piezoelectric sensors are reported. However, the sensitivity of the two strain sensors are not fundamentally comparable, since they respond to different characteristics of strains (change with time vs absolute amplitude). Hasted's solution to this problem was to expose both strain sensors on the same specimen and so empirically determine which type produced most signals.

The two different sensors were mounted at the same positions on opposite sides of an aluminium strip of dimensions 150 x 12 x 0.8 mm. The strip was placed horizontally in a radial orientation to the subject. Sessions with Stephen North and Willy G were held in Hasted's screened enclosure at Birkbeck. A dummy channel was used and witnessing was performed by both experimenters and sometimes additional witnesses. Control runs of 30 minutes in the absence of subjects were performed prior to each experimental session to check freedom from instrumental artifacts.

In North's first session 7 signals were obtained on the strain gauge only, 13 on the piezo sensor only and 4 on both channels. In North's subsequent three sessions and in all three sessions with the other two subjects nearly all of the signals were only recorded by the piezo channel (ibid).

However, Hasted mentions that superior sensitivity in the piezo channel was available for sessions after the first owing to reduction of the noise factor of the amplifier by changes in the electronics - although no details of these changes are given.

The results appeared to show that piezoelectric sensors are more sensitive to uPKMB than strain gauges. Whilst this is almost certainly true, several weaknesses of procedure and reporting reduce the value of this study.

Thus the novelty of the new piezo targets may have stimulated the principal subject Stephen North into preferentially producing signals on them. Hasted's earlier studies of localisation provide sufficient evidence to justify the hypothesis that effects could be selectively localised to the piezoelectric sensor itself (Hasted 1980a).

In addition, no minimum levels of chart recorder pen deflection are stated so as to define criteria for deflections to be counted as signals, nor is the strain gauge amplifier noise factor and gain stated, although the piezo amplifier is stated to have a gain of x100 (and previously published circuits of Hasted's strain gauge amplifiers (eg Hasted 1976a) show gains of x300).

Since the piezo based work appeared to show that uPKMB dynamic strains are of fast rise time Hasted concedes in this paper that the slow rise time of his chart recorders used in previous strain gauge based studies may have prevented the acquisition of potentially important data because the chart recorder pen could not follow rapid changes in signal voltage. UPKMB events of short durations (< 50 mS) would be heavily attenuated, shorter duration events (<10 mS) probably not being registered atall, the degree of attenuation being relative to the amplitude of the signals, large signals being attenuated relatively more than small ones. But the differentiating function of Hasted's input circuitry would be bound to produce fast responses to signals, since it could not produce slow ones, due to its differentiating action and its restricted low frequency response. The direct feedback series of sessions (chapter 7) demonstrated that the main component of uPKMB signals probably lies between 1 - 10 Hz.

A1.5.2 Kelly's Piezo-Based Instrumentation

The group centered around E.F.Kelly, formerly at the electrical engineering department of Duke University (N.C. USA) was alerted to the possible role of piezo based uPKMB detection systems for use in electrophysiological studies correlating PK with EEG and other measures by Isaacs. The group's primary interest lies in physiological studies and it subsequently developed its own piezoelectric sensor and conditioning circuitry (Dunseath 1983).

The piezo input signal conditioning circuitry employed by Dunseath differs from Hasted's approach in using a charge amplification technique (Sheingold 1980) which combines the virtues of resistance to reception of electromagnetic interference without the sacrifice of sensitivity at low frequencies inherent in Hasted's low impedance input circuitry.

Experimental work with this equipment appears to be in a preliminary stage. Reference is made to pilot sessions run with ostensible PK agents to check equipment functioning where subjects created signals having signal to noise ratios better than 15 : 1, but full details are not given. More than one subject was found who was capable of creating effects upon the apparatus (ibid p9). Control periods were used before and after experimental sessions and the detection system includes monitoring for both acoustic noise, vibration and electromagnetic interference (ibid p8). The system appears to be impressively well engineered and well thought out.

A1.6.1 Structural Effects

An obviously salient question relative to PKMB is whether psychokinetic "treatment" by PK agents causes changes to the observable properties or internal structural composition of metal specimens which are unique to paranormal metal bending. Such changes might be used as criteria to separate genuine paranormal metal bending from fraudulent simulations. Several groups have performed various types of metallurgical analysis on specimens given ostensible PKMB treatment (Hasted 1981a, Franklin 1974, Crussard & Bouvaist 1978, Scutt 1981, Sasaki et al 1976).

A serious problem affecting any attempt of this sort is that if significantly deformed specimens are submitted to examination, structural changes which are due to normal components of the deformation process may mask those which are paranormal in origin. Samples which show no deformation or only a minimal degree are therefore the most suitable for metallurgical analysis. The studies reported can therefore usefully be divided into those conducted on essentially non-deformed specimens, those conducted on significantly deformed specimens, and those employing fractured specimens.

A1.6.2 Hardness Changes

Sasaki reports a carefully controlled study of changes in the hardness of undeformed specimens of aluminium plate (Sasaki et al 1979). The 120 x 20 x 1 mm specimens of 99.99% purity were first annealed in vacuo. For exposure to the subjects, the specimen was taped, using transparent tape, to a flat bakelite back-plate, care being taken to avoid distortion of the specimen. Matchstick wooden spacers were then placed around the edge of the back-plate and a 1.5 mm thick glass plate was placed on top and fixed in place by tape. This form of assembly enabled subjects to see and handle the target specimen whilst being denied direct contact. Some exposures involved the protective glass cover being displaced slightly, allowing a limited area of the aluminium plate to be touched by the subject, although results showed that the hardness changes were not confined to the touched areas. In all cases, exposures of specimens to subjects was carefully controlled by the experimenters.

Prior to exposure to the subjects the hardness of each plate was measured at 50 points having 0.5 mm spacing using a Vickers microhardness tester (100 gm weight for 10 secs).The Vickers test involves a square diamond point being impressed into the specimen surface and the size of the resulting diagonal of the impression being measured using a microscope. Statistical analysis showed the hardness measurements to be distributed normally and means, standard deviations and variances were calculated. The authors present a table (ibid,p7) summarising the results of their main study.

Twelve specimens were used, assigned in groups of four to three conditions. The first group was assigned to a control condition and not submitted to treatment by the subjects. The second group was used in a with-touch PK trial, the third group being assigned to a no-touch PK trial. Mean hardness values for each specimen and group means were calculated. The normality of the distributions of hardness values was checked by Chi-squared test and calculation using the t test showed that differences in group means of 0.23 units of hardness on the Vickers scale would be significant at the 0.01 level.

Four teenage male japanese subjects were employed who had previously shown ostensible PKMB ability. Treatment consisted of the subjects holding the specimen assembly in one hand whilst being witnessed by the experimenters. In the case of multiple exposures to subjects exposure time was very variable in duration.

After exposure to the subjects the means of the two PK-treatment groups showed small but statistically significant changes. No deformations were observed with any of the PK-treated specimens. The control group mean was 16.49, the with-touch group mean was 16.96 and the no-touch group mean was 17.20. It is interesting to observe that the magnitude of the anomalous hardening was therefore largest for the untouched group, which tends to reinforce the impression that results were not due to fraud.A further control condition was utilised whereby a specimen was submitted to three PK attempts by a non PK-gifted subject. No significant differences in hardness were found for this procedure.

Several subsidiary findings were made. Repeated treatments of the same specimen by several subjects were reported to show that their effects were not additive, although the data as tabulated (ibid fig 6 & 7, p6) do appear to suggest a slight additive effect may occur between the first and second exposures, but subsequent exposures show no clear trends. Some specimens appeared to increase in hardness slightly after the termination of the formal PK attempt (ibid fig 4, p5). Leaving samples for periods (100hr, 620hr, 1050hr) after treatment appeared slightly to decrease hardness levels of previously PK-hardened specimens. In the case of the with-touch specimens it was found that hardness levels did not appear to drop off with increasing distance of the tested points from the area where finger contact had occurred. The closeness of fit of the glass cover was reported as effectively preventing subject contact with these areas of the specimens.

Crussard and Bouvaist (1978) have published a report describing eight of the twenty instances of ostensibly paranormal deformation or anomalous structural modifications which they consider to have occurred under completely satisfactory control against fraud (see section 1.5.8 in chapter 1 where their macro PKMB validation is reviewed). Two series of tests are presented which are metallurgically significant.

One of these series employed aluminium alloy plates of known composition and previous treatment history. Crussard was chief scientist at the Pechiney-Ugine-Kuhlmann Aluminium Company whose products and resources were used in this study. Four duralmin plates were selected from groups of identically prepared plates, the unused specimens being employed as reference specimens for comparison.

The first two of the plates were used in the alloy sheet's original state. The third experimental plate was shot peened all over on both sides (shot-blasted with small glass pellets) to increase its pre-treatment hardness so as to provide the opportunity to see if PK treatment might still further increase its hardness. The fourth had been machined and polished, its pre-treament hardness being measured in the central section. This specimen was exposed to Girard in Hasted's presence in London and was later submitted to independent blind analysis for hardness (Hasted 1981a). All specimens were measured, weighed and scratched with an original and unique identifying code mark.

Exposure of the four plates to Girard took place on four separate occasions at three different locations, in front of different sets of witnesses. The four alloy plates were exposed to Girard's touch for between two and five minutes whilst he was carefully witnessed by the experimenters. The subsequent procedure with the first three specimens was that they were then taken by the experimenter and put inside a stoppered glass tube and handed back to Girard for a period after verification of their straightness and marking. These specimens remained in their glass tubes until their laboratory examination. The step with the glass tube was eliminated with the fourth sample.

The first specimen bent slightly twice during the two minute period of finger contact. The deflections were of opposite directions, + 1 mm and -0.5 mm, leaving a residual deformation of +0.5 mm. The other three specimens suffered no distortion following treatment by Girard.

Prior to metallurgical examination the identifying marks, weights and dimensions of the specimens were checked and confirmed that substitution had not taken place.The specimens were then electrolytically polished and their hardnesses on both faces measured using a Vickers microhardness tester (3 kg load). Reference specimens were also tested. The results showed that each of the treated specimens had a centrally situated zone of between 10 mm and 15 mm width and up to 40 mm length where the hardness had increased by an average value of 8%. This increment in hardness is claimed to be statistically significant by the authors (ibid p25), although details of the statistical treatment are not given. The fourth specimen was submitted to hardness analysis at the laboratory of the Electrical Research Association (Leatherhead, England) as well as at Crussard's laboratory.

Two analytical techniques were used to detect internal stresses associated with the hardened zones. X-ray diffraction analysis of the first specimen indicated that within the hardened zones residual internal stress levels of five times the level present in the unaffected zones existed. The second specimen was submitted to a chemical shaping technique (Rosenthal-Norton technique) which also revealed large anomalous residual stresses present in the modified zone .

The first two specimens were examined by transmission electron microscope. Thin laminae parallel to the surface were sampled at half thickness and on the two opposite faces of the modified zones of the first and second specimens. The material from the modified zones showed a characteristic microstructure consisting of a very high density of small dislocation loops (of diameter about 200 Angstroms). At half thickness, the density of the loops was less but was still eight times that of the unaffected zones at the ends of the specimen and that of the reference specimen.

The authors tried to reproduce the structural alterations ostensibly caused by Girard using their repertoire of normal metallurgical treatments. They appeared to be interested both in the metallurgical and physics implications of their simulation techniques and also to be aware that the more complex and difficult the simulation process was required to be, the more unlikely would the hypothesis of fraud become.

Three simulation techniques were used. The first was to bend the specimen in one direction and then to bend it back into its original flat profile. It was found that to reproduce the increase in hardness recorded a radius of curvature of the plate of only 50 mm would be required, corresponding to a deformation of some 30 mm which would certainly have been noticed under the conditions of control imposed. This treatment of reference specimens produced a microstructure of tangles of dislocations, as observed using the same electron microscope techniques as with the experimental specimens, rather than the small loops which were found.

The second simulation involved compressing the reference specimen using a press. Similar hardening to the experimental specimens was observed, but a decrease in thickness of 13% was produced, whereas the greatest reduction of thickness of any of the experimental plates was 2%, localised to the modified zone of the second specimen. The press treatment produced a uniform change in thickness, hardness and modification of microstructure, whereas the alterations produced by Girard were heterogeneous through the cross section and across the length and breadth of the treated specimens.

The third simulation treatment was to shot peen both faces of a reference specimen. Surface hardening comparable to that observed and a similar microstructure were produced, but the shot peened surface of the reference specimen was dull, whereas the experimental specimens had remained bright.

Hasted has reported that hardness measurements made on both polycrystalline and single crystal metal specimens of his that were deformed ostensibly paranormally to a significant degree have shown no obvious differences from those to be expected from specimens bent by normal physical means (Hasted 1981a). It should be noted that the degree of deformation displayed by these specimens substantially exceeds that in the specimens submitted to hardness testing by Crussard and Bouvaist, so that his results may be explicable as due to the masking of anomalous hardness changes by normal increases in hardness caused by work hardening created by the deformation.

A1.6.3 Anomalous Softening

Hasted reports some further results obtained by Crussard and Bouvaist which are not included within the English translation of their paper (Hasted 1981a). The specimen was of the same duralmin alloy as used in the authors' hardness experiments reviewed above. After exposure to Girard the specimen remained undeformed but two soft regions each of more than 10 mm in length were found. The mean hardness of this specimen was 167 VPN. In the first softened region the hardness gradually decreased to a minimum of 90 VPN but in the second the softened zone of 80 VPN exhibited a sharp boundary.

Electron photomicrographs of the first region showed a spotty appearance typical of precipitation of components of the alloy, normally caused by heating to 625 degrees followed by cooling. At low magnification, photomicrographs of the second region revealed that the grains were surrounded by dark intergrain films, characteristic of thin layers of liquid metal. This structure is typical of a metal heated to near the melting point and then slowly cooled, or of a specimen which has experienced quasi-viscous creep. Yet the conditions of control of Girard apparently precluded the possibility of surreptitious heating of the specimen (ibid p130). Anomalous softening has not been reported by any other groups investigating metallurgical aspects of PKMB.

Al.6.4 Phase Changes in Stainless Steel

In the same paper Crussard and Bouvaist also report their investigation of the ostensibly paranormal local conversion of non magnetic austenitic stainless steel into its magnetic martensitic form. A special non commercial stainless steel was used which had been the subject of a previous metallurgical study of the production of the martensitic form by work hardening.

The specimens were of dumbell form, the central connecting rod being 7 mm diameter and 85 mm long, the end pieces being cylinders of 12 mm diameter and 16 mm length. Three specimens were used which remained from the prior study. The specimens had been left with Girard for a few days prior to the experiment in order to help facilitate his performance in the later trial. Girard had been instructed not to attempt to affect the specimens until the formal trial.

At the start of the experimental session the specimens were engraved with identifying numbers, surrounded with a circle. Sample 1 was retained as a reference specimen. After marking the specimens, Crussard verified the straightness of specimens 2 and 3 by rolling them on a flat surface. No "out of round" was found.

The austenitic form of the steel is amagnetic, so that except for very small traces of the martensitic form on the surface caused by the finish machining, the specimens should have shown no response to a magnet. This was tested by means of a small powerful magnet which was placed in contact with the surface of the specimens and then pulled off by means of a chain. The horizontal distance between the magnet and the specimen at the point where the magnet just dropped away from the specimen provided a measure of the force of attraction between the suface of the specimens and the magnet which could then be computed. At no point on the surfaces of the specimens did this force exceed 0.01N when the specimens were examined prior to handing them to Girard to affect.

After their magnetic test the specimens were placed on the table at which Girard was seated and from this point onwards until they were handed back to the Crussard they were kept under continuous observation by video camera. Girard took specimen 2 by one head and placed it in a glass tube without exerting any force, closed the tube with a stopper and then held the closed tube whilst concentrating on it. He then gave the tube to Crussard and from then on did not touch it. The procedure was repeated with specimen 3 except that a witness obstructed the video camera for a moment.

Specimen 2 was found to be deformed slightly (2 mm) from true straightness, the deformation being close to one head. This sample showed a large increase in local magnetic susceptibility of that head (0.12 N) and of the end of the connecting rod nearest to it (0.15 N), values of the rest of the specimen being only slightly above pre-treatment levels. Specimen 3 suffered no deformation but showed a large increase in susceptibility (0.22 N) in its connecting rod near to one head, values over the rest of the surface being near pre-treatment levels.

Specimen 2 was sawn electrolytically close to the affected head. The sawn end of the connecting rod was placed within a magnetic test apparatus (ibid p16) which produced a reading consistent with there being 1.9% of the martensitic form present. Photomicrographs were taken of the sawn surface of the end of the rod, after mechanical and electrolytic polishing, which revealed a mixture of martensites. The authors were certain that the martensitic structures were not due to cooling nor heating during manufacture or afterwards, since the specimens had been well characterised during the previous metallurgical studies. Photomicrographs of suface and core showed similar features, suggesting a rather uniform distribution of martensite, whereas a heterogeneous distribution would have resulted from normal work-hardening processes, where work hardening is usually more severe in the outer layers of specimens. The amount of martensite found would normally have been produced by tensile deformations of between 5% and 10%, much more than that actually observed.

Specimen 3 was submitted to X-ray analysis which revealed surprisingly high proportions of martensites in the altered zone. There was also a slight decrease in cross section in the modified zone.

Simulation tests were conducted in attempts to produce similar changes by normal means. Specimen 1 was clamped by one head, its shaft bent by some 30 degrees and then restraightened. However the special characteristics of this steel caused the specimen to retain a visible residual S shape. Since the clamped head suffered no work hardening, it showed no change in magnetic properties, unlike the head of specimen 2, although the end of the connecting rod showed changes similar to specimen 2. Another reference specimen was subjected to similar but more extreme treatment which produced similar densities of martensite to those observed in specimen 2 but this was distributed heterogeneously between the surface and the core, unlike specimen 2. The authors conclude that they are unable to conceive of any simple metallurgical operations capable of exactly reproducing the properties and structures of the transformed zones (ibid p21).

A1.6.5 Phase Changes in Brass

Anomalous phase changes in brass have been reported by Hasted (Hasted & Robertson 1980a). The phase changes occurred in deformed regions of brass strip in which had been created abnormal plane bends.

Abnormal plane bends are bends which occur not along the long axis of a strip, as in clock springs for example, but in the plane of the strip (for example causing a straight flat strip to become bent like a boomerang). Unbuckled abnormal plane bends are normally impossible to achieve by manual means and are produced commercially by use of a conical roller working on a flat plate which subjects the strip to differential stretching.

Hasted's subject Willie G was apparently able to bring about abnormal plane bends of 30 degrees by stroking the brass strips. Annealed specimens of alpha-brass (70% copper 30% zinc) were prepared professionally by Mycock and Smith and the bends were produced by Willie G.

After etching, microscopic examination at a magnification of 100 revealed dark areas of beta-brass (of composition 60% copper, 40% zinc) in the region of the bend. A photomicrograph is included in one of Hasted's publications which clearly shows this effect (Hasted & Robertson 1980a).

The same subject also produced similar bends in aluminium strip of 6.5 x 0.75 mm cross section (Hasted 1981a). Under microscopic examination the inner edges of the deformed region showed fine radial creases, but no buckling of the strip was observed. Attempts to produce similar bends by normal means have produced local markings quite distinct from th appearance of the ostensibly paranormally deformed specimens.The simulated specimens do not show the fine creases found in the PKMB treated specimens.

Hasted interprets the ability to create abnormal plane bends of his sort as being evidence for the temporary softening of the material produced by psychokinetic action. Micro-hardness measurements of the aluminium strip were made on the outer and inner edges and in the neutral plane in the center which revealed only the normal increase of hardness usually produced by the work hardening of deformation.

A1.6.6 Changes in Grain Size

Scutt has reported a study (Scutt 1981) in which he sought to test the hypothesis put forward by Taylor (Taylor 1975) that the energy necessary to deform metal specimens might be derived from the redistribution of residual internal stress.

Scutt's key hypothesis was that residual stress would be lowered in paranormally deformed zones owing to its dissipation in creating the observed deformations and that this reduction in residual stress could be revealed by alteration in grain size of the modified regions after recrystallisation of specimens at high temperature.

The specimen used was a tapered sheet aluminium alloy specimen normally employed in a metallurgy teaching experiment at Caulfied

Institute of Technology where Scutt teaches metallurgy.

In the initial description it is described as being an alloy, whereas later in the text (ibid p 4) it is termed pure sheet aluminium and Scutt comments that there were no grain refining components present in it (ibid pl).

In the teaching experiment the specimen was pulled in a tensile tester, its tapering width ensuring that a gradation of residual stress due to deformation was left in it by the pulling process. It was then heated for 20 minutes at 540 degrees Celsius to allow recrystallization to occur. The grain structure was then revealed to naked eye observation by etching, decreasing levels of residual stress being associated with increasing grain size.

A specimen was prepared by pulling and given to the australian teenage metal bender Ory Svoray to take home and bend there. The returned specimen was heated and then etched. Scutt's hypothesis was that the deformed region would show enlarged grain size in the deformed zone because residual stresses had been used up by the bending. The result was in contradiction to Scutt's expectation, the deformed zone showing a finer grain structure (which would be expected for normal deformation). A similar specimen was bent by Svoray whilst being witnessed and filmed but the result was identical.

Scutt next used unstrained strips of the alloy containing residual stress only along their cut edges.

A serious weakness of his account is that it is not clear how many unstrained samples were used. In the same paragraph (ibid p3) he both refers to a single specimen and also to several. A photograph is reproduced in the paper (ibid p3) of a specimen labelled "F" , but there are disturbing suggestions in the text, although this is not explicitly stated, that only the result with specimen F was reported because larger grain size had been found only in this specimen after its ostensibly paranormal deformation.

If several specimens had been subjected to similar treatment, results from all of these tests, other factors being equal, ought to have been reported, but they were not. The impression is given that the result with specimen F was only reported because it appeared to concur with Scutt's hypothesis, although in fairness to Scutt, he did also report that a simlar control sample bent normally to the same degree showed similar grain size.

The unsatisfactory impression created of the non reporting of results not in accord with Scutt's own picture of the process is reinforced by his stating immediately afterwards in the account that a fully annealed specimen of the alloy had been used as PK target but that the results had been "confusing" and that extra work would be done on this in the future (ibid p3). This is a serious omission, since Scutt's own confusion regarding the possible falsification of his view of the process constitutes no grounds whatever for witholding results in what is supposed to be a scientific report.

One of Scutt's colleagues at Caulfield suggested giving Svoray a specimen which would be etched but not heat treated after its ostensibly paranormal deformation. Two specimens were bent by Svoray at his home and etching revealed grain enlargement around the edges. Scutt comments that there was a high level of residual strain energy on the edges of these samples where they had been stamped out and that Svoray's effects were comparable to the effects of the heat treatment normally given such specimens. The result was unexpected as Scutt states that normal bending of the metal will not cause grain enlargement unless subsequent heat treatment is performed.

There is a puzzling paradox raised by these comments, since there is every indication in the text that the same material was used, which earlier had been claimed by Scutt to show a reduction, not an increase, in grain size when worked, heat treated and etched, yet here grain size enlargement is claimed to result from normal working (deformation).

The experiment was repeated, but the specimen was spray painted, an area being masked off by a key to provide security against surreptitious heating of it by Svoray. No grain growth was found with this sample.

Scutt in his comments on this result draws a strange analogy between PKMB and heating, stating that since PKMB seems similar to the effects of heating, and since grain growth is not created until the specimen is raised to its recrystallisation temperature, perhaps the PKMB effect also did not reach the equivalent of the metal's recrystallisation temperature.

Since Scutt's supply of these specimens had ended, a new type was selected for a second series of experiments. This was an age-hardening copper-beryllium alloy, prepared in specimens of 12 mm square section and 9 mm length.

The specimens were heated to 790 degrees Centigrade so that the alloying elements would dissolve into the copper and then were rapidly quenched so that the alloying elements would stay in solution, resulting in the alloy being in its softest state.

Reheating of this alloy to 350 degrees Centigrade produces increasing hardening of the specimens with increased heat treament duration due to the precipitation of the alloying elements with time. However, if the heating time is greatly prolonged, the alloy becomes softer again. This process is termed overaging.

Two specimens were prepared. One was aged at 350 degrees as described above to reach a hard state (Rockwell C scale measurements of 40, 42). The other was heated and quenched, producing a soft specimen (Rockwell C values of 5, 5, 6.5).

To ensure detection of heat treatment whilst out of the experimenter's posession each specimen was given a distinctive fine machine finish and was measured exactly for length. Heat treatment would cause discolouration, only removable by further machining which would alter the dimensions of the specimens.

When returned the specimens were of their previous dimensions and bore the same distinctive machining marks and were not bent. Scutt expected that the soft specimen would become harder after ostensible PKMB treatment, and that the hard specimen would become softer due to overaging.

However, when the specimens were measured for hardness it was found that the hard one was unaffected but that the softer one had become even more soft (Rockwell C values of -2, -1, -1, -1 (a drop of 6 points)).

This experiment was repeated but no changes were observed in hardness this time. Scutt comments that this inconsistency is typical of PKMB.

In his conclusions section Scutt acknowledges that ostensibly paranormal deformation of the aluminium sheet specimens produced effects similar to work hardening, and that redistribution of stored strain energy (residual stress) had not occurred, so that Taylor's hypothesis appeared to be falsified.

In the case of the copper-beryllium specimens, Scutt compared the effect of the ostensibly paranormal treatment to annealing, which produces softening of metals. PKMB therefore showed apparently contradictory characteristics, being comparable to both work hardening and annealing.

Finally, he suggests that PKMB may be analogous to vibratory stress relieving (VSR) of welded steel structures. The usual means by which welded steel structures are relieved of the internal stresses created by welding is by heating. However it was found that similar stress relief could be produced by subjecting welded structures to high intensity vibration.

The comparison with PKMB is interesting, especially as Hasted (1979a) has described PKMB as essentially being "metal-churning" rather than metal bending.

A1.7 Changes in Magnetic Properties

Hasted reports some changes in magnetic properties of materials subjected to PKMB action. In one case (1981a) an ultra pure crystal of molebdenum was bent by Geller, without touch and whilst being carefully witnessed. High purity molebdenum has a low magnetic susceptibility but this specimen was later found to have a much larger magnetic susceptibility than is normal for high purity molebdenum. It was subjected to neutron irradiation analysis which established that the levels of ferromagnetic impurities (iron, cobalt and nickel) were too low to account for the anomalously high magnetic susceptibility (ibid p116).

Hasted also reports (ibid p116) that curled bends and tight twists produced by some of his subjects in stainless steel cutlery are usually accompanied by the creation of subsidiary magnetic poles at the sites of the bends. Stainless steel cutlery is usually weakly magnetised and normally has only two poles present, one at each end of the fork or spoon. Hasted states that only fracture, heating to above the Curie point, prolonged hammering or demagnetisation followed by remagnetisation are normally sufficient to produce subsidiary magnetic poles. He states that he has failed to produce subsidiary poles by normal physical bending of the centre of the neck of cutlery specimens (ibid p117).

Hawke (1976) has reported that Geller ostensibly altered the pattern of magnetic stripes in a card used for storage of computer programs used in a Hewlett Packard model 65 programmable calculator. The card consists of a thin layer of iron oxide bonded to a plastic base.

Geller was allowed to handle two cards which he changed. The calculator had accepted the cards prior to their treatment by Geller but rejected the cards afterwards as being deviant. Placement of the cards in a magnetic viewer (containing a colloidal suspension of iron particles which cling to magnetised areas) revealed definite changes in the pattern of magnetised regions.

Hawke presents the report as exploratory rather than definitive and indicates that further investigation of the effect will follow. Nothing further has been published in the parapsychological literature however.

A1.8 Accelerated Creep Bends

An important finding reported by Hasted is that ostensible PKMB agents can apparently cause greatly accelerated creep bends in a brittle eutectic alloy (54% bismuth, 26% tin, 20% cadmium) (Hasted 1981a).

This alloy has the property that it is so brittle that it cannot be bent by normal plastic deformation, but because its melting point is low (103 degrees Centigrade = 376 degrees Kelvin), it can be bent by "creep", a deformation mechanism which only becomes appreciable at temperatures of more than one half of the alloy's absolute melting point (188 degrees Kelvin = - 85 degrees Centigrade).

Normal creep deformation processes are slow, a 6 mm x 8 mm cross section specimen of the alloy placed on knife edges 100 mm apart and subjected to a 3.2 kg load for 4.25 hours showed only a 16 degree bend. A sudden application of 3.5 kg under the same conditions fractures the specimen, suggesting that this rate of creep deformation is near the upper limit.

Attempts to deform specimens of this alloy rapidly by manual application of force either produce no deformation or fracture, so that the production of significant deformations in short times is indicative that a physically anomalous and hence ostensibly paranormal effect is being produced.

Specimens of 6 x 8 mm cross section 150 mm in length were tendered to Hasted's subjects Andew G and Nicholas Williams and deformations were produced at rates as follows : 135 degrees in 10 min, 100, 111, 135, 160 and 170 degrees in 5 min, 67 degrees in 3 min and 62 degrees in 2min.

This represents a valuable method of validation of the macroscopic PKMB effect, (as reviewed above in chapter 1, section 1.5.10), but the results are also metallurgically relevant, since Hasted reports that as is normal with creep deformation, little or no hardening of deformed zones of specimens was encountered (ibid p 41), suggesting that it was indeed a creep mechanism that had been apparently paranormally facilitated.

A1.9 Fracture Surface Analysis

Microscopic examination of the fracture surfaces of ostensibly paranormally fractured metal specimens has produced rather inconsistent and contradictory results. As Hasted points out (Hasted

1983a), the interpretation of photomicrographs is itself still somewhat of an art, and experts in this field do not always reach a consensus regarding interpretation of particular micrographs.

Franklin (1974) privately published the first account of fracture surface analysis of ostensibly paranormally broken specimens. Analysis was performed by examination of photomicrographs produced from a scanning electron microscope (SEM) giving high definition photographs of the fracture surfaces. He published various versions of this report (1975, 1976, 1977) in two parapsychological journals and in a chapter in a book (Panati 1976) devoted to accounts of experimentation with Geller.

The finding which he considered most significant concerned a platinum alloy ring which had ostensibly been fractured paranormally by Geller. Parts of the surfaces appeared to show regions which had been fractured at high temperature near the melting point lying in close proximity to other areas showing fracture zones suggestive of very low temperature fracture (Franklin 1977). Franklin considered this paradoxical finding to be important, since no obvious normal explanation could be found. The sceptic Martin Gardner suggested that the ring had merely broken at its brazed join and after subsequent reexamination, Franklin conceded that this might have been the case, although this could not be established with certainty (Franklin 1977a). The other specimens submitted to examination were two stainless steel teaspoons and a needle.

The fracture surfaces of the two spoons showed no very obvious differences from those produced in identical specimens by normal to-and-fro repeated bendings to fracture. However, the shank of one of the spoons exhibited a crack within which were regions of fracture typical of high temperature shear, rather than room temperature fracture (Franklin 1977).

Franklin proposed that there might be two distinct paranormal fracture phenomenologies (Franklin 1976). In the more common, the metal weakens in strength and increases in ductility to the point where rather small forces can deform it, leading to fracture. In rarer instances a crack may develop spontaneously in the metal specimen whilst it is neither being touched nor observed, as was apparently the case with the needle (ibid). This might lead to two typical SEM micrograph appearances, one being akin to normal fatigue fracture, the other not.

Hasted reports having submitted several ostensibly paranormally fractured specimens to electron micrography by a group within his college (Hasted 1983a). Although some features were found which were uncharacteristic of normal fractures, the complications were such that ostensibly paranormal fractures could not be reliably distinguished from normal ones.

Sasaki (Sasaki et al 1978) has reported an SEM study of the fracture surfaces of platinum wires and two stainless steel spoons. The wires were fractured by japanese child subjects who held them between forefinger and thumb whilst being witnessed by the experimenters. A normal fracture in a similar wire specimen was produced by repeated bending by the experimenters and SEM photomicrographs of both specimens are reproduced in the paper. Similar photomicrographs of normal and ostensibly paranormal fractures produced in the same stainless steel spoons are also reproduced.

The authors' comments on the differences between the two types of fracture are rather cautious. The photomicrographs of the wire fractures show clear differences between the normally fractured specimen which has an appearance typical of fatigue fracture in a ductile metal, and the ostensibly paranormally fractured specimen which shows an unusually diverse appearance, having areas of ductile fracture and dimples but also areas of apparent brittle fracture. The authors point out this diversity and comment that the PK treated specimen showed more extreme brittleness and ductility than the fatigue-broken specimen but state that in general their appearances were similar. Hasted (Hasted 1981a) states that localised melting is to be observed in the original photomicrographs of Sasaki's ostensibly paranormally fractured platinum wire specimens.

The two spoons were broken in the absence of the experimenters. In Japan a common method whereby PKMB agents create fractures in cutlery is to throw it in the air, imparting a spin whilst doing so. Breakage occurs as the neck of the spoon loses strength and becomes ductile, when inertial forces generated by the spinning shear the bowl from the neck. Both spoons were broken by this means.

The normal fractures produced in the spoons by the experimenters for comparison purposes had the typical appearance of ductile fracture. The ostensibly paranormally fractured surfaces showed a diversity of appearance similar to that shown by the ostensibly paranormal fracture in the wire. Regions of the fracture surfaces showed brittle fracture characteristics, but also areas of extreme ductile appearance.

The authors' summary of differences between the PK fractures and the normal ones is that the PK fracture surface, although similar to a fatigue fracture surface is more complex and shows fewer striations, which are more closely spaced than is found in the fatigue fractured surface, and also shows a zig-zag line structure. Fatigue bars at the neutral axis which are a common feature of fatigue fractures, appear to be missing.

A1.10.1 PKMB and Steel Wire Beams

Sasaki and his co-workers have published papers on the modification by PK of the stress/strain relationships of materials subjected to loading (Sasaki et al 1974, 1976, 1977).

Unfortunately although these papers have been available in England, no written translation of them has been made. However, a partial verbal translation of the first paper (Sasaki et al 1974) has been performed (Hara 1984) and from this and the English abstracts and the diagrams and graphs which are partly titled in English it has been possible to obtain a general idea of the results obtained.

In all cases the experiments have been modeled on standard materials science experiments where the relationship between some measure of deformation of a metal specimen and the amount of some imposed load is investigated for different values of load (Timoshenko & Young 1968).

The classic experiment in this area is the Young's modulus experiment, usually performed with a wire subjected to loading by weights being placed on its lower end, increases in the length of the wire being plotted against the loading as the wire stretches under increasing stress, values of stress (loading) being assigned to the Y axis, the strain (deformation) being assigned to the X axis.

For some materials, including most metals, at low values of stress, the stress/strain relationship is linear (Hooke's Law). As the stress is increased, the deformation (strain) per unit stress increases, causing the previously straight graphed line to heel over. Onwards from this point, for some materials including some metals, deformation due to increased loading becomes inelastic and not recoverable upon the stress being released and may be added to by creep deformation, where the wire continues to elongate as a function of time at a static loading. If the loading is increased further, the yield point is reached and fracture occurs.

In the first paper (Sasaki et al 1974) a beam bending, rather than a wire stretching experiment is described. A commercially available steel wire such as is normally used for flower arrangement was used as the beam. The wire specimens were not heat treated in any way prior to use. Some wire specimens were of 0.72 mm diameter, others were of 0.88 mm diameter. All were of 250 mm length.

The beams were placed upon two supports spaced 200 mm apart. The supports were composed of three items per side, a large steel block upon which a short steel bar was placed, upon which was placed a matchstick having a V shaped groove used to retain the wire. The steel blocks, steel bars and matchsticks were secured to each other and the table by adhesive tape to ensure stability. The table was bolted to the concrete floor.

The loading weight was suspended by means of a hook and thread from the center of the beam. Measurement of the height of the center of the beam was performed using a height gauge sliding on the table top which was graduated to 0.02 mm. Deflection distance of the top of the center of the beam from its original height was taken as the deformation variable.

The subjects used were four Japanese child PKMB agents. A total of 17 experimenters took part, all being staff, postgraduates or final year undergraduate students of the Denki Tsushin University. Experimenters were selected for their like of children and heavily sceptical individuals were excluded. The children and their parents had no hand in designing the experimental protocol.

The subjects were allowed, under observation by more than one witness, to place their hands some 30 to 150 mm above the wire for periods of a few minutes (exposure times of 3 to 11 minutes are shown on the graphs). Care was taken to ensure that no touch occurred and for any case where touch was known to have taken place, the experiment with that specimen was voided and the results removed from the records.

A number of graphs are reproduced which appear to show that, as the authors conclude, ostensible PKMB action causes an increase in bending of the beam under static loading conditions. The deformation ostensibly due to PK increases with increased loading of the beam, suggesting a facilitation of both elastic and plastic deformation. Where the normal loading was sufficient to cause creep deformation it appeared that PKMB accelerated its rate. The beams were loaded and treated with PK, then unloaded, this cycle being repeated several times in some cases, all points on these cycles being shown graphically.

A1.10.2 Bamboo and Wooden Specimens

In this study (Sasaki et al 1977) bamboo specimens of diameter 1.78 mm to 1.86 mm and length 250 mm and wooden specimens of section 2.01 mm x 2.18 mm and 250 mm length were used.

Since every component of the the beam bending test apparatus appears to be identical with that used in the above study, it can be presumed that the procedure followed similar lines to that of the preceding study, although only two subjects appear to have been employed.

One bamboo specimen seems to have been loaded in stages to 200 g and then unloaded so as to establish its normal stress/strain curve. This left a small permanent deflection in the specimen. It was then loaded up to 150 g but at each stage of loading a PK attempt was made. From the 90 g loading point onwards the PKMB treatment created small additional deflections, but on unloading, the beam's permanent deflection was only very slightly different from that measured after the first, normal, loading. Other bamboo specimens' graphs show similar characteristics. Nearly all of the ostensibly PK contributed deflection was thus elastic rather than plastic.

Although the authors state in their abstract that permanent deformation was observed with the wooden specimens, they only reproduce a stress/strain graph for one wooden specimen. This particular graph is unsatisfactory because during the first deformation cycle employing low loadings only elastic deformations were present, whereas the subsequent higher loading cycle is identified at its topmost loading weight as showing creep. Since the creep shown cannot be separated from the ostensibly PK contributed plastic deformation in this graph, the authors' conclusions remain difficult to assess.

A1.10.3 PKMB and Aluminium and Steel Strip

Sasaki's 1976 paper (Sasaki et al 1976) summarises the results of the 1974 wire beam bending tests and reports the results of tensile tests on aluminium strip and cantilever tests with steel plate.

This paper remains untranslated but the overall results are shown graphically and most details in the accompanying diagrams are labelled in English. Four Japanese child PKMB agents were employed in this study.

The aluminium strip was 40 mm long and 0.5 mm thick (its width is not given in English). It was suspended vertically, gripped by steel jaws at top and bottom. The bottom set of jaws were weighted, increasing weight being added during the experiment. Measurement of the streching of the strip was made by use of a height gauge, as in the previous studies, this time horizontal lines having been scribed on the strip, on which the height gauge was set.

At 11 Kg loading the first 5 minute PK attempt was made, producing an extra elongation of several millimeters which made the specimen depart from its normally smooth stress/strain curve. Five further 5 minute PK attempts were made, each time at the next loading point, the loading being increased in 2 Kg steps.

Three regions of stress/strain behaviour are revealed. At the lowest loadings used for PK attempts the elongation produced by PK is at a maximum. At this point the work-hardening of the specimen produced by stretching is at a minimum. As higher levels of loading are reached, the PK contributions to elongation decrease. The authors state (in the English abstract) that this is due to the work-hardening process. At still higher levels of loading where the specimen approaches its yield point the elongations caused ostensibly by the PK contribution once more increase, presumably by assisting the creep processes which set in at this region of the stress/strain curve.

The cantilever bending study involved an annealed (90 minutes at 400 degrees Centigrade) low carbon (0.07% C) steel strip of width 6 mm, and thickness 0.5 mm. The strip was held by a vise at one end, the length of strip protruding from the vise being 87.5 mm. At a point 82.5 mm from the vise jaws a hole was drilled in the strip to which was attached a wire upon which the loading weights were placed.

The PK attempts were performed in 3 minute periods. The loading of the strip was taken to 2 Kg and five PK attempts were made in succession. Each PK attempt produced deflection, the amounts being variable. The deflections are described as being creep deflections and a non-PK control deflection/stress curve is shown for (presumably) a similar control strip loaded with 2.2 Kg which in 30 minutes showed only slightly more deflection by static creep than did the 2 Kg loaded experimental strip after 9 minutes. At the end of its 15 minute exposure period the experimental strip showed nearly 50% more deflection than the control strip after 30 minutes of loading at the higher weight.

A1.10.4 Comment

It is surprising that Sasaki's studies have not been replicated by any American or European group because prima facie they would seem to present a rational approach to the study of some aspects of PKMB. Presumably the obscurity of these largely untranslated Japanese studies has prevented their replication. Since the approach involves only the addition of a PK component to already very well established experimental techniques it has the advantage that the behaviour of the systems affected has been extremely well characterised.

This form of study also seems potentially to be amenable to high levels of security against fraud in some of its forms, because if, for example, a wire stretching study were used, manual manipulation of the wire would need to be of some considerable force in order fraudulently to reproduce the extensions registered ostensibly by PK. This would be easily detected by witnesses. Additionally, use of electronic "touch-detection" circuitry could be made to provide instrumental registration of the absence of touch.

A1.11.1 Paranormal Electrical Effects : First Indications

The first sign that apparently paranormal electrical effects may be involved in PKMB was encountered during Hasted's investigation of

Geller at Birkbeck College of the University of London (June 21st 1974) (Hasted 1976b).

Geller was given a gieger counter tube to hold and requested to produce an effect upon it. The output from the geiger counter was input to a ratemeter and the ratemeter's output was chart recorded. The geiger tube's output was also audible via a loudspeaker.

The system was checked to determine that it responded normally to ionising radiation by exposure to a radioactive source. The background count was also ascertained. Deliberate rough handling of the tube assembly and cable produced no artifactual responses. Twenty minutes of background radiation were recorded, followed by a test pulse resulting from exposure to a radioactive source, followed by a further ten minutes of constant background radiation. Hasted then used the gieger counter to search for concealed radiation sources on Geller's person. None was found. Geller was then handed the geiger counter tube. He held it in both hands and concentrated hard on affecting it.

Within two minutes two count-rate pulses had occurred, one of about 25 counts per second, one smaller. Geller said that he had felt some sort of shock, which Hasted construed as possibly electrical in origin. After another sixteen minutes there was another pulse, and after a further five minutes a larger pulse, during which Geller reported feeling a prickly sensation. A further ten minute's control running of the counter was performed, without Geller holding the geiger tube, during which it performed normally and the apparatus was then switched off.

During this period a magnetic field recording device had been in operation and the technician watching its chart recorded output reported that pulses had been recorded on it which synchronised with the two latter large pulses produced on the geiger tube. This suggested to Hasted that the effects might have been electrical in origin, since the discharge of electric current would produce a transient magnetic field (Hasted & Robertson 1981b).

At a session the following day Geller produced five count-rate pulses, one of which produced an extraordinarily large count-rate reading, putting the chart recorder pen off scale (Hasted 1976b).

Paradoxically, no clicks were audible during this pulse. Two other pulses before this had also been accompanied by anomalously low levels of clicks, which reinforced the impression that it was not nuclear radiation which Geller was producing, but transient surges of electricity. At the second session another geiger counter nearby had not registered any unusual effects, only that handled by Geller responded.

The next day Hasted found that the geiger tube's stainless steel case was electrically connected to the circuit of the counter and was not earthed with respect to the rest of the counter circuit but formed part of the return path for discharges within the tube.

He tried shorting a 90 volt battery across part of the steel case and found that a count rate pulse could be so produced. His conclusion was that perhaps Geller's hands had produced transient voltages of the order of 50 - 100 volts which had shorted across the steel case.

The production of these charges by static electricity caused by friction seemed ruled out because the case was conductive, was held steadily by Geller, rather than being rubbed and his feet were quite still on the carpet.

Al.11.2 The Air Ionisation Hypothesis

The second point of emergence of paranormal electrical effects occurred by chance. Hasted had noticed that his subject Stephen North sometimes tended to make grabbing movements towards the PKMB target specimen. He reports the movements as occurring in response to the subject hearing the sudden motion of the chart recorder pen (Hasted 1980a) and therefore as following the PKMB event rather than preceding or being simultaneous with it.

To prevent this and also to detect touching, he developed a "touch detector" circuit which was wired to the specimen and responded to the mains hum present on North's hand if it touched the specimen. The circuit also provided a chart record of touch incidents (Hasted 1981a). North was later cured of the tendency to reach towards the target by means of a moving PK target (Hasted & Robertson 1980a).

Several sessions were conducted with North, using the touch detection circuitry, without touch signals being encountered.

Hasted reports (Hasted & Robertson 1980a) that at one evening session he and his assistant David Robertson were watching North very closely when the touch detector channel on the chart recorder gave a response at the same instant that the PKMB (strain gauge) channel did.

North cried out and claimed that he had felt a pricking sensation at the end of his thumb at the moment that the chart recorder pens were heard to move. Hasted and Robertson were positive that North had not touched the PK target, or even moved, at that instant. Hasted reports that the closest of North's hands to the PK target was 4 inches away from it and that it had been stationary (ibid p387). Hasted quickly examined North's thumb and saw a tiny pink mark on it. When the thumb was squeezed a tiny drop of blood appeared at that spot. The PK target, a metal disc, showed a deformation of some 20 degrees as a result of this single event.

During the winter of 1978-1979 Hasted conducted a series of sessions exploring these effects, using Stephen North and Matthew

Manning as subjects. The first exploratory experimental sessions involved the creation of signals upon one electrode located in air, analogous to the arrangement which had originally enabled the discovery to be made. It is important to note that the electrical resistance between the electrode and earth was only about 100 Ohms, so that radio and other forms of electrical interference were eliminated, and no effects could be produced by stationary ostensibly non-psi talented subjects.

Both subjects produced effects on this apparatus, but Manning moved his arms violently in a windmilling motion which was later found capable of creating effects on the electrode by normal means, due to dynamic electrostatic induction effects. North succeeded when quite stationary (Hasted & Robertson 1980a).

An important issue to clarify regarding this effect was whether it involved as a primary event the paranormal creation of bursts of air ions, or whether the generation of charge occurred directly at or very near the electrode itself.

Early studies were made using a ferrite ring wound toroidally with 500 turns of insulated copper wire which was usually used in conjunction with an electrode.

The rationale for this type of experiment was that if the subject generated bursts of air ionisation between his hand and the electrode, which was designated target, the drift of this airborne charge would be detected as it passed through the central hole in the toroid which was placed in an intermediate position between the subject's hand and the electrode.

The toroid windings were connected to a sensitive low impedance amplifier and would respond by magnetic induction to the passage of electrically charged ions through the air, the outputs of both the electrode amplifier and the toroid amplifier being recorded on different channels of the same chart recorder.

With Stephen North, synchronous effects were recorded upon the electrode and toroid (within chart recorder time resolution - approx 100 ms). Once the toriod was electrostatically screened, no further signals were produced from it by North (this may have been a psychological effect).

Manning in his first session was given only the screened toroid as target and succeeded in producing signals from it. In his second session both toroid and an electrode were present and he produced effects only upon the electrode.

Although airborne ions were not excluded as the fundamental effect by these results, Hasted interpreted them as possibly showing that charge might have been paranormally generated directly within the windings of the toroid as well (ibid p389).

A short pilot series of sessions were held with Manning using two disc electrodes mounted at various distances from each other. The electrodes and Manning's wrist were held at various different voltages. The results of these exploratory runs were not reported in detail, Hasted only remarks that the recorded polarities of the signals detected were not affected by changes in relative potentials of the electrodes and subject (ibid p391). This study led to the more detailed investigations of the role of airborne ions reviewed below.

The question of whether strain events were always accompanied by electrical effects was next addressed (Hasted & Robertson 1981b), although somewhat unsatisfactorily.

Two aluminium strip specimens (100 mm long, 10 mm wide, 1mm thick) were mounted radially to the subject (Stephen North), one being closer to him than the other, the separation being about 480 mm.

North's hand was only 60 to 70 mm from the nearest one. Each specimen was equipped with a strain gauge and was also treated as an air electrode by being connected to an electrode amplifier.

The weakness of this design is that later work by Hasted (eg Hasted 1981a) shows that strain events can be localised to distances of very few millimeters. Use of 100 x 10 mm strips for this study meant that strain events could easily be localised to areas of the strips which were not effectively monitored by the single strain gauge of some 10 x 5 mm size, nor are details given of where on the strips the gauges were placed, although it seems likely they would be centrally placed. It would therefore seem probable that Hasted's estimates of the frequency of synchronous electrical and strain signals may be too low.

Six sessions were conducted sequentially, and a clear trend in results across the sessions is evident, although Hasted gives no statistical analysis to underpin the trend evident to simple inspection (Hasted & Robertson 1980a).

Mean signal numbers per session was 49 (disregarding a seventh session which was not comparable and not part of the series). The proportion of strain signals unaccompanied by electrical signals S, and electrical signals unaccompanied by strain signals E, and synchronous signals SE, are separately tabulated.

Across the six sessions the results show a decline in pure strain signals S, per session, and a decline of synchronous strain and electrical signals, (excepting the first session where no synchronous ES signals were detected), accompanied by an increase in the proportion of electrical signals E.

Apart from the psychological interest of these results in showing apparent learning (Hasted states that North was aware of the experimenters' interest in the new electrical signals (ibid p76), these results apparently show that within the rather large limits of possible error of the study, PKMB strain events are not necessarily accompanied by electrical events.

Hasted next used the same sized electrodes placed parallel to each other with different distances between them in each session to further study the atmospheric ion production hypothesis (ibid p77).

The electrodes were placed with their long axes pointing upwards and with the gap between them centered on a radial plane originating from North's hand's position. The experiment took place in Hasted's electrically screened room at Birkbeck. Each electrode was connected to a 9 volt voltage source, one being at 9 volts positive with respect to the screened enclosure, the other being at 9 volts negative. Reversal of the polarity of both electrodes was periodically accomplished every 11 seconds by means of a relay driven by a timer.

The point of this procedure was that if the effects were due to the creation of atmospheric ionisation in the space between the electrodes, the creation of an electrical field between them would cause the separation of negative and positively charged species of ion-clusters. Each ion type would drift to the opposite polarity electrode, causing corresponding signals on their arrival at the electrode.

If on the other hand the primary mechanism was the generation of charge at the electrode plates themselves, rather than in the air between them there would be no particular reason why each electrode should not experience the generation of charges of both like and unlike polarity to its battery-supplied polarity. The circuit was arranged so that the chart record provided indication of the polarity of each electrode during each period.

Hasted interpreted the results as favouring the atmospheric ionisation hypothesis, because only 4.9% of the 1323 signals recorded were of sign inappropriate to the separation of charge process implicit in the air ionisation hypothesis. Hasted cites the results of calculations which suggest that the most probable durations of the signals was of the order of 0.23 seconds (ibid p78).

Further analysis is presented to show that the relationship between the proportion of synchronous signals (on both electrodes) to non synchronous varies with the place of generation of the ion clusters in fair agreement with calculation based on data from the normal particle swarm analysis (ibid p82). However the mathematical treatment of both this and that of the axial distribution of the ion clusters is acknowledged by Hasted as being largely invalidated by the non uniformity of the electric field produced by the use of the two strip electrodes (ibid p83).

Accordingly, a Townsend-Huxley drift tube was constructed. This consisted of a tube having electrodes taking the form of end pieces made as concentric rings of metal insulated from each other (designated bull, inner and outer - each being connected to a detector amplifier). Each set of target electrodes was surrounded by a metal screen. The space between the ends was surrounded at intervals by rings of metal which were set at appropriate potentials by means of a resistor chain, thereby generating a relatively uniform electric field within the interior of the drift tube. These rings also prevented finger contact with the target electrodes.

Full results of the use of this tube in five sessions are not reported, but Hasted's tentative conclusions were that the data obtained was consistent with there being ionisation bursts occurring at more than one place simultaneously and that an appreciable proportion of the charge production may have occured at or very near to the electrode surfaces (ibid p86).

A1.11.3 The Paranormal Temporary Conduction Path Hypothesis

In addition to the two hypotheses developed by Hasted above, that charge placement might occur directly, or that the phenomenon may consist of bursts of atmospheric ionisation, a third hypothesis was available.

Brookes-Smith (1975) had earlier found temporary electrical conduction paths to be ostensibly paranormally generated on electrode systems mounted on the underside of experimental tables subjected to ostensibly psychokinetic forces. Early psychical research investigations of physical mediumship had also seemingly disclosed that certain ostensibly PK gifted individuals could discharge charged electroscopes without touch from a distance (Sudre 1960).

The third hypothesis was that a temporary conduction path could be formed in air which could enable charge to be transported to electrode systems (Hasted & Robertson 1981b). Such a path might possibly be composed of air ions.

Hasted accordingly designed an experiment which would enable the hypothesis of air ionisation to be tested. Since air ions are subject to drift, diffusion and formation of secondary charged particle clusters, conduction paths composed of air ions cannot transmit rapidly varying electrical potentials, because the processes cited above lead to a smearing of rise times and loss of rapidly varying potentials. An experiment in which an attempt was made to pass a rapidly varying signal down a paranormal conduction path would show negative results if the path were composed of air ions (ibid p181).

An immediately relevant question was that of where the charge conducted by the path might originate from. The first hypothesis to be tested was that it originated from the PK agent's body.

The experiment therefore involved the capacitative coupling of a 10 kHz sine wave signal into the body of Stephen North via a 150 mm square plate placed near to, but not in contact with him (ibid p182).

No trace of the 10 kHz signal was detectable at the electrodes of the Townsend-Huxley drift tube used as PK targets when North was not present, nor when he was present but not PK-active, nor could any other non PK gifted individuals induce the signal by movement etc. Touching of the electrodes with an uninsulated piece of wire held in the hand produced a burst of 10 kHz sinewave, as would be expected.

North succeeded in producing (100-200 ms) bursts of 10 kHz signals intentionally. The signal to noise ratio of his signals was approximately 5:1, smaller by a factor of five than that of the signals produced by touch with the wire. The envelopes of his bursts of 10 kHz signal show greater variations in amplitude than that shown by the touch-created signals.

This result seemingly contradicts the air ionisation hypothesis in a decisive manner. The apparent finding that signals could be transmitted along paranormal conduction paths must be classed as one of the most significant discoveries made by Hasted. Replication and extension of this work may enable the delineation of the conduction mechanism to be made.

APPENDIX TWO

APPARATUS AND ELECTRONICS

A2.1 The Three Channel Device

Referring first to figure 27, (i) it shows the uPKMB sensor assembly. The diagram shows the 20 mm PZT strip fixed to the underside of the lead bob. The plastic tube is transparent and open at the lower end. The PZT strip was first soldered to the two inner strands of the shielded output cables. The soldered connection was made to the silver surfaces of the PZT strip and the point where the joint was made was then covered by a thin layer of epoxy resin (Araldite) to protect it from fracture due to mechanical stress. The entire exposed assembly was then dipped into rubber solution in order to insulate it. After this had dried the exposed surface of the strip was then painted with a silver based electrically conductive paint. The painted-on shielding was earthed to the bob by means of a wire soldered to the bob and wrapped around the epoxy blob so as to be covered by silver paint when it was applied. The screens of the cables were earthed at the bob and an earth wire (not shown in the diagram so as to preserve clarity) connected the plumb bob to the earth of the apparatus. The screened leads were taken up the sides of the plumb bob and the whole assembly held together with PVC insulating adhesive tape, which secured the plastic tube to the underside of the plumb bob. The bob's weight was 60 grams. The PZT strip of Mullard (now Phillips) PZT 5 material was 20 mm long with a self capacitance of 1000 pf. The 20 mm strips were cut from 70 mm strips bought from the distributors Intel and was Phillips part number 4322-020-04840.

Figure 27 (ii) shows the uPKMB sensor assembly in use. It was suspended by means of three elastic bands connected to form a compliant suspension. The shielded output cables were allowed to hang fairly loosely from the cross-bar so as to minimise the mechanical coupling between the wires and the sensor. Miniature shielded cable was used to maximise the cable compliance. Vigorous movement of the cables would produce a small output in the uPKMB channel due to capacitative and other effects. When stationary, no output was generated and the cables in use were carefully clipped to the stand and taped at any loose point which might move under its own weight. The upright and horizontal part of the stand was of aluminium tubing and was a tight push fit into a hole in the cast iron base.

Referring now to figure 28, it shows the schematic of the three channel device. The outputs from the two cables were each input to unity gain high impedance buffers of impedance 470,000 ohms in the twelve session study and 168 megohms impedance in the accelerated start study. The impedance was changed because studies of the waveforms had suggested that the events were longer lasting than had originally been thought. The outputs from the two buffers were fed to a differential amplifier stage of gain 22. The output of the differential stage was AC coupled to the followng stages, the lower cut off point being at 10 Hz (-3dB) at 6 dB/octave. The devices used throughout were Texas type 070 series FET input operational amplifiers, used in quad form except for circuits needing offset adjustment such as the digital voltmeter and comparator circuits.

The output from the differential amplifier stage was input to a precision full wave rectifier stage. The output from this stage operated a comparator which was set so as to trigger at just above the 2 mv level. When the comparator switched it actuated a delay circuit which held the clock off for a fixed time interval (150 ms). The clock was of adjustable period from about 10 Hz to 1 Hz. The output from the clock was fed to the peak hold stage which received the input from the rectifier stage. The peak hold stage was reset to zero volts by each clock output pulse. The output from the peak hold circuit was fed to the voltage controlled oscillator, which also had an offset control to enable the free running frequency of the voltage controlled oscillator to be adjusted. The output from the voltage controlled oscillator was fed to a small piezoelectric sounder which acted as a loudspeaker. The output from the automatically reset peak hold circuit was fed to a buffer which output the signal to the chart recorder (set at a sensitivity of 10 mv fsd).

Another output from the peak hold circuit was fed to a slow droop rate peak hold circuit which was manually reset. The output from this peak hold circuit was input to an offset control circuit which enabled small DC offsets to be nulled out. The output from this circuit was input to a 200 mv fsd digital voltmeter which gave a resolution to 0.1 mv.

The mains monitoring channel was not intended to give an output linearly related to the transient magnitude, but was utilised to provide a yes/no decision criterion as to whether any significant departure of the mains voltage from normal levels had occurred. The sensitivity was such that small changes in mains voltage due to the small voltage drop occurring in response to the demand from heavy current using devices could be detected in some houses.

The mains monitoring channel was connected to both live and neutral mains lines. The mains earth was connected to the internal common (single point) earth point in the apparatus to which all circuits were referenced. The inputs from the live and neutral mains leads were fed to resistive attenuators (of 200,000 ohms resistance). The outputs from the attenuators were mixed and isolated at DC by high voltage high quality capacitors and fed to a 50 Hz notch filter. The output from the notch filter was fed to a semi logarithmic amplifier giving a range of gains from 600 to unity, according to the signal amplitude input, large signals being amplified less that small ones. This non linear element was incorporated in order to allow the very wide range of possible transient voltages to be accommodated without serious overloading of later stages or lack of sensitivity at low levels. The output from the semi logarithmic amplifier was first full wave precision rectified and then fed to a fast peak hold stage which had a high droop rate but rapid response. The output from this circuit was fed to a peak hold stage having a slower droop rate but slower response. This stage was reset to zero volts by the clock. The output from this stage was input to the chart recorder (at fsd sensitivity of 1 volt).

The microphone used was a crystal microphone insert which was fixed to the uPKMB sensor's stand. The output from the microphone was input via miniature shielded cable to an amplifier of input impedance 1 megohm and gain of 20. The output of this stage was fed to a full wave precision rectifier. The output from this stage was input to a peak hold circuit which was reset to zero volts by the clock. The output from the peak hold circuit was input to the chart recorder (at sensitivity of 100 mv fsd).

The apparatus was used essentially unchanged for all chart recorded studies (the input circuit time constant was changed, but the time constant of the subsequent AC coupled circuits was set to produce a bandwidth which was 6 dB down at 10 Hz and dropped at a rate of 6 dB per octave.

It may be wondered why no effort was made to calibrate the output of the system with known force inputs into the PZT sensor. This was not attempted for three reasons.

One was that support from physics based personnel was lacking and the theoretical response can be calculated from the manufacturer's published data on the PZT strip. A more important reason was that it was most strongly felt that while such calibrations may be reassuring and satisfying in the sense that they seem to produce a result whereby it could be claimed that the observed effects had certain physical magnitudes, this claim is really quite spurious, because the mechanism of the effects remains entirely unknown. While the mechanism remains unidentified, calibration of the system with known forces is meaningless because there are no grounds for assuming that the paranormal action operates in any way similarly to a normal force. This data would present the appearance of precision but would really be meaningless at this stage of our knowledge.

The final point is that one can validly approach the problem of the unknown nature of the PK-PZT physical nexus by regarding the apparatus as a black box, and refrain from making specific assumptions about the modus operandi of the PK, but presume that if the same apparatus is used unchanged it will provide a constant measure which can be compared from session to session and between subject and subject, even if the physical meaning of the effects remains unclear. This approach was felt to be conceptually superior to that of pretending that the mode of operation was known to be comparable with a given physical force.

A2.2 The Home Use Device

The home use device was essentially a much simplified version of the device used in the twelve session series. As can be seen from figure 29 it had two unity gain buffers feeding a x 22 differential stage which had its output AC coupled to the precision full wave rectifier. The input resistance to the uPKMB sensor was 2.2 megohms per input, giving a total input resistance of 1.1 megohm. The output from the precision rectifier stage was input to a manually reset peak hold circuit. The output from this stage fed a voltage controlled oscillator which fed its output to a small piezo electric sounder (miniature loudspeaker) and also to an amplifier stage which fed the analogue meter which had a switched range of between 5 mv and 5 volts fsd.

A2.3 The Direct Feedback Device

The direct feedback device may appear to be more complex than it really is. Essentially the system simply consists of two amplifiers. Examining figure 30, it will be seen that the overall schematic shows two units. Each unit is equipped with its own microphone (electret capacitor type) and uPKMB sensor (standard model). The units were made so that a four channel tape recorder could be fed with all four outputs from each of the units, A or B. The output of all four channels (PZT A and B, microphones A and B) was mixed for each set of headphones, the mixing being fully variable, so that any one or all four of the channels could be heard. The connecting screened cable was some 20 metres long, allowing the units to be widely spaced.

Turning now to the detailed schematic in figure 31 it can be seen that the four inputs are present on the left hand side (local PZT, local microphone, distant PZT distant microphone). Buffers were used to condition line signals and local signals for recording in order to avoid problems of mains hum. this was successful, the system being free from hum. The input from the PZT uPKMB sensors was put through a simple capacitive-resistive radio frequency filter to remove possible radio breakthrough. The PZT input circuitry was similar to that used in previous devices and had an impedance of 4.7 megohms to ground on each differential input, giving a total of 2.3 megohms input resistance. The gain of the differential amplifier was the same (22) and the inputs from the local two channels were mixed separately from the distant channels and fed to separate miniature power amplifiers, allowing the headphones to be used in stereo mode, with one side dedicated to local signals and the other to the remote signals. In practice it was rapidly found that this dichotic arrangement was confusing compared to the mixing of all signals to produce a central monophonic sound image which proved much easier to listen to.

A2.4 The Four Note Device

The input impedance of the PZT input was 100 megohms. Examining figure 32 it can be seen that the first stage is a simple resistive-capacitive RF filter, followed by an amplifier stage. The use of a differential second stage was dropped for this and the twenty note device since it was thought that this design did not offer superior rejection of transients or mains hum as had been hoped.

The output of the amplification stage was full wave precision rectified. It should be noted that a higher gain front end was used (gain of 220) because it was required that the comparators should switch at well defined voltages. The level set for the lowest level comparator to switch at was 20 mv, making the criterion identical to that used in the three channel apparatus (100 microvolts from the PZT strip). Four comparators were fed with the rectified input and each gated its own oscillator. The comparators were wired so that comparators at each level inhibited all the comparators at a lower level than themselves. This procedure avoided the problem of more than one note being activated by uPKMB signals.

The outputs from the four oscillators were mixed and fed to a stage feeding the headphones. A direct input to this stage from the first PZT amplifier stage was permanently wired in, thus allowing the direct output of the PZT strip to be heard. This feature was incorporated so that in the absence of uPKMB signals large enough to produce notes, the subject could still directly hear the output from the PZT strip and hence still feel in touch with it. This feature proved very effective in practice according to the reports of subjects.

Another feature creating a very similar psychological effect was the use of a comparator at the bottom end of the comparator chain which would produce a lot of jitter ("threshold noise") when fed with a voltage which slowly rose through its switching window. The threshold noise produced by sub-scoring PK inputs encouraged the subjects because it signalled that they were producing PK, even though not at scoring level.

The facility existed to switch in the microphone input to the headphones but this was not used since the headphones were sufficiently acoustically transparent to allow conversation to proceed whilst wearing them.

The output of the electret capacitor microphone was amplified (gain of 47) and recorded on one channel of the portable cassette recorder whilst the uPKMB channel was recorded on the other.

A2.5 The Twenty Note Device

The twenty note device incorporated several modifications which were intended to allow the experimenter to modify possibly psychologically relevant features of its performance. Examining figure 33 it can be seen that a separate preamplifier was used. This was originally intended to be used with a sensor assembly which was to be physically integral with the preamplifier, but since subjects did not like this design the standard sensor was substituted and wired into the preamplifier box. the cable connecting the preamplifier with the main unit was of low noise and high quality with a semiconductive polyethylene inner layer designed to minimise noise. The input to the main unit was differentiated using a differentiator of switchable time constant (values of 50 ms, 300 ms, 3 seconds and 27 seconds). At the 50 ms setting, the device cannot be actuated by hand heat, so that the PK induction by artifact feature can be switched out. The other time constant settings are intended to be used in studies designed to establish the temporal durations of signals. The output from the differentiator stage is fed to a further amplifier stage, giving a total amplification of 1000, so that the 100 uV signal from the uPKMB sensor (equivalent to the 2 mv criterion level used in chart recorder studies) is amplified to a level of 100 mv. This signal is then precision full wave rectified and the output fed to a bank of 20 comparators. Only three comparators are shown in the diagram. The comparators were wired so as to inhibit the operation of comparators set at lower reference voltages than themselves, avoiding more than one note being played at any one time. In order to allow less gifted subject to be able to produce as many notes as possible with low level uPKMB inputs a "span" control was incorporated which allowed continuous control of the range of voltages between the lowest and the highest which were used as reference voltage levels for the comparators. It should be noted that the bottom comparator reference voltage was specially arranged not to be affected by the span control so that the minimum level had to be reached before any note was played. In order to avoid having to build twenty separate oscillators the outputs of the comparators were put through potential dividers (and steering diodes) and summed in an adder stage and the resultant voltage input to a single voltage controlled oscillator. An adjustable offset voltage can be applied to the voltage controlled oscillator to effect tuning to the tempered scale, although the intervals between notes are fixed.

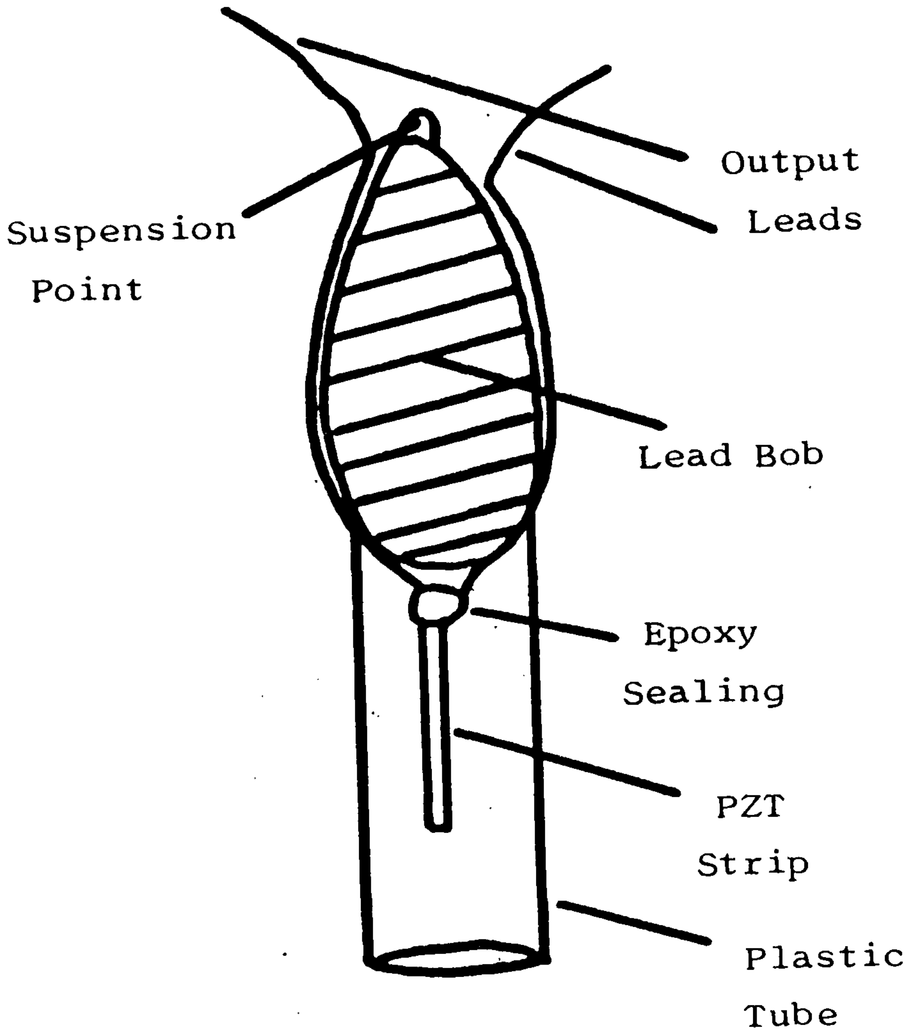
In order to allow short duration uPKMB events to produce long lasting notes a peak hold circuit can be switched into operation so that the input from the front end is not durectly fed to the comparators but is fed to the peak hold circuit which feeds the comparators. this is a switchable function ("storage") and the rate of droop of the storage function is continuously variable by means of a potentiometer control. In addition a feature was incorporated which detected the switching of any of the comparators and which inhibited the output of the oscillator for a selectable period, giving intervals of silence between notes. This feature was incorporated so as to provide a possible staccato effect feature in the device.

Similarly to the four note device, a direct connection existed between the PZT strip and the mixer amplifier stage, allowing subjects to hear directly the PZT strip's output in addition to the musical output. The microphone used was the same type of miniature electret capacitor type and outputs from the uPKMB channel and microphone channels were available for stereo recording, together with a DC output from the preamplifier stage and one from the differentiator stage.

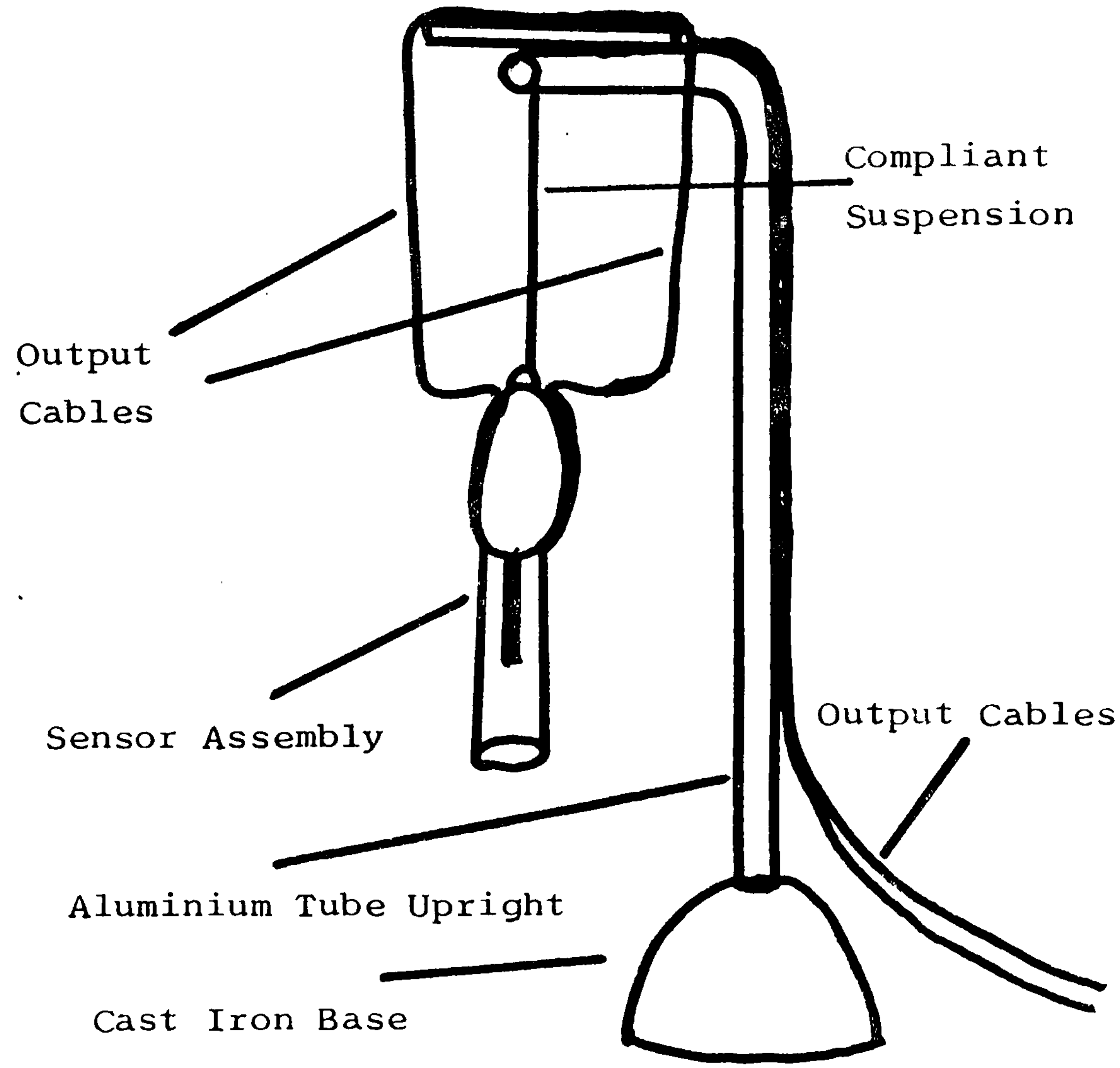
A2.6 The Chart Recorder

The chart recorder was a J.J. Lloyd model 553 three channel device.

writing speed was specified as less than 0.4 seconds fsd, having a calibration accuracy of 1%, linearity of 2% and input impedance of 100,000 ohms. The chart width was 50 mm. An internal low pass filter produced an upper frequency limit of 100 Hz, but the makers do not claim an upper frequency limit of above 20 Hz to be successfully registered by the pen. Input sensitivity was available in decade ranges from 10 mv fsd to 10 volt fsd. Chart speed in all studies was set at 1 mm per second.



(i) PZT UPKMB Sensor Assembly



(ii) UPKMB Sensor and Stand Configuration

Figure 27

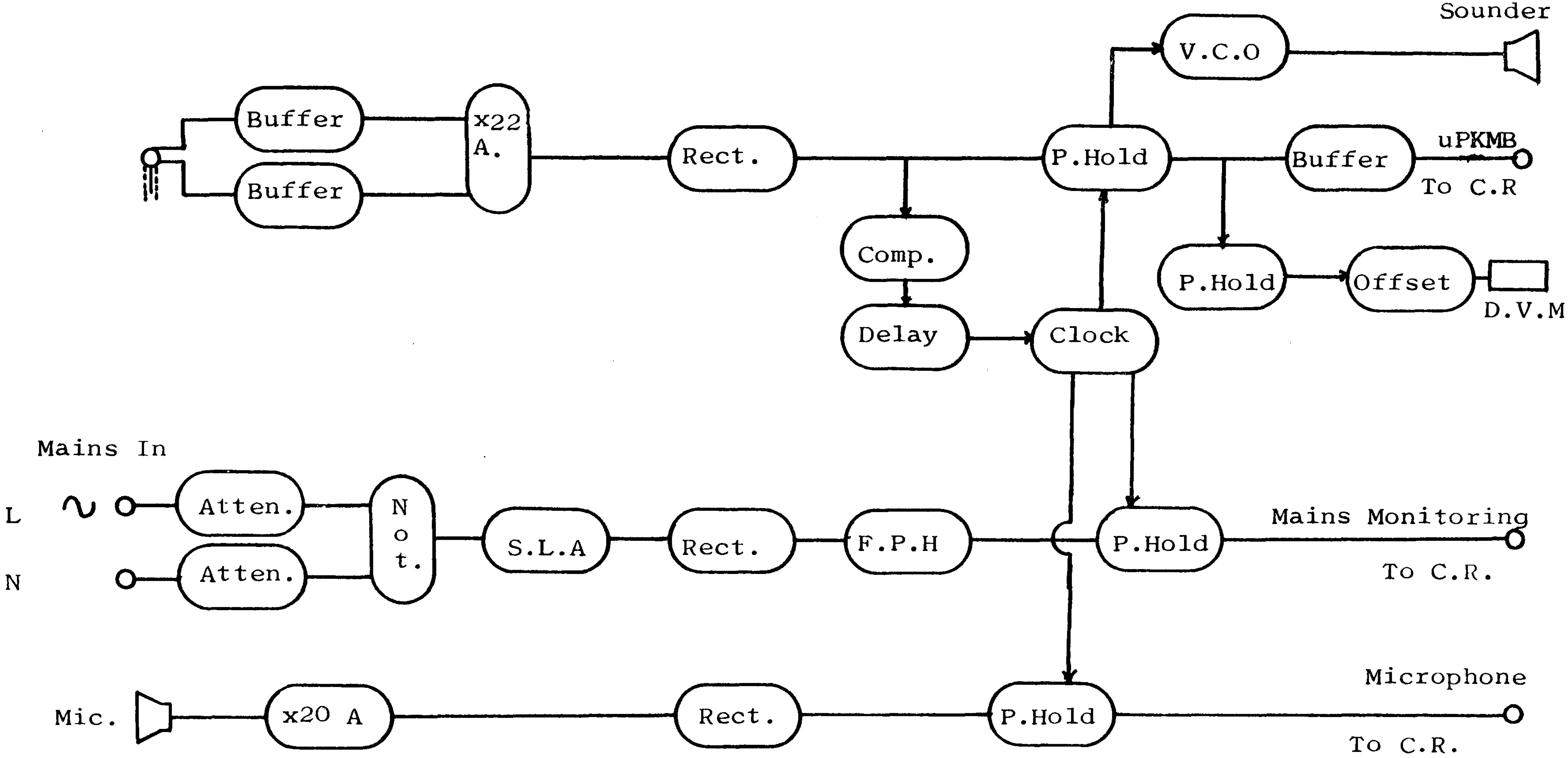


Figure 28. Schematic of Three Channel UPKMB Detection Device

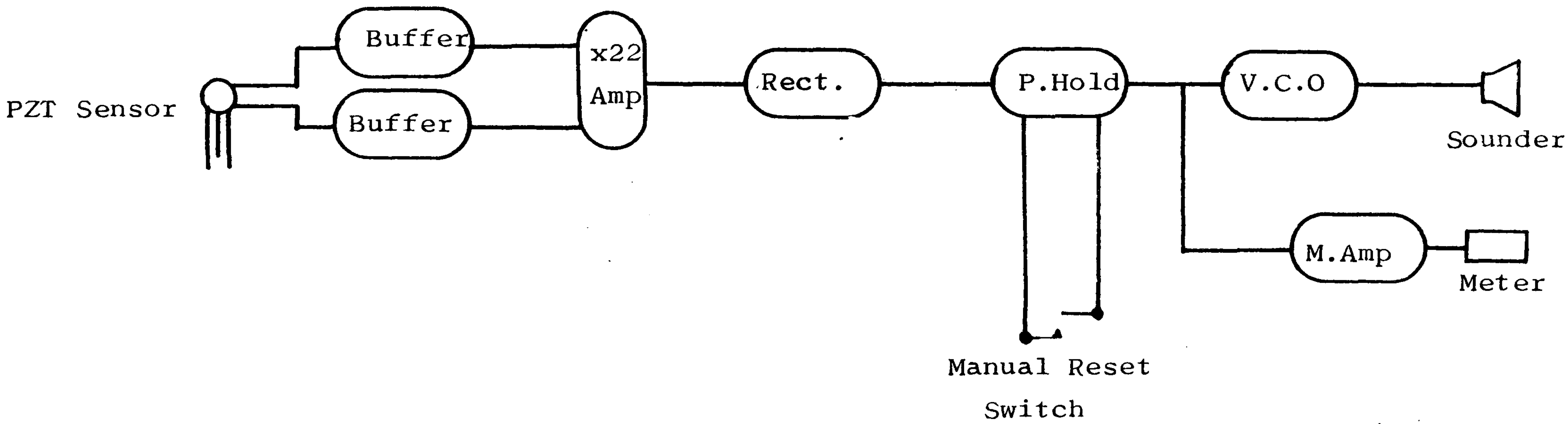


Figure 29. Home Use Device

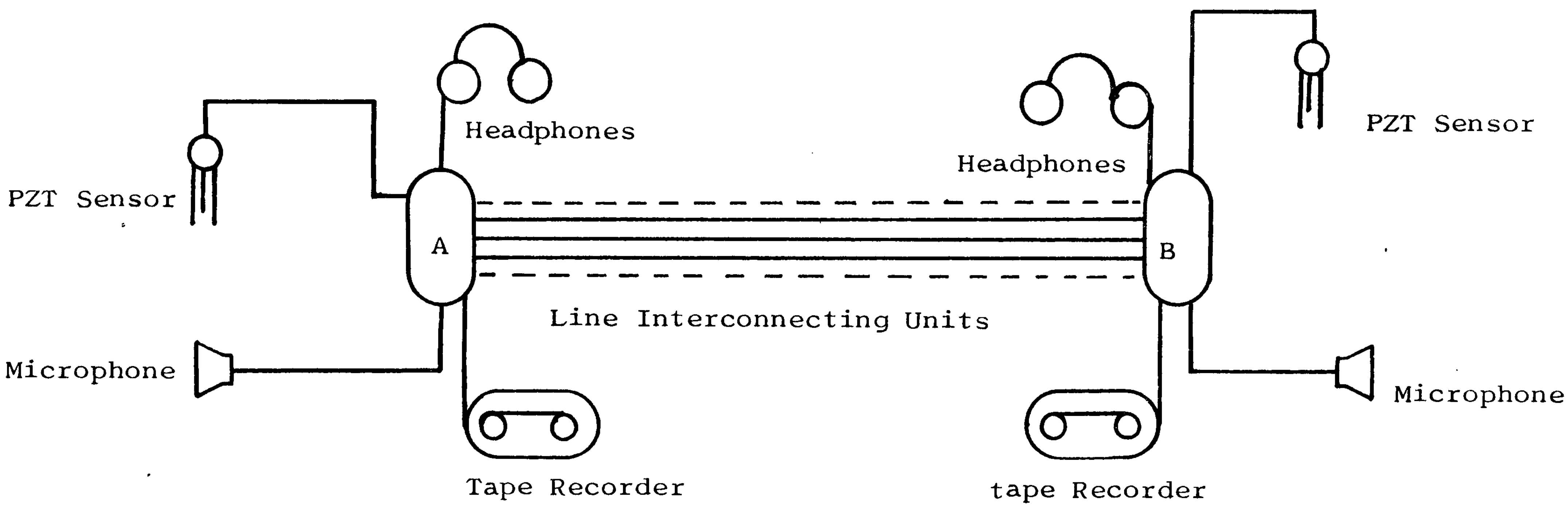


Figure 30 . Direct Feedback Device : Overall Schematic

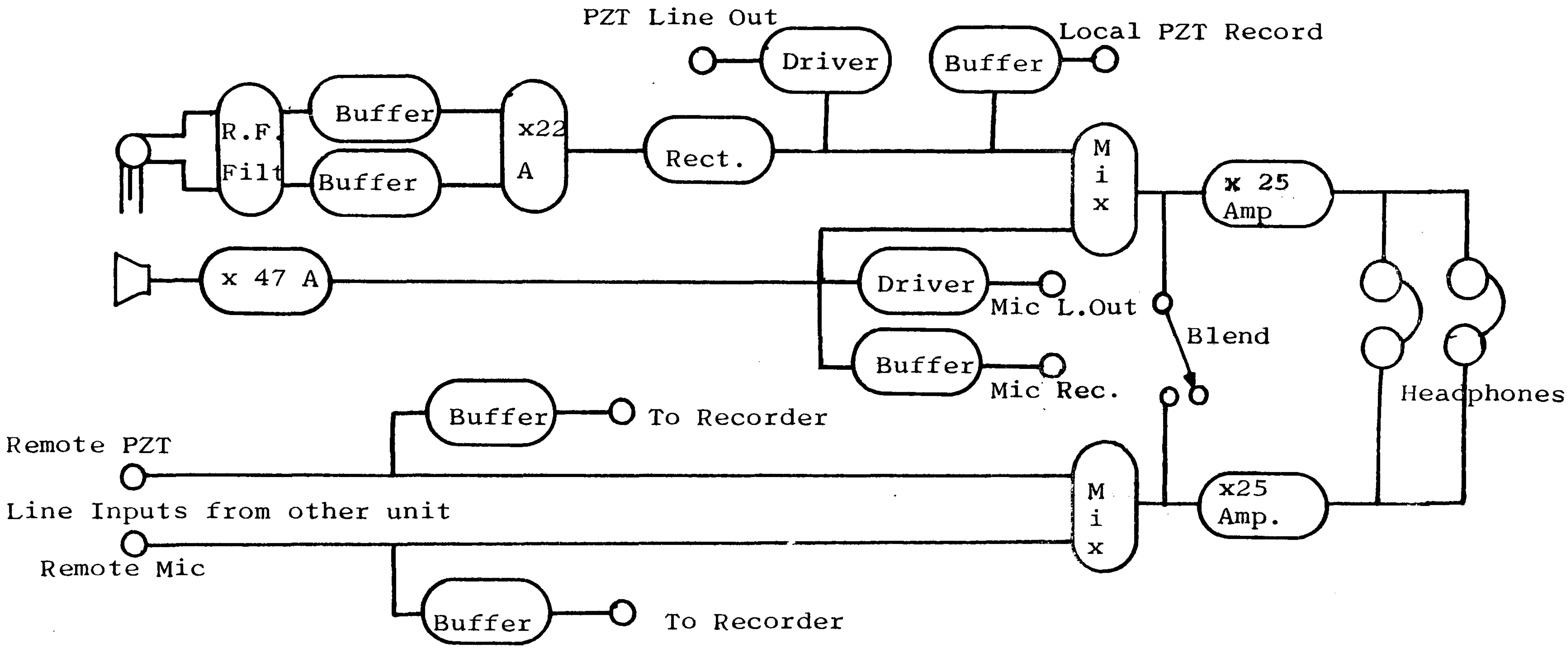


Figure 31. Direct Feedback Device : Detailed Schematic of One Unit

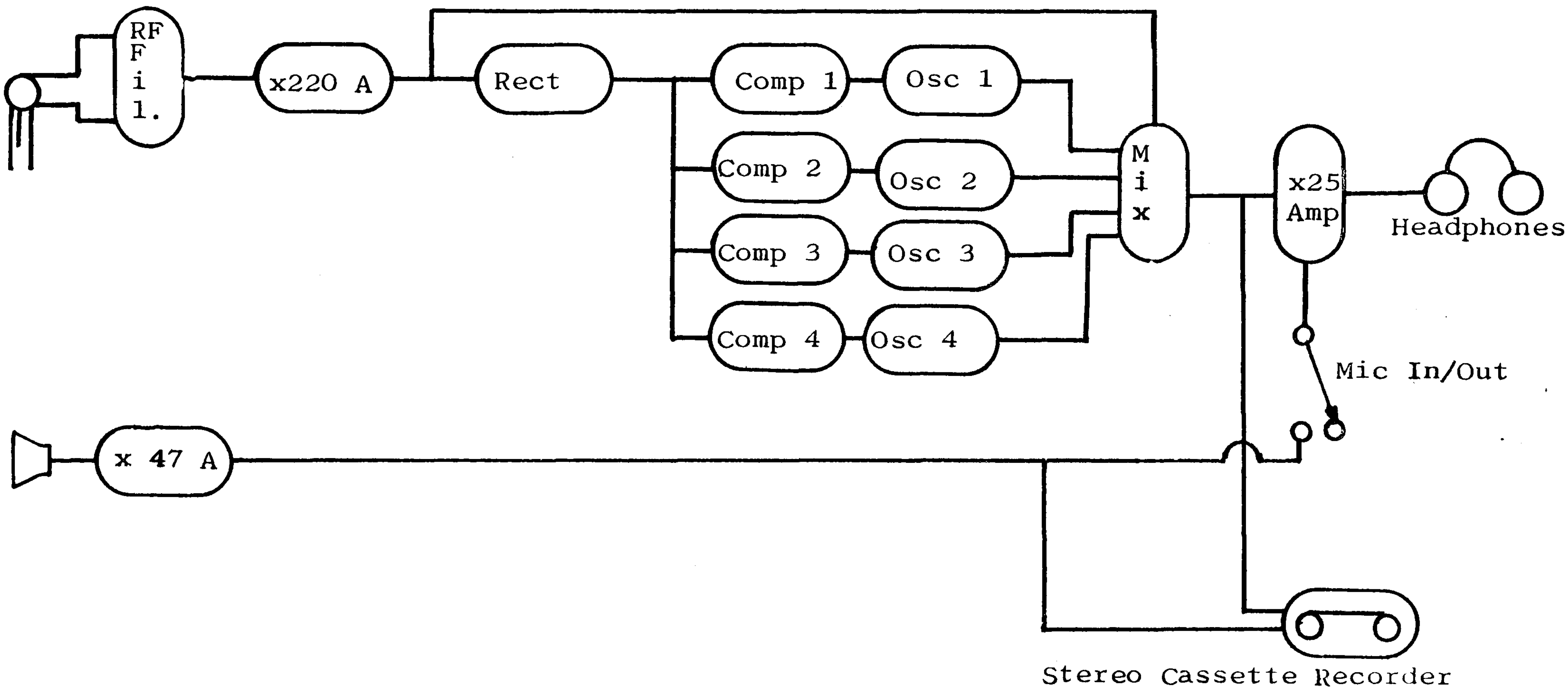


Figure 32. Four Note Device Schematic

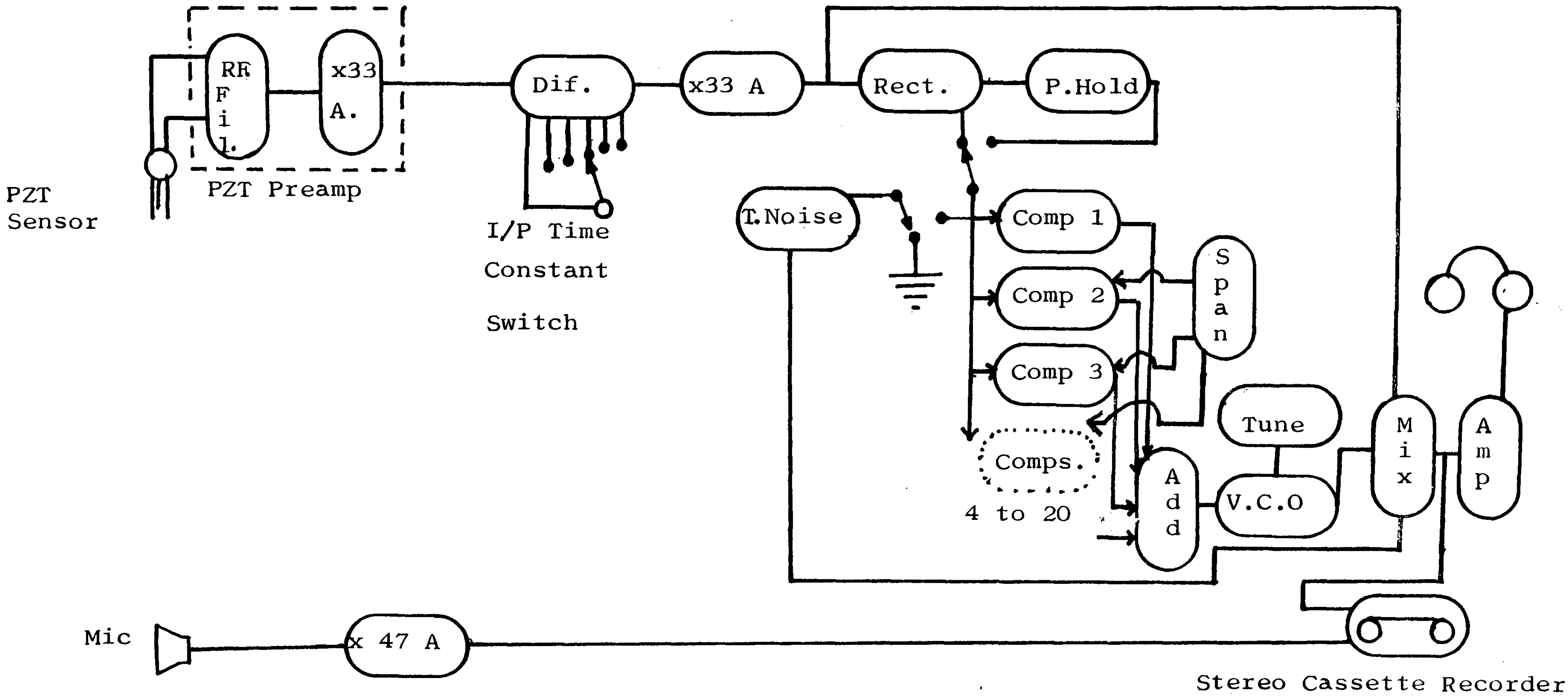


Figure 33. Schematic of Twenty Note Device

APPENDIX THREE

TWELVE SESSION STUDY DATA

Twelve Session Study Data : Scoring Sessions

Subject : Phyllis W.

	Session Number and Date			
	1	7	9	10
Period	8/12/81	26/1/82	8/2/82	16/2/82
R1		2.4 (1)		20 (4)
D2			5.0 (2)	
D3		4.0 (2)		
N6	2.4 (1)			
Totals Per Condition				
Near	2.4 (1)			
Dist		4.0 (2)	5.0 (2)	
Rest		2.4 (1)		20.0 (4)
Totals Per Session				
	2.4 (1)	6.4 (3)	5.0 (2)	20.0 (4)

Figure 39

Twelve Session Study Data : Scoring Sessions

Subject : Phyllis W.

	Session Number and Date			
	12	13	14	15
Period	2/3/82	9/3/822	23/3/82	30/3/82
R3	10.0 (1)			
N3		5.8 (1)		
R4	9.6 (2)	2.4 (1)		
R5	4.0 (1)			
R6	2.6 (1)			
N6	2.2 (1)			

Sessions 14 and 15 were self paced

Totals Per Condition	12	13	14	15
Near	2.2 (1)	5.8 (1)		
Dist				
Rest	26.2 (5)	2.4 (1)	12.7 (3)	2 (1)

Totals Per Session	12	13	14	15
	28.4 (6)	8.2 (2)	12.7 (3)	2 (1)

Figure 40

Twelve Session Study Data : Scoring Sessions

Subject : Mary H-W.

	Session Number and Date				
	1	6	7	8	12
Period	21/12/82	19/12/81	10/2/82	17/2/82	31/3/82
R1				10.4 (3)	
N1	3.2 (1)				
N2			2.0 (1)		
N3		2.2 (1)			
R4					2.8 (1)
R5			4.2 (1)		
N5					2.2 (1)
R7			3.2 (1)		
Post Session Self Paced Trial					7.8 (2)
Totals Per Condition					
Near	3.2 (1)	2.2 (1)	2.0 (1)		2.2 (1)
Dist					
Rest			7.4 (2)	10.4 (3)	2.8 (1)
Totals Per Session					
	3.2 (1)	2.2 (1)	9.4 (3)	10.4 (3)	5.0 (1)

session 12 score including self paced trial = 12.8 (3)

Figure 41

Twelve Session Study Data : Scoring Sessions

Subject : Helen H.

	Session Number and Date			
	3	7	8	12
Period	16/12/81	13/1/82	20/2/82	17/2/82
R1		56.4 (14)		
R2	2.0 (1)			
R3			14.0 (3)	
D4				2.2 (1)
N6		2.6 (1)		
Totals Per Condition				
Near		2.6 (1)		
Dist				2.2 (1)
Rest	2.0 (1)	56.4 (14)	14.0 (3)	
Totals Per Session				
	2.0 (1)	59.0 (15)	14.0 (3)	2.2 (1)

Figure 42

Twelve Session Study Data : Self Paced Sessions

Subject : Helen H.

	Session Number and Date		
	17	18	19
Period	24/3/82	31/3/82	21/4/82
Trial 1	20.0 (2)	164.0 (4)	
Trial 2		130.3 (9)	
Trial 3	16.4 (2)	47.1 (5)	172 (1)
Totals Per Session			
	36.4 (4)	341.4 (18)	172 (1)

Figure 43

Twelve Session Study Data : Scoring Sessions

Subject : Monica B

Period	Session Number and Date 1 1/12/81	 4 5/1/82	 6 19/1/82	 7 26/1/82
R1				29.8 (4)
D1	2.4 (1)			
R5			14.5 (4)	
N5				6.5 (1)
R6		2.4 (1)		
N6				5.0 (2)

Totals Per Condition

Near				11.5 (3)
Dist	2.4 (1)			
Rest		2.4 (1)	14.5 (4)	29.8 (4)

Totals Per Session

	2.4 (1)	2.4 (1)	14.5 (4)	41.3 (7)

Figure 44

Twelve Session Study Data : Scoring Sessions

Subject : Monica B.

Period	8 2/2/82	9 16/2/82	10 16/3/82	11 23/3/82	12 30/3/82
N1				3.4 (1)	17.1 (5)
N2	6.8 (1)	4.9 (2)	4.4 (2)	10.2 (3)	20.4 (6)
N3		3.6 (1)	3.0 (1)	18.1 (3)	19.9 (6)
N4			2.4 (1)	14.2 (3)	14.0 (5)
N5		6.8 (1)	6.9 (1)	22.2 (5)	14.7 (3)
N6			14.8 (1)	22.2 (4)	27.3 (8)
R7		2.2 (1)			
Post Session Self Paced Trial					58.2 (17)
Totals Per Condition					
Near	6.8 (1)	15.3 (4)	31.5 (6)	90.3 (19)	113.4 (33)
Dist					
Rest		2.2 (1)			
Totals Per Session					
	6.8 (1)	17.5 (5)	31.5 (6)	90.3 (19)	113.4 (33)

session 12 score including self paced trial = 171.6 (50)

Figure 45

Twelve Session Study Data : Self Paced Sessions

Subject : Monica B.

Period	Session Number and Date 13 13/4/82	 14 22/4/82	 15 4/5/82
Trial 1	55.4 (16)	16.3 (6)	?
Trial 2	21.1 (7)	35.4 (10)	6.0 (1)
Rest 3		2.4 (1)	
Trial 3	40.4 (11)	73.8 (16)	12.2 (2)
Trial 4		51.6 (11)	12.2 (3)
Trial 5		64.8 (14)	

first trial of session 15 lost

Totals Per Session

	116.9 (34)	244.3 (58)	30.4 (6)

Figure 46

Twelve Session Series

SUBJECT'S PRE-SESSION QUESTIONNAIRE 4

Subject Mary H. ____

Session 4.

Date 27th Jan 82

Time 12.45.

1. How confident are you that you will produce some PK effects this session?

Very Confident ———————————— *Very Doubtful*

2. How relaxed do you feel at the moment?

Very Relaxed ———————————— *Very Tense*

3. Have you anything serious 'on your mind' at the moment?

Very Little ———————————— *Very Much*

4. Is it easy for you to concentrate at the moment?

Very Easy ———————————— *Very Difficult*

5. What is your general mood at the moment?

Very Good ———————————— *Very Bad*

6. How rested do you feel at the moment?

Very Well Rested ———————————— *Very Tired*

7. How awake do you feel at the moment?

Very Awake ———————————— *Very Sleepy*

8. How keen are you to produce PK in this particular session?

Very Keen ———————————— *Completely Indifferent*

Figure 47

9. How physically well do you feel at the moment?

Very Well ———————————————— *Very Ill*

10. If you feel in any way unwell, please indicate what you feel is wrong.

Sleepy

11. M.P. 1__ 2__ 3__ 4__ OC/NA__

12. At what time do you normally go to sleep? ____________

And awake? ____________

13. Have you had any disturbance of your normal sleep pattern in the past two mights?

YES/~~NO~~

If YES, please answer the sleep section of the questionnaire on the next page.

14. Have you taken any form of alcoholic drink in the past two days?

~~YES~~/NO

If YES, please answer the alcoholic beverages section of the questionnaire on the next page.

15. Have you taken any form of medication (including tranquillisers and sleeping pills) in the past two days?

YES/~~NO~~

If YES, please answer the medication section of the questionnaire on the next page. BUT if you are taking medication on a long term basis, do not answer this section unless you have changed your intake in the last two days.

Figure 48

SLEEP SECTION

16. At what time did you go to sleep on the night before last?

1, A.M.

17. How well did you sleep that night?

Very Well ——————————————————————— *Very Badly*

18. At what time did you wake up yesterday?

9, A.M.

19. At what time did you go to sleep last night?

1, A.M.

20. How well did you sleep last night?

Very Well ——————————————————————— *Very Badly*

21. At what time did you wake up this morning?

6·30 AM.

Figure 49

ALCOHOLIC BEVERAGE SECTION

22. The day before yesterday did you take any form of alcoholic drink?

    YES/NO

    If YES would the amount you had represent very much for you?

    Very Much ________________________________ *Very Little*

23. The day before yesterday, at what time did you take your last alcoholic drink?

    ____

24. Yesterday did you take any form of alcoholic drink?

    YES/NO

    If YES would the amount you had represent very much for you?

    Very Much ________________________________ *Very Little*

25. Yesterday at what time did you take your last alcoholic drink?

    ____

26. Today have you taken any form of alcoholic drink?

    YES/NO

    If YES, would the amount you have had represent very much for you?

    Very Much ________________________________ *Very Little*

27. At what time did you take the last alcoholic drink?

    ____

Figure 50

MEDICATION SECTION

28. The day before yesterday did you take any form of medication?

YES/~~NO~~

If YES, please indicate what it was Pain Killer tablet,

29. Yesterday did you take any form of medication?

YES/~~NO~~

If YES, please indicate what it was Aspirin Tablet,

30. Today have you taken any form of medication?

~~YES~~/NO

If YES, please indicate what it was ______________

Figure 51

Twelve Session Series

SUBJECT'S POST-SESSION QUESTIONNAIRE

1. How many of the PK effects happened while you were actually concentrating on producing them?

None ———————————————— *All*

2. How many of the PK effects did you sense as they happened?

None ———————————————— *All*

3. If you did sense any of the PK effects as they happened, how many were sensed:

With your mind?

None ———————————————— *All*

With a bodily feeling?

None ———————————————— *All*

In some other way?

None ———————————————— *All*

Please explain what this other way is like:-

4. How many of the PK effects did you find you could predict just before they happened?

None ———————————————— *All*

5. How do you feel about your performance in the session you have just completed?

Very Satisfied ———————————————— *Very Dissatisfied*

Figure 52

6. Did you get more, or less, PK than you expected in this session?

Very Much More ———————————————————— *Very Much Less*

7. How confident do you feel about producing PK in the next session?

Very Confident ———————————————————— *Very Doubtful*

8. How easy did you find it to get on with the experimenter this session?

Very Easy ———————————————————— *Very Difficult*

Figure 53

Twelve Session Series

EXPERIMENTER'S PRE-SESSION QUESTIONNAIRE

Subject ______________________ Session __________

Experimenter __________________ Date __________

1. How rested do you feel at the moment?

   Very Well Rested ________________________________ *Very Tired*

2. How many experimental sessions have you conducted today so far?

   ____

3. How relaxed do you feel at the moment?

   Very Relaxed ________________________________ *Very Tense*

4. Have you anything serious 'on your mind' at the moment?

   Very Little ________________________________ *Very Much*

5. How much do you feel like conducting this session?

   Very Much ________________________________ *Very Disinclined*

6. What is your general mood at the moment?

   Very Good ________________________________ *Very Bad*

7. How well do you expect this subject to perform in this session?

   Very Well ________________________________ *Very Badly*

8. Do you expect this subject to perform better or worse in this session than the last one?

   Very Much Better ________________________________ *Very Much Worse*

9. How sociable do you feel?

   Very Sociable ________________________________ *Very Withdrawn*

Figure 54

Twelve Session Series

10. How easy do you find this subject to relate to?

Very Easy ———————————————————————— *Very Difficult*

11. How keen are you that this subject should do well in this session?

Very Keen ———————————————————————— *Completely Indifferent*

12. How physically well do you feel?

Very Well ———————————————————————— *Very Ill*

Figure 55

Twelve Session Series

EXPERIMENTER'S POST-SESSION QUESTIONNAIRE

1. How harassed were you by technical problems in the session?

   Very Harassed ________________________________ *Completely Untroubled*

2. How much rapport did you achieve with the subject?

   Very Good ________________________________ *Very Bad*

3. How satisfied were you with your own performance in facilitating the subject's PK?

   Very Satisfied ________________________________ *Very Dissatisfied*

4. How far did the subject's PK output compare with your expectations?

   Very Much Above ________________________________ *Very Much Below*

5. How do you expect this subject to perform at the next session?

   Very Much Better ________________________________ *Very Much Worse*

6. How fatiguing did you find this session?

   Very Fatiguing ________________________________ *Not At All Fatiguing*

7. How much of the subject's PK output seemed to be in response to voluntary effort?

   None ________________________________ *All*

8. How far did the subject's PK output seem to be inhibited by distance?

   Very Greatly ________________________________ *Not At All*

Figure 56

APPENDIX FOUR

ACCELERATED START STUDY DATA

Accelerated Start Study Data : Scoring Sessions
2mv Criterion

Subject : Judy E.

	Session Number and Date			
	7 10/3/83	8 11/3/83	9 17/3/83	10 25/3/83
T1	7.9 (3)	11.4 (4)	9.7 (4)	5 (2)
R1				
T2		13.5 (5)	15.6 (5)	30 (5)
R2				
T3			10.0 (3)	

Totals Per Condition

Trial	7.9 (3)	24.9 (9)	35.3 (12)	35.0 (7)
Rest				

Totals Per Session

	7.9 (3)	24.9 (9)	35.3 (12)	35.0 (7)

Figure 57

Accelerated Start Study Data : Scoring Sessions
2 mv Criterion

Subject : Judy E.

	Session Number and Date				
	11 29/3/83	12 8/4/83	13 4/4/83	15 5/5/83	16 11/5/83
T1	4.0 (2)		13.5 (6)	2.1 (1)	
R1					
T2	31.4 (8)	7.5 (3)	43.1 (12)	5.7 (2)	
R2	42.0 (1)	9.7 (4)			
T3	15.1 (5)		47.3 (12)	5.3 (2)	7.7 (3)
R3			6.7 (1)		
T4					19.7 (1)

Totals Per Condition

T	50.5 (15)	7.5 (3)	103.9 (12)	13.1 (5)	27.4 (4)
R	42.0 (1)	9.7 (4)	6.7 (1)		

Totals Per Session

92.5 (16)	17.2 (7)	110.6 (30)	13.1 (5)	27.4 (4)

Figure 58

Accelerated Start Study Data : Scoring Sessions
1mv Criterion

Subject : Judy E.

	Session Number and Date			
	7 10/3/83	8 11/3/83	9 17/3/83	10 25/3/83
T1	7.9 (3)	16.7 (8)	13.4 (6)	8.3 (4)
R1				
T2		14.7 (6)	18.4 (7)	30.0 (5)
R2				
T3			15.5 (7)	

Totals Per Condition

Trial	7.9 (3)	31.4 (14)	46.3 (20)	38.3 (9)
Rest				

Totals Per Session

7.9 (3)	31.4 (14)	46.3 (20)	38.3 (9)

Figure 59

Accelerated Start Study Data : Scoring Sessions
1 mv Criterion

Subject : Judy E.

Session Number and Date

	11 29/3/83	12 8/4/83	13 4/4/83	15 5/5/83	16 11/5/83
T1	5.4 (3)		25.6 (16)	3.1 (2)	
R1					
T2	37.3 (13)	12.4 (6)	49.6 (16)	7.1 (3)	
R2	42.0 81)	11.3 (5)			6.2 (5)
T3			60.1 (20)	7.0 (3)	20.6 (12)
R3			6.7 (1)		
T4					23.8 (4)

Totals Per Condition

T	59.0 (22)	12.4 (6)	135.3 (52)	17.2 (8)	50.6 (21)
R	42.0 (1)	11.3 (5)	6.7 (1)		

Totals Per Session

101.0 (23)	23.7 (11)	142.0 (53)	17.2 (8)	50.6 (21)

Figure 60

Accelerated Start Study

SUBJECT'S PRE-SESSION QUESTIONNAIRE

SUBJECT ________________ DATE ________________

SESSION ________________ TIME ________________

1. How physically well do you feel at the moment?

Very Well ____ *Very Ill*

2. Do you feel at all tired at the moment?

Not at all ____ *Very Tired*

3. What is your general mood at the moment?

Very Good ____ *Very Bad*

4. How confident are you that you will produce some PK effects in this session?

Very Confident ____ *Very Doubtful*

5. Has your sleep been disturbed to a significant degree:

THE NIGHT BEFORE LAST? ____________ *LAST NIGHT?* ____________

6. Have you had a significant amount of alcoholic drink:

YESTERDAY? ____________ *TODAY?* ____________

Figure 61

... (Cont.) ...

7. Have you taken any form of medicine (which is different from your normal intake if you are on regular medication):

TODAY? ___________

8. Have you had any emotional disturbance of any sort:

YESTERDAY? _______________ *TODAY?* _____________

9. M.P. 1__ 2__ 3__ 4__ N/A:O/C__

Figure 62

Accelerated Start Study

SUBJECT'S POST SESSION QUESTIONNAIRE

TIME: ____________

1. How many work periods did you do in this session? ____________

2. Roughly how many minutes did they last? ____________

3. How effortful was your approach to the PK task in this session?

Very Effortful ________________________________ *Completely Effortless*

4. What strategies did you use in your session?

IGNORE IT ______

IMAGINING OR VISUALISATION ______

"THIRD EYE" ______

OTHER APPROACHES ______

VOLUNTARY CONTROL ______

5. How do you feel about your performance in the session you have just completed?

Very Satisfied ________________________________ *Very Dissatisfied*

6. How much control do you feel you had over your PK?

Complete Control ________________________________ *None*

7. Did you get more, or less PK than you expected this session?

Very Much More ________________________________ *Very Much Less*

Figure 63

... (Cont.) ...

8. Do you think that in any way you have improved your performance compared to your last session?

YES ______

DON'T KNOW ______

NO ______

9. If the experimenter was present in this session, how easy did you find it to get on with him?

Very Easy ____ *Very Difficult*

10. Roughly how many PK pulses did you get this session?

NONE ______

1 or 2 ______

3 to 5 ______

5 to 10 ______

10 to 20 ______

20 to 40 ______

11. When the PK effects happened, what were you thinking or doing?

Figure 64

Accelerated Start Study

EXPERIMENTER'S PRE-SESSION QUESTIONNAIRE

SUBJECT ____________ DATE ____________

SESSION ____________ TIME ____________

1. How physically well do you feel at the moment?

Very Well ______________________________ *Very Ill*

2. Do you feel fatigued at the moment?

Not at all tired ______________________________ *Very Tired*

3. What is your general mood at the moment?

Very Good ______________________________ *Very Bad*

4. How confident are you that the subject will produce some PK today?

Very Confident ______________________________ *Very Doubtful*

5. Will the subject's performance be better or worse than the last session?

Much Better ______________________________ *Much Worse*

6. How much do you feel like conducting this session?

Very Much ______________________________ *Not at all*

Figure 65

... (Cont.)...

7. Has you sleep been disturbed :

THE NIGHT BEFORE LAST ______

LAST NIGHT ______

8. Have you had a significant amount of alcohol :

YESTERDAY ______

TODAY ______

9. Have you taken any medicine today? ______

10. Have you had any sort of emotional disturbance :

YESTERDAY ______

TODAY ______

Figure 66

EXPERIMENTER'S POST-SESSION QUESTIONNAIRE

1. Were you bothered by technical problems in this session? ________

2. How much voluntary control did the subject exhibit?

None ____ *Complete*

3. Did the subject produce more, or less PK than you expected?

Much More ____ *Much Less*

4. How easy was it this session to relate to the subject?

Very Easy ____ *Very Difficult*

5. How close do you feel to this subject, compared to the others?

NEARER ________

AVERAGE ________

FURTHER ________

6. What duration were their work and rest periods?

1st W _____	*2nd W* _____	*3rd W* _____	*4th W* _____	*5th W* _____
1st R _____	*2nd R* _____	*3rd R* _____	*4th R* _____	*5th R* _____
6th W _____	*7th W* _____	*8th W* _____	*9th W* _____	*10th W* _____
6th R _____	*7th R* _____	*8th R* _____	*9th R* _____	*10th R* _____

7. What strategies did they use in their work periods?

Figure 67

APPENDIX FIVE

AUDIO PK STUDIES DATA

JUDY EVANS : FOUR NOTE SESSIONS DATA

DATE	EVENTS IN TRIAL PERIOD	SPONTANEOUS EVENTS
2/8/83	41	17
16/8/83	9	7
25/8/83	17	0
30/8/83	21	0
9/9/83	33	0
27/9/83	43	0

Numbers given are for total number of events without respect to amplitude (other than exceeding criterion).

Figure 68

KENNETH R : EXTENDED FOUR NOTE SERIES RESULTS BY SESSION

Scoring Values : A = 2, B = 3, C = 4, D = 5.

Note A is lowest pitch note.

SESSION	DATE	SCORE	TOTAL
1	31/7/83	0	0
2	1/8/83	0	0
3	3/8/83	13H 1A	2 + 13H
4	4/8/83	18H 5A 1B	13 + 18H
5	9/8/83	8H 4A 1B	11 + 8H
6	10/8/83	3H 1A 1B 2C	9 + 3H
7	11/8/83	5H 1A	2 + 5H
8	12/8/83	9H 3A 1B	9 + 9H
9	14/8/83	7H 1A (short session)	2 + 7H
10	16/8/83	1H 6A 1C	16 + 6H
11	18/8/83	9H 5A 1B	13 + 9H
12	19/8/83	13H 3A 1B	9 + 13H
13	21/8/83	14H 5A 1D	15 + 14H
14	23/8/83	1H 5A	10 + 1H
15	24/8/83	2H 4A	8 + 2H
16	26/8/83	3H 3A 1B 1C	13 + 3H
17	27/8/83	4H 5A	10 + 4H
18	31/8/83	4H 4A	8 + 4H
19	1/9/83	1H 4A	8 + 1H
20	2/9/83	5A 2B 2C 1D	29

Figure 69

KENNETH R : FOUR NOTE EXTENDED SERIES RESULTS BY SESSION

21	3/9/83	6A 3B	21
22	4/9/83	5A 2B 1C	20
23	6/9/83	4A 1B	11
24	11/9/83	1A 4B 3C	26
25	12/9/83	6A 6B	30
26	13/9/83	4A 3B 2C 2D	35
.....................TWO WEEK BREAK.....................			
27	28/9/83	2A 3B 2D	23
28	29/9/83	1H 2A 1B 2D	17 + 1H

Figure 70

APPENDIX SIX

A6.1 Professor Wood's Criticisms of Hasted's Work

After this thesis had been printed, it was realised that an omission had been made which might be thought important. It was decided to include the material below which had inadvertently been omitted from appendix one which reviews Hasted's work.

Professor R.H. Wood has published a paper containing a series of criticisms (1982) of aspects of Hasted's (Hasted & Robertson, 1979, 1980) work. He had five criticisms, some specific, some general.

The first criticism was general and was that Hasted's published work did not cite strain values (extension divided by original length) but gave results in terms of the electrical (millivolts) output from the strain gauge amplifier.

Wood acknowledged that Hasted communicated a conversion coefficient (from electrical terms to strain terms) to him when requested (that 1 mv = 1.6 x 10 (-7) strain) from which Wood concluded that Hasted's measurements of effects in a thick cast metal bar (see section A1.4.4) were of effects giving strains of 1/3000 of the yield strain.

From this he developed his second criticism which was that signals of this very small magnitude would be unreliable, because (according to Wood) they are at the limit of strain gauge performance. He stated that he would only believe such signals if a linear strain bending diagram could be produced as a calibration reference by means of the exertion of normal force on the bar. This would establish the accuracy of the strain gauges' response for such small values of strain. He cited a professor of civil Engineering who told him that recorded strains of less than order 10 x (-6) could not be trusted.

His third criticism was that such small strain signals ought to have been elastic, and that Hasted's reported signals were not. This suggested additional reasons to him for not trusting the results reported by Hasted for the bar.

His fourth criticism was that Hasted's mathematical analysis of strain vectors for a circular disc was too simple - that the assumption of only two mutually orthogonal strain vectors was only valid for pure shearing action (see section A1.4.5) and that the action was more complex than that, as Hasted and Robertson had stated, so the results of Hasted's cited calculations were incorrect (Hasted & Robertson 1979).

His fifth criticism was that Hasted's analysis for the limits to the possible normal strain which a twisted spoon could stand before fracturing (Hasted & Robertson 1980) was incorrectly based on the assumption that the strain involved was extensional strain, when in fact shear strain was responsible, invalidating Hasted's cited calculations.

Hasted's reply was published in the same paper. He pointed out that in every case information was given which could allow strain values to be calculated, even though they were not explicitly stated.

He stated that linear strain diagrams were produced in calibration trials of the thick metal bar down to about 1/1000 of the yield strain. He conceded that the signals recorded therefore could not be validated from the results of the calibration test, although this did not necessarily invalidate the results. It just meant that testing by normal means could not provide a calibration reference.

However, he also pointed out that in gravitational wave research, strains of only 10 x (-12) were recordable with good accuracy. He stated that it was desirable to use strain detection equipment which had a noise floor which was determined by ambient shock and vibration, rather than being electrical and stated that PZT strain transducers (which this author had introduced to Hasted as possible uPKMB detection elements) were in this respect very much superior to strain gauges and that he had (1981) now explored their use.

Hasted conceded that Wood's criticism of his analysis of behaviour of the circular disc was correct in one respect in that he (Hasted) had erroneously stated that a single stress vector would produce equal and mutually orthogonal strain vectors of opposite sign. He also conceded that the analysis of the strain for the spoon was incorrect, although he maintained that control spoons twisted normally did not reach the degree of strain before fracture which the putatively paranormally softened and twisted spoons had, so that the paranormality of the effect had not been brought into question by the incorrectness of the analysis.

In evaluating Wood's criticism, this author has had the benefit of having discussed the criticisms with both Hasted and with another of his critics. Hasted concedes quite freely that Wood was correct in his criticisms of his analysis of the twisted spoon strain. The unstated core of Wood's position, Hasted thought, might possibly be a sceptical attitude towards results which apparently contradicted those of normal mechanics.

In particular, in normal stress/strain relationships describing the response of materials to applied stresses, small stresses cause small elastic (recoverable) strains, whereas in paranormal PKMB effects, the strains seem mostly not recoverable, even though the strains involved may be very small. It may have been difficult for Wood to believe that non recoverable small strains are possible in PKMB.

However, the suppression of the elastic component seems to be one of the defining characteristics of paranormal strains which marks them out from normal ones. This feature suggests that internal structural changes may produce the strains, rather than the strains occurring in response to applied forces (which is why calibration of PZT strain sensors is meaningless since PKMB seems to operate "from the inside" rather than by applying force "from the outside" of the PK targets).

The fact that outputs from PZT (lead-zirconium-titanate) ceramic piezoelectric transducers (ie the Mullard multimorph elements) can occur in electrically shielded rooms when no sounds or vibration are present (as has happened frequently during Hasted's sessions with Stephen North at Birkbeck) suggests that strain signals from strain gauges do represent strains.

Additional supporting evidence comes from the fact that macroscopic bendings visible to the eye correlate well with strain signals, and most of Hasted's strain signals are large enough for the calibration tests employing exertion of normal forces to apply to them. Further discussion of the validity of Hasted's recorded effects is given in sections A1.3.1 to A1.3.3.

This author's opinion is that Wood's criticisms are very much peripheral to the validity of the main body of Hasted's work.

References

Hasted & Robertson 1979 The Detail of Paranormal Metal-Bending. Journal of the Society for Psychical Research, 50, 9 - 20.

Hasted & Robertson 1980 Paranormal Action on Metal and its Surroundings. Journal of the Society for Psychical Research, 50, 379 - 398.

Wood, R.H. On the Importance of Correct Mechanics in Paranormal research. Journal of the Society for Psychical research, 51, 246 - 252.