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Pelvic floor exercises, incontinence and pregnancy: knowledge, motivation and behaviour

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Dedication

For my father, Ian Brewster.

Who recognised the importance of education, and who would have been so proud, had he lived to see the completion of this work.

Declaration

Thesis: Pelvic floor exercises, incontinence and pregnancy: knowledge, motivation and behaviour

Heather M Whitford

I declare that I am the sole author of this thesis and that all the references cited have been consulted by me personally; that the work of which this thesis is a record has been done by myself, and that it has not been previously accepted for a higher degree.

Signed:…………….…………………

Heather M Whitford, Author

Date:……...…………………

I declare that the above thesis is the work of the author and that all the relevant regulations have been fulfilled.

Signed:…………….…………………

Professor E. M. Alder, Supervisor

Date:……...…………………

Summary

Pelvic floor exercises, incontinence and pregnancy: knowledge, motivation and behaviour

Heather M Whitford

Childbirth and obstetric factors have been linked to the subsequent development of urinary incontinence. It has been suggested that the practice of pelvic floor exercises during pregnancy may reduce the prevalence of postpartum incontinence. However little is known about current information provision about pelvic floor exercises to pregnant women and rates of practice of the exercises. Motivation of pregnant women to practise the exercises has not been examined. This study was designed to address these deficiencies and to find out if the Revised Theory of Planned Behaviour (RTPB) was applicable to the practice of pelvic floor exercises during pregnancy. A cohort of women (n = 289) attending antenatal clinics in Dundee were interviewed in the third trimester of pregnancy regarding information and practice, as well as beliefs and attitudes about pelvic floor exercises using the RTPB as a framework. A follow-up postal questionnaire was sent between 6 – 12 months after delivery (63.4% response rate). 77.9% of women reported receiving information in the current pregnancy: younger women, first-time mothers and those from more deprived backgrounds were less likely to report receiving information. Just over half the women (54.0%) reported the practice of pelvic floor exercises during pregnancy, and 83.2% of responders to the follow-up reported

practising the exercises in the first month after delivery. Non-practice of the exercises in pregnancy was associated with younger age, more deprived area of residence and lower educational level, but not parity. The RTPB variables (‘attitude to the new behaviour’, ‘subjective norm’ and ‘self-efficacy’) explained 53.1% of variance in intention to practise pelvic floor exercises during pregnancy. Perceived vulnerability to incontinence (‘attitude to current behaviour’) had no relationship with intention, but this relationship may have been moderated by current behaviour. Generally women did not think postnatal incontinence was likely. Measures of past behaviour significantly improved the percentage of explained variance in intention. Confidence in ability to correctly perform the exercises (‘self-efficacy’) was significant in predicting subsequent practice. These findings will help to inform future interventions in order to encourage more women to practise pelvic floor exercises.

Abbreviations

ACB	Attitude to Current Behaviour
CTG	Cardiotocograph
EMG	Electromyographic
GP	General Practitioner
HV	Health Value
HEBS	Health Education Board for Scotland
ICS	International Continence Society
IVBD	Intravaginal Balloon Device
M	Mean
MHLC	Multidimensional Health Locus of Control
NMES	Neuromuscular Electrical Stimulation
OPCS	Office of Population Censuses and Surveys
OR	Odds Ratio
PBC	Perceived Behavioural Control
PFE	Pelvic Floor Exercises
RCT	Randomised Control Trial
RTPB	Revised Theory of Planned Behaviour
SD	Standard Deviation
SE	Standard Error
SVD	Spontaneous Vaginal Delivery
TPB	Theory of Planned Behaviour
TRA	Theory of Reasoned Action

Chapter 1: Introduction and Literature Review

1 Introduction to Chapter 1

The review of the literature is divided into five sections. The first section describes the condition of urinary incontinence, the prevalence in the general population of women and the association between incontinence, age and parity. The second section examines the prevalence of incontinence around the time of childbirth and the prognosis after delivery. In particular some of the factors relating to childbirth that may have a relationship with stress incontinence are considered. The third section describes the muscles of the pelvic floor and pelvic floor exercises. The relationship between the pelvic floor, pelvic floor exercises and incontinence, predominantly around the time of childbirth are then considered. The fourth section examines the factors that affect the effectiveness of pelvic floor exercises. Finally the fifth section considers the role of social cognition models, in particular the Theory of Planned Behaviour, as well as other measures of health-related beliefs, in the understanding and prediction of health related behaviour.

A literature search was carried out systematically using electronic databases (Medline, Cinahl, BIDS citation index and PsychLit between 1980 and 1998). The key words used were urinary, incontinence, stress, postpartum, postnatal, pelvic floor, pelvic muscle, Kegel, compliance, health behaviour, Theory of Planned Behaviour and Theory of Reasoned Action. The reference lists of the resulting papers and relevant journals were hand-searched to find further articles. Only articles in English were included.

This review of the literature includes all literature published up to and including 1998, when the data collection for the study began. Literature published after 1998 is included in the discussion.

1.1 Incontinence in women

Incontinence, the involuntary leakage of urine, is an embarrassing and distressing condition that can severely limit the activity of sufferers. The condition affects more women than men (Thomas et al. 1980), and childbirth has been implicated as a precipitating or exacerbating factor in its development (Foldspang et al. 1992).

The focus of this thesis is pregnancy and childbirth, however it is relevant first to examine the problem of incontinence in the general population of women before focusing specifically on childbearing. The first section of this review will examine the impact of incontinence on sufferers, the prevalence of incontinence in women and provide an overview of the risk factors.

1.1.i Definitions

The International Continence Society (ICS) has defined urinary incontinence as "involuntary loss of urine which is objectively demonstrable and a social or hygienic problem" (Abrams et al. 1990, p14). The ICS definition may be relevant for clinical practice and identifying those who should receive treatment, but is too vague for research purposes where quantification of the urine loss is required for objective outcome measures (Foldspang et al. 1992).

Stress incontinence is when a patient complains of "involuntary loss of urine during physical exertion" (Abrams et al. 1990, p14). Genuine stress incontinence is defined as "the involuntary loss of urine occurring when, in the absence of a detrusor contraction, the intravesical pressure exceeds the maximum uretheral pressure" (Abrams et al. 1990, p14). A diagnosis of genuine stress incontinence is therefore usually only made after confirmation of the symptoms by urodynamic investigations.

Urge incontinence is distinct from stress incontinence when the involuntary loss of urine is "associated with a strong desire to void (urgency)" (Abrams et al. 1990, p14). Symptoms of both urge and stress incontinence can be present in the same woman; a condition referred to as mixed incontinence.

1.1.ii Impact of incontinence

Any kind of incontinence can be distressing because of the effect it can have on the quality of life of sufferers. Surveys that have included questions about the effect of incontinence on lifestyle have found that it limits social activity (Yarnell et al. 1981; Wyman et al. 1987; Lam et al. 1992), physical activity (Lam et al. 1992), work activity (Norton et al. 1988; Lam et al. 1992), and can lead to a reluctance to visit unfamiliar places, for example going shopping or to the cinema (Wyman et al. 1987; Norton et al. 1988; Ashworth and Hagan 1993).

Many women report that they are afraid of other people noticing a smell and that they feel dirty (Ashworth and Hagan 1993). A further consequence is that sexual relationships are adversely affected, even to the point of marital breakdown (Norton et al. 1988; Lam et al. 1992; Ashworth and Hagan 1993). Stress incontinence has a greater impact on the lives of younger women than older women, by restricting social activities (Sandvik et al. 1993).

Adverse psychological consequences have been reported, including an altered perception of self (Wyman et al. 1987; Ashworth and Hagan 1993), feeling a lack of personal control (Ashworth and Hagan 1993), suffering from stress and anxiety (Lam et al. 1992) and feeling isolated by the problem (Ashworth and Hagan 1993). Many women find the subject too difficult to talk about (Ashworth and Hagan 1993). Guilt and denial have been noted (Ashworth and Hagan 1993). Ashworth and Hagan (1993) also found that some suffers blamed themselves for the condition because they had not performed pelvic floor exercises.

The stigma and embarrassment may lead to treatment not being sought for many years after the condition develops (Norton et al. 1988; Rekers et al. 1992). There are also many women who regard some degree of incontinence as a normal consequence of childbirth (Bick and MacArthur 1995) and a part of being a woman that must be endured (Holst and Wilson 1988; Norton et al. 1988; Ashworth and Hagan 1993).

1.1.iii Discrepancies in self-reported rates of incontinence

Discrepancies arise when prevalence rates of stress and urge incontinence are compared. Not all studies classify the type of incontinence, and no epidemiological study confirms the diagnosis using urodynamic investigation. In Norway, Sandvik et al (1995) (Table 1.1) carried out a two-stage study to investigate the validity of self-reported diagnoses of incontinence by women. The first part involved a structured questionnaire, which was administered (by a nurse during an interview), to 250 women consecutive women with incontinence attending an out-patient clinic. A diagnosis was made based on self-report; a second diagnosis was then independently made by a gynaecologist who was unaware of the initial classification of the incontinence. The diagnosis made by the clinician was described as the ‘gold standard’, and included urodynamic testing. The diagnosis based on self-report was correct in 64% of cases, and changed in 36% of cases. The sensitivity (percentage of women with incontinence who were correctly diagnosed) and specificity (percentage of women without incontinence who were correctly diagnosed) of the reported diagnoses were then computed, and indices of validity were calculated.

The second part of the study involved sending a questionnaire to all women (n = 2366) over the age of 20 living in one area of Norway asking about symptoms of incontinence. The response rate was 77% and 29.4% of these women reported urinary incontinence. Using the previously derived indices of validity these self-reported rates were then adjusted to take account of inaccuracies. In this way they concluded that stress incontinence was under-diagnosed (adjusted up from 59% to 89% of the women who reported incontinence), mixed incontinence over-diagnosed (adjusted down from 36% to 8%) while the proportion of urge incontinence (10% to 12%) did not change significantly.

Although the indices of validity may be affected by the method of data collection and the population sampled, if these inaccuracies also apply to other research, then the self-reported proportions of different types of incontinence must be treated with caution.

1.1.iv Prevalence in general population

A total of 23 articles were found relating to the prevalence of urinary incontinence in populations that included women of childbearing age (under age 45 years). These will be described according to the method of data collection used. Although some of the articles included in sections 1.1.iv.1 and 1.1.iv.2 differentiate between stress and urge incontinence, the rates quoted in section 1.1.iv.3 are for all incontinence, including both stress and urge.

Some studies do not give details about the time scale under investigation. The rate will be affected by whether the women were asked about incontinence occurring at the time of the questionnaire or interview (point prevalence), incontinence occurring over a specific period of time such as during the preceding year (period prevalence), or any incontinence suffered at any time in their life. It is questionable whether a report of point prevalence of incontinence is possible. Reporting a rate for point prevalence overlooks the fact that incontinence generally occurs over a period of time. These issues must all be taken into account when results are considered.

1.1.iv.1 Questionnaire surveys

Questionnaires were used in 18 of these studies. Of these 18, some did not describe the method of investigation clearly (Iosif and Ulmsten 1981; Glew 1986; Mäkinen et al. 1992), some did not detail the questions that were asked (Feneley et al. 1979; Sommer et al. 1990; Milsom et al. 1993), while others used doubtful methods of sample selection (Crist et al. 1972; Shershah and Ansari 1989; Nygaard et al. 1990; Turan et al. 1996). The remaining eight studies that used questionnaires are described in this section. Only one of these used the ICS definition (Elving et al. 1989), and none confirmed the diagnosis with urodynamic investigations.

Surveys using postal questionnaires may be affected by the rate of non-response. There is some evidence that incontinent women are under-represented among responders to postal questionnaires (Sandvik and Hunskaar 1994), possibly due to embarrassment. However other commentators have suggested that those suffering from incontinence may be more likely to respond to, or remain in a survey than those not affected (Mallett and Bump 1994). Follow-up surveys may not elicit a response from those whose condition has resolved. As noted previously the self-reports of those who do respond may not accurately reflect the true nature and extent of the incontinence if urodynamic investigation had been used to confirm or refute the diagnosis.

The eight questionnaire surveys of the prevalence of incontinence in the general population of women will be discussed in this section. Methodological characteristics of studies are summarised in Table 1.1. None of these self-reported prevalence rates was confirmed by urodynamic investigation. The largest and most widely quoted postal survey was carried out by Thomas et al (1980) on all 22430 patients in 12 GP practices in England and Wales. A response rate of 89% was achieved. It found prevalence for regular incontinence of 8.5% among women aged 15 – 64 years (period of prevalence not specified, although assumed to be at the time of the survey). 'Regular' incontinence was defined as involuntary leakage of urine twice or more a month, regardless of the quantity of urine lost and thus included both stress and urge incontinence. Less frequent 'occasional' incontinence (occurring less than twice a month) was reported by a further 16.6% of the sample, leading to a total of 25.1% who experienced some level of incontinence.

A more recent study by O'Brien et al (1991) used the same definition as Thomas et al (1980) when surveying 7300 adults over the age of 35 years randomly selected from two GP practices in England. Of the 79% who responded, 16.5% of women in the age group 35 to 64 years reported regular incontinence (regular incontinence being two or more leaks in any one month). This is similar to the findings of Thomas et al (1980) who found a prevalence of 11.2% for women in the same age group (35 – 64 years). O'Brien et al (1991) do not give results for women with mild incontinence.

A postal questionnaire survey by Elving et al (1989) found that 25.5% of women had suffered one or more periods of incontinence at some time during adult life. When asked how they felt about the incontinence, 17.9% perceived the incontinence as a problem, and 13.7% as a social or hygienic problem (according to the ICS definition). A period prevalence rate of 17.1% was found for all types of incontinence for the whole sample during the calendar year 1987. When the ICS definition was used, the rate was 10.4%. No attempt was made to quantify the urine lost in terms of frequency or quantity. Similar to Elving et al (1989), the previously described epidemiological phase of the study by Sandvik et al (1995) reported that 29.4% of the women surveyed reported some degree of urinary incontinence (assumed to be at the time of the survey).

Comparable results to Elving et al (1989) have been found in the previously described epidemiological phase of the study by Sandvik et al (1995) (29.4%) and by Rekers et al (1992) (26.5%). Both studies reported on involuntary loss of urine of any frequency or severity at the time of the survey. Rekers et al (1992) detailed the quantity and severity: urine loss occurring at least once a day was reported by 5.9% of the total sample, and more than just a few drops of urine by 12.6%. The incontinence was serious enough for 45.9% of these women to wear sanitary protection; in spite of this only 13.3% considered themselves handicapped by the condition, and only 28.2% had consulted a doctor about the problem.

These rates contrast with 41% with inappropriate leakage of urine reported by Jolleys (1988). The higher rate may be accounted for by the lack of specificity in the questions asked about prevalence and the inclusion of all types of incontinence. In addition, 68% of the women reported as being incontinent only suffered from dampening of underwear; other studies have not included such a small quantity of urine loss as incontinence.

Studies that used samples drawn from attenders at doctors' surgeries have also found higher rates of incontinence. Simeonova and Bengtsson (1990) reported that 44% of women had current symptoms of incontinence and Lagace et al (1993) that 33% had some degree of incontinence in the past year. Neither of these studies reports on whether the characteristics of the sample were similar to the population as a whole. However it seems likely that as they were already attending the doctor (reasons for the visits are not given), they were atypical, thus explaining the higher prevalence.

1.1.iv.2 Interview surveys

Five studies used interviews as the method of data collection, but one was inconsistent in the questions used and the subjects studied (Cutler et al. 1992); the remaining four have been included in this section, and of these only one used the ICS definition (Hørding et al. 1986). Interviews provide the opportunity to clarify questions and answers. However using interviews is generally more expensive than postal questionnaires, and usually involves smaller numbers of participants. The attitude, manner and training of the interviewer can influence interviewees, and studies that use more than one interviewer may have problems of inter-rater reliability.

Methodological characteristics of studies using interviews are summarised in Table 1.2. As with the questionnaire surveys, none of these studies confirmed the self-reported diagnoses with urodynamic investigation.

Brocklehurst (1993) found that some form of incontinence of urine, of any severity, at some time in their lives was reported by 14.0% of all women; for incontinence in the preceding year the rate was 9.3%.

Other interview-based surveys have found higher rates. Hørding et al (1986) reported a rate of 22% for all types of incontinence (using the ICS definition) at the time of the interview. This included symptoms of severe stress incontinence (loss of urine on light physical effort) and slight stress incontinence (when the loss only accompanied more energetic activities).

However other studies using interviews have found even higher rates. A study in New Zealand by Holst and Wilson (1988) used the same definition of incontinence as in the study by Thomas et al (1980). They found that in the 12 months prior to the interview, some degree of incontinence occurred in 31.4% of women, with regular incontinence being experienced by 16.7%.

Yarnell et al (1981) found that 45% of women reported some degree of incontinence ranging from a teaspoonful or less, less often than weekly (28%) to wetting of clothes on a daily or continuous basis (2.6%). Women who reported any amount of urine loss more often than weekly, comprised 13.2% of the total sample. The effect of different interviewers may have influenced the results.

1.1.iv.3 Rate of incontinence in general population

In conclusion it is apparent that there is no consensus about the rate of incontinence in the general population, mainly due to differences between studies in the definitions and methodology used. Table 1.3 summaries the findings of the studies included in the preceding sections (Sections 1.1.iv.1 and 1.1.iv.2). Four out of the six studies that report on point prevalence agree that approximately one in four women suffer from some degree of incontinence either currently (Thomas et al. 1980; Hørding et al. 1986; Rekers et al. 1992; Sandvik et al. 1995) or at some time in their lives (Elving et al. 1989). Differences from this rate can be accounted for by the wider definition used (Yarnell et al. 1981; Jolleys 1988), the population sampled (Simeonova and Bengtsson 1990; Lagace et al. 1993), or the data collection method employed (Brocklehurst 1993).

Table 1.3 Prevalence of all incontinence in women

Authors	Method	Age range	All severity (%)	More than moderate (%)
Prevalence at time of survey				
Thomas et al (1980)	Questionnaire	15 - 64	25.1	8.5
Hørding et al (1986)	Interview	45 year old cohort	22.0 *	
Jolleys (1988)	Questionnaire	over 25	41.0	
Simeonova and Bengtsson (1990)	Questionnaire	over 18	44.0	
O'Brien et al (1991)	Interview	35 - 64		16.5
Rekers et al (1992)	Questionnaire	35 - 79	26.5	12.6
Sandvik et al (1995)	Questionnaire	over 20	29.4	
Period prevalence: previous year				
Yarnell et al (1981)	Interview	over 18	45.0	13.2
Holst and Wilson (1988)	Interview	over 18	31.4	16.7
Elving et al (1989)	Questionnaire	30 - 59	17.1 (10.4 *)	
Brocklehurst (1993)	Interview	over 30	9.3	
Lagace et al (1993)	Questionnaire	over 20	33.0	
Period prevalence: ever				
Elving et al (1989)	Questionnaire	30 - 59	25.5 (13.7 *)	
Brocklehurst (1993)	Interview	over 30	14.0	

* International Continence Society definition

While the early study by Thomas et al (1980) is not explicit in the period of prevalence reported on, it remains the largest survey of a general population, with a good response rate and using a wide definition of incontinence. Subsequent studies using similar definitions have reached similar findings. Thus it can be concluded that approximately one in four women aged between 15 – 64 suffer from some degree of incontinence at some time in their lives.

Although women may report suffering from incontinence, not all consider it a problem, as demonstrated by the difference between the overall rates and the rates according to the ICS definition. It is not clear to what extent this difference is affected by popular perception of what is 'normal'.

Differing cultural attitudes to incontinence or modification of lifestyle/clothing as a result of the incontinence may make women perceive the incontinence less of a problem. These factors inevitably have implications for the results of any survey about incontinence. For example, the relatively high number of studies from the Scandinavian countries might suggest that incontinence is a particular problem in these countries, or perhaps that they more readily acknowledge the problem and are more willing to report it.

Further discrepancies arise when the differential rates of stress and urge incontinence are examined. Table 1.4 summarises the prevalence by of types of incontinence from the studies that give details. From this it is apparent that stress incontinence is more common than urge incontinence. However if the previously discussed discrepancies in self-reports of incontinence, as identified by Sandvik et al (1995), also apply to other research based on self-report alone, then the reported proportions of different types incontinence must be treated with caution. It is possible that the proportion of women suffering from stress incontinence may be higher, and the proportion suffering from mixed incontinence lower, than that reported by the studies included in Table 1.4.

Table 1.4 Classification of incontinence

Authors	Method	Stress (%)	Urge (%)	Mixed (%)
Yarnell et al (1981)	Interview	22	9	14
Hørding et al (1986)	Interview	17	2	3
Holst and Wilson (1988)	Interview	16	8	7
Elving et al (1989)	Questionnaire	7.3	1.3	7.1
Simeonova and Bengtsson (1990)	Questionnaire	16	12	15
Sandvik et al (1995) (reported)	Questionnaire	14	3	11
Sandvik et al (1995) (adjusted)	Questionnaire	20	3	3

1.1.v Age and parity

It is commonly assumed that incontinence is more of a problem in older women. Table 1.5 summarises the findings relating age and incontinence. For the reasons discussed above the prevalence rates of all types of incontinence vary between studies, however the trends within individual studies can be compared. These confirm that the prevalence of incontinence increases as the age of the woman increases, peaking at around age 45- 54 years. The reason for the reduction in rates in women over the age of 55 years is not clear.

The findings of studies that have investigated the relationship between the prevalence of incontinence and parity are summarised in Table 1.6. Women who have had children have higher rates of incontinence than those who have none, and the greater the number of children, the more chance of being incontinent.

Table 1.5 Prevalence of urinary incontinence according to age

Authors	Method	Age (years)	Prevalence of Incontinence (%)
Thomas et al (1980)	Questionnaire	15 - 24	4.0
		25 - 34	5.5
		35 - 44	10.2
		45 - 54	11.8
		55 - 64	11.9
Yarnell et al (1981)	Interview	17 - 24	24
		25 - 34	31
		35 - 44	50
		45 - 54	56
		55 - 64	49
Jolleys (1988)	Questionnaire	under 25	31
		25 - 34	40
		35 - 44	46
		45 - 54	60
		55 - 64	39
Holst and Wilson (1988)	Interview	18 - 24	4
		25 - 34	16
		35 - 44	18
		45 - 54	20
		55 - 64	15
Elving et al (1989)	Questionnaire	30 – 34	10.3
		35 – 39	16.2
		40 – 44	15.4
		45 – 49	23.9
		50 – 54	20.0
		55 – 59	17.7
Rekers et al (1992)	Questionnaire	35 - 39	31.2
		40 - 44	26.5
		45 - 49	32.0
		50 - 54	28.2
		55 - 59	27.6
		60 - 64	23.7
Brocklehurst (1993)	Interview	30 - 49	10.9
		50 - 59	15.4
		60+	16.8

Table 1.6 Prevalence of urinary incontinence according to parity

Authors	Method	Parity	Prevalence (%)	
Jolleys (1988)	Questionnaire	0	17	
		1	42	
		2	48	
		3	53	
		4	56	
Foldspang et al (1992)	Questionnaire		All incontinence	Stress incontinence
		0	11.9	8.7
		1	17.0	14.6
		2	16.3	14.4
		3	23.2	21.7
		4	22.1	18.3
		5	26.7	22.2
Wilson et al (1996)	Questionnaire		All women with no previous incontinence	All women
		1	21.4	29.7
		2	26.0	37.8
		3	22.2	38.3
		4	20.7	35.0
		5+	16.7	48.4

However, older women tend to have delivered more children. When age is adjusted for, parity continues to exert an independent significant effect. Two studies used multivariate logistic regression to correct for the effect of age (Foldspang et al. 1992; Wilson et al. 1996). Foldspang et al (1992) (Table 1.1) in an analysis of the data described in a previous study (Elving et al. 1989), considered age (30 - 59 years), parity, occupation, menopause and whether the women had previously had abdominal, urological, gynaecological or obstetric surgery. They found that independent of these other factors, the prevalence of stress incontinence increased with parity. In particular, women older than 45 years had increasing risk with increasing parity but decreasing risk with increasing age at first childbirth. This analysis showed that when parity was controlled for, there was a diminishing risk with increasing age (in the under 60 age group).

Wilson et al (1996) carried out a postal survey on all women delivering in one hospital in New Zealand (n = 2134) (Table 1.7). They concluded that independent of age, parity was a risk factor in the development of incontinence, confirming the results of Foldspang et al (1992). Both these studies confirm that when age is controlled for, increasing parity is an independent risk factor.

1.1.vi Summary of Section 1.1

Incontinence is a common problem, affecting approximately one in four women at some time in their lives. Methodological differences and the use of different definitions account for the variation in estimates, highlighting the need for further research in this area using standard definitions. This level of morbidity may cause considerable misery and can restrict the lives of sufferers. Although increasing age is a factor in the prevalence of incontinence, when this variable is controlled for, it is apparent that parity is an independent risk factor in the aetiology of the condition. Women of higher parity are at increased risk of suffering from incontinence.

1.2 Stress incontinence, pregnancy and childbirth

Having demonstrated the association between childbirth and incontinence, it is important to have an understanding of how it is that pregnancy and delivery can influence its development. This section examines the prevalence of incontinence before pregnancy, during pregnancy and after childbirth, the prognosis of childbirth-related incontinence and the factors associated with delivery that have been found to precipitate incontinence.

The literature search resulted in 21 articles relating to the prevalence of urinary incontinence in connection with pregnancy or childbirth. Ten of these studies are excluded. Reasons for exclusion are as follows: some included a small sample of less than 100 participants (Maly 1980; Beckett 1987) or achieved a response rate below 50% (Umlauf and Mathis 1995), some did not give sufficient details of the method of sample selection (Francis 1960; Beck and Hsu 1965), two did not give details of the questions asked (Francis 1960; Audit Commission 1997), one excluded women with any prior incontinence (Dimpfl et al. 1992) and three asked very general questions (Glazener et al. 1995; Marshall et al. 1996; Marshall et al. 1998). Of the remaining 11 articles, two describe the same data (Laycock et al. 1994; Mayne et al. 1995); only the former has been included. The findings of these 10 articles relating to prevalence of incontinence around the time of childbirth will be discussed in sections 1.2.i to 1.2iv. The methodological characteristics of the 10 studies are summarised in Table 1.7. A further three studies of the prevalence of incontinence in nulliparous women are also included and their methodological characteristics described in Table 1.8.

Subsequent sections (1.2.v to 1.2.vi) also include other relevant research studies that have investigated pelvic muscle and nerve damage in relation to childbirth, or have studied obstetric and other factors that may be implicated in the aetiology of incontinence.

1.2.i Type of incontinence in the antenatal and postnatal periods

As previously described, stress incontinence has been found to be more prevalent in the general population of women than urge incontinence. From the 10 articles relating to pregnancy and childbirth, only four gave detailed differential rates for the types of incontinence (Table 1.9).

Table 1.9 Comparison of antenatal and postnatal rates of stress and urge incontinence

Authors	Method	Time of survey	Stress (%)	Urge (%)
Antenatal				
Stanton et al (1980)	Interview	36 weeks gestation		
		Primiparous	34.6	9.8
		Multiparous	41.7	12.5
Cutner (1993)	Interview	36 weeks gestation	38	10
Chiarelli and Campbell (1997)	Interview	During last month of pregnancy	20	7
Postnatal				
Stanton et al (1980)	Interview	6 weeks postnatal		
		Primiparous	5.8	8.7
		Multiparous	10.6	7.1
Cutner (1993)	Interview	6 weeks postnatal	9	6
Wilson et al (1996)	Questionnaire	3 months postnatal	23.9	14.8

During pregnancy stress incontinence is at least three times more common than urge incontinence (Stanton et al. 1980; Cutner 1993; Chiarelli and Campbell 1997). Similarly after delivery there is general agreement that stress incontinence is more prevalent than urge incontinence. The lack of detail in the definitions used in some of these studies may account for the lower rates found. For example Cutner (1993) used the International Continence Society (ICS) definition of "involuntary loss of urine which is objectively demonstrable and a social or hygienic problem" (Abrams et al. 1990). Stanton (1980) did not specify the frequency or severity used to define incontinence.

Wilson et al (1996) asked detailed questions of women 3 months after delivery about any degree of incontinence since delivery. Stress incontinence was defined as leakage with coughing, laughing or sneezing, and the women were asked about the frequency of loss. Some degree of loss was reported by 34.3% of women; 23.9% suffered from stress incontinence and 14.8% from urge incontinence. As previously discussed the work of

Sandvik et al (1995) (Table 1.1), suggested that self-reports tend to under-estimate the rate of stress incontinence and over-estimate mixed incontinence. This might lead to higher rates of postnatal stress incontinence in comparison to urge incontinence if the women were fully investigated.

Thus studies on cohorts of childbearing women confirm the findings from surveys of women in the general population (Foldspang et al. 1992) that stress incontinence is a more common problem than urge incontinence, both during and after pregnancy.

Unless otherwise stated, the subsequent sections (1.2.ii to 1.2.vii) include only papers describing stress incontinence.

1.2.ii Prevalence of stress incontinence in nulliparous women

To interpret data on frequency of incontinence in parous women, it is necessary to know the frequency in nulliparous women (Table 1.8). Estimates in the range of 16% - 52% have been reported from studies of women who have never had children (Nemir and Middleton 1954 – 2.6% frequent loss, 52.4% some degree of stress incontinence; Wolin 1969 – 16.2% daily leakage, 50.7% some degree of stress incontinence; Bø et al. 1994 – 38%). Methodological flaws such as discussion of the questionnaire before administration or method of sample selection may have affected the earlier studies. The sample of physical education students in the study by Bø et al (1994) is atypical. These factors may account for such wide variation in results. However these rates are higher and appear to be anomalous compared with findings from surveys of women in the general population. For example Foldspang et al (1992) found that 11.9% of nulliparous women reported any kind of incontinence using the ICS definition, while 8.7% reported stress incontinence alone.

Some studies have asked cohorts of first-time mothers about their previous history of incontinence. This approach has led to lower estimates than reported above. Wilson et al (1996) reported that 8.4% (n = 51) of primigravidae questioned 3 months after delivery said that their incontinence began before they become pregnant (19.4% of primigravidae who were incontinent at three months). This latter rate included any type of incontinence (urge and mixed incontinence as well as stress). Recall of symptoms may have been affected by the long time interval between the questionnaire and the time period under investigation. A similarly low rate of 4% for primigravidae who had experienced any severity or frequency of stress incontinence before the pregnancy was reported by Viktrup et al (1992).

Although these results show diversity of findings, the most recent studies suggest that stress incontinence is present to some degree in between 4 – 8.7% of women before the first pregnancy.

1.2.iii Prevalence of stress incontinence during pregnancy

Rates of stress incontinence during pregnancy have been reported in the range of 20 – 41.7% (Table1.10). The lower estimate only included incontinence in the last month of pregnancy, and enquiry was made retrospectively (Chiarelli and Campbell 1997). In contrast other studies have reported higher rates either at 36 weeks or any time in the pregnancy. Both Stanton et al (1980) and Viktrup et al (1992) agree that a third of primigravidae have some degree of incontinence in pregnancy, while Stanton et al (1980) and Cutner (1993) quote slightly higher rates for multiparous women. Comparisons are confounded by differences in the time of questioning, and the definitions of stress

incontinence used, but between 32% and 42% of women have some degree of stress incontinence at some time during pregnancy.

1.2.iv Prevalence of stress incontinence following childbirth

The rates of stress incontinence after delivery have been summarised in Table 1.11. In the immediate postnatal period Iosif (1981) found that 22.7% of all women complained of some degree of stress incontinence, while Viktrup et al (1992) reported that about 20% of primigravidae reported any degree of leakage occurring at least twice.

Investigations of the later postnatal period (six weeks – three months after delivery) have found postnatal rates of stress incontinence in the range of 5.8% to 23.9%. The reason for such a range of findings may be accounted for by differences in the method of data collection, report of point prevalence or period prevalence, or different definitions of the severity/frequency of stress incontinence account for the variation (see Table 1.11). All studies appear to report on any degree of leakage, although not every paper gives details of questions asked, while Viktrup et al (1992) specified that the leakage occurred at least twice. Studies using interviews at six weeks after delivery have reported lower rates of 6% to 10% depending on parity (Stanton et al. 1980; Viktrup et al. 1992; Cutner 1993). In contrast a higher rate (19%) was found at seven weeks postnatal by a study using questionnaire as the method of data collection (Laycock et al. 1994). The highest rate (23.9%) has been found by Wilson et al (1996), again using a questionnaire, of any stress incontinence at three months postnatal. Possibly women are more reluctant to admit to stress incontinence when asked in an interview than when completing a more anonymous questionnaire.

Questionnaires that have been sent to women more than three months after delivery have reported that about one in five women report experiencing stress incontinence during the first postnatal year (MacArthur et al. 1993; Bick and MacArthur 1995).

As an example of the effect of the use of different definitions, Viktrup et al (1992) found that 3 –5 days after delivery, 19% of primigravid women gave a positive answer to a question about any severity or frequency of stress incontinence appearing at least twice (but not including the 2 days after delivery). However only 5% of all the women said the stress incontinence was on a daily basis, and fewer (2%) said it was a social or hygienic problem for them. Corresponding figures at three months postpartum were 6%, 1% and 0.3%. These figures demonstrate that the quoted prevalence rates from the same population can vary using different definitions.

1.2.v The effect of mode of delivery on the development of postnatal stress incontinence

The following sections will consider the effect of the type of delivery on the development of postnatal stress incontinence.

1.2.v.1 Vaginal delivery versus caesarean section

The effect of the mode of delivery has been examined in several studies (see Table 1.12). The prevalence of postnatal incontinence has been found to be significantly lower among women who have had a caesarean section compared with those who had a vaginal delivery (Viktrup et al. 1992; MacArthur et al. 1993; Wilson et al. 1996; Chiarelli and Campbell 1997). This has been confirmed by studies that have examined women for evidence of physical damage following childbirth. No pudendal nerve damage was detected in women who had an elective caesarean delivery (Snooks et al. 1984; Allen et al. 1990; Tetzschner et al. 1997).

In contrast women who had an emergency caesarean section after time in labour did show evidence of pudendal nerve damage, suggesting that time in labour may cause some of the damage, and not just the trauma of the delivery (Allen et al. 1990; Tetzschner et al. 1997). Allen et al (1990) also found that severe nerve damage was significantly linked to incontinence at 8 weeks postnatal. However other studies have not found significantly higher rates of urinary incontinence following an emergency compared with an elective caesarean section (MacArthur et al. 1993; Wilson et al. 1996).

Table 1.12 Prevalence of incontinence by type of delivery

	Vaginal delivery		**Caesarean section**	
Stress incontinence	**Spontaneous**	**Assisted**	**Elective**	**Emergency**
Viktrup et al (1992) (primigravidae only)	13.0%		0%	
MacArthur et al (1993)	16.4%		9.0%	
All incontinence				
Wilson et al (1996)	36.1%		23.6%	
Laycock (1994) (primigravidae only)	15%	31%	11%	
Brown and Lumley (1998)	10.9%	18.2%	2.4%	6.8%

Studies which have measured pelvic floor muscle strength of the levator ani muscles found that there is greater reduction in pelvic muscle strength after a vaginal delivery than after a caesarean section (Samples et al. 1988; Sampselle 1990). Samples et al (1988) used a pressure-sensitive, intra-vaginal balloon device. Sampselle (1990) measured pelvic floor muscle strength by an examiner digitally rating the strength of the contraction during a vaginal examination. Decreased muscle strength was connected with the development of incontinence (Sampselle 1990). Neither of these studies distinguished between elective and emergency sections.

Thus it appears that while a caesarean section confers some protection against the subsequent development of stress incontinence, it may be that this effect is less pronounced if the operation is performed as an emergency after some time in labour.

1.2.v.2 Spontaneous vaginal delivery versus assisted vaginal delivery

There is no consensus on whether an assisted vaginal delivery (forceps or vacuum extraction) leads to higher rates of incontinence compared with a normal vaginal delivery (Table 1.12). Large questionnaire surveys of postnatal women have shown similar rates for normal and forceps deliveries (MacArthur et al. 1993; Wilson et al. 1996).

The evidence from studies that have examined postnatal damage to nerves is conflicting. Snooks et al (1984) found pudendal nerve damage was more common and more severe in multiparae delivered vaginally and especially if by forceps compared with primigravidae delivered by similar methods, or women delivered by caesarean section. By two months postnatal, this group also showed the least improvement in measurement of pudendal nerve conduction time. Numbers in this study were not large (only 22 out of 71 were delivered by forceps) and subsequent development of incontinence was not established. Tetzschner et al (1997) found significantly more damage to the pudendal nerve after a vacuum delivery compared with a normal delivery (there were no women delivered by forceps in this study – see Table 1.16). Other neurophysiological studies have failed to find any difference between normal and forceps deliveries (Allen et al. 1990; Sultan et al. 1994). Studies which have examined pelvic floor muscle strength did not distinguish between normal and forceps deliveries (Samples et al. 1988; Sampselle 1990).

The evidence that more damage is caused by an assisted vaginal delivery compared with a spontaneous delivery is therefore not convincing, and no conclusion can be drawn about whether an assisted delivery is more likely to lead to stress incontinence than a normal delivery.

1.2.vi Other obstetric factors and the development of postnatal stress incontinence

Other obstetric variables have been linked to the development of stress incontinence. These include delivery of a large baby, longer length of second stage and perineal trauma. Similarly, factors such as obesity, racial differences and collagen status have also been suggested as influencing the development of stress incontinence. Not all of these factors have been confirmed as increasing the rate of postnatal stress incontinence and they will not be included here.

1.2.vii Summary of Section 1.2

Some degree of urinary incontinence is a problem that affects many women at some time in their lives. Stress incontinence has been found to be more common than urge incontinence in the postnatal period, although most studies fail to differentiate clearly between the two. Incontinence is a problem for some women who have never had children. At least a third of women report some degree of incontinence during pregnancy, while between 5% and 24% will be incontinent following delivery.

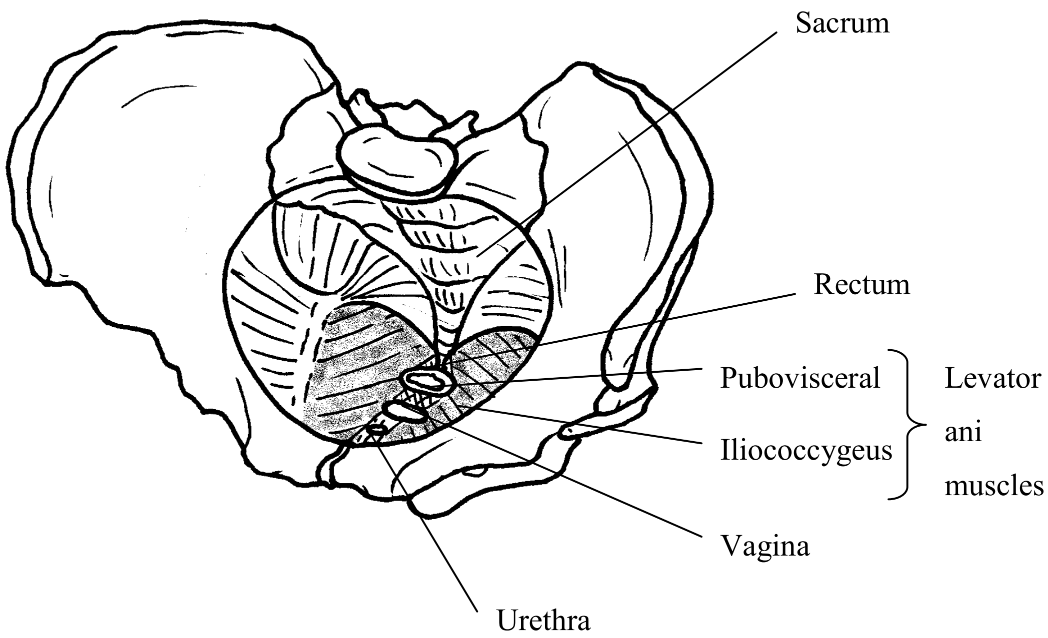
Incontinence is more likely to develop following a vaginal delivery than after a caesarean section; there is less agreement about the effects of having an assisted vaginal delivery, and whether an elective caesarean section confers greater protection than an emergency caesarean section.

Stress incontinence has been consistently found to be under reported (Thomas et al. 1980; MacArthur et al. 1993); prompt identification and treatment of the condition could alleviate a great deal of short and long-term morbidity (Norton et al. 1987; Sampselle et al. 1997). Furthermore the possibility of prevention or minimisation of the condition has received scant attention. The following section will examine the role of the pelvic floor in the aetiology of incontinence and will consider whether preventive measures might be applicable in the context of childbearing.

1.3 Pelvic floor muscles and pelvic floor exercises

The pelvic organs (uterus and vagina) are held in place in the pelvic cavity by the combined support of the endopelvic fascia and the levator ani muscles (Figure 1). The fascia suspends the organs from the sidewalls of the pelvis, while the muscles provide a platform on which the organs rest (DeLancey 1990). The levator ani muscles form a strong muscular sling which includes the pubovisceral muscle (comprising the pubococcygeus and the puborectalis muscles) and the iliococcygeus muscle (DeLancey 1994). The urethra, vagina and rectum penetrate this muscular diaphragm. The muscles of the pelvic floor, as with all skeletal muscle in the human body, comprise slow twitch (type I) fibres and fast twitch (type II) fibres (Gosling et al. 1981; Gilpin et al. 1989; McArdle et al. 1994). Slow twitch (type I) fibres use a system of aerobic energy transfer, are relatively fatigue resistant and are suitable for prolonged activity: they contribute to the resting tone of the pelvic floor muscles. Fast twitch (type II) fibres have the ability to transfer energy rapidly and are employed during an active muscle contraction; they can be recruited in response to raised intra-abdominal pressure such as during coughing or sneezing (Gosling et al. 1981; McArdle et al. 1994). A combination of both types of muscle activity is required to maintain continence (Dixon and Gosling 1994).

Figure 1 Diagram of pelvic floor muscles



Adapted from: Chamberlain et al (1991) p26

This section of the review will focus on how these muscles can be exercised and examine the evidence for the relationship between muscular strength in the pelvic floor and the maintenance of continence. The previously described search strategy (page 1) was used to identify relevant literature. The number of articles found is described section by section, and where appropriate methodological characteristics have been described in tabular form.

1.3.i Pelvic floor exercises

The International Continence Society defines pelvic floor training as "repetitive selective voluntary contractions and relaxations of specific pelvic floor muscles. This necessitates muscle awareness in order to be sure that the correct muscles are being utilized and to avoid unwanted contractions of adjacent muscle groups." (Andersen et al. 1992, p26).

The use of pelvic floor retraining for the treatment of urinary incontinence has been credited to an American physician, Arnold Kegel; pelvic floor exercises are sometimes referred to as 'Kegels' (Burgio et al. 1986; Norton and Baker 1990; Tries 1990; Bump et al. 1991; Brubaker and Kotarinos 1993). Kegel described a "syndrome of lack of awareness of function and coordination of the pubococcygeus muscle" (Kegel 1951, p915) and that this lack of function contributes to stress incontinence of urine. He described this condition as affecting not only women who had delivered vaginally, but also those delivered by caesarean section and nulliparous women.

His treatment for such urinary stress incontinence was a programme of physiological therapy involving muscle education and resistive exercise (Kegel 1951); these same principles apply to pelvic floor muscle training fifty years later. The first step involves teaching awareness of the correct muscles, and then through repeated contractions of those muscles alone, strength is built up and conscious control established (Kegel 1951). Kegel advocated the use of the Perineometer (a cylindrical chamber attached to a calibrated manometer) to allow visual feedback of contractions, and provide resistance to exercise against. The frequency proposed by Kegel was to exercise for 20 minutes, three times daily, or a total of 300 daily contractions. In addition, he suggested that a weekly check of progress was necessary to ensure that the correct muscles were still being used, and to avoid undue fatigue (Kegel 1951). For mild cases of stress incontinence he reported success in almost all cases. He further recommended that prophylactic use might include the antepartum period.

Since those first reports of the use of pelvic floor exercises, many studies have confirmed their place in the treatment of urinary stress incontinence. Pelvic floor exercises have been found to be the first line of treatment for urinary stress incontinence in 94% of English district health authorities (Mantle and Versi 1991). Similarly out of 40 units (unspecified locations) surveyed by Thow (1990a) 100% used pelvic floor exercises as the first choice of treatment.

1.3.ii Pelvic floor muscle strength and stress incontinence

The relationship between pelvic floor muscle strength and stress incontinence has been investigated in a number of studies. Methodological characteristics of studies included are described in Table 1.13. Lack of consistency between studies in the equipment used and the procedure for testing the strength of muscle contraction (frequency and duration of contraction required, as well as type of instruction during testing) make comparison of results difficult.

When continent women have been compared with incontinent women results have been inconsistent. Bø et al (1994) found no significant difference in pelvic floor muscle strength in a group of physically fit nulliparous women, half of whom were incontinent. The sample was possibly too small to detect a difference ($n = 22$). A larger study by Hørding et al (1986) found that significantly more women who complained of stress incontinence had impaired function of the levator ani muscles, compared with the continent women (26% versus 10%, $p<0.001$).

Similarly Laycock (1992a) examined the pelvic floor muscle strength (using both digital assessment and perineometry) of 147 women suffering from incontinence compared with 86 women attending the same gynaecology out-patient clinic for reasons other than

incontinence. The women who were classed as incontinent were found to have significantly weaker measures of muscle strength, however there was no significant difference between the groups on measures of muscle endurance. No urodynamic assessment was carried out to confirm the diagnosis of incontinence. The groups were not matched on age or parity (the average age of the group who were continent was less than that of the women reporting incontinence), factors which might account for some of the differences in muscle strength.

Other studies have measured strength of the pelvic floor muscles in incontinent women (see Table 1.13). Cutler et al (1992) found that women who reported more severe symptoms of incontinence had significantly weaker pelvic floor muscles however the age group of the participants is not clearly stated. Theofrastous et al (1997) also measured pelvic floor muscle strength in a group of 202 women with confirmed urinary incontinence, however they found no significant relationship between the ability to perform an adequate pelvic floor muscle contraction and the severity of incontinence.

When the strength of the pelvic floor has been measured as part of a pelvic floor exercise treatment programme for stress incontinence findings are inconclusive. Dougherty et al (1993) found that a graded exercise programme for 16 weeks resulted in significant reductions in urine loss, as well as significant increases in pelvic muscle strength. However no correlation was found between either maximum pressure or sustained pressure, and urine loss. In other words, an increase in pelvic floor muscle strength did not always correlate with a reduction in loss of urine. This study suggested that training may indirectly improve continence mechanisms, but the strength of an active contraction may not be relevant.

Similarly Oláh et al (1990) found that women treated with pelvic floor exercises showed a significant improvement in both subjective and objective measures of stress incontinence. However results for the strength of an active contraction did not correlate with continence results, whereas results for passive tone were significantly correlated. This suggests that the resting pelvic tone may be more important for the maintenance of continence than the strength of the active contraction.

Further support for the importance of the resting tone of the pelvic floor comes from the work of Griffin et al (1994) who conducted a series of experiments on 38 continent women aged 35 to 54 years. They found that during a series of measures of pelvic floor muscle contractions in one session, the mean resting tone increased significantly from the baseline measure suggesting that when the muscles had warmed up the resting tone increased. In addition they found that a programme of pelvic muscle exercise led to an increase in the resting tone throughout the duration of the programme. This work adds to the evidence that resting tone contributes to the maintenance of continence

The relationship between stress incontinence and the ability to contract the muscles of the pelvic floor has not been established. Cutler et al (1992), Laycock (1992a) and Hørding et al (1986) have found that women with stress incontinence are significantly more likely to have weaker pelvic floors. However the work of Bø et al (1994) and Theofrastous et al (1997) has not confirmed this. The findings of Griffin et al (1994) suggest that pelvic floor exercises can improve the resting tone of the pelvic floor. Dougherty et al (1993) found that although a programme of pelvic floor exercises led to improved continence, there was no demonstrable improvement in pressure during an active contraction. In addition the work of Oláh et al (1990) confirms that passive tone may be of greater importance for continence than an active contraction. These findings suggest that pelvic floor exercises might lead to an improved resting tone, and that this is important for improving continence, rather than just a strong active contraction.

1.3.iii Pelvic floor exercises and treatment of stress incontinence

Numerous studies have been carried out examining the effect of pelvic floor exercises for the treatment of stress incontinence. Many of these studies have included samples of women over the age of childbearing. Inclusion of all the research pertaining to pelvic floor exercises for the treatment of stress incontinence is therefore not relevant for this thesis. However articles that have reviewed this body of literature will be mentioned to give an indication of the conclusions regarding this form of therapy for stress incontinence.

Wells (1990) reviewed all studies of pelvic muscle exercise from 1952 to 1988 (excluding case studies and clinical papers) and found the quality of the research to vary widely. Comparison between studies was hampered by differences in:

- design
- population being studied
- age of the sample
- method of diagnosing stress incontinence
- type of treatment given (pelvic floor exercises alone or in combination with another therapy)
- length of the treatment
- technique of exercise (frequency and number of repetitions)
- attrition from the study
- compliance with the regime
- outcome measures (pelvic muscle strength, change in level of incontinence)

- subjective and objective measurement of incontinence

The review identified deficiencies in most of the papers, and concluded that in spite of the many questions about pelvic muscle exercise that remain unanswered, there was enough evidence (particularly from recent more rigorous studies) to recommend their use for the treatment of stress incontinence.

A narrative review by Wall and Davidson (1992) identified the numerous methodological flaws in the literature. The article does not detail the search strategy, or clearly assess the quality of the papers. However they concluded that for women with mild stress incontinence a programme of pelvic floor exercises can lead to continence, both using subjective and objective criteria. They found that some women may not achieve a complete cure, but are symptomatically improved to the extent that they may not desire surgery. The authors advised that in spite of the lack of sound research evidence, pelvic floor exercises (including during pregnancy) should be encouraged as part of a preventive health regime for all women (Wall and Davidson 1992). Further research into this aspect of pelvic floor exercises was recommended.

A further review by Bø (1992) rejected any studies that failed to include an assessment of the ability of the participants to contract the pelvic floor muscles in the correct manner. Out of 15 studies examined, only seven met the above criteria. Again variations in study design and assessment measures made comparison difficult. Only two of the seven studies measured pelvic floor muscle strength as the independent variable, and both found a significant improvement in strength (Benvenuti et al. 1987; Bø et al. 1990). Based on women's evaluation of the treatment, cure or improvement rates of between 32% (Benvenuti et al. 1987) and 84% (Kegel 1951) have been reported. Studies using urodynamic assessment were considered with caution due to the differing methods of evaluation employed. No conclusions were made about the type of patient likely to benefit due to conflicting results. Bø (1992) found that in order to be effective for the treatment of stress incontinence pelvic floor exercises must be conducted in an intensive manner, include teaching about correct contraction, continue over a long period of time and with close input from a therapist. She concluded that as there are no known side effects, the exercises should be the first line of treatment for female stress incontinence. Again recommendation about the need for further research into the preventive role of pelvic floor exercises is made.

A more recent systematic review of conservative treatment was conducted by Berghmans et al (1998). Including literature published between 1980 and 1998, the paper clearly describes the search strategy and inclusion criteria and used a pre-defined scoring criterion to rate papers. However blinding to study authors and outcome was not possible, as the reviewers were already familiar with most of the literature. They acknowledge that research into pelvic floor exercises has been characterised by poor methodological quality, and that comparison between studies often difficult. However they concluded that there was strong evidence (from multiple RCTs of sufficient methodological quality) that pelvic floor exercises are effective in reducing the symptoms of stress urinary incontinence in women. Uncertainty remains regarding which is the most effective regimen of exercises and whether pelvic floor exercises are effective as a preventive measure.

1.3.iv Postnatal pelvic floor exercises and treatment of incontinence

Evidence for the efficacy of pelvic floor exercises for the treatment of incontinence has also been found in women suffering from incontinence following delivery.

Studies that have surveyed women about the occurrence of incontinence and also asked about the performance of pelvic floor exercises have found that women who performed pelvic floor exercises were more likely to suffer from incontinence (Foldspang et al. 1992; Wilson et al. 1996) (Table 1.7) and (Jolleys 1988) (Table 1.1). However the explanation for this finding is probably that women who suffer from incontinence were more likely to exercise their pelvic floor muscles in an effort to improve the condition. In contrast, Beckett (1987) found that women who performed pelvic floor exercises postnatally were less likely to be incontinent. She suggested that the exercises were effective in prevention, however no statistical association was established to back this up, there was no control group and only 97 women were included in the study.

Research designed to examine the effect of pelvic floor exercises for the treatment of incontinence after delivery is summarised in Table 1.14. A small cohort study carried out in Canada concluded that neuromuscular electrical stimulation and pelvic floor exercises were effective in reducing urine loss in women genuine stress incontinence persisting for more than 3 months after delivery (Dumoulin et al. 1995). Only 8 women completed the treatment programme, and the therapist measuring muscle strength was not blind to inclusion in the study (although the nurse measuring incontinence was).

Stronger evidence comes from randomised trials of postnatal pelvic floor exercises in women reporting incontinence at 3 months after delivery (Wilson et al. 1997; Wilson and Herbison 1998). Only one RCT published in a refereed journal was identified (up to 1998). Wilson and Herbison (1998) carried out a pilot study in New Zealand. Only 45% of those approached agreed to take part and there was a high rate of withdrawal from the study both from the control group (22%) and the intervention group (52%). Nonetheless

the prevalence of urinary incontinence was significantly less in the intervention group one year after delivery (50% versus 76%). Women in the intervention group reported a significantly higher rate of practice of pelvic floor exercises, however there was no significant difference between the groups on measures of pelvic floor muscle strength. The high withdrawal rate mean results of this study have to be interpreted with caution.

The study by Wilson and Herbison (1998) was the precursor to a larger multi-centre RCT. This has subsequently been published by Glazener et al (2001). In the period covered by this review, only the conference abstract relating to the multi-centre trial, Wilson et al (1997), was available. In this larger trial higher follow-up rates (control group – 66%; intervention group – 76%) were reported. On assessment at 12 months, 58% of the intervention group were still incontinent, compared with 68% of the control group (p = .016). Neither the method of assessment nor attrition from the study was detailed in the conference abstract. Greater compliance was reported in the intervention group compared with the control group (79% versus 48% had done pelvic floor exercises in the month before the assessment) and the proportion practising the exercises daily was higher (27 per day versus 10 per day).

As with studies about the effectiveness of pelvic floor exercises for the treatment of stress incontinence in samples of non-parturient women, the studies by Wilson and Herbison (1998) and Wilson et al (1997) suggest that in the postnatal period, pelvic floor exercises may have an important role to play in the treatment of postnatal incontinence.

1.3.v Pelvic floor muscle strength in healthy continent women, during pregnancy and after delivery

There are few studies of normal pelvic floor muscle strength in healthy continent women. Characteristics of these are described in Table 1.15. Pelvic floor exercises have been

consistently found to lead to a significant increase in measures of pelvic floor muscle strength in a sample of healthy women of reproductive age (Dougherty et al. 1992). Healthy continent women used as control groups in a study of pelvic muscle exercise for the treatment of stress incontinence have also been found to increase muscle strength following a programme of training (Fischer and Linde 1997). Increases in muscle strength were also measured by Roughan and Kunst (1981) in a small sample of continent women who practised pelvic floor exercises as part of a trial of treatment for sexual problems. No studies have measured the changes that occur in the strength of the pelvic floor when a woman becomes pregnant.

Measures of pelvic floor muscle strength during pregnancy and following childbirth have been made in a number of studies (Sampselle et al. 1989; Small and Wynne 1990; Cosner et al. 1991; Röckner et al. 1991; Klein et al. 1994; Peschers et al. 1997) (see Table 1.16). These show greater weakening of the pelvic floor in the immediate postnatal period (lasting up 6 – 10 weeks) following vaginal delivery compared with measures made after caesarean section. None of these studies have examined whether there is a difference between pelvic floor muscle strength following an elective and emergency caesarean section, however Tetzschner et al (1997) found greater pudendal nerve damage after an emergency section compared with an elective section.

Results from some studies have shown that weakening persists for at least 6 – 8 weeks (Sampselle et al. 1989; Cosner et al. 1991; Röckner et al. 1991). In contrast Small and Wynne (1990), Klein et al (1994) and Peschers et al (1997) found that 6 – 12 weeks after delivery, there was no significant difference between the antenatal and postnatal values. Studies that have followed women for longer have found that by one year muscle strength returns to at least a similar level to that found during pregnancy (Gordon and Logue

1985; Cosner et al. 1991; Peschers et al. 1997). The findings of Sampselle et al (1989) that there is poor reliability of measures of pelvic floor muscle strength during pregnancy throw doubt on the results of many of the studies described above. Further work is needed to establish normal pelvic floor muscle strength in healthy continent women, and to confirm the changes in muscle strength that happen during and after a normal pregnancy.

Another study by Sampselle (1990) investigated the relationship between antenatal and postnatal pelvic floor muscle strength and the incidence of stress urinary incontinence. This study confirmed the reduction in muscle strength following a vaginal delivery, and the protective effect of caesarean section. In addition she found that the greater the antepartum muscle strength, the greater the postpartum muscle strength. Stress urinary incontinence was found to be significantly less common in women who had stronger pelvic floors before or after delivery. These results, arising from objective data in a longitudinal study (although numbers were small, n = 20) lend weight to the importance of a strong pelvic floor for maintaining continence, and point to the potential importance of pelvic floor exercises for antenatal women.

1.3.vi Pelvic floor muscle strength and progress of labour

Obstetric and midwifery textbooks refer to the role of the pelvic floor during labour and delivery. Hormones produced during pregnancy (oestrogen and progesterone from the placenta, and relaxin from the corpus luteum (Steer and Johnson 1998)) are described as having the effect of relaxing and softening of the pelvic floor to allow stretching of the muscles and ligaments to take place during labour (Cunningham et al. 1997; Morrin 1997; Stables 1999). Following delivery of the placenta these hormones are no longer in the circulation; this helps to explain the natural recovery of the pelvic floor musculature.

Furthermore the slope of the pelvic floor muscles is claimed to facilitate increasing flexion and rotation of the fetus in order to allow it to negotiate the birth canal during the latter stages of labour (Sweet and Tiran 1997; Parsons 1998).

Indirect evidence for the role of pelvic floor muscle strength in the progress of labour comes from a randomised single-blind study of 118 women (Stoddart et al. 1994). They studied the effects of low and high dose epidurals in two groups of women compared with a similar group of women who did not have an epidural. The control group had significantly shorter labours and were significantly more likely to have a spontaneous delivery. High dose epidurals were significantly more likely to lead to a Kielland's rotational forceps delivery, while those who had a low dose epidural were significantly more likely to have a Neville-Barnes forceps delivery. They suggest that this evidence tends to support the theory that increased relaxation of the pelvic floor muscles leads to inadequate rotation of the fetal head and thus to increased obstetric intervention.

In seeming contradiction, Frahm (1985), Montgomery (1986) and Dolman (1993) all suggest that relaxation of the pelvic muscles is important to allow stretching of the pelvic floor muscles and perineum during delivery thus avoiding a tear or the need for an episiotomy. These authors suggest that exercising the pelvic floor in the antenatal period leads to improved awareness and control of the muscles in order to allow relaxation during labour and delivery and therefore to quicker labours and easier births. Frahm (1985) also suggests that increased elasticity due to exercise will also facilitate recovery to the pre-pregnant state following delivery. No evidence is cited to support any of these claims.

It may be that the slope and strength of the pelvic floor is important in the latter part of the first stage and the earlier part of second stage of labour to help rotation of the fetal head. In contrast during the latter part of second stage when the head distends the perineum relaxation of the muscles facilitates stretching.

Anecdotal evidence and common sense suggest that a pregnant woman might be more motivated to perform pelvic floor exercises if the benefits were expressed in terms of a more straightforward delivery. If the incentive to exercise is merely the prevention of a hypothetical condition (stress urinary incontinence) that may seem remote and unlikely, then the necessary motivation may not be present. Pregnant women are notoriously unable to focus beyond the birth itself. The motivation of women to perform pelvic floor exercises during pregnancy has not been investigated.

1.3.vii Pelvic floor muscle strength and effect on sexual activity

Another suggested benefit of pelvic floor exercises is an improvement in sexual satisfaction (Health Education Authority 1993; Herbert 1998). Scott and Hsueh (1979) reported this as a benefit of galvanic muscle stimulation of the pelvic floor as a treatment for stress urinary incontinence. Their study was not a randomised controlled trial, and it is possible that other factors such as self-selection, reduction in incontinence, or the counselling opportunity may have accounted for the reported improvement in sexual satisfaction.

Roughan and Kunst (1981) set out to test the theory that pelvic floor exercises, in addition to strengthening the pelvic floor muscles, would also lead to increased sexual responsiveness and ability to orgasm. Although the 25-week programme did lead to improvements in muscle strength, no effect on the other outcomes was found. Studies of pelvic floor exercises for incontinence have not usually measured the effect on sexual fulfilment. The randomised trial by Wilson and Herbison (1998) included sexual satisfaction as an outcome measure but failed to find any effect from the exercises. This was not one of the main outcome measures, and the study may not have been large enough to detect a difference.

The claims for pelvic floor exercises leading to an improvement in sexual satisfaction require to be confirmed by further research.

1.3.viii Antenatal pelvic floor exercises, pelvic floor muscle strength and prevention of stress incontinence

The preceding sections suggest that a strong pelvic floor is associated with a reduced likelihood of incontinence, that pelvic floor exercises can be successful in the treatment of incontinence and that pelvic floor exercises may increase the strength of the pelvic floor. If pelvic floor exercises increase the strength of the pelvic floor they might be effective in the prevention of stress incontinence, particularly if practised during the antenatal period.

The use of pelvic floor exercises for prevention of problems has been suggested in research publications (Shepherd 1983; Sampselle and Brink 1990; Small and Wynne 1990, editorial comment; Wall and Davidson 1992; Bø et al. 1994). Similarly the importance of performing antenatal pelvic floor exercises is regularly emphasised in literature designed for pregnant women (Whitby 1989; Balaskas 1990; Brayshaw and Wright 1996). Web-based information available to all consumers about health suggests that the practice of pelvic floor exercises before delivery may help prevent postnatal urinary incontinence (GPnotebook 2001). Those teaching antenatal classes in preparation for childbirth are also exhorted to teach the exercises (Williams and Booth 1985; Wilson

1990; Priest and Schott 1991; Health Education Authority 1993; Brayshaw and Wright 1994; Halksworth 1994). This section will review the evidence for the effectiveness of these exercises during the antenatal period.

Research designed to find out the effect of pelvic floor exercises during pregnancy is described in Table 1.17. The first published study was carried out by Henderson (1983) in America. The intervention group had significantly higher perineometer readings at the postpartum visit (at 5 weeks) than the control group. Women were asked if they were experiencing stress incontinence at this visit. Henderson states that results showed a definite relationship between higher perineometer readings and a decreasing occurrence of stress incontinence. No instances of stress incontinence were found in women who had perineometer readings of above 50mm of mercury. She does not state whether the relationship reached significance. Details are not given in the paper about what an 'office' visit entailed, nor the number of visits made to the office by each woman. Some women appeared to have their own perineometers, as these were used to confirm the readings of the instrument used by the researcher. The control and experimental groups were not recruited in the same way, and group allocation was not random. Antenatal perineometery readings were not made for the control group. These factors are all limitations to the study.

A randomised trial by Neilsen et al (1988) compared two groups of primigravid women. A significant improvement in measurements was found in both groups during pregnancy and although the training group showed a greater improvement, this did not reach significance. The influence of the baseline measurements may have positively influenced the control group. However at both postnatal assessments the training group recorded

significantly higher readings of pelvic floor muscle strength than the control group, with the 8-month values being back at the initial level during pregnancy. No mention is made of compliance with the exercise regime. Postnatal incontinence was not assessed in this study, and a high rate of attrition may have affected results.

More recently Sampselle et al (1998) tested the effect of antenatal pelvic floor exercises on both pelvic floor muscle strength and stress incontinence in a randomised trial. Comparison of results for incontinence and muscle strength at each time point showed no significant difference between the two groups. Using the 20-week measure as a baseline, change scores also were calculated for both measurements. These showed that for the vaginal and caesarean births combined the treatment group had significantly different changes in incontinence symptoms over time compared with the control group until 6 months postpartum. By 12 months postpartum, the difference had disappeared. A similar analysis for vaginal births only, found a similar pattern, but results did not reach significance. The measure used to assess incontinence included only 4 categories, and with the majority of women scoring 0 or 1 results were highly skewed.

Results for the small group for whom complete muscle strength data was obtained, similarly showed that the pattern of change was in the hypothesised direction, but results were not significant. Baseline muscle strength had a significant effect on muscle strength at 12 months postpartum. However, although the group lost to follow-up was reportedly not significantly different in terms of age, race or educational status, no information is given about the similarity of the baseline muscle strength to the women who were analysed. The high number of subjects for whom complete data was not available was a severe limitation of this study. Full details of the intervention are not given. Testing pelvic floor muscle strength of the control group may have influenced results and led to less difference between the two groups than expected.

These are the only studies that have investigated the effect of antenatal pelvic floor exercises on postnatal pelvic floor muscle strength, and only two of the studies used a RCT. The studies by both Neilsen et al (1988) and Henderson (1983) involve small numbers, and Sampselle et al (1998) had a low number of complete data sets. Sampselle et al (1998) and Neilsen et al (1988) both measured muscle strength of the control group throughout the study, which may have influenced results (Wilson et al. 1991), and some of the women studied by Henderson (1983) already appeared to have some experience of using a perineometer. While the study by Sampselle et al (1998) may be the most methodologically sound and suggests that an antenatal programme of pelvic floor exercises might improve postnatal muscle strength and possibly lead to less stress urinary incontinence in the postnatal period, further work is required to confirm these conclusions.

This evidence has been backed up by a retrospective postal survey in New Zealand which examined the relationship between obstetric factors and the prevalence of urinary incontinence three months postpartum (Wilson et al. 1996) (Table 1.7). A questionnaire was sent to women (n = 2134) at three months postpartum and achieved a 70.5% response rate. Questions were asked about continence and urinary symptoms, as well as performance of pelvic floor exercises during and after the pregnancy. They found that women who said they performed daily antenatal pelvic floor exercises had a significantly reduced chance of developing incontinence compared with those who did not. Pelvic floor exercises performed less than daily had an almost equal odds ratio, but not significantly lower, thus failing to reinforce the relationship between antenatal exercises and prevention of incontinence. There was a negative association between pelvic floor exercises after delivery and continence status at three months, suggesting that women who are incontinent are more likely to perform pelvic floor exercises in order to treat the condition. There was no confirmation made by the investigators about the accuracy of these self-reports of performance of pelvic floor exercises or incontinence.

1.3.ix Postnatal pelvic floor exercises, strength of the pelvic floor and prevention of stress incontinence

The previous section examined the evidence for the effectiveness of antenatal pelvic floor exercises in strengthening the pelvic floor and in the prevention of stress incontinence. This section will examine evidence for the effect of postnatal pelvic floor exercises (Table 1.18).

Trials of intensive training regimes for women who have had a vaginal delivery have found significant improvements in muscle strength using both vaginal cones (a training device to aid practice of the exercises) and pelvic floor exercises alone (Jonasson et al. 1989; Mørkved and Bø 1996). A smaller study by Dougherty et al (1989a) failed to find a significant difference between the training group and the control groups. None of these studies included an assessment of incontinence.

Gordon and Logue (1985) measured perineal muscle function in 70 postnatal women one year after delivery using a perineometer. There were 5 groups of 14 women who had varying degrees of perineal trauma at delivery (ranging from no trauma following caesarean section, to a forceps delivery with an episiotomy) as well as a group of 14 nulliparous controls. No significant difference was found in perineal muscle strength between the six groups, suggesting that by one year after delivery the effects of childbirth

on the perineal musculature were minimal. This confirms the findings of Cosner et al (1991) and Peschers et al (1997) (Section 1.3.v, Table 1.16) that after one year, measures of pelvic floor muscle strength return to a normal (or pregnancy) level. The groups in the study by Gordon and Logue (1985) were small, and the women were not tested during pregnancy or immediately after delivery as a baseline. Incontinence was not investigated in this study.

The participants in the study by Gordon and Logue (1985) were also asked about exercise. The data was then reanalysed according to the answers given: no exercise of any kind, hospital postnatal exercises only and hospital postnatal exercises plus some other form of regular exercise ('other' forms of regular exercise ranged from yoga or walking to training for the London marathon). Results analysed on the basis of this allocation showed that regardless of perineal trauma, the amount of exercise taken in the postnatal period was more closely related to perineal pressure measurements. Women in the group taking regular exercise or the group only doing the hospital postnatal exercises had significantly higher readings than those who did no exercise of any kind. The least difference was between the two groups that had done any exercise. The authors concluded that the hospital postnatal exercises did exert a significant impact on pelvic floor muscle strength, and that the results were comparable to doing any other form of regular exercise. They suggest that, as other forms of exercise may be more acceptable to women, and therefore compliance rates higher, they should be emphasised more. However the paper does not state whether the 3 groups were similar in terms of age, type of delivery, obesity or birth weight of the baby; some of these factors may have accounted for the differences in pelvic floor muscle strength between the groups. Furthermore women with weaker pelvic floors may have been more likely to suffer from incontinence, and less likely to indulge in vigorous exercise as a result. This study is widely quoted as justification for any type of physical exercise being more beneficial than hospital postnatal exercises. No other studies have investigated the effect of other forms of exercises after delivery compared with pelvic floor exercises to confirm or refute this suggestion.

Early work by Sleep and Grant (1987) threw doubt on the efficacy of pelvic floor exercises after delivery for the prevention of postnatal incontinence. The large randomised trial of postnatal pelvic floor exercises found that at 10 days postnatal, those in the exercise group were more likely to have performed their exercises (78% vs. 68%), a difference which was still present at 3 months (58% vs. 42%). At three months there was no difference between the two groups in the amount of reported incontinence. The only significant difference between the two groups was that women in the intervention group reported less perineal discomfort and improved feelings of general well being. The extra input from the research midwife may have contributed to the improved feelings of well being. There was no objective measure of the effect on perineal muscle strength or level of incontinence. Furthermore the same community midwives were visiting women in the control arm so contamination of this group may have been possible, and assessment was not blind.

A more recent study provides contrasting results. Mørkved and Bø (1997) conducted a prospective comparison study of 99 matched pairs in Norway. Results showed that the control group had stronger muscle strength at baseline, and reported greater frequency of pelvic floor exercises both during pregnancy and in the first 8 weeks postpartum. In spite of this, by the follow-up at 16 weeks, the training group recorded a significantly greater increase in pelvic floor muscle strength compared with the control group. The training group also reported greater frequency of pelvic floor exercises, significantly less urinary incontinence and had fewer positive tests of urinary incontinence. Although not a randomised trial, (hence unmeasured differences in the matched pairs cannot be discounted) this is the first study to have found improvements in muscle strength as well as a lower incidence of (objectively measured) urinary incontinence. The intensive nature of the intervention may help to account for the impressive results, and indicate that this level of instruction and encouragement may be necessary to improve motivation and compliance of postpartum women. It is questionable how many women in other settings would be prepared to attend weekly hospital sessions during the postnatal period, and whether service providers would consider the extra expense justifiable.

The studies by Sleep and Grant (1987) and Gordon and Logue (1985) are both widely quoted, to justify any other form of postnatal exercises being as good as postnatal pelvic floor exercises. Mørkved and Bø (1997) however suggest that with intensive professional input pelvic floor exercises in the postnatal period may help to prevent postnatal incontinence.

1.3.x Summary of Section 1.3

The pelvic floor is a vital structure in the support of the pelvic organs and the maintenance of continence. Although measurable strength of the pelvic floor and degree of incontinence do not always correlate, pelvic floor exercises have been found to be effective in the treatment of stress urinary incontinence both in the general population of women and during the postnatal period.

Although less extensively studied, it appears that the pelvic floor is weakened following pregnancy and childbirth, and that a weak pelvic floor may be implicated in the aetiology of postpartum incontinence. The weakening effect is more pronounced in women who have had a vaginal delivery compared with women who have had a caesarean section. There is some evidence that pelvic floor exercises practised during pregnancy may lead to improved strength in the pelvic floor and possibly a lower prevalence of postpartum incontinence, however the studies have involved small numbers and been characterised by methodological flaws. Further work is required to confirm these findings. Additional claimed benefits may be enhancement of the progress of labour and improvement in sexual relationships, but the evidence for these assertions is minimal. Furthermore if practised intensively postnatal pelvic floor exercises may also help to prevent postnatal incontinence.

1.4 Factors affecting the effectiveness of pelvic floor exercises

Clearly the effectiveness or otherwise of any therapeutic or preventative programme of exercises to strengthen these muscles depends on the participants carrying out the prescribed exercise regime. Many of the studies mentioned in the preceding review make no mention of compliance with the exercises. The following section focuses on various factors that might affect whether a programme of pelvic floor exercises is likely to be effective. Most of the topics covered in section 1.4 have not been extensively studied. Therefore all relevant literature has been included in the review, and methodological limitations acknowledged as appropriate.

1.4.i Patients most likely to benefit from pelvic floor exercises

There is conflicting evidence on factors influencing the response to pelvic floor exercises in the treatment of stress incontinence. Although younger age has been identified as being important (Henderson and Taylor 1987; Wilson et al. 1987; Bishop et al. 1992), this has been contradicted by Bø and Larsen (1992). Recent onset of symptoms (Tapp et al. 1988) and lesser severity of the condition (Wilson et al. 1987; Tapp et al. 1988; Elia and Bergman 1993) have similarly been found to be influential. However Henderson and

Taylor (1987) have suggested that longer duration of symptoms and greater severity may increase motivation and therefore the magnitude of response by others. Harder to assess, but of great importance for this type of therapy is the motivation of the patient. Both Henderson and Taylor (1987) and Lagro-Janssen et al (1991) found patient motivation (assessed by patients' subjective self-reports of compliance with the instruction programme) to be predictive of success. Interestingly the motivation and enthusiasm of the therapist has also been mentioned as a factor that can improve the outcome (Bø 1992).

In the view of physiotherapists surveyed by Mantle and Versi (1991), factors that helped influence improvement in the condition of stress incontinence following the use of pelvic floor exercises were good patient motivation, recent onset of symptoms, current ability to contract the pelvic floor and being young or pre-menopausal. Women who were poorly motivated, obese, had had previous surgery, long duration of symptoms, prolapse or had a cough were regarded as being less likely to succeed with treatment.

As these studies are all based on samples of women already suffering from incontinence the relevance to a preventive programme of exercises for continent women remains to be demonstrated. Furthermore none of the factors mentioned above have been formally tested, and all may be confounding factors in studies that have examined the effectiveness of pelvic floor exercises.

1.4.ii Meaning of pelvic floor exercises to women

A series of in-depth interviews with younger incontinent women (aged 25 to 55 years) explored the meaning of incontinence to younger sufferers (Ashworth and Hagan 1993b). The women interviewed represented a range of parities, age groups, duration of the problem and were mainly those who had not sought professional help for the condition. Purposive sampling was used to achieve a sample representative of a range of circumstances. One of the issues that emerged strongly was the social and emotional consequences of non-compliance with pelvic floor exercises; these were further elaborated on in another article (Ashworth and Hagan 1993a).

This subsequent article explored two broad themes that emerged during the interviews. Firstly the meaning of the exercises to the women was discussed. The women interviewed reported that the exercises had been suggested as a treatment in a vague manner, and that the potential for improving their incontinence had not been emphasised. Consequently the personal relevance to the women was not apparent. Performance of the exercises was reported as being difficult due to their low priority and lack of consciousness of the area of the body. No obvious reward was gained by exercising and it was seen as a lonely activity. Lack of feedback about the effect of the exercises was compounded by lack of belief about their efficacy (Ashworth and Hagan 1993a).

The second theme to emerge was the consequences of non-compliance. As a result of non-completion of the exercises, women felt guilty. Other feelings about non-completion were resignation to the condition, apathetic inaction and embarrassment in front of doctors. There was a feeling that no further help could be expected from professionals and that nothing else could be done because of the woman's own inaction. Inaction for some women reinforced the feeling of being weak-willed. The belief that exercises would only by effective in the early stages of the condition was common. However these emotions, although contradictory, did not detract from the perception that the exercises were important and should be recommended to others (Ashworth and Hagan 1993a).

Thus the consequences of encouraging women to carry out a seemingly harmless and potentially beneficial activity may be guilt, lack of faith in professional help and advice, and discouragement from participating in future treatment programmes. Nygaard et al (1996) reported that 39 out of 110 women who were being recruited into a trial of pelvic floor exercises refused; 3 of these due to a previous failed course of pelvic floor exercises. The findings of Ashworth and Hagan (1993a) indicate that women who become incontinent subsequent to childbirth may be reluctant to present for treatment because they perceive the problem to be their own fault. These authors suggest that the manner in which pelvic floor exercises are presented to women must ensure that there will be no self-blame or fear of censure in the future.

1.4.iii Correct contraction of pelvic floor muscles

The muscles of the pelvic floor have been described as the "invisible muscle" (Wall and Davidson 1992), and because there is no overt feedback when a correct contraction is achieved they are hard to isolate (Bø et al. 1988; Sampselle 1990). Bø et al (1988) investigated the relationship between the knowledge of incontinent women about pelvic floor exercises and their ability to perform the exercises correctly. They found that almost 70% of the women they studied who stated they had previously exercised their pelvic floor had been performing the contraction incorrectly. Bump et al (1991) found that after brief verbal instruction, only 49% of subjects had an ideal pelvic muscle contraction, and concluded that verbal instruction alone was insufficient to ensure that effective contractions were being performed.

Cosner et al (1991) conducted a study to measure the strength of the pelvic floor during and after pregnancy in a small group of 29 women. Participants were also asked about pelvic floor exercises. The self-reports of pelvic floor exercise revealed that there was variety in technique and consistency among participants, and levels of exercise did not correlate with strength measurements.

Interviews with incontinent women about pelvic floor exercises have revealed that women themselves can be uncertain about whether they are correctly exercising the appropriate muscles, and the lack of any obvious evidence of improvement can be demoralising (Ashworth and Hagan 1993a). The area of the pelvic floor is not thought of as easily accessible to conscious control (Ashworth and Hagan 1993a), thus increasing the apparent difficulty of performing the exercises.

1.4.iv Number and type of exercises and length of treatment

Many studies do not specify the full details of the exercise regime under investigation (Montgomery and Shepherd 1983; Shepherd and Montgomery 1983; Sleep and Grant 1987; Tchou et al. 1988; Wilson et al. 1997). Others give details, but show wide variation in the regime followed. For example there are differences in the intensity or number of seconds subjects are required to hold each contraction performed, the number of repetitions per day prescribed and the frequency of exercise per week. The input of the therapist is also variable. Examples of treatment regimes that have been used are:

- RCT: 8 – 12 strong contractions 3 times daily at home for 6 months compared with 6 – 8 second contraction followed by 3 – 4 fast contractions; 8 – 12 of these sets done in standing, sitting, lying and kneeling positions. Weekly sessions of 45 minutes with an instructor, and continued at home between sessions. Treatment continued for 6 months (Bø et al. 1990)
- 10 x 6 second contractions 5 -10 times every day for three months. One initial teaching session by the G.P. (Lagro-Janssen et al. 1991)

- An increasing regime of 5 quick and 5 sustained contractions (held for 3 – 30 seconds depending on the ability of the patient) starting with 4 sets of 10, increasing to 4 sets of 30. Position while doing the exercises varied and included supine, side, standing and crawling positions. Clinic visits 3 times per week for 25 – 35 minutes per session, with training continued at home 3 times a day. Treatment continued for 4 weeks. (Berghmans et al. 1996)

A further unknown is the optimum length of time each patient requires to continue treatment to achieve an improvement. Hahn et al (1993) treated a group of 170 incontinent women who were awaiting surgery, and found that 3- 4 months of training was required to achieve a cure or improvement in more than half the subjects. Bishop et al (1992) found that 12 weeks of graded training produced no response in 26% of the 85 women who participated in the programme. Dougherty et al (1993) found significant gains in pelvic floor muscle strength occurred in the first 4 weeks of muscle training compared with gains in the subsequent 12 weeks, and changes in urine loss variables were greatest in the first 8 weeks compared with the final 8 weeks. Similarly Bø (1994) has described how the first 6 – 8 weeks of muscle training result in more effective recruitment of motor units and increased frequency of excitation. She suggests that further gains in strength after this time are due to hypertrophy of the muscles and are a much slower process. She advises that at least 5 months of training are required, and that longer training might produce further gains.

In recent review of the therapeutic literature Dougherty (1998) recommends 30 – 45 x 10 second contractions with a 10 second period of relaxation between each, carried out three times per week. The training regime should be continued for between 6 to 12 weeks, with the greatest improvement to be expected in the first 6 – 8 weeks. She acknowledges that there is no consensus in the literature regarding the minimum prescription.

Examples of preventative regimes for pregnant women that have been suggested include:

- 50 brief maximal contractions (for a maximum of 10 minutes) morning and evening during the last 8 weeks of pregnancy. Method of instruction not specified (Neilsen et al. 1988)
- 3-second contraction repeated 100 times a day OR 3 sessions of 20 minutes of exercise daily. Perineometer used for feedback at antenatal visits (frequency of visits not specified). Exercise regime carried out for last 4 – 8 weeks of pregnancy. (Henderson 1983)
- From 8 weeks after delivery, training in a group of 5 – 10 participants for 45 minutes weekly for 8 weeks. In addition home training of 8 – 12 maximal contractions (held for 6 – 8 seconds) twice a day, with 3 – 4 fast contractions at the end of each maximal contraction. (Mørkved and Bø 1996)
- 10 x 10 second maximal contractions with a 3 second rest between, then 10 fast contractions – done at regular intervals throughout the day such as after each time the bladder is emptied or while doing the dishes (Brayshaw and Wright 1994)
- 50 contractions daily of one 10 second hold followed by 3 quick flicks each (Elliott et al. 1997)

These examples illustrate that there is no consensus in the literature about the minimum amount of exercise required which will achieve a result either for treatment of incontinence or prevention. Without clear consistent guidelines, women may well be confused and lack confidence in professional advice. There is a need for further research to clarify the minimum intensity of exercise and length of training to produce an improvement both for treatment and for prevention.

1.4.v Information/teaching currently given about pelvic floor exercises to pregnant women

Many women never learn about the pelvic floor until they are pregnant. Published evidence regarding the teaching of pelvic floor exercises to women during pregnancy is scant. Candy (1994) reported that only 40% of mothers (n = 50) at a mother and toddler group knew what pelvic floor exercises were, while 62% reported that they had been given instructions while in hospital after delivery. Chiarelli and Campbell (1997) interviewed 304 women in the postnatal ward of a large teaching hospital in Australia. Questions were asked about incontinence and whether advice about bladder control had been given during pregnancy by a health care professional. Only 13% of the sample said they had been told about pelvic floor exercises in relation to bladder control during pregnancy. This study made specific enquiry about bladder control information rather than pelvic floor exercises generally, and did not ask women about information from any other sources.

Clearly without any information women are unlikely to practise pelvic floor exercises. There is therefore a need to find out more about the information that women are given routinely during pregnancy about pelvic floor exercises.

1.4.vi Compliance with pelvic floor exercises

'Compliance' is defined as 'acquiescence or a disposition to yield to others' (Makins 1992). Closely related to 'compliance' is the concept of 'adherence' which means to 'stick or hold fast to' (Makins 1992). In the literature relating to taking of prescription medicine the term 'compliance' means 'following doctor's orders'; in contrast the concept of ‘concordance’ implies that the prescriber and patient work in alliance via a process of negotiation (Royal Pharmaceutical Society of Great Britain 1997). In the literature relating to pelvic floor exercises, the terms ‘compliance’ and ‘adherence’ are often used inter-changeably (for example, (Bø 1995)). Throughout this thesis the terms ‘compliance’ and ‘adherence’ will both be used to refer to the extent to which the patient has followed the suggested regimen of pelvic floor exercises.

A number of studies have identified problems associated with ensuring that women comply with the exercise protocol, as well as problems with measuring compliance. Most of these studies are on samples of incontinent women. In a review of 22 studies which used pelvic floor exercises to treat stress incontinence Wells (1990) found drop-out or non-compliance rates of between 7% to 42% noted in seven of the studies. The rest of the papers did not mention rates of compliance with the study protocol, or attrition from the study. Similarly the review by Berghmans et al (1998) also acknowledges that the success of treatments for incontinence involving the use of pelvic floor exercises may be affected by factors such as intensity of instruction and motivation of the patient to adhere to the treatment regime.

Follow-up of incontinent women who had participated in a treatment programme found that women who did not complete the exercises cited inability to follow the rigid exercise regime, lack of interest and discouragement from others as reasons for non-completion (Diokno and Yuhico 1995).

Bishop et al (1992) studied a group of 85 incontinent women who completed a 12 week course of pelvic floor exercises. In order to monitor adherence, participants completed a written record of their exercises and sent the record to the research nurse every week. A weekly phone call from the nurse provided encouragement and monitoring of progress. Results showed that women with maximum improvement were significantly younger than the least improved. No significant difference was found between the two groups in parity, and adherence to the exercise protocol was not found to affect results significantly. These women were all over 35 years, and all incontinent therefore results may not be applicable to younger continent women. However they suggest that in spite of similar levels of compliance, some women show greater levels of improvement in muscle strength than others. The authors question whether a written record adequately represents actual compliance with the protocol.

Twenty incontinent women who were randomised to a programme of pelvic floor exercises with or without a resistance device were studied by Ferguson et al (1990). Participants were followed up 12 – 24 months after the completion of the study and asked about incontinence and performance of pelvic floor exercises. Only half the group had continued to perform the exercises and although none reported their symptoms were worse, three had undergone surgery for the incontinence and others reported a return of symptoms when exercises were discontinued. These results demonstrate that in the absence of instruction and supervision, even incontinent women who have benefited from a programme of pelvic floor exercises may be poorly motivated to continue exercising.

Henderson and Taylor (1987) compared the effect of pelvic floor exercises combined with biofeedback in two groups of incontinent women of different ages. Compliance was assessed by the use of diaries; all women in the older group reported excellent compliance, compared with only fair compliance in the younger group (definitions of ‘fair’ and ‘excellent’ not given). The authors conclude that older women may be more motivated than younger women. They postulate that this may be due to younger women having more commitments with young children that interfere with performance of a daily exercise regime. The older women had more severe incontinence at the start of the programme, which may have been a motivating factor. Small numbers limited this study, and the fact that three out of the five younger women had taught Kegel exercises while conducting childbirth education classes prior to taking part in the study. Similarly Lagro-Janssen et al (1991) assessed compliance using the patient's own subjective assessment; reported compliance ranged from 53 - 61% who reported 'excellent' or 'good' compliance to 27 - 43% who said their compliance was 'reasonable' or 'poor' to 12 - 13% who did not carry out the exercises at all.

Methods that have been used to improve compliance include:

- A daily diary (Sleep and Grant 1987) or weekly diary (Henderson and Taylor 1987)
- Clinic visits three times weekly (Berghmans et al. 1996) or weekly (Bø et al. 1990)
- Individual training sessions (Bø et al. 1990) or group training sessions (Thow 1990b; Mørkved and Bø 1997)
- Phone calls (weekly – (Bishop et al. 1992) and (Mooney and Dougherty 1989); frequency not specified – (Sleep and Grant 1987))
- Use of biofeedback such as the perineometer (Henderson 1983)
- Audio cassette tapes (Wyman et al. 1998)
- Watch with an hourly alarm (Thow 1990b)
- Visual prompts (orange dots 2cm in diameter) to act as a visual reminder to exercise. These were placed around the home in places where the women would

be able to practise pelvic floor exercises (preferably unobtrusive places where they were not constantly observed so as to avoid saturation) (Elliott et al. 1997)

There has been no formal comparison to find out which is the most effective method of improving compliance with the exercises.

A further variable may be the enthusiasm and motivation of the health professional. Sluijs et al (1993) analysed the quality of the interactions between patients and physical therapists in the Netherlands. They found wide variation between different practitioners both in the quality and quantity of information provided. In addition the therapists' perceptions of the level of short and long-term compliance that clients would reach was very variable. Although in a different country and with a different professional group, it is reasonable to conjecture that similar differences in attitude and practice might be found within the midwifery profession and among obstetric physiotherapists. It may be that one reason that professionals hesitate to recommend the exercises as a preventative measure is due to the lack of firm evidence for their effectiveness, and that this in turn may be due to low compliance with the exercise regime in the studies conducted to date.

If compliance with pelvic floor exercises in research studies is poor then it is likely to be even worse in the 'real world'. Dolman (1995) sent a questionnaire to 220 women who had bought a set of vaginal cones by mail order. She found that 45% of the women who replied (response rate of 73%) admitted that they had been taught how to do pelvic floor exercises but did not bother to do them. The age range of the sample was 21 – 75 years (mean 46 years) and all reported some degree of incontinence that had lasted from 1 month to 5 years.

1.4.vii Compliance with exercises in the antenatal period

Lee (1996) conducted a randomised trial of regular aerobic exercise for pregnant women. Three hundred and seventy women (370) out of 550 who were approached before 20 weeks gestation, agreed to participate in the study. The participants in the exercise group agreed to take part in an exercise class for one hour three times a week from 20 weeks of pregnancy until birth. Participants used a daily logbook to record daily resting pulse rates, pulse rates during exercise and any other exercise undertaken. Rates of compliance were less than specified in the study protocol. They found that 22.9% attended at least once a week for at least 16 weeks, 34.3% attended at least once a week for 6 – 15 weeks, 27.4% attended at least once a week for 5 weeks or less and 15.4% did not attend. The practicalities of this ambitious and intensive programme of exercise led to high levels of low and non-compliance, and the results of the programme were difficult to interpret. Social class affected compliance with the programme, with women from higher social groups being significantly more likely to attend the classes.

Studies designed specifically to study the effect of antenatal pelvic floor exercises have not recorded rates of compliance in detail. Henderson (1983) asked women to keep a record of the daily practice sessions; this was found to be too cumbersome. She noted that no women kept to the exercise regime as instructed though all reportedly improved the practice time as their control of the muscles improved. Neilsen et al (1988) do not report on compliance rates with the suggested exercise regime in their RCT, however they comment that in the antenatal period women are particularly motivated to practise pelvic floor exercises. Sampselle et al (1998) reported that 85% of participants were adherent at 35 weeks gestation (classed as reporting the practice of the exercises at least 75% of the time), while in the year after delivery rates of 62 to 90% were reported.

Wilson et al (1996) in a postnatal questionnaire sent out to 2134 women 3 months after delivery, asked about the frequency of performance of pelvic floor exercises. Reports from the 70.5% of women who responded indicated that 16.9% had exercised daily during pregnancy, 29.7% said they had done them a few times a week and 7.0% said they had done them once a week. The 3-month gap may have led to inaccurate recall of frequency of the exercises, however it is questionable whether such a low rate of regular practice of the exercises would have led to a preventive effect.

A small study by Elliott et al (1997) was designed to improve compliance with pelvic floor exercises by pregnant women. Seven women who were attending antenatal classes participated in a trial of orange dots as visual prompts to remind them to practice the exercises. Following a baseline period (4 – 8 days) of recording the frequency of practice of pelvic floor exercises, they were instructed to place the dots in various places where they would act as a reminder. The dots were left in place for 4 days, then removed. Recording of the frequency of pelvic floor exercises continued throughout the 'treatment' period and for a few days beyond. Only 3 participants achieved a significant increase in exercise frequency and even these failed to practise as many as the 50 exercises per day recommended. All reduced the rate of exercising when the prompts were removed. The authors comment that contemporaneous recording of exercise frequency may be more accurate than 'recalled' data. A further suggestion from their findings was that women closer to term may be more likely to practise the exercises frequently than women who are at an earlier stage of pregnancy.

The only study to have specifically examined whether compliance with preventive pelvic floor exercises can be predicted was carried out by Dolman and Chase (1996). The study set out to test two models of health behaviour: the Health Belief Model and the

Subjective Expected Utility Model, and was planned as a precursor to a large study (not subsequently carried out – personal communication). The Health Belief Model includes measures of perceived susceptibility to the disease or problem, perceived severity of the disease or symptom, perceived benefits of the health action and perceived barriers to carrying out the action. The purpose of the Subjective Expected Utility Model is to assess decision making under conditions of uncertainty, where participants have to make an estimate of the chance of a particular outcome.

A small sample (n = 56) was used and participants included a mixture of antenatal and postnatal women, so measures must have been general enough to apply to both. Participants included only women who attended classes and no data is presented about whether the sample was representative of the population of childbearing women. Compliance behaviour was assessed by a telephone call 3 months after the initial questionnaire for only a sub-sample (n = 26) of the sample and no details are given about how this sub-sample was selected.

Dolman and Chase (1996) concluded that compliance with pelvic floor exercises was predicted by information about incontinence and the perceived cost of remembering to do the exercises, however the method of analysis is not clearly described. As compliance data was only available for 26 women and at least 8 independent variables appear to have been used, the sample size was insufficient for the regression analyses that were carried out (Tabachnick and Fidell 2001), therefore the conclusions must be treated with caution. The tentative nature of these findings suggests that further work in this area is required.

Rates of compliance with pelvic floor exercises during pregnancy have not been extensively studied, and although they may be reasonable in the context of a research study, it is not clear what the usual practice of pregnant women is. This area requires further study.

1.4.viii Compliance with pelvic floor exercises in the postnatal period

Having looked at the rates of compliance with antenatal pelvic floor exercises, it is also relevant to consider the frequency of reported practice with the exercises in the postnatal period.

A quarter (25.5%) of the women who were questioned 3 months after delivery by Wilson et al (1996) reported daily practice of the exercises after delivery, while 14.9% had exercised daily during the month preceding the questionnaire. At three months 42% were doing less than 5 contractions, and 45% between 5 and 25 contractions a day. Information is not given about the recommended number of contractions and the level of instruction women may have been given about pelvic floor exercises during the pregnancy or after delivery.

In a follow-up intervention study the women who reported incontinence were invited to take part in a RCT of pelvic floor exercises to treat the incontinence (Wilson and Herbison 1998). One year after delivery 65% of women in the control arm of the trial said they had done pelvic floor exercises in the month preceding the assessment, while 9% said they were doing the exercises daily, with an average of 35 contractions carried out each day (Wilson and Herbison 1998).

In the opinion of Norton (1994), compliance with pelvic floor exercises in the postnatal period may be difficult for women due to the presence of a young baby, but this has not been investigated.

Although not specifically measured as part of their study, Peschers et al (1997) noted that while attempting to measure pelvic muscle strength in the immediate postpartum period (3 – 8 days after delivery), many women were unable or unwilling to contract their muscles hard due to discomfort in the perineum. This same reason may similarly lead to poor compliance with a postnatal exercise programme.

Mooney and Dougherty (1989) examined adherence to a pelvic floor exercise programme as part of a larger study into the effect of the exercises (Dougherty et al. 1989a; Dougherty et al. 1989b). Strategies designed to improve adherence included completion of weekly research records by participants, telephone contact from the nurse practitioner on a weekly basis to answer questions and as a reminder of the changes to the weekly programme. On completion of the programme participants were able to choose a different exercise regime in case they were not allocated to their first choice on randomisation. Further measures designed to encourage participants included arranging baby-sitting facilities for postpartum women during their assessments and encouraging exercising at a suitable time for individual women. Detailed teaching was given about the potential consequences of a weak pelvic floor and about how to perform the exercises. Verbal and visual biofeedback was provided during teaching and questions to enhance clarification encouraged. The nurse practitioner had a friendly, outgoing nature and endeavoured to show interest in participant's progress and allow time for questions and concerns to be expressed. Spousal support was considered to be good as the postnatal participants were recruited from classes where the husbands were present, and several participants commented that their husbands noticed an improvement in muscle tone. Financial reimbursement was provided for expenses if 75% of the home training was completed. Using these methods they calculated that of those who completed the study, adherence rates were 94.6 to 96.2% (calculated by: number of days exercised/number of days of prescribed exercise x 100). No ratio could be calculated for those who dropped out.

Gordon and Logue (1985) found that exercise other than pelvic floor exercise, such as walking, jogging or running, improved pelvic floor strength significantly more than postnatal exercises as instructed in hospital. The authors suggest that women may be more interested and motivated in these types of exercise than pelvic floor exercises, which they perceive as tedious or ineffective. The women who reportedly exercised more may have done so as a result of having stronger pelvic floors and hence less incontinence, rather than the stronger muscles being due to the exercise. The study did not compare the characteristics of the groups, raising the possibility that other differences between the groups may have affected the result, nonetheless this suggestion has not been tested in a properly designed trial. A group of 144 elite nulliparous university athletes were found by Nygaard et al (1994) to have a 28% rate of urinary incontinence. Similarly a rate of 38%, confirmed by urodynamic investigation, was found by Bø et al (1994) among 37 nulliparous physical education students. These findings suggest that the exercise these women were participating in did not particularly protect them against developing incontinence.

Sleep and Grant (1987) noted that there was uncertainty regarding the level of compliance with the exercises in their RCT of postnatal pelvic floor exercises. Women in the intervention group kept diaries, which also served as a memory aid to doing the exercises, as well as increasing motivation and compliance. At 10 days 78% of women in the intervention group said they had performed the exercises compared with 68% in the control group. By 3 months after delivery the difference was more marked (58% versus 42%).

High dropout rates and the poor compliance of participants who remain in trials of pelvic floor exercises limit conclusions. There is an acknowledged need to address these issues by drawing on other disciplines such as exercise physiology, education and psychology to inform interventions and improve motivation of participants and effectiveness of the intervention (Editorial comment, p 264, (Wilson and Herbison 1998).

As Sluijs and Knibbe (1991) point out, it is remarkable that many studies of preventive or curative exercise regimes fail to mention compliance with the prescribed exercises. The same is also true of studies of pelvic floor exercises whether for treatment or prevention. In the worst case very low levels of compliance may lead to the results of a study being impossible to interpret (Thow 1990a; Lee 1996). At the very least low compliance may minimise the effect of a potentially beneficial therapy and lead to it not being adopted in practice.

The majority of studies that have used a randomised control trial design have analysed results on the basis of 'intention to treat'. This is the safest method of assessing the effect of a planned intervention (Altman 1991). Another approach is to analyse on the basis of 'per protocol'. A 'per protocol' analysis is seriously flawed because it negates the effects of randomisation and may create bias (the participants that comply with the study protocol are likely to be inherently different from those who do not) (Altman 1991). However reporting of the rate of attrition from each treatment condition might allow some indication of the acceptability of the intervention, as well as the extent to which low compliance may have confounded the results.

1.4.ix Summary of Section 1.4

In this section the literature relating to the factors that might affect whether a programme of pelvic floor exercises is successful has been reviewed. There is no consensus regarding which women are most likely to benefit from a programme of pelvic floor exercises, but most commentators agree that patients need to be motivated to comply with the suggested regime. The factors that might motivate both incontinent and continent women to practise the exercises have not been extensively studied. Incontinent women have reported difficulty with the exercises due to lack of obvious feedback and uncertainty about efficacy. Guilt and self-blame at non-compliance with a programme of pelvic floor exercises have also been noted (Ashworth and Hagan 1993a).

In spite of instruction regarding the exercises, incorrect method of contraction may be common. There is lack of consensus regarding the minimum intensity of exercises and length of time required to achieve a treatment effect; similarly the requirements for a preventive regime have not been fully established. Many trials of pelvic floor exercises have ignored the issue of compliance with the exercises, while others have reported varying levels of adherence. Various strategies have been used to improve compliance, but these have not been formally compared. There is little in the literature about the information pregnant women receive about pelvic floor exercises and levels of compliance during the antenatal period for women not participating in research studies have not been established. There is a need to examine more fully the motivation of women to practise these exercises, both for treatment and prevention, in order to optimise compliance rates.

1.5 Social cognition models and associated measures of health behaviour

Women who are pregnant are encouraged to practise pelvic floor exercises on a regular basis. Some women may already suffer from incontinence, and for them pelvic floor exercises represent a treatment option (or a measure to minimise symptoms). Other women may have had experience of incontinence in the past and the exercises will be an attempt to prevent a condition they have previously experienced. Others will have no prior or current experience of incontinence and pelvic floor exercises will be seen to be to prevent something they have only been told about by others. Additionally if they are carried out during micturition, pelvic floor exercises may also enable women to recognise a difficulty. If a woman is unable to stop her flow of urine mid-stream by contracting her pelvic floor muscles, she may detect a less than optimum state of health, i.e. weak pelvic floor muscles. Action can then be taken to improve the strength of the pelvic floor muscles by exercising them. Pelvic floor exercises may therefore be classified as falling into all three of the traditionally described goals of health behaviour: prevention, promotion and detection (Maddux 1993). More than one of these goals may be present at one time, or a person may start undertaking the behaviour for one reason, and through time the motivation may change as the state of health of the individual changes.

Pelvic floor exercises although similar to other exercise behaviours in that specific muscle groups are being exercised in a specific manner, are quite different in other respects. They require no specialised equipment or clothing, the person is not required to go to a specific place, they can be done without others being aware, and they do not need to be done at particular times. They require a degree of skill or knowledge in order to ensure that the correct action is being performed (although a person may believe that they are carrying out the exercises correctly, whilst in fact contracting the wrong muscles). As described in Section 1.4.iv prescriptions of the required regime (number and frequency of repetitions) may be vague and variable, or quite specific and exact depending on the book, leaflet or person being consulted. Although pelvic floor exercises during pregnancy may be described as exercise behaviour, they are perhaps more similar to a health behaviour such as dental brushing in the predominantly preventive nature of the goal (for the majority of women). Apart from a report of a pilot study using the health belief model and the subjective expected utility model (Dolman and Chase 1996) there has been little research on pelvic floor exercises in relation to motivation, particularly as a preventive health measure (rather than an exercise to treat incontinence).

It is therefore relevant to examine the health promotion and health psychology literature in order to find a suitable theoretical framework to explore the motivation to performing the exercises. Social cognition models are used to explain and understand behaviour and these models, particularly a proposed adaptation of the theory of planned behaviour will be considered in the following sections.

1.5.i Social cognition models

Behaviours (including health-related behaviours) are affected by a number of factors. These include personality traits, emotional state, cognitive factors, biological characteristics, demographic factors, attitudinal factors and environmental influences. All these play a part in shaping behaviour to a greater or lesser extent, depending on the behaviour under study and the circumstances (Conner and Norman 1996).

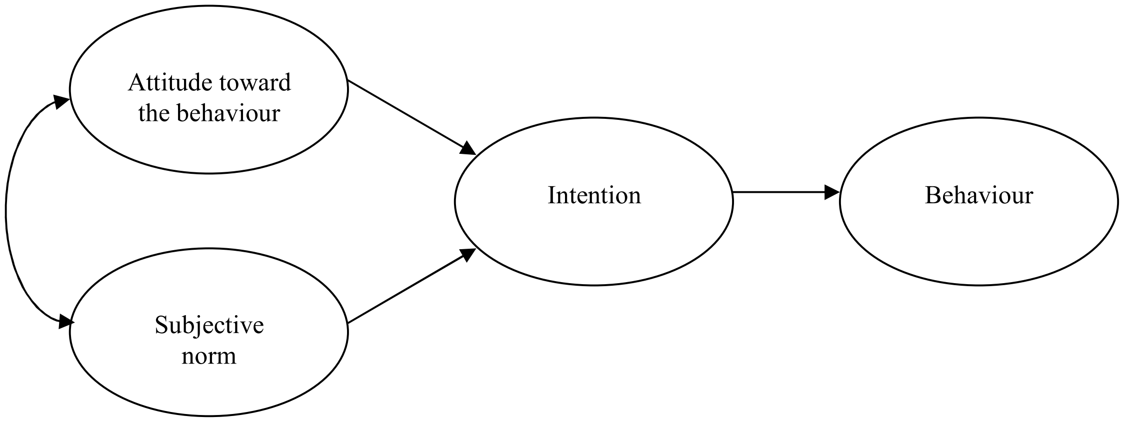
Social cognition models are tools for explaining and understanding behaviour, and predicting when behaviour might occur. A number of different social cognition models have been developed. Some of the better known models include the Health Belief Model, Protection Motivation Theory, Subjective Expected Utility Model, Self-efficacy Theory and the Theory of Reasoned Action/Planned Behaviour (Weinstein 1993; Conner and Norman 1996). As well as enabling better understanding of health behaviours, they also allow appropriate interventions to be developed in order to persuade people to change their behaviour.

Many of these models incorporate similar features, sometimes given different names in different models, sometimes combined in different ways. Bearing in mind the health behaviour under investigation (pelvic floor exercises) various models were considered. A suggested adaptation of the Theory of Planned Behaviour by Maddux (1993) was selected as it seemed to include all the elements which were relevant to the practice of pelvic floor exercises during pregnancy. The following sections will describe the Theory of Reasoned Action/Theory of Planned Behaviour, and then the adaptation proposed by Maddux. Subsequent sections will examine in more depth some of the methodological considerations regarding the use of the model.

1.5.ii Theory of Planned Behaviour

The Theory of Planned Behaviour (TPB) was developed by Icek Ajzen (1988; Ajzen 1991) as an extension to the Theory of Reasoned Action (TRA) (Ajzen and Fishbein 1980). The TRA (Figure 2) proposes that the direct determinant of any behaviour is always intention to perform the behaviour. In turn, intention to carry out the behaviour is influenced by two proximal variables: attitude towards the behaviour (the opinions the person holds about the behaviour) and subjective norm (the beliefs the person holds about whether other people think they should perform the behaviour). Other variables such as personality traits and socio-demographic factors are held to exert their influence directly on the proximal determinants (attitude and subjective norm) and therefore do not directly affect intention or behaviour.

Figure 2 Theory of Reasoned Action (Ajzen and Fishbein 1980)



An important aspect of the theory is that there should be compatibility between all of the measures used to assess these concepts. Each measure must include specific reference to four elements. These are:

(a) an action or behaviour

(b) performed on or towards a target

(c) in a context

(d) at a time or occasion

This ensures that exactly the same aspect of the behaviour in question is being measured for every element in the model. An example of an intention statement relating to pelvic floor exercises might be “I intend to practise (behaviour) pelvic floor exercises (target) every day (time) during pregnancy (context)”.

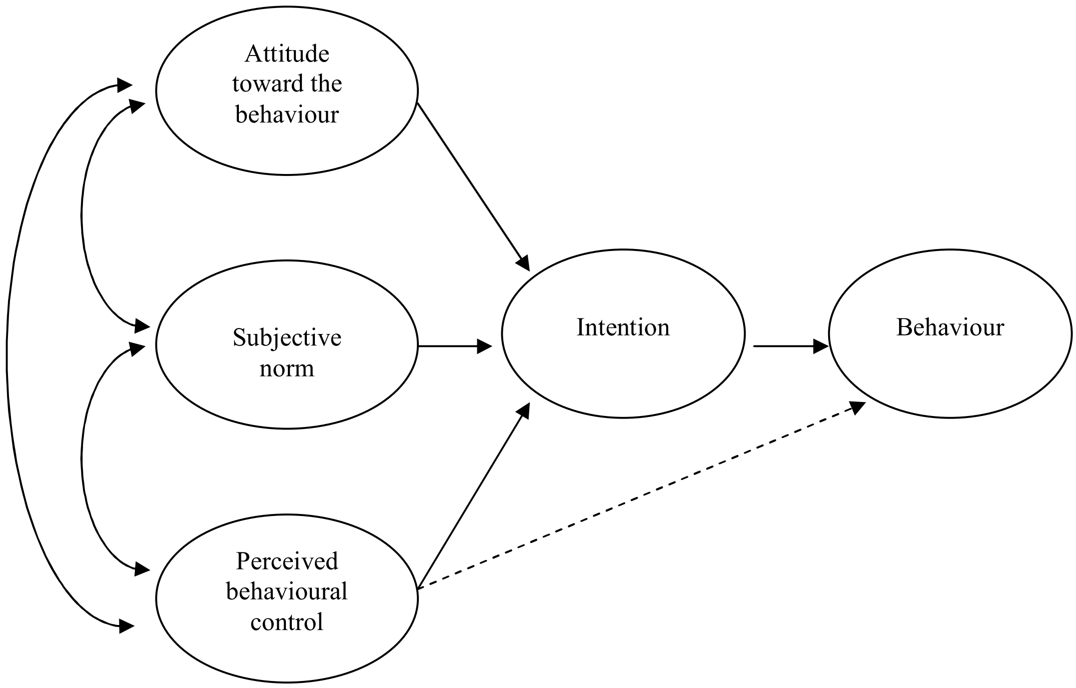
Furthermore the theory is based on an expectancy-value framework. Thus attitudes are constructed from beliefs about the consequences of carrying out the behaviour, weighted by the value the individual places on that outcome. These are referred to as behavioural beliefs. Ajzen (1991) described how the belief-based measures should predict the direct measure of each concept. However some authors have regressed belief-based measures directly onto intention (Godin et al. 1989; White et al. 1994; Terry and O'Leary 1995), or used a mixture of both (for example de Vries et al (1988) used direct measures for self-efficacy, but belief-based measures for attitude and subjective norms). Behavioural beliefs can include both positive and negative outcomes.

Similarly subjective norms can be assessed by direct measures and/or measures of normative beliefs. Normative beliefs are assessed by beliefs of the individual about whether salient others (such as family members or friends) would want them to carry out the behaviour, weighted by the value the referent places on the opinion of that other person (or the motivation to comply with the person).

Ajzen developed the TPB (Figure 3) as an extension of the TRA (Ajzen 1988; Ajzen 1991). The TRA relies on the assumption that the behaviour is completely under the control of the person (volitional control). The TPB is identical to the TRA except that Ajzen included the element of perceived behavioural control (PBC) to allow the model to be applied to non-volitional behaviours.

A continuum is proposed by Ajzen (1988) whereby some behaviours are completely in the control of the person (volitional behaviour; for example voting behaviour), and other behaviours are not fully under the control of the person (incomplete volitional control; an example might be sneezing). Most behaviour lies somewhere in between (such as giving up smoking). PBC is the opinion of the person about how much control they perceive they have over performing the behaviour. Factors that may affect how much control a person feels they have over performing a particular behaviour include time, financial and environmental constraints, as well as the actual belief of the person in their ability to carry out the behaviour in question.

Figure 3 Theory of Planned Behaviour (Ajzen 1988; Ajzen 1991)



This addition to the TRA model helped to explain why even in the face of a positive attitude towards a particular behaviour, and a positive evaluation of the beliefs of others about the behaviour, intention to perform the behaviour could nonetheless be low. Furthermore PBC was also found to have a direct effect on behaviour, so that even in the face of positive intention, the perceived difficulty of performing the behaviour could influence action. Thus most behaviour even if seemingly under volitional control, is to a certain extent non-volitional. This may particularly apply to health protective behaviours such as dental flossing or using safety belts which require consistent observance and establishment of a routine (McCaul et al. 1993).

Godin and Kok (1996) reviewed the application of the TPB to health-related behaviours. They concluded that of the studies included in the review, on average the model was able to explain 41% of the variation in intention and 34% of behaviour. In explaining the behaviour (only studies that measured longitudinal data were included), intention accounted for 66.2% of the variance in behaviour that the model explained, while PBC was generally less important. They suggest that for health-related behaviours, the motivation of the person remains the most important factor driving behaviour. For a health protective behaviour such as oral hygiene, averaging the 4 studies included, PBC added a further 24.3% to the 46.8% explained variance in intention (over and above that explained by attitude and subjective norm). Of all the categories of health-related behaviour included in the review, this was the highest variance added by PBC.

A review of the models in relation to exercise behaviour found that PBC added an extra 4 – 20% (mean 8%) in explaining the variance in intention over and above the TRA (Godin 1993). Only 2 of the 8 studies included in the review found that PBC explained additional variance in behaviour (although this information was not available in 3 of the studies). However as Godin acknowledges, the role of PBC may be highly variable according to the type of exercise behaviour under investigation, as the initiation of each may involve very different factors affecting the amount of control perceived (such as equipment, weather, time constraints).

In a recent meta-analysis of studies that have applied the TRA and TPB to exercise behaviour Hausenblas et al (1997) concluded that for both models intention has a large effect on exercise behaviour. Attitude was found to exert more influence on intention than subjective norm. The addition of PBC exerted a large effect on both intention to exercise and the behaviour itself, thus supporting the TPB as a superior model to the TRA at least in respect of exercise behaviour. This may be because exercising generally involves more potential barriers than simply volition. While the direct relevance to pelvic floor exercises (a quite different form of exercise in that they do not require special equipment or premises) may be questioned, these findings lend general support to the utility of the TPB to exercise behaviour.

A small study by Godin et al (1989) of 98 pregnant women used the TRA to investigate their intentions to exercise after giving birth. Three additional measures were included in the model: past exercise behaviour (called habit in this study), role belief (whether other pregnant women believe exercise after delivery is appropriate) and perceived barrier (evaluation of ease or difficulty of exercising after the birth in view of lifestyle constraints). Behaviour after delivery was not measured. The model explained over half the variance in intention (52%), with attitude being more important than subjective norm. Report of previous exercise significantly predicted first time mothers' intention to exercise after delivery, whereas for parous women habit was not a significant predictor. In contrast parous women were significantly more likely to be influenced by barriers to exercise, unlike primiparous women. The constraints of life with a new baby may make future intentions more realistic for parous women.

These studies demonstrate that the TRA/TPB have been used to describe the influences on a health protective behaviour such as oral hygiene, exercise behaviour in general and the intention of pregnant women to exercise after delivery. They can clearly provide a useful basis from which to explore the motivation of women to practise pelvic floor exercises during pregnancy.

1.5.iii Revised theory of planned behaviour (RTPB)

Maddux (1993) contends that an important deficiency of the TPB is the failure to include a direct assessment of the perceived vulnerability to the particular health threat. This is due to the fact that this model, unlike the Health Belief Model or the Protection Motivation Model, was not designed only for examining health behaviours, but also for application to behaviour such as voting in elections, or performance in exams. Attitudes in general are included, but this does not necessarily include all the outcome expectancies that are specified in the other models.

A solution to this is proposed by Maddux (1993) (Figure 4). He divides the attitude component into two parts: the attitude to the current behaviour and the attitude to the new behaviour. The attitude to the current behaviour incorporates the perceived benefits and costs of continuing the unhealthy behaviour and assessment of the value for the benefits and costs for this current behaviour. This assumes that the current behaviour is the unhealthy behaviour. The expectancies and values of the costs and benefits of the new (healthy) behaviour are assessed in similar but separate manner.

A further modification of the original model by Maddux (1993) is the acknowledgement of the role of habit in the continuation of some behaviours. This is further subdivided into an initiation phase (cues-to-decision) and a habitual phase (cues-to-action). The former is relevant to those people who are considering, or have recently started to perform the behaviour under investigation. The latter is important in the maintenance or continuation of the healthy behaviour. These elements may be particularly important in

the case of pelvic floor exercises, as the pilot study by Dolman and Chase (1996) identified that remembering to do the exercises and getting into a habit may be important features in the practice of the exercises.

A further (slight) modification is the replacement of the concept ‘perceived behavioural control’ with that of ‘self-efficacy’. The stated reason for this is to avoid the blurring of the notion of whether a person believes they are able to perform the behaviour, and the concept of outcome expectancy (which is part of PBC in the TPB) (this is discussed in greater detail in the next section). In this revised model, outcome expectancy is assessed separately in the attitude to the new behaviour.This revised theory of planned behaviour (RTPB) model seems to incorporate most of the elements that might be relevant to pelvic floor exercises. As a framework for exploring the behaviour and motivation for performing the behaviour it seems appropriate. However the replacement of ‘perceived behavioural control’ with ‘self-efficacy’ requires further consideration, and this will be addressed in the following section.

1.5.iv Self-efficacy and perceived behavioural control

The theory of reasoned action was developed to explain behaviours under volitional control. Criticism that the model did not explain behaviours that were non-volitional led to the inclusion of perceived behavioural control (PBC) (Ajzen 1988; Ajzen 1991). PBC is an assessment of how much control the person judges that they have over the behaviour. It has been described by Ajzen (1991, p188) as ‘the perceived ease or difficulty of performing the behaviour’. However Ajzen (1988, p135/136) fails to describe clearly the method for measuring the indirect determinants of PBC. He gives an example of three items used to assess PBC directly, but not the control beliefs that lead to PBC itself (p141).

In one of the earliest published examples of the use of the TPB, Ajzen and Madden (1986) used the sum of 3 or 5 statements to measure PBC, asking respondents about the amount of control they felt they had over the behaviour in question. The indirect or belief-based measures consisted of the sum of 8 -10 statements evaluating the extent to which various factors would interfere with performance of the behaviour (similar to the measures used by Godin et al (1989), and more akin to 'perceived barriers'). This method of measuring the indirect determinants of PBC is different to that described by other authors (such as Conner and Norman (1996)), and omits the weighting of the perceived power of each factor.

This lack of clarity has led to varying interpretations of the concept of PBC. The confusion in the literature regarding the interpretation and methods of assessing the different constructs in the TPB has been noted by a number of authors (Terry and O'Leary 1995; Godin and Kok 1996; Conner and Armitage 1998). In a review of health-related applications of the TPB, Godin and Kok (1996) included all interpretations of PBC and SE, and did not merely restrict the review to papers that used the concept of PBC. Furthermore in an effort to clarify operationalisation of the model the paper gives examples of ways of measuring each construct, however no attempt is made to distinguish between PBC and SE, the terms being used interchangeably.

Ajzen and Madden (1986) use the term PBC and state that while perceived control may affect intentions, actual control (measured by perceived control) may affect behaviour directly. In contrast de Vries et al (1988) use the term self-efficacy (SE) in their study, and they suggest their findings support Ajzen and Madden (1986) in that the concept includes both perceived control (which they claim resembles SE) and actual control.

Other interpretations of the meaning of PBC have also been used. As described by Godin and Kok (1996, p88) PBC may be interpreted as the chance of achieving particular goals (performance attainment). An example of outcome expectancy being equated with PBC is found in Terry and O'Leary (1995). Bandura himself distinguishes between SE (ability to perform a behaviour) and outcome expectancy (the notion that the behaviour will lead to the desired outcome) (Bandura 1977). Another interpretation of PBC is that of 'perceived barriers'; Godin and colleagues (1989) assessed whether lifestyle constraints would prevent exercise behaviour after delivery. They assert that this measure is an indicator of PBC.

Others have contended that SE and PBC are subtly different. McCaul et al (1993) claim that while SE is a judgement about whether one has the ability to carry out the desired behaviour, PBC is about control over the behaviour, or performing the behaviour over a period of time. In neither case is an assessment of the effect of the behaviour included. McCaul et al (1993) conducted a series of experiments designed to find out whether the concepts of SE or PBC each contributed to the prediction of intentions. They found that PBC was a better predictor of intentions than SE. However the measures used to capture PBC in their study were more similar to measures of intention than measures of control.

A more useful way of understanding the difference between SE and PBC might be to acknowledge that the choice of name/concept/operationalisation depends to an extent of the behaviour under investigation. Some behaviours require a number of steps (external constraints) that need to be followed in order to carry them out, such as breast screening (as described in (Godin and Kok 1996)). PBC might be an appropriate concept in such instances where external factors might affect the amount of control an individual has over the successful performance of the behaviour. In contrast other behaviours require less in the way of equipment or facilities or other people. SE may be relevant for such a behaviour that requires predominantly knowledge, skills or ability, and thus might only be affected by internal constraints. Godin and Kok (1996) tentatively suggest that for certain health-related behaviours requiring a complex series of steps to carry out, that perceived control and actual control are quite different.

The findings of Terry and O'Leary (1995) lend strong support for the separation of the concepts of SE and PBC. They found clear evidence that for exercise behaviour SE exerted a direct effect on intention, but not on behaviour. In contrast PBC had no effect on intention, but directly affected behaviour. The authors suggest that previous studies where PBC has been found to influence intention may have been confounded by the incorporation of a measure of SE in the PBC assessment.

The ambiguities in the measurement of PBC are acknowledged by Maddux (1993, p122). He claims that some studies have measured PBC as though it was perceived barriers (such as Ajzen and Madden (1986)). He also describes confusion about whether PBC is the belief that the person has about their ability to perform the behaviour itself (e.g. the ability to eat a low fat diet or take more exercise). Or whether it should be an assessment of their belief about their ability to attain the goal that is a consequence of the behaviour (e.g. the ability to lose weight). This latter concept is similar to outcome expectancy. Maddux (1993) therefore proposes that his revised model should use the term SE instead of PBC, and that this is 'the substitution not of a name but of a concept' (p134). However he fails to describe clearly the definition or method of measuring the concept to which he alludes. Earlier discussion in the paper suggests that SE is concerned with a belief regarding having the necessary skill to perform the particular behaviour (rather than the outcome leading from the behaviour, or the value one places on that outcome).

A further cause of confusion is that Maddux (1993) refers in the text to 4 determinants of intention, including SE. However the diagram in the paper does not include an arrow connecting SE and intention. It must be assumed that this is a typographical mistake as the description and the model both fit the Ajzen (1991) schemata of SE/PBC directly influencing intention as well as behaviour.

The behaviour of pelvic floor exercises is almost completely under volitional control, therefore external constraints should have minimal influence on whether the person intends to perform the behaviour. However the woman may have doubts about whether she is actually doing the exercises correctly. Thus in spite of believing that the exercises are a good thing and that other people believe that she should do them, an inability to do the exercises may deter her from doing the exercises. The inclusion of a measure of perceived ability to do the exercises, worded in the manner of the concept of SE (perceived ability to do the exercises), is therefore justified.

1.5.v Additional measures

A number of studies have suggested that the inclusion of additional variables into the model can improve the relationships within the model. The following sections review the literature relating to these proposed additions.

1.5.v.1 Planning

Netemeyer and Burton (1990) found that a measure of 'planning' moderated the relationship between attitudes and intentions and between intentions and behaviour. The measure of 'planning' was a summed measure of four questions assessing whether respondents had completed various stages required in order to vote (the behaviour under investigation). Similarly White et al (1994) found that a composite measure of 'planning' improved the prediction of intention (for the studied behaviours of condom use and discussion about using a condom with a new partner) and the prediction of behaviour for condom use. These behaviours were readily broken down into the component parts, each of which was necessary for the successful completion of the behaviour. It is therefore of interest to find out if assessment of 'planning' improves the prediction of intention in this study.

1.5.v.2 Past behaviour

Prior behaviour is not included in the TRA/TPB as it is an additional variable (such as age, social class or personality traits) presumed to exert an indirect influence on both intention and behaviour through the intervening variables (attitude, subjective norm and perceived behavioural control). Sutton (1994) however argues that a number of studies have found that a measure of past behaviour has added significantly to explaining the variance in both intention and behaviour. This view is supported by Conner and Armitage (1998). For this reason he suggests that 'past behaviour' should be included as an independent variable in studies of health behaviours.

1.5.v.3 Habit

Related to 'past behaviour' is the concept of habit formation. The model proposed by Triandis (1977) was influential in stimulating interest in the importance of habit in the prediction of behaviour. In this model behaviour is a function of two concepts: intention and habit. Each of these is weighted by facilitating or inhibiting factors. Triandis (1977) suggests that habit is assessed by asking respondents how many times they have performed a behaviour in the past. He also suggested that the more a behaviour is carried out, the more automatic (habitual) it becomes. For novel behaviour intention is the more important predictor, while for often-repeated behaviour is primarily determined by habit.

Hunt et al (1979) suggest that in order to develop and maintain health habits the important aspects are that:

- they remain simple in nature
- the cues to health habits must be compatible with one's daily routine i.e. tie in with mealtimes, or something similar
- the cues for compliance should be in close contiguity (latency) with the habit i.e. at the time the habit is likely to be performed

Further they propose that as the habit becomes more established, the influence of conscious processes decreases and the explicit link to the decision cue will become less important.

The work of Triandis and Hunt has been further elaborated on by Ronis et al (1989) who distinguished between behaviour governed by decision or conscious thought, and behaviour resulting from habit. The former type of behaviour may evolve through repeated use into the latter. Ronis and colleagues (1989) describe in more detail the stages that characterise the whole process. The initial stage is when the person begins to think about the health threat, and may be influenced by the type and form of the information they receive. The decision may be affected by the time available to consider the health threat, the desirability of the action, and the person's confidence in whether they can carry out the action. Once the decision has been made there may be a period of trying to perform the necessary actions. Depending on perceived success or failure and self-belief in ability, repeated attempts may eventually lead to success or failure.

Eventually as the action is repeatedly carried out, less conscious effort is required and the process becomes automatic when the appropriate cues are available.

In contrast Sutton (1994) suggests that 'habit' should be distinguished from 'routine'. Habits are claimed to be behaviours that are repeated many times a day and continue even when the original prompts for the behaviour are no longer relevant. In this way the behaviour becomes automatic, even if the behaviour is no longer desirable by the person (examples might be biting the nails or thumb sucking). In contrast a routine consists of a sequence of behaviours that are carried out on a regular basis. These behaviours may be predictable over time, but are amenable to change if circumstances alter (for example seat belt use or breast self-examination). It is not clear whether pelvic floor exercises would fall into the former or latter category, but as some conscious thought process probably intervenes between the cue-to-action and the behaviour, they may be more of a routine than a habit. Nonetheless, the literature does not always clearly distinguish between the two, and they have been described by some synonymously (Hunt et al. 1979).

Incorporating 'cue-to decision' and 'cues-to-action' in the RTPB as put forward by Maddux (1993) acknowledges the possible importance of habit/routine in the practice of pelvic floor exercises and attempts to establish whether habit/routine influence intention and behaviour.

1.5.v.4 Multidimensional Health Locus of Control

The Multidimensional Health Locus of Control scale (MHLC scale) was developed and tested for reliability and validity by Wallston et al (1978) as an extension to the locus of control scale developed by Rotter (1966). The concept of the locus of control proposed that each individual holds beliefs about responsibility for events and actions. These expectancies are determined by whether the person scores highly on a measure of internal or external locus of control. The general nature of the original scale led to low specificity and hence low success in explaining the amount of variance in health behaviour (Norman and Bennett 1996).

The MHLC scale extended the locus of control scale to make it more specific to health by dividing the external control concept into powerful others and chance. The MHLC scale comprises 3 sections. These 3 sections tap into different aspects of the health locus of control dimension; internality (a belief that health is under one's own control), powerful others (a belief that health is influenced by other people) and chance (a belief that luck or fate controls health). Each section includes 6 statements scored on 6-item Likert scales with a score of 1 representing 'strongly disagree' to a score of 6 equating to 'strongly agree'.

Health locus of control describes individual differences in attribution tendencies. The MHLC has been used successfully to understand the extent to which individuals participate in or practice health protective behaviours. It is also amenable to intervention involving control enhancement. High scores on the internal MHLC scale have been found to correlate highly with high scores for a range of health protective behaviours in a sample of college students (Weiss and Larsen 1990). However other results are more equivocal, and have failed to confirm the link between internality and health behaviour (Norman 1995). The lack of specificity of the MHLC has been criticised and proposed as a reason for some of the more equivocal findings (Norman and Bennett 1996).

The generalised health locus of control concept has been less successful in predicting adherence to antenatal health care recommendations when applied during pregnancy.

(Faragalla (1983) cited by (Tinsley et al. 1993)). This may be because these scales measure the degree of control the woman feels she has over her own health. During pregnancy beliefs about control over health may be confounded by concern about the health of the baby or about events surrounding pregnancy or birth. To address this problem, pregnancy specific locus of control scales have been developed (Labs and Wurtele 1986; Tinsley et al. 1993). These measure beliefs of the woman about what affects the health of her unborn child. Examples of items include ‘My unborn child’s health can be seriously affected by my dietary intake during pregnancy’, ‘Fate determines the health of my unborn child’ or ‘Health professionals are responsible for the health of my unborn child’ (Labs and Wurtele 1986). These studies have found a correlation between high internal scale scores and health behaviours (Labs and Wurtele 1986; Tinsley et al. 1993), and also with better outcomes (Tinsley et al. 1993). However their success is because they specifically relate to the health of the baby rather than the health of the mother, and they may not be appropriate for behaviours during pregnancy that only affect the health of the mother.

The preceding studies were conducted using samples of lower middle-class women. Contrasting findings have been reported when women from low socio-economic groups have been studied. Reisch and Tinsley (1994) found that women with high external scores (who believed in the controlling influence of powerful others) were more likely than ‘internals’ to seek out adequate prenatal care. The studies may not be directly comparable. Reisch and Tinsley (1994) questioned women within 2 days of delivery while they were still in hospital (compared with the earlier studies where the questionnaire was completed during pregnancy). During these early postnatal days there may have been a heightened dependence on powerful others as a result of being in hospital and the new vulnerability of motherhood. Also the perception of control over the health of a newly born infant may be quite different to the perception of control over the health of an unborn child.

However the findings might also suggest that women from lower socio-economic groups may not conform to a model of high internal control being associated with healthy behaviours. In situations of impoverishment where people have little control over what happens in their lives (little money, no job prospects) a belief in the externality of events may lead to less internal conflict. This may be comparable to cognitive dissonance (Festinger 1962). The reality of life and the powerlessness to do anything about life circumstances may lead to conflict in those who are 'internals'. Another explanation may be that most of the 'internals' may have already done something about their situation and 'got out', therefore leaving the 'externals' to predominate in the population. Thus external beliefs (contrary to findings in most other groups of people) may serve an adaptive function in impoverished groups by allowing consistency between life situation and own belief system (similar to Smith (1985)). In a similar manner, Rutter and Quine (1990, p 559) suggest that pregnancy (a period of increased vulnerability) may be a time of weak internal locus of control.

Norman et al (1998) have criticised the MHLC, highlighting contradictory findings of studies about internality and performance of healthy behaviours. Some studies support the idea that high internal scores are associated with health behaviours and other studies have not found any relationship. Few studies have supported the idea that high powerful other scores predict health behaviours. (an exception is noted above (Reisch and Tinsley 1994)). Norman and colleagues (1998) have suggested that the method of testing may have been deficient and that health behaviour may depend on combinations of MHLC beliefs. They also stress the importance of including a health value measure in the model as health value may moderate the MHLC interactions.

1.5.v.5 Health Value

The suggestion that the value a person places on health can affect other beliefs about health as well as behaviour itself has been made by a number of authors (for example (Lau et al. 1986)), and measures of health value have been used in a number of studies with varying success.

Greater reporting of health protective behaviours has been reported among a population of college students (n = 213) by those who place higher value on their health (Weiss and Larsen 1990). In a study by Lonnquist et al (1992) health value was found to predict health protective behaviour for females, but not for males in a sample of college students (n = 167). However Rosenblum et al (1981) failed to find an effect of health value on low-income mothers' behaviour (n = 94) (immunising their children), even though a high value was placed on health by the mothers. This study demonstrates that results may be complicated when the behaviour affects others apart from the health of the person answering the questionnaire. As with the Multidimensional Health Locus of Control (MHLC), lower socio-economic groups may hold different beliefs and values when compared with more affluent groups.

To address these issues Norman et al (1998) used a large representative sample of 11,632 (61% response rate) randomly sampled (stratified multi-stage cluster design) from a population in Wales. A shortened version of the MHLC scale was used, as well as a 4-item health value scale. Respondents were also asked about 4 health behaviours (smoking, alcohol, exercise, and diet). They found that a greater number of health behaviours were performed by those who believed that health was under their own control, and less likely by those who believed that it was as a result of chance. High belief in the role of powerful others was related to fewer health behaviours, thus implying that this reflects a belief in the power of doctors to cure illness. They found that the health value measure moderated the MHLC in respect of the powerful others and chance dimensions, but not the internal dimension.

The two measures (health value and MHLC) together only explained 3 percent of the variance in scores, suggesting that these measures are not very powerful in predicting health behaviour. They suggest that this may be because these measures only apply to new situations, where individuals use generalised beliefs. Otherwise, specific locus of control models may be more effective in predicting behaviours. Another problem is that health may not be the most important reason for performing or not performing behaviours that might influence health. In terms of behaviours such as smoking, alcohol, drugs, sex, etc, the excitement of the activity and factors such as peer pressure may be stronger motivational factors. They suggest that health value measures perhaps need to compare health with other values. A further factor suggested as being important is the role of self-efficacy, or how much a person believes that they are able to perform the behaviour under study.

A frequently used scale to measure health value is that developed and tested for reliability and validity by Lau et al (1986). It includes 4 items each scored on a scale of 1 – 7 and then summed. This scale has been used successfully (Norman et al. 1998) and has the benefit of brevity.

1.5.vi Summary of Section 1.5

A frequently used model to understand and predict behaviour is the Theory of Planned Behaviour. This model takes account of the attitude of the person towards the behaviour, their belief about the opinion of others about the behaviour and whether they think they are able to carry out the behaviour. Many studies across a range of behaviours have confirmed the strength of the model in explaining health-related behaviour. The model is used to identify the relative importance of each factor in explaining intention to carry out the behaviour, so that more appropriate interventions can be designed to increase intention to perform the behaviour. The practice of pelvic floor exercises during pregnancy is a health behaviour that may be used for prevention of ill-health, promotion of better health as well as detection of less than optimum health. The adaptation of the TPB model proposed by Maddux (1993) divides the attitude component into attitude to the current behaviour (incorporating an assessment of the perceived benefits and costs of continuing the current behaviour – in this case the risk of incontinence) and attitude to the new behaviour (pelvic floor exercises). In this revised TPB model the concept of SE replaces PBC. SE measures perceived ability to carry out pelvic floor exercises (rather than perceived control over performing the exercises). Additional elements include measures of past behaviour, as well as the role of 'cue-to decision' and 'cues-to-action' to assess whether habit plays a part in the practice of the exercises. This model was chosen as a theoretical framework to study the practice of pelvic floor exercises as it includes all the elements relevant to the practice of pelvic floor exercises. Furthermore two measure of health-related beliefs (Multidimensional Health Locus of Control and Health Value) will also be included in the study as these variables have been found to be influential in the practice of health-related behaviours.

1.6 Summary of literature

Urinary stress incontinence is prevalent in the general population of women. It is more common in older women and women who have had children, however when age is controlled for parity is an independent risk factor. Some women experience stress incontinence before ever becoming pregnant, while about a third of women suffer form some degree of stress incontinence during the pregnancy. In the immediate postnatal period one in five women are stress incontinent and between 5% to 24% of women experience some degree of stress incontinence in the later postnatal period. Vaginal delivery is more likely to result in incontinence than delivery by caesarean section, however it is unclear whether assisted delivery causes more long term problems than a normal delivery. The evidence is also equivocal regarding whether an elective section confers more protection than a section carried out after the woman has been in labour for some time.

The strength of the pelvic floor muscles is an important factor in the maintenance of continence. Women who are incontinent have been found to have weaker pelvic floor muscles than continent women, although there is wide variation between women. Similarly women with more severe symptoms of incontinence may have weaker pelvic floor musculature than those who report mild incontinence, although not all studies agree. Pelvic floor exercises are repeated contractions of the muscles of the pelvic floor and have been proposed as a method of strengthening the pelvic floor. Pelvic floor exercises have been found to be effective in the treatment of stress urinary incontinence in the general population of women. Additionally they have also been found to be effective in the treatment of incontinence during the postnatal period.

Measures of pelvic floor muscle strength made around the time of childbirth, suggest that the muscles may be weaker in the immediate postnatal period (compared with antenatal strength) but return to near antenatal strength by one year following delivery. Pelvic floor exercises during pregnancy as a preventive measure may help to mitigate this weakening and possibly lead to a reduced prevalence of postnatal incontinence, however further research is required to confirm these findings. Little is known about current levels of information provision about pelvic floor exercises to pregnant women, or about current levels of practice of the exercises during pregnancy.

Motivation of women to comply with the programme of exercises seems to be crucial to the success or otherwise of pelvic floor exercises, but motivation has not been studied in detail. A variety of strategies have been used to improve compliance rates, but these have not been compared to establish which is most effective. Another area that requires further study is the minimum intensity and frequency of exercises required to achieve an effect, or the length of time that treatment should continue. All these issues are equally applicable to a programme of preventive pelvic floor exercises during pregnancy, as well as to pelvic floor exercises practised as a therapeutic measure in populations of incontinent women.

A social cognition model from the health psychology literature (the revised Theory of Planned Behaviour) has been identified as a suitable framework for the study of the practice of pelvic floor exercises during pregnancy. This model incorporates measures of attitude to the exercises, attitude to incontinence, beliefs about ability to perform the exercises and beliefs about the attitudes of others towards the person performing the exercises. Additional measures that may be relevant to the behaviour include measures of past behaviour and assessment of the importance of habit, measures of Health Locus of Control and a measure of Health Value.

1.7 Research questions

Unanswered research questions identified from the literature that relate to pelvic floor exercises during pregnancy and the prevention of postpartum incontinence are detailed below:

1. What are the current levels of information about pelvic floor exercises reported by pregnant women?
2. How many women report the practice of pelvic floor exercises during pregnancy?
3. What motivates pregnant women to practise pelvic floor exercises during pregnancy?

4. Which method of instructing pregnant women in antenatal pelvic floor exercises is most effective in improving rates of compliance with the exercises?
5. What is the effect of antenatal pelvic floor exercises on pelvic floor muscle strength and postpartum incontinence?
6. Which regime of antenatal pelvic floor exercises is most effective in preventing postpartum incontinence?

The first question needs to be addressed in order to identify which groups of women need to be provided with information. The answer to the second question will give baseline data about current practice, while the information provided by the answer to the third question can then be used to design an intervention to improve compliance rates among pregnant women. Once these three questions have been answered then randomised controlled trials could be planned to address the latter three questions.

Therefore the research questions that will be addressed in this thesis are based on the first three questions above. As this is an exploratory study investigating subject areas which have not been previously researched, it is not possible to make predictions about findings, and hence not possible to test hypotheses. The exploratory research questions the thesis will address are therefore as follows:

1. How many pregnant women in Dundee report having information about pelvic floor exercises?
2. How many of these women report practising pelvic floor exercises during pregnancy (Primary research question) and after pregnancy?
3. What distinguishes women who practise pelvic floor exercises from those who do not?
4. How applicable is the revised theory of planned behaviour to intention to practise pelvic floor exercises during pregnancy?
5. How applicable is the revised theory of planned behaviour to the practice of pelvic floor exercises during pregnancy?
6. How applicable are the Multidimensional Health Locus of Control and Health Value measures to the practice of pelvic floor exercises during pregnancy?

Chapter 2: Exploratory Interview Study

2 Introduction to Chapter 2

In Chapter 1, the revised theory of planned behaviour (Maddux 1993) was identified as a proposed framework for a quantitative study to answer the research questions. First the items for inclusion in the questionnaire had to be identified and developed (Ajzen and Fishbein 1980). Although the literature suggested a number of issues that might be fruitful to explore, the dearth of research involving parturient women pointed towards the need for an exploratory study involving a group of such women.

2.1 Methods

Streiner and Norman (1995) propose that in order to develop a questionnaire in a subject area where very little previous research has been carried out, preliminary research (in addition to a literature review) may be necessary to identify items appropriate for inclusion in the questionnaire. For this reason exploratory qualitative interviews were carried out with key informants (pregnant and recently delivered women). Furthermore Streiner and Norman (1995) suggest that the less that is known about a subject, the less structured the interview should be. As suggested by Oppenheim (1992) exploratory interviews can be used to generate ideas and find out more about the topic under investigation. Unstructured interviews were therefore selected as the most appropriate method in order to encourage women to talk freely about their experiences and beliefs (Oppenheim 1992).

2.1.i Aims and objectives

2.1.i.1 Aims

Preliminary qualitative interviews were planned to identify attitudes and beliefs of pregnant and recently delivered women about the practice of pelvic floor exercises in order to inform a larger quantitative study.

2.1.i.2 Objectives

The objectives of the exploratory interviews were, in a sample of childbearing women, to:

- explore knowledge about pelvic floor exercises
- discover the salient beliefs regarding the practice of pelvic floor exercises
- identify possible perceived facilitating and inhibiting factors relating to the practice of pelvic floor exercises during pregnancy
- determine beliefs and attitudes about postnatal incontinence

2.1.ii Study permission

The local Medical Research Ethics Committee gave ethical approval (Reference number 110/98) and the midwifery manager of the NHS Trust permitted access.

2.1.iii Recruitment

Women were approached at parent education classes, antenatal clinics and in the postnatal ward of Ninewells Hospital, Dundee. Purposive sampling was used (Silverman 2000) to include a range of ages (teenagers to women in their late thirties), backgrounds (across the spectrum of social class) and parities (some women in their first pregnancy and others who had had a baby before). In order to give women time to consider whether they wanted to participate, an information sheet (Appendix 1) was given at recruitment and an appointment made to interview the women between one to ten days after the initial approach. Nine women were approached and all agreed to be interviewed.

2.1.iv Method

Prior to the start of the interview the woman signed a consent form (Appendix 2). With permission all interviews were tape-recorded. A rough guide of topics to be covered in the interview was used (Appendix 3) but the interview was conducted in conversational style to facilitate exploration of issues important to the woman (Oppenheim 1992; Bowling 1997). Interviews were conducted in a side room, consulting room or quiet office to keep disruption to a minimum (Oppenheim 1992). In the few instances when the interviewee knew nothing about pelvic floor exercises, and specifically asked for information, the information was provided by the research midwife.

The researcher who had conducted the interviews transcribed the interview tapes. During this process the researcher became familiar with the content of the interviews and the process of coding was facilitated. Content analysis was used to analyse the data (Morse and Field 1996). Categories were noted in margins of the transcripts as they emerged (Bowling 1997). The interview transcripts were read and re-read and comparisons made as emergent themes became apparent. Initially categories were based on obvious themes, such as information sources, reasons for doing the exercises, personal experience of incontinence, remembering and forgetting. Key concepts were grouped and reorganised until an intuitive, logical structure was revealed, overlap between the themes was minimised and a credible structure emerged (Bowling 1997).

To minimise subjective bias a midwifery colleague independently read all the transcripts and using the suggested themes verified that the ideas expressed by the women did indeed fit into the themes (Bowling 1997). This ensured that the themes were dependable.

2.2 Characteristics of participants

Nine women were interviewed. The characteristics of interviewees are described in Table 2.1.

Table 2.1 Characteristics of participants

Age	Gestation/Postnatal Day	Occupation
First pregnancy		
16	41 weeks	Secretary (now unemployed)
17	Day 1	Student
19	40 weeks	Unemployed
26	30 weeks	Teacher
32	32 weeks	Controller for car delivery firm
38	35 weeks	Nurse (now unemployed)
Second pregnancy		
23	Day 1	Unemployed
25	40 weeks	Nursery Nurse
29	31 weeks	Nursery Nurse

2.3 Results

The final themes that emerged from the data are described below.

2.3.i Knowledge about pelvic floor exercises

Although some women had heard about and practised pelvic floor exercises before becoming pregnant, most found out about them during their first pregnancy. Only a few said they did not know anything about pelvic floor exercises, and had never been given any information about the exercises. All the women interviewed after delivery and all those who had a previous baby had heard about pelvic floor exercises. Some women had received no information during pregnancy, but had been told about the exercises during the postnatal period, suggesting that provision of information about the exercises may be more comprehensive after delivery.

2.3.ii Vagueness/uncertainty

Even women who had heard about pelvic floor exercises were not always clear about what the exercises involved and some who reported practising the exercises expressed doubt about whether they were doing them correctly;

'I <u>think</u> I'm doing them right…' (sounding unsure)

or uncertainty about the purpose of the exercises:

'...think it's for that…I'm no sure…'

In contrast, those women who had found the exercises to be beneficial or who felt they had confirmation that they were doing them correctly reported success with practising them:

"I did do them actually and they did work."

"It's good to know that you're doing them properly."

Some women found difficulty finding appropriate language to describe what the exercises involved. The following description of the exercises illustrates the embarrassment felt by some of the women when trying to discuss the topic:

'…squeeze your, …em thingy shut…'

2.3.iii Deterrents

Some woman were put off doing the exercises by concern about pain or discomfort:

'I don't think I did them properly though…….it was sore ….so I didn't really want to try it again…'

Closer questioning revealed that this woman had been doing a pelvic tilt rather than a pelvic muscle contraction, again reflecting uncertainty about how to perform a correct contraction.

Another woman mentioned discomfort:

'…it's a bit sort of, with the baby being low, it's a bit sort of, uncomfortable...'

One woman mentioned that a reason for not doing the exercises was possible embarrassment at being found out by other people while doing them:

'…they said you do it anywhere…in Tesco's queue or things like that, but it made me laugh, because every time, ….I tried it once in Tesco's queue, and I can't stop raising my eyebrows….the guy in front of me will be thinking I'm making eyes at him….'

Lack of time was also mentioned as a reason for not doing the exercises:

'…never really got the time.'

2.3.iv Difficulty/success

In addition to uncertainty about the correct exercise to perform, another difficulty was the problem of remembering to do the exercises:

'I didn't really have a routine…just…when I remembered, to be honest.'

In contrast, women who reported managing to do the exercises stated that this was achieved by getting into a routine;

'...self-discipline really...getting into the way of doing it...'

and by using triggers as a reminder:

'I'd remember when I would go to the toilet.'

2.3.v Incongruity/inconsistency

Despite high levels of knowledge about the exercises or a previous positive experience of practising them, some women reported frequency of practice that was inconsistent with their previous experience:

'I've probably found I've done them less since I've been pregnant.'

'I would certainly do them again.' (but hadn't) (second pregnancy)

2.3.vi Lack of salience

Some women did not perceive the exercises as being relevant to themselves. This lack of personal salience was evident in comments that emphasised the unimportance of the exercises for these women:

'It's not something that's at the forefront of my mind.'

'It'll only help if you know you're going to be incontinent.'

Similarly, there seemed to be a perception that the exercises were merely a prescription by health professionals rather than something that the women thought of as salient:

'It's meant to help you.' (sounding doubtful)

'They said if I practised I would be able to... (stop while passing urine in the toilet)*'*

'You were supposed to do them so many times every day.' (but hadn't done any)

There were other women who appeared to give the exercises a higher priority and hence made more effort to practise them:

'It's quite important a thing.'

2.3.vii Normality of incontinence

A further factor that may lead to many women not bothering with the exercises is that incontinence may not be thought of as a particularly serious condition. Some women considered leakage of urine to be a normal consequence of childbirth and not something they were worried about. One woman (in her second pregnancy) described how she wet herself:

'Only on the occasions when you're laughing.....not as a run-of-the-mill sort of, day-to-day thing...'

Another had not reported her incontinence to anyone because she:

'... just thought it was part and parcel...'

2.3.viii Getting it right

Some mothers reported that they were more conscientious about doing the exercises during their first pregnancy than their second:

'With the first you tend to be a bit more attentive.'

The reason for this is not clear, but one can speculate possible explanations. It may reflect disillusionment with practising pelvic floor exercises due to the lack of effect during the first pregnancy. Or perhaps having had some experience of incontinence, the condition no longer posed enough of a threat to motivate in favour of doing the exercises. This again may suggest an acceptance of the normality of incontinence. It may simply have been that the first pregnancy was more significant at the time, and that being preoccupied with caring for the first child made it harder to remember to do the exercises during the second pregnancy.

2.3.ix Being found out

Some women felt contrite about not having done the exercises. One woman had informed her GP about a problem with incontinence, and had been told off for not doing her exercises:

'…and she got onto me…'

Another reported guilt at non-performance:

'I haven't (done them) ….but I should have been.'

Remorse at less than optimal frequency of performance was also described:

'I should have listened to the advice.'

2.4 Summary of findings

Interviews with pregnant and recently delivered women found some women lacked knowledge about pelvic floor exercises. Even if women know about the exercises some do not practise them or are unsure that they are doing the exercises correctly. Obstacles to the regular practice of the exercises may be incomplete or inaccurate information, difficulty with remembering to exercise or lack of personal relevance. However some women are more conscientious; getting into a routine or using triggers as a reminder can enhance success. Perceived failure to perform the exercises regularly may lead to guilt and fear of censure from others.

2.5 Questions arising from the exploratory interviews

This exploratory study using a small sample of pregnant and recently delivered women identified modal salient beliefs for inclusion in the quantitative questionnaire. It also raises further questions:

1. How many pregnant women know about pelvic floor exercises?
2. Which women miss out on information about pelvic floor exercises during pregnancy?
3. Where and from whom do women get the information during pregnancy?
4. How many women practise pelvic floor exercises during pregnancy?
5. What differentiates women who practise pelvic floor exercises from those who do not?
6. What strategies help women to practise the exercises successfully?

There is therefore a need to answer these questions using a large quantitative investigation. The following chapters describe the research that was planned to address these issues.

Chapter 3: Structured Interview Study – Methods

3 Introduction to Chapter 3

Having identified research questions and carried out initial exploratory interviews to inform the quantitative phase, a structured interview study was planned to address the identified questions.

3.1 Study design

The structured interview study proceeded in two phases. The pilot phase was used to test the feasibility of the recruitment and interview procedures, assess the rate of recruitment, refine the structured interview schedule and develop the pelvic floor exercises questionnaire. The main data collection phase then followed. Both the pilot phase and the main data collection phase used the same study location, inclusion criteria, method of recruitment and the same interview procedure. These are all described in sections 3.3 to 3.8. The data collection tools were modified during and following the pilot phase, as described in sections 3.2.i, 3.2.ii and Chapter 4.

3.2 Data collection

This section describes the all the data collection tools that were used and the development of those specifically designed for the study.

3.2.i Interview schedule

An interview schedule was designed for the study to gather data about variables that might influence whether or not women practise pelvic floor exercises (Appendix 4). Other items relating to activities aimed at improving maternal health were also included (relaxation exercises and taking care of the back) so that the main topic of interest (pelvic floor exercises) was concealed. Women were asked about sources of information for each of these activities in the current and in previous pregnancies and whether they were being practised. Questions about related morbidity (incontinence and backache) and attendance at parent education classes during the current and previous pregnancies were also included.

The questions relating to incontinence included questions about whether the woman had suffered from stress incontinence at various times: before ever pregnant for the first time, during or after previous pregnancies, and during this current pregnancy. The definition of incontinence used was 'leakage of urine when coughing, laughing or sneezing'. This corresponds to the definition used by Wilson et al (1996). Women who reported any incontinence during the current pregnancy were also asked about severity and frequency in the past week. Various definitions of incontinence have been used in previous studies. In order to allow comparison similar criteria for severity and frequency of incontinence were used as in the study by Wilson et al (1996). Severity was defined as mild (never need to wear sanitary protection), moderate (occasionally have to wear sanitary protection) or severe (always have to wear sanitary protection). These options were read out to women during the interview. The options for frequency of incontinence were occasionally, once a week, several times a week and daily.

Additional demographic questions were incorporated at the start of the questionnaire (age and postcode) as well as details relating to the current and previous pregnancies. At the end, questions about educational attainment, employment status, occupation and ethnic background were included.

Pre-pilot testing of the interview schedule was carried out with 4 midwifery colleagues. The interview schedule was then piloted with 34 pregnant women interviewed in the antenatal clinic. (Recruitment procedure is described below)

During the piloting phase, the interview schedule was repeatedly modified, as problems became apparent. The main difficulty was with the questions relating to back exercises. This was finally resolved by using the phrase "taking care of your back" rather than "back exercises" or "avoiding problems with your back", both of which had slightly different meanings. Minor wording changes were made to make it easier to administer, and formatting was adjusted to make coding and data entry simpler.

3.2.ii Development of Pelvic Floor Exercise (PFE) Section

Women who answered affirmatively to the question in the structured interview schedule about having received information about pelvic floor exercises either in this or in a previous pregnancy, or who reported practising pelvic floor exercises, were also given a questionnaire to assess attitudes and beliefs about pelvic floor exercises.

The pelvic floor exercises questionnaire was designed using the central components of the Theory of Planned Behaviour (Ajzen 1991) as a framework. Modal salient beliefs were identified through the semi-structured interviews conducted with pregnant and recently delivered women (Chapter 2), discussions with midwifery and physiotherapy colleagues and from the relevant literature. The justification for inclusion of each item will be described in Chapter 4.

The theory of planned behaviour model was adapted according to Maddux (1993). 'Attitude' was divided into 'attitude to new behaviour' (pelvic floor exercises) and 'attitude to current behaviour' (incorporating an assessment of perceived vulnerability to relevant negative health outcomes and perceived severity of these – in this case, incontinence). 'Perceived behavioural control' was replaced by the concept of 'self efficacy' (Maddux 1993) (see section 1.5.iv in Chapter 1). 'Subjective norms' were unchanged from the original model. These direct determinants were then further examined to explore the indirect determinants of each (see Chapter 4).

Also included in the revised model was an assessment of the importance of situational cues that lead to intention to perform the behaviour (cues to decision), and situational cues that might automatically prompt the behaviour (cues to action). These elements were suggested by the habit theory proposed by Ronis et al (1989). Additional measures of past behaviour (Sutton 1994) were also included.

From these a structured questionnaire was developed. This was tested initially with colleagues (n = 4) before the pilot phase of the study began. The items were rearranged and numbered. There were 75 items in total for the pilot phase, including two for parous women only. Chapter 4 describes the changes that were made to the pelvic floor exercises questionnaire following the pilot phase.

3.2.iii Psychological factors

Subjective beliefs about control over health (self, powerful others or chance) was assessed by the 18-item Multidimensional Health Locus of Control Scale (Wallston et al. 1978) (Appendix 5). The scale is subdivided into three 6-item scales: internal health locus of control, chance health locus of control and powerful others health locus of control. Each of these sub-scales was analysed separately. If one of the six items was missing, an average was calculated of the other five items and this figure substituted for the missing item. If two items or more were missing, the case was excluded from the analysis.

General belief about the importance of being in good health was assessed by the 4-item Health Value Scale (Lau et al. 1986) (Appendix 6). This scale is not specific to one health behaviour but provides a general measure of the worth the individual places on overall good health. The scoring on two out of the four items were reversed and a mean score calculated for each individual. If one of the four items was missing, an average was calculated of the other three items from that individual and this figure substituted for the missing item. If two items or more were missing, the case was excluded from the analysis.

All women were asked to complete these two questionnaires.

3.3 Study permission

Approval for the study was given from Tayside Committee for Medical Research Ethics (extension to permission for exploratory study, Reference number 110/98). All the obstetric consultants gave permission for women in their care to be approached. Permission was also obtained from the Midwifery Manager.

3.4 Study setting

The study was carried in antenatal clinics in Dundee. Three sessions per week (Monday morning, Tuesday afternoon and Thursday morning) were held in Ninewells Hospital (the regional referral hospital). During these three sessions, seven different antenatal clinics were run: four were consultant clinics and three were midwife clinics. At a consultant clinic a doctor saw all women. Women attending the consultant clinic were usually having care shared between hospital and GP, with few visits to the hospital unless problems were detected. At a midwife clinic women had all their care from midwives and were only referred to a doctor if there were problems. One of the consultant clinics was for women expecting twins.

The other clinics were held on a Wednesday morning and a Friday morning at satellite antenatal clinics in the Whitfield and Ardler areas of Dundee. These clinics are located in deprived areas on the outskirts of the city (both have a deprivation category rating of 6 (McLoone 1995)). They facilitate access by women who might have difficulty attending antenatal clinics in the main hospital. They are staffed by community midwives and obstetricians, and operate in a similar way to the antenatal clinics held in Ninewells Hospital. Women could choose to have all their antenatal care at these clinics, or could share care between their own GP and the satellite clinic.

3.5 Inclusion criteria

Women were eligible to participate in the study if they were over the age of 16 and over 30 weeks gestation at the time of interview. Women at less than 30 weeks gestation were approached for recruitment if at the time of interview (at the next clinic visit) they would be over 30 weeks gestation. They had to be older than 16 in order to be able to give consent. Women also had to be able to speak and understand English, as no interpreter was available. There were no exclusions for obstetric complications as it was felt that the topics in the interview schedule were important to all women regardless of obstetric history. Women expecting twins were also included. Women who were being recruited into any other research study at the same visit were excluded (although they could be recruited at a subsequent visit).

3.6 Sample size

The pilot phase aimed to recruit about 40 women. This would provide a sufficient number to try out the method of data collection and test the data collection tools.

The main data collection phase of the study aimed to recruit 200 women to complete the PFE section. This would provide an estimate of the proportion of women who did not do the exercises. Under the most conservative approach (assuming a proportion of 50% reported the practice of the exercises) the 95% confidence interval of the proportion would be +/- 7.1%. This proportion was based on the findings of Wilson et al (1996) who found that 53.6% of women said they practised pelvic floor exercises once a week or more.

The proposed model included four independent variables ('self efficacy', 'attitude to new behaviour', 'attitude to current behaviour' and 'subjective norms') to predict the dependent variable (intention). For testing individual predictors, Tabachnick and Fidell (2001, p117) recommend that at least 104 + 4 (number of IVs) = 108 cases are necessary. If at least 200 women completed the PFE section, even allowing for missing cases, there would be sufficient cases to allow the use of multiple regression.

3.7 Patient recruitment

Recruitment for the pilot phase was during May 1999. The main data collection ran from July 1999 to March 2000. The same procedure was used for recruitment during both the pilot and main data collection. Every week patients were recruited from five antenatal clinic sessions. Before the start of each clinic all the notes of women due to attend the clinics were examined to identify women who met the inclusion criteria. A coloured card marker was inserted into the notes to single out eligible women and clinic staff were asked to inform the research midwife (author of the study, HW) after the antenatal consultation was completed. Some women carried their own maternity record so it was not always possible in advance to determine the gestation of the pregnancy. If there was any doubt about eligibility, a marker was inserted in the main notes and eligibility determined when the woman arrived with her maternity record at the clinic. Women were not approached if the notes identified difficulty understanding English, however sometimes this was not apparent until the first approach was made. The midwives at the clinic were often able to help to exclude women who would have had difficulty with the interview due to language problems. Only 6 women were not eligible due to inability to understand English.

During 1999 women were also being recruited at 34 weeks gestation into another research study (a trial of admission cardiotocograph (CTG) in labour – see study protocol in Appendix 7). As the Ethics Committee does not permit recruitment into more than one study at the same visit, women already identified as eligible for recruitment into the CTG study at that visit were not approached. However if it transpired that the woman was not to be recruited into the CTG study (for example if there was a problem such as doubt about the growth of the baby) then in some instances they were recruited into the current study instead. Some women interviewed for the current study had already been recruited into the CTG study, others were recruited for the CTG study subsequent to being interviewed for this study.

After the woman had her antenatal consultation with the midwife or doctor the research midwife spoke to her about participating in the study. A brief explanation of the study was given. If a woman was willing to consider being interviewed, an information sheet (Appendix 8) was given to her to take away and read, and an appointment made to coincide with her next clinic appointment (between one and six weeks later). This allowed time for the woman to consider whether she wanted to participate.

3.8 Interview procedure

The interview was carried out in a private room in the clinic, or in a private corner of a large waiting room. If the clinic was busy, the interview was carried out while the woman was waiting to be seen. Otherwise she was interviewed after the consultation. Before the interview started the woman was given the opportunity to ask questions about the study and read the information sheet again. She was then asked to sign the consent form (Appendix 9).

The research midwife completed the initial interview schedule with all women (Appendix 4). Demographic and pregnancy details were ascertained first, as well as class attendance in this and any previous pregnancies. Questions were then asked regarding whether the woman had received information about each of the health topics of interest. A list of possible sources of information was read out, and the woman indicated as many on the list as were appropriate to her. She was also given the opportunity to mention any other source of information not included in the list. The interview continued with questions about the practice of each of the activities, and finally a section about related morbidity such as backache and incontinence. The last few questions were about educational attainment, employment and ethnic background.

All women were asked to complete the Multidimensional Health Locus of Control questionnaire (Appendix 5) (Wallston et al. 1978) and the Health Value scale (Appendix 6) (Lau et al. 1986). If a woman had heard of, or had any knowledge about pelvic floor exercises she was also given the 'pelvic floor exercise questionnaire' (See Chapter 4). If a woman had no knowledge about pelvic floor exercises she was only given the former two assessment tools. Prior to self-completion of these sections women were advised not to spend too long on each question and to miss out any questions they had difficulty with. If the interview was carried out after her clinic appointment, she was left to complete these sections in the interview room. If the woman was interviewed before her clinic appointment, she was given these questionnaires to complete in the waiting area, and asked hand them back to the reception desk on completion. All questionnaires completed in the waiting room were returned. Seventeen (17) women did not have time to wait in the clinic to complete the other sections, and a stamped addressed envelope was provided to post the questionnaires after completion at home. Only six of these were returned.

If women were not interviewed the first time the appointment was made, an effort was made to carry out the interview when they attended for their next clinic visits. During the main data collection phase some interviews were carried out on the third or fourth attempt.

Every 50 interviews, five interviews were tape-recorded and a research colleague checked the validity of the coding. This minimised misinterpretation of the women's responses.

On a few occasions, women indicated that they were having problems with incontinence or backache, but no help had been sought for the condition. Following completion of the data collection, advice was given that the women should report the problem to a doctor or midwife in order to seek referral to a physiotherapist.

3.9 Data entry

Data was coded and entered into SPSS. The data was checked, missing values inserted as appropriate and anomalous data checked and corrected. Items in the pelvic floor exercise questionnaire and health value scale were recoded as necessary so that all were scored in the same direction to ensure consistency in the analysis (as detailed in section 7.2).

3.10 Statistical analysis

3.10.i Reliability, validity and missing value procedure

Completion of a questionnaire, particularly one that assesses attitudes and beliefs may be a relatively complex and time-consuming task for some respondents. Giving a considered or optimal response to every question (the ideal of the researcher) may not be of interest to some respondents for a variety of reasons. ‘Satisficing’ refers to arbitrary processes respondents may use to answer items in a questionnaire. The form may be competed in a satisfactory manner, but answers are not optimal (Streiner and Norman 1995).

As Streiner and Norman (1995) describe, there are a number of different ways that satisficing may manifest. Respondents may check the first option presented, or simply agree with every statement. Another option may be to mark the same box for each item on one page; this can be a particular problem for questionnaires using Likert scales where the respondent can go down the page marking boxes in a straight line. The same response can be selected as for the first item on the page, or a neutral or mid-point response might be used. Another method might be to select items at random throughout the questionnaire.

As suggested by Streiner and Norman (1995), in order to minimise satisficing, the questionnaire was kept as short as possible and each item was tested during the pilot phase for ease of understanding and completion. Following the pilot study, as a further (albeit crude) way of assessing whether respondents were giving 'true' answers, two questions were randomly selected from the final pool of questions and included twice with the coding reversed as a check on the reliability of respondents answers (Oppenheim 1992). In the analysis of the main study data, answers to these two questions were compared to check whether the two questions had been answered in the same direction.

A count was also made of the number of questions in the pelvic floor exercises questionnaire that had been missed. Women who answered less than 80% of the questions were compared on demographic details to those who answered more than 80% of questions. A similar comparison was also made between women who answered the pelvic floor exercises questionnaire and those who did not.

Furthermore internal reliability of the scales used in the pelvic floor exercises questionnaire was assessed using the split-half method, whereby the co-efficient Cronbach's alpha is calculated to measure the internal consistency of a scale. This is done by dividing the sample at random and correlating each half with the other, the alpha co-efficient being the average correlation among all of the items (Oppenheim 1992; Pallant 2001).

Validity was assessed using the relationship between the scale of intention and the measures of the behaviour of pelvic floor exercises; both the cross-sectional measure made at the time the pelvic floor exercises questionnaire was completed (concurrent validity), and the longitudinal measure from the follow-up (Chapter 8) (predictive validity).

3.10.ii Statistical tests

Descriptive statistics such as percentages, means, modes, medians and measures of dispersion (range, standard deviation, skew and kurtosis) were used to examine the data. Where the distribution of continuous data violated assumptions of normality (assessed by calculating a z value for skewness and kurtosis), an appropriate transformation was applied to improve distribution to within normal limits.

Chi square analyses were used to examine the relationships between discrete variables. Where 2 x 2 tables were used, Yates continuity correction was applied to compensate for the over-estimate in the Chi-square value (Pallant 2001; Fowler et al. 2002). Fisher's exact test (2-tailed) was applied where cells had an expected value of less than 5 (Pallant 2001).

Independent samples t-tests were used to compare scores on continuous variables between two different groups (Pallant 2001). Where a difference in the variation in the scores between the two groups was detected by Levene's test for equality of variance, an adjustment in the t-test was made (Pallant 2001).

Comparisons between groups on differential chances of exposure to certain factors (such as not having knowledge about pelvic floor exercises) were made using comparison of odds ratios (Streiner and Norman 1996; Moon and Gould 2000).

The degree of relationship between two continuous variables was examined using Pearson product-moment correlation coefficient (Tabachnick and Fidell 2001). Standard multiple regression was used to examine the relationship between a continuous dependent variable and a set of continuous independent variables (Tabachnick and Fidell 2001). Where the dependent variable was dichotomous, a logisitic regression model was used (Tabachnick and Fidell 2001). Hierarchical regression was used to find out if the addition of another variable added to the variance previously explained by a set of variables.

An alpha level of .05 was used for all statistical tests. Although many tests are used throughout the whole thesis, each independent section uses no more than 20 tests so a Bonferroni correction was not required (Bland and Altman 1995). However where significance levels approach .05, results will be treated with caution.

3.11 Summary of Chapter 3

Chapter 3 described the design and methodology used in both the pilot phase and the main data collection phase of the structured interview study. Each of the data collection tools were described (structured interview schedule, pelvic floor exercises questionnaire, Multidimensional Health Locus of Control Scale and the Health Value Scale) and where appropriate their development. Following a description of the study setting, the inclusion criteria, the sample size, the method of patient recruitment and the interview procedure were detailed. Finally justification for each of the statistical tests used in the analysis was given.

Chapter 4: Pilot phase of structured interview study. Recruitment rate, response rate and development of pelvic floor exercise section

4 Introduction to Chapter 4

The purpose of the pilot phase of the structured interview study was to determine whether the proposed method of data collection was feasible, and to test the data collection tools. Section 3.2.i described the development of the structured interview schedule. This chapter describes the recruitment and response rate during the month of the pilot phase, and the changes that were made to the pelvic floor exercises section of the questionnaire as a result of the piloting.

4.1 Pilot phase recruitment and response rate

Over a period of three weeks and one Monday (14 clinics in total), a total of 99 eligible women were identified. (78 women who would have been eligible were not approached because they were eligible for the CTG study.) Of the 99, 63 women were approached about taking part in the study. Every effort was made to speak to all eligible women about participation in the study, however for several reasons not all were approached. Reasons that eligible women were not approached were: non-attendance at clinic (12), changed or cancelled appointment (3), not returning to clinic because of induction or planned caesarean section (10), not feeling well (2), no time (2), missed (8). Midwives in the clinic informed the research midwife when the consultation was completed and the women had made a return appointment. In some cases the women left the clinic before the research midwife was notified; these cases are recorded as ‘missed’. Eight women who were approached declined to take part in the study. Out of the 63 women approached, a total of 55 interviews were arranged (87.3% recruitment rate).

The pilot phase aimed to recruit about 40 women. Three and a half weeks after recruitment began sufficient interviews had been arranged. Interviews organised for after that date (12 in total) were cancelled, leaving 43 interviews arranged for the duration of the pilot stage.

The Ethics Committee stipulated that women should not be recruited and interviewed at the same visit to allow them time to decide whether to participate. Women were therefore recruited at one visit and interviewed at the next clinic visit. Many women who were recruited towards the end of the pregnancy were not asked by the doctor or midwife to return until they were past their expected date of delivery. For this reason it was inevitable that some women had delivered before the next appointment. In the pilot phase three women had delivered before their return appointment, leaving 40 possible interviews. Of these six were not carried out. Reasons included: not feeling well (1), not having time (1) and non-attendance at the clinic (4). A total of 34 interviews were carried out (85.0% response rate) and included in the analysis of the pilot data.

The mean age of the women interviewed in the pilot study was 28.2 years (Range 16.8 to 42.3, SD = 6.1). Half were expecting their first baby (n = 17, 50.0%), half had no education beyond secondary school (n = 17, 50.0%) and most lived in Carstairs deprivation categories 4, 5, 6 and 7 (the most deprived areas of residence) (n = 21, 61.7%). Nearly half the women were not in paid employment at the time of the interview (n = 16, 47.0%). Correspondingly only 13 women (38.2%) reported being in a non-manual occupation (Social class I, II & IIINM). Full demographic details of the pilot sample are reported in Appendix 11.

The pilot study allowed both the recruitment and interview procedures to be tested. It confirmed that it was possible for one research midwife both to recruit the women and carry out the interviews. The high recruitment and response rate demonstrated that the method was acceptable to the women. The problem of women leaving the clinic before the research midwife was informed, highlighted the need for good communication about the study with all staff working in the clinic.

4.2 Development of pelvic floor exercise section

The pilot study was used to test whether pregnant women had any difficulty with any of the items in the pelvic floor exercises questionnaire. The reliability of items in the TPB model was also checked.

4.2.i Method of scoring items

There is discrepancy in the literature regarding the scoring of items in the TPB. For scales that use the sum of individual item scores, it will make no difference to results to use unipolar or bipolar scores. However for scales that use the sum-of-products the scoring of individual items will affect the scale score and can lead to low internal reliability of the scale. Lauver and Knapp (1993) advise that caution should be exercised when using bipolar scoring for multiplicative composites for this reason. Hence in the current study unipolar scoring was chosen. The use of unipolar scored items also avoids the problems of a zero mid-point (which will always produce a product of 0 when combined in a multiplicative equation). In order to be consistent throughout the questionnaire all items were given unipolar anchor points of 1 and 7.

The relevance of assessing the reliability of sum-of-products scales has also been questioned by Lauver and Knapp (1993). They suggest that the individual product scores may be more useful if a study is designed to explain behaviour and gather information in order to design appropriate interventions. Another consideration is that high internal consistency might not be expected for individual product items that are measuring beliefs about discrete concepts. Similarly measures of social referents beliefs might not be expected to be consistent. For the pilot phase of the study, in order to select items for inclusion in the final questionnaire, internal reliability of the sum-of-products scales are used. However in the main data collection phase the product items were not used as a scale, although internal reliability is reported (Chapter 7).

4.2.ii Terminology and operationalisation

In order be consistent and to aid clarity throughout the thesis, the determinants of intention to practise pelvic floor exercises in the RTPB model will be referred to as 'direct determinants' (self-efficacy, attitude to new behaviour, attitude to current behaviour and subjective norms). The concepts, or belief-based measures, that were explored in order to understand and explain each of these determinants will be referred to as 'indirect determinants'.

Consistent with Ajzen's principle of compatibility (Ajzen 1988), the behaviour or goal was clearly defined: the practice of pelvic floor exercises every day during pregnancy. Correspondingly each item was specific towards the behaviour in terms of:

(a) action = practice of the exercises

(b) performed on or towards a target = pelvic floor

(c) in a context = during pregnancy

(d) at a time or occasion = every day

This level of specificity ensured that there was uniformity throughout the questionnaire, avoided ambiguity and allowed aggregation of measures.

4.2.iii Intention

Intention to practise pelvic floor exercises was assessed by three items. Cronbach's alpha was used to determine the internal reliability of the items combined together to form a scale. The sum of these three items gave an alpha of .97, and all were retained in the final questionnaire:

- "I intend to do pelvic floor exercises every day during pregnancy (agree strongly/disagree strongly)."
- "I am likely to do pelvic floor exercises every day during pregnancy (agree strongly/disagree strongly)."
- "I will do pelvic floor exercises every day during pregnancy (agree strongly/disagree strongly)."

As described in section 1.5.v.1, a single measure of planning was included to find out whether this concept improved the prediction of intention:

- "I plan to do pelvic floor exercises every day during pregnancy (agree strongly/disagree strongly)."

4.2.iv Self-efficacy for new behaviour

Self-efficacy assesses the belief the person holds about whether they are able to carry out the behaviour in question. As discussed in the introduction (section 1.5.iv) the measures used in this study assessed the confidence of the woman in her ability to do pelvic floor exercises correctly every day during pregnancy. It was not appropriate in this instance to measure 'perceived behavioural control'; in other words whether the woman thought the performance of pelvic floor exercises was under her control (as it clearly was). In this study confidence in ability to do the exercises was operationalised in a similar way to the way self-efficacy was measured by Terry and O'Leary (1995).

4.2.iv.1 Self-efficacy – direct determinants

Four items assessed directly whether women believed that they had the ability to do pelvic floor exercises. Cronbach's alpha was used to determine whether the items combined together to form a scale. The four items together gave an alpha of .55. Deletion of one improved the alpha to .76. The three that were retained were:

- "How confident are you that you can do pelvic floor exercises correctly? (very confident/not at all confident)."
- "If I wanted to, I could easily do pelvic floor exercises every day during pregnancy (agree strongly/disagree strongly)."
- "Doing pelvic floor exercises correctly every day during pregnancy would be…(easy to do/difficult to do)."

4.2.iv.2 Self-efficacy – indirect determinants

The exploratory interviews suggested that some women were uncertain whether they were doing pelvic floor exercises correctly, and that the uncertainty was a barrier. It also emerged that difficulty remembering to do the exercises was an issue for some women, a finding that was also included in the study by Dolman and Chase (1996). These concepts relate to ability to do the exercises and were possible indirect determinants of self-efficacy. A further theme that was mentioned in the interviews was that lack of time might deter women from doing the exercises. All three concepts were therefore included as indirect measures:

- Difficulty of doing the exercises correctly
- Difficulty with remembering to do the exercises
- Insufficient time to practise the exercises

For each of these, the model suggests that the perceived likelihood of the factor (*c*) is multiplied by the perceived facilitating or inhibiting power of the factor (*p*). These multiplicative items are then summed to form a scale (Equation 4.1):

$$SE = \sum_{v=1}^{b=v} c_b \, . \, p_b$$

c_b = perceived frequency or likelihood of occurrence of factor b
p_b = perceived facilitating or inhibiting power of factor b
v = number of control factors

Equation 4.1

Different phrasing of each concept was tried in the pilot, giving a number of different combinations (36 in total). The combination that gave the highest alpha determined the statements that were selected to be included in the final questionnaire (Table 4.1). The alpha for this combination was .67 and the correlation between the scales from the indirect determinants to the direct measures was .42.

Table 4.1 Indirect determinants of self-efficacy in final questionnaire

Concept	Perceived likelihood of occurrence (c)		Perceived facilitating/inhibiting power (p)
Difficulty of doing the exercises correctly	"Uncertainty about whether I am doing pelvic floor exercises correctly makes the chance of doing them…(more likely/less likely)"	x	"If I thought pelvic floor exercises were hard to do properly, that would put me off (agree strongly/disagree strongly)"
Difficulty with remembering to do the exercises	"Doing pelvic floor exercises every day during pregnancy would be…(difficult to remember/easy to remember)"	x	"If I thought it was hard to remember to do pelvic floor exercises, that would put me off (agree strongly/disagree strongly)"
Insufficient time to practise the exercises	"Would you be more or less likely to do pelvic floor exercises if you thought they took up a lot of time? (more likely/less likely)"	x	"I often run out of time to do things (agree strongly/disagree strongly)"

4.2.v Attitude to new behaviour

The measure of attitude to the new behaviour assesses whether the person holds a positive or negative evaluation of the behaviour.

4.2.v.1 Attitude to new behaviour – direct determinants

Five statements measured the beliefs of pregnant women about the behaviour. A range of adjectives appropriate to the practice of pelvic floor exercises (Valois and Godin 1991) were included:

"Exercising my pelvic floor muscles every day during pregnancy would be…

- ….extremely good/extremely bad."
- ….extremely harmful/extremely beneficial."
- …extremely important/extremely unimportant."
- …extremely useful/not at all useful."
- ….extremely pleasant/not at all pleasant.

In addition a further two items were included that assessed whether the respondent considered that pelvic floor exercises would be effective in reducing the chances of becoming incontinent after delivery. These are equivalent to response efficacy beliefs in other health psychology models such as the health belief model and were suggested for inclusion in the revised TPB model by Maddux (1993). It was necessary to specify two degrees of incontinence as attitudes to incontinence may be affected by the severity of the condition (Lagro-Janssen et al. 1992; Dugan et al. 1998):

- "While I am pregnant, I think if I do daily pelvic floor exercises I will decrease my chances of leaking a few drops of urine every day after delivery (agree strongly/disagree strongly)."

- "While I am pregnant, I think if I do daily pelvic floor exercises I will decrease my chances of soaking myself with urine after delivery (agree strongly/disagree strongly)."

These seven items scaled together gave an alpha of .85, and all were retained in the final version.

4.2.v.2 Attitude to new behaviour - indirect determinants

The exploratory interviews suggested that women might be put off from doing pelvic floor exercises by discomfort, pain or embarrassment. These three potential perceived costs of the new behaviour were therefore assessed as indirect determinants. For each of these, an outcome statement evaluated the belief about the behaviour. The sum of these multiplicative items formed a scale (Equation 4.2).

$$A_{NB} = \sum_{w=1}^{c=w} bn_c \, . \, en_c$$

bn_c = behavioural belief that performing the new behaviour, NB, leads to some consequence c (subjective probability that the behaviour has the consequence c)
en_c = evaluation of the consequence c
w = number of salient consequences

Equation 4.2

The sum of the products of these pairs of items showed moderate internal reliability (α = .76). There was very low correlation between the multiplicative items relating to embarrassment and discomfort (r = .18), and between the multiplicative items relating to embarrassment and pain (r = .32). The two items relating to embarrassment were omitted, while the pairs of statements relating to pain and discomfort were retained. The correlation between the multiplicative composites formed by the two statements relating to pain and the two relating to discomfort was .91.

Other items relating to perceived benefits of pelvic floor exercises as suggested in the antenatal education literature (improving the sex life and making the delivery easier) were not tested in the pilot but were added to the final questionnaire. The indirect determinants relating to attitude to new behaviour that were included in the final questionnaire are shown in Table 4.2:

Table 4.2 Indirect determinants of attitude to new behaviour in final questionnaire

Concept	Perceived likelihood that performance of the behaviour will lead to a particular outcome (bn)		Evaluation of that outcome (en)
Discomfort of the exercises	"Exercising my pelvic floor muscles every day during pregnancy would cause me …(a lot of discomfort/no discomfort)"	x	"While I am pregnant, if pelvic floor exercises caused me any discomfort, the likelihood of doing them is…(very high/very low)"
Pain of the exercises	"Exercising my pelvic floor muscles every day during pregnancy would cause me …(a lot of pain/no pain)"	x	"While I am pregnant, if pelvic floor exercises caused me any pain, the likelihood of doing them is…(very high/very low)"
Birth of the baby	"While I am pregnant, I think if I do daily pelvic floor exercises then giving birth to my baby might be easier (agree strongly/disagree strongly)"	x	"It is important to me to do everything I can to help make the birth of my baby as easy as possible (agree strongly/disagree strongly)"
Birth of the baby	"While I am pregnant, I think if I do daily pelvic floor exercises then the muscles of my pelvic floor might stretch more easily during the birth (agree strongly/disagree strongly)"	x	"It is important to me to do everything I can to help make the birth of my baby as easy as possible (agree strongly/disagree strongly)"
Sex life	"While I am pregnant, I think if I do daily pelvic floor exercises then it will help to make sex more enjoyable after the birth of my baby (agree strongly/disagree strongly)"	x	"It is important to me to do everything I can to improve my sex life after childbirth (agree strongly/disagree strongly)"

4.2.vi Attitude to current behaviour

According to Maddux (1993) the individual in considering whether to adopt a new and healthy behaviour will compare the new behaviour with the current behaviour in terms of costs and benefits. If women believe that pelvic floor exercises confer a reduced likelihood of becoming incontinent after having the baby, they may also believe that non-performance of the exercises will increase the chances of incontinence. Thus an assessment of the attitude to the current behaviour revolves around beliefs about the perceived vulnerability to postnatal incontinence and the perceived severity of this potential outcome. In the exploratory interviews it was clear that some women did not regard pelvic floor exercises as personally relevant due to lack of perceived risk of incontinence. In this section perceived vulnerability to postnatal incontinence will be assessed by the direct determinants of attitude to current behaviour. The perceived severity of postnatal incontinence will be assessed by the indirect determinants.

4.2.vi.1 Attitude to current behaviour – direct determinants

Beliefs about incontinence may be influenced by the amount of leakage experienced (Lagro-Janssen et al. 1992; Dugan et al. 1998). Therefore two statements relating to beliefs about the likelihood of developing two different degrees of postnatal incontinence were included as direct measures:

- "After I have my baby I think the likelihood of me leaking a few drops of urine every day is…(very high/very low)."
- "After I have my baby I think the likelihood of me soaking myself with urine every day is…(very high/very low)."

The correlation between these two items was .75 ($p < .01$).

4.2.vi.2 Attitude to current behaviour - indirect determinants

Exploratory interviews suggested that postnatal incontinence can be viewed by women as an inevitable and normal consequence of childbirth, and not something they necessarily regarded as problematic. These findings imply that views about the effect of incontinence might indirectly influence attitudes to incontinence. The literature relating to the consequences of incontinence on sufferers has indicated that incontinence may lead to feelings of embarrassment and feeling dirty (Ashworth and Hagan 1993b), as well as disruption to daily life (Wyman et al. 1987; Lam et al. 1992).

Three outcomes arising from the incontinence were therefore assessed as indirect measures (embarrassment, hygiene and inconvenience). For each of these outcomes one option related to a slight degree of incontinence, and the other to a more serious level of incontinence. The same evaluation statement was used for the two levels of incontinence. Equation 4.3 was used to calculate the scale of the indirect determinants of attitude to the current behaviour.

$$A_{CB} = \sum_{x=1}^{d=x} bc_d . ec_d$$

bc_d = behavioural belief that performing the current behaviour, CB, leads to some consequence d (subjective probability that the behaviour has the consequence d)
ec_d = evaluation of the consequence d
x = number of salient consequences

Equation 4.3

The products of these six items formed a scale with an alpha of .75. Deletion of the items relating to inconvenience improved the internal reliability to .78. Although this improvement was not large, the scale formed from the sum of the products of the four items (not including the two inconvenience items) correlated well with the sum of the direct determinants (.43), compared with a correlation of .32 (using the sum of all six multiplicative items). The last three items relating to inconvenience were therefore omitted from the final version of the questionnaire. The statements included in the final questionnaire are shown in Table 4.3.

Table 4.3 Indirect determinants of attitude to current behaviour in final questionnaire

Concept	Perceived likelihood that performance of the behaviour will lead to a particular outcome (bc)		Evaluation of that outcome (ec)
Embarrassment at a little incontinence	"I consider leaking a few drops of urine after I have my baby would be…(extremely embarrassing/not at all embarrassing)"	x	"It is important to me to avoid doing anything that would cause me embarrassment after I have my baby (agree strongly/disagree strongly)"
Embarrassment at a lot of incontinence	"I consider soaking myself with urine after I have my baby would be…(extremely embarrassing/not at all embarrassing"	x	"It is important to me to avoid doing anything that would cause me embarrassment after I have my baby (agree strongly/disagree strongly)"
Unhygienic aspect of a little incontinence	"I consider leaking a few drops of urine after I have my baby would be…(extremely unhygienic/not at all unhygienic)"	x	"It is important to me to avoid doing anything that would be unhygienic for me after I have my baby (agree strongly/disagree strongly)"
Unhygienic aspect of a lot of incontinence	"I consider soaking myself with urine after I have my baby would be…(extremely unhygienic/not at all unhygienic)"	x	"It is important to me to avoid doing anything that would be unhygienic for me after I have my baby (agree strongly/disagree strongly)"

4.2.vii Subjective norms

The measure of the subjective norm assesses how much the behaviour is influenced by other people. This is expressed in terms of the beliefs a person holds about what others think about whether the person should or should not engage in the behaviour. The importance of this belief is then measured by how much the referent is likely to comply with that particular person.

4.2.vii.1 Subjective norms – direct determinants

Three statements were included as a general measure of the importance of other people's views about the referent performing pelvic floor exercises. Reliability between the three items was very poor ($\alpha = .01$). Two statements referred to health in general, while the third was specifically related to pelvic floor exercises. This last item correlated well with the indirect measures ($r = .68$, $p < .01$). Many studies use only one item to measure subjective norm (Ajzen and Fishbein 1980; Fishbein and Stasson 1990; Ajzen 1991; Sparks et al. 1997; Sparks and Guthrie 1998). Therefore one item was retained in the final questionnaire:

- "Most people who are important to me think I should do daily pelvic floor exercises while I am pregnant (agree strongly/disagree strongly)."

4.2.vii.2 Subjective norms - indirect determinants

In order to explore the determinants of subjective norms, an assessment of the referent about the views of significant others as well as an evaluation of the likelihood of complying with that person's views were included as indirect measures. The exploratory interviews had suggested that the views of the General Practitioner regarding performance/non-performance of the exercises might be important. *A priori* knowledge suggested that family, and in particular the views of the partner of the woman might be relevant. Similarly the nature of antenatal care and the regular contact with midwives during pregnancy indicated that this group might also be influential. An evaluation of peer group influence was also included. Therefore the five significant others were partner, family, midwives, doctors and other pregnant women. Using the format suggested by Conner and Sparks (1995) the belief of the referent about what the other person thought about pelvic floor exercises was assessed using the format:

- "While pregnant, my partner thinks I should do daily pelvic floor exercises (agree strongly/disagree strongly)."

and the motivation to comply with the other person by:

- "How important is it to you what your partner thinks you should do about your health while you are pregnant? (extremely important/not at all important)."

Equation 4.4 was used to form the scale.

$$SN = \sum_{y=1}^{e=y} nb_e \,.\, mc_e$$

nb_e = normative belief (i.e. a subjective probability) that some referent e thinks one should perform the behaviour

mc_e = motivation to comply with the referent e

y = number of salient referents

Equation 4.4

The reliability of the sum of the products of these 5 multiplicative items was .54. However, if the last multiplicative item, relating to other pregnant women was omitted, the alpha rose to .58. Four referents were therefore included (Table 4.4).

Table 4.4 Indirect determinants of subjective norm in final questionnaire

Referent	Subjective likelihood that referents think the person should or should not perform the behaviour (normative belief) (nb)		Motivation to comply with that referents expectation (mc)
Partner	"While pregnant, my partner thinks I should do daily pelvic floor exercises (agree strongly/disagree strongly)"	x	"How important is it to you what your partner thinks you should do about your health while you are pregnant? (extremely important/not at all important)"
Family	"While pregnant, my family think I should do daily pelvic floor exercises (agree strongly/disagree strongly)"	x	"How important is it to you what your family think you should do about your health while you are pregnant? (extremely important/not at all important)"
Midwives	"While pregnant, the midwives think I should do daily pelvic floor exercises (agree strongly/disagree strongly)"	x	"How important is it to you what the midwives think you should do about your health while you are pregnant? (extremely important/not at all important)"
Doctors	"While pregnant, the doctors think I should do daily pelvic floor exercises (agree strongly/disagree strongly)"	x	"How important is it to you what the doctors think you should do about your health while you are pregnant? (extremely important/not at all important)"

4.2.viii Habit theory

Ronis (1989) has suggested that certain behaviours become automatic through repeated use and are no longer performed following a conscious decision (see section 1.5.v.3). Behaviours such as brushing the teeth or putting on a seat belt might be examples of preventive health behaviours that have become habit. In the interviews conducted with pregnant and recently delivered women, those who reported they were successful in practising pelvic floor exercises said they managed to get into a routine and that this helped them remember to do the exercises. Integrating elements of habit theory into the TPB fitted with evidence from the pre-pilot work and was supported by the literature.

4.2.viii.1 Cues to decision

Seven items relating to prompts to deciding to do pelvic floor exercises were included:

"I decide to do pelvic floor exercises when…

- I am told about them by my doctor (agree strongly/disagree strongly)."
- I am told about them by my midwife (agree strongly/disagree strongly)."
- I am told about them by the physiotherapist (agree strongly/disagree strongly)."
- I am told about them by someone else (agree strongly/disagree strongly)."
- I read about them (agree strongly/disagree strongly)."
- I leak urine myself (agree strongly/disagree strongly)."
- I hear about other people wetting themselves (agree strongly/disagree strongly)."

Cronbach's alpha for the sum of these 7 items was .70.

4.2.viii.2 Cues to action

In the habit stage of performing the behaviour, the behaviour becomes almost automatic and may be triggered by certain situational cues. These were explored using five items: "While I am pregnant, I remember to do pelvic floor exercises …

- whenever I go to the toilet (agree strongly/disagree strongly)."
- because I am aware that I am pregnant (agree strongly/disagree strongly)."
- while I am watching television (agree strongly/disagree strongly)."
- when I am in bed (agree strongly/disagree strongly)."
- while I am washing the dishes (agree strongly/disagree strongly)."

These formed a scale with an alpha of .84.

4.2.viii.3 Repetition/routine

The concept of getting into a routine was measured by 3 items:

- "While I am pregnant the same routine every day helps me to remember to do pelvic floor exercises (agree strongly/disagree strongly)."
- I do pelvic floor exercises at the same time every day (agree strongly/disagree strongly)."

- I make sure I do pelvic floor exercises at the same time every day (agree strongly/disagree strongly)."

The alpha for the sum of these items was .71.

4.2.ix Planning

One item relating to planning to carry out the behaviour was included:

- "I plan to do pelvic floor exercises every day during pregnancy (agree strongly/disagree strongly)."

This correlated highly ($r = .96$, $p < .0005$) with behavioural intention and was retained in the final questionnaire.

4.2.x Past behaviour

Three questions relating to past behaviour were included. Some research suggests that one of the strongest predictors of future behaviour is past behaviour (Bentler and Speckart 1979; Norman and Smith 1995) (see section 1.5.v.2). All women answered one question about behaviour before the current pregnancy:

- "Before this pregnancy I was in the habit of doing pelvic floor exercises on a daily basis (agree strongly/disagree strongly)."

Finally two other questions were only answered by women who had been pregnant before:

- "During previous pregnancies I was in the habit of doing pelvic floor exercises on a daily basis (agree strongly/disagree strongly)."
- "Following previous pregnancies I was in the habit of doing pelvic floor exercises on a daily basis (agree strongly/disagree strongly)."

There was high correlation between these two items ($r = .97$).

4.2.xi Reliability check

The final version of the pelvic floor exercises questionnaire incorporated 64 items, including two that only related to women who had been pregnant before. Two questions were randomly selected and included twice with the coding reversed as ‘reliability check’ questions (section 3.10.i). The two selected at random were:

- “Exercising my pelvic floor muscles every day during pregnancy would cause me …(a lot of discomfort/no discomfort).”
- “Before this pregnancy I was in the habit of doing pelvic floor exercises on a daily basis (agree strongly/disagree strongly).”

Finally the items were shuffled.

4.3 Summary of Chapter 4

This chapter described the results of the recruitment and response rate of the pilot phase of the structured interview study. This confirmed that the method of recruitment and data collection was acceptable to the women and that it was possible for one person to carry out recruitment and conduct the interviews at the same time.

The pelvic floor exercises questionnaire was tested during this phase. Items that produced scales with optimum reliability were selected prior to the main data collection phase.

Chapter 5: Main data collection phase of structured interview survey.

Results 1 – Sample details

5 Introduction to Chapter 5

Having finalised the method of data collection and the data collection tools during the pilot phase, the main data collection phase commenced in July 1999 and continued for nine months. The method of data collection and the tools used in the main data collection phase are described in Chapters 3 and 4. This chapter presents the recruitment and response rates for the main data collection phase and the demographic, obstetric and parity details of respondents. A comparison of demographic and parity details of respondents will also be made between the samples used in the pilot and main data collection phases. Furthermore, to assess the generalisability of results to the whole population of pregnant women in Dundee a comparison will also be made between women attending clinics used in the study and those attending clinics not used in the study. Another comparison will be made between women attending clinics used in the research who were interviewed and women attending the same clinics who were not interviewed in the research.

5.1 Recruitment and response rate

5.1.i Recruitment rate

A total of 735 women were identified as eligible to take part in the study. Some eligible women were not approached on the first opportunity, but were recruited on a subsequent clinic visit. The reasons eligible women were not asked if they would like to participate included:

- Did not attend clinic (65)

- For induction or caesarean section/not returning to clinic/going to Day Care (39)
- Returning when research midwife on annual leave/after end of data collection (64)
- Missed (103)
- No time (15)
- Did not want to be approached (6)

In total 443 women were approached about the study. Of these five refused, while 438 agreed, giving a recruitment rate of 98.9%.

5.1.ii Response rate

In the main data collection phase 88 women had delivered their baby before the next clinic appointment. This left 350 women still available to be interviewed. Of these, 290 interviews were actually carried out. Most (258) were carried out at the first attempt. Some were carried out at subsequent visits (2^{nd} attempt – 29; 3^{rd} attempt – 2; 4^{th} attempt – 1).

The total number of failed interview opportunities was 136. As some interviews were carried out on the third or fourth attempt the total number of reasons is higher than the number of women not interviewed. The reasons that interviews were not carried out are detailed below.

- Changed appointment (9)
- No time (56)
- Missed (left the clinic before the research midwife was notified) (5)
- Did not attend clinic (26)
- Not feeling well (5)
- Did not want to be interviewed (14)

- In early stages of labour (15)
- In ward/day care (6)

One woman was inadvertently given the completed interview schedule to take home as well as the other sections, none of which were subsequently returned. Two hundred and eighty-nine (289) interview schedules were therefore available for analysis, a final response rate of 82.6%.

Following completion of the structured questionnaire with the research midwife, all women were given the MHLC and HV questionnaires to complete themselves. Women who reported that they knew anything about pelvic floor exercises (n = 260) were also given the 'pelvic floor exercise (PFE) questionnaire'. Most women completed these questionnaires while in the clinic (either while waiting to have their antenatal consultation, or before they left the clinic). A few did not have time to wait (n = 17), and were given a stamped addressed envelope and asked to return the completed questionnaires (six questionnaires returned). One woman was dyslexic and was unable to complete the MHLC and HV questionnaires (she did not know about pelvic floor exercises).

Two hundred and forty seven (247) women (85.5%) completed the pelvic floor exercises questionnaire. Although all women were given the MHLC and the Health Value questionnaire, some women missed one or other of these sections (they were copied back-to-back). In total 275 women (95.1%) completed the MHLC questionnaire and 254 (87.9%) completed the Health Value questionnaire.

5.2 Demographic and pregnancy details of participants

This section presents the demographic, obstetric and parity details of the sample in the main data collection phase. In order to assess whether the sample used in the in the pilot phase was similar to the main sample, a comparison of demographic and parity details will be made between the main and pilot phase samples.

5.2.i Demographic characteristics of participants

Participants ranged in age from 16 years 2 months to 40 years 10 months (M = 27.44, SD 5.99). Only 4 (1.3%) were from a non-Caucasian ethnic group. No further analysis on the basis of ethnicity was carried out, as numbers were too small.

The deprivation category of participants was calculated from the postcode of residence using the Carstairs classification (Carstairs and Morris 1991; McLoone 1995). This measure of relative deprivation or affluence is based on information collected in the 1991 Census and applied at the level of small geographical localities. The four variables used in calculating the score are overcrowding, male unemployment, low social class and car ownership; the standardised variables (using the z-score method) being summed to form the deprivation score for each area (Carstairs and Morris 1991; McLoone 1995). The score is similar to the Townsend Deprivation Index (Townsend et al. 1988), but was designed for use in Scotland. In the Carstairs classification ‘low social class’ replaces ‘households not owner occupied’ as Scotland was considered to have a higher proportion of housing stock in the public sector, rendering the latter variable less valuable (Carstairs and Morris 1991). It correlates well with other deprivation measures such as Townsend and Jarman, as well as with indicators of health (Morris and Carstairs 1991). A few postcodes (n = 5) did not appear in the coding scheme, and a deprivation score could not be assigned. More than half of participants (n = 179, 62.0%) resided in the three most deprived areas of residence (Carstairs deprivation categories 4, 5 and 6) (Table 5.1).

Table 5.1 Carstairs deprivation category of participants

Carstairs deprivation category	n	%
1	18	6.2
2	37	12.8
3	50	17.3
4	25	8.7
5	11	3.8
6	143	49.5
Total	284	98.3
Missing	5	1.7
Total	289	100.0

Occupational classification was derived from the occupation of the woman herself using the OPCS classification (Employment Department Group Office of Population Censuses and Surveys 1990a; Employment Department Group Office of Population Censuses and Surveys 1990b; Employment Department Group Office of Population Censuses and Surveys 1991). In contrast to the results for deprivation category, more than half the women (n = 186, 64.3%) were classified in the higher three social classes (classifications I, II and IIIN) (Table 5.2).

Table 5.2 Occupational classification of the woman

Occupational classification	n	%
Professional - I	15	5.2
Managerial and technical - II	81	28.0
Skilled occupations non-manual – IIIN	90	31.1
Skilled occupations manual – IIIM	23	8.0
Partly skilled – IV	40	13.8
Unskilled – V	11	3.8
Total	260	90.0
Missing	29	10.0
Total	289	100.0

Women were also asked about their job status. Those who were not working at the time of interview were asked about their employment status before becoming pregnant. More than half (n = 196, 67.8%) were in some kind of paid employment: 45.0% in full-time employment and 22.8% in part-time employment. A third (n = 93, 32.2%) were not working.

Just over half the interviewees (n = 159, 51.5%) had been educated beyond secondary school: 13.8% had a University degree and 37.7% a professional, technical qualification or diploma.

5.2.ii Obstetric details of participants

Half the women were expecting their first baby (50.5%), another third were in their second pregnancy (34.3%) while the rest (15.2%) were in their third or subsequent pregnancy. Six women were expecting twins; numbers were too small to allow any further analysis.

At the time of the interview all women were over 30 weeks gestation, with half being in the last 4 weeks of the pregnancy (n = 142, 49.1%) ($\underline{M}$ = 36.5 weeks, SD 2.4). A further 31 (10.7%) women were beyond their due date when interviewed.

5.2.iii Attendance at parent education classes

One hundred and eleven women (38.4%) reported attending parent education classes during the current pregnancy. Compared with women expecting a second or subsequent baby, women in their first pregnancy were more likely to have attended classes (59.6% versus 16.8%, χ^2 (1, n = 289) = 56.22, p < .0005). The average number of classes attended in the current pregnancy was 4.16 (SD 2.64, mode 2).

Seventeen (17) women reported they had attended aquanatal classes during the index pregnancy. The average number of aquanatal classes attended was 6.29 (SD 5.13). Four women had attended aquanatal classes but not parent education classes. In total, the number of women who reported attending any classes during the current pregnancy was 115 (39.8%).

Of the 143 women expecting their second or subsequent baby, 55.9% (n = 80) reported that they had attended classes during a previous pregnancy. The number of classes attended previously (in total) ranged from 1 to 20 (M = 6.3, SD 2.75).

A total of 175 women (60.6%) said they had attended a parent education or an aquanatal class at some time during the current or previous pregnancy. For any class attendance at any time, there was no significant difference between parous women and primigravidae (60.1% versus 61.0%, χ^2 (1, n = 289) = 0.02, p = .89).

5.2.iv Data analysis

Subsequent analysis of the demographic details of respondents uses age as a continuous variable, apart from when odds ratios are calculated, when the sample is divided into those women under the age of 20 and those over 20 years. Younger women and teenagers are less likely to receive information and attend classes (Redman et al. 1991; Nichols 1995), and are therefore a group of particular interest. For categorical data such as the Carstairs deprivation category and occupational classification, categories are collapsed such that there are equal numbers of categories in each group. Employment status is grouped according to whether in any kind of paid employment or not, while education is divided into having progressed beyond secondary education or not. Women are grouped according to parity into those expecting their first baby and those expecting a second or subsequent baby. Stage of pregnancy at the time of interview is divided into those over and those under 36 weeks gestation.

5.3 Comparison between pilot phase sample and main data collection phase sample

In order to check whether the sample of women used in the main data collection phase were similar to the sample used in the pilot phase, differences between the two samples were examined using Chi-square analyses and t-tests. Table 5.3 shows that there were no significant differences between the two samples in deprivation category, social class, job status, education, age or parity.

Table 5.3 Results of Chi-square analyses and t-tests for differences in socio-demographic and parity variables for pilot phase sample and main data collection phase sample

	Pilot phase sample		**Main data collection phase sample**					
	n	**% (row)**	**n**	**% (row)**	**N**	χ^2	**df**	**p**
Deprivation category								
4 and over	18	9.1	179	90.9	197	.12	1	.73
3 and under	13	11.0	105	89.0	118			
Social Class								
Manual social class (IIIM, IV & V)	13	6.5	186	93.5	199	.001	1	.98
Non-manual social class (I, II & IIINM)	6	7.5	74	92.5	80			
Job status								
Paid employment	18	8.4	196	91.6	214	2.38	1	.12
Not in paid employment	16	14.7	93	85.3	109			
Education								
Up to secondary	17	10.8	140	89.2	157	.00	1	1.00
Beyond secondary	17	10.2	149	89.8	166			
Age	M	SD	M	SD	t-test			
	28.15	6.09	27.44	5.99	-.65		321	.52
Parity								
First pregnancy	17	10.4	146	89.6	163	.00	1	1.00
Second or subsequent pregnancy	17	10.6	143	89.4	160			

5.4 Details of the whole population of pregnant women attending antenatal clinics in Dundee during October 1999 and February 2000

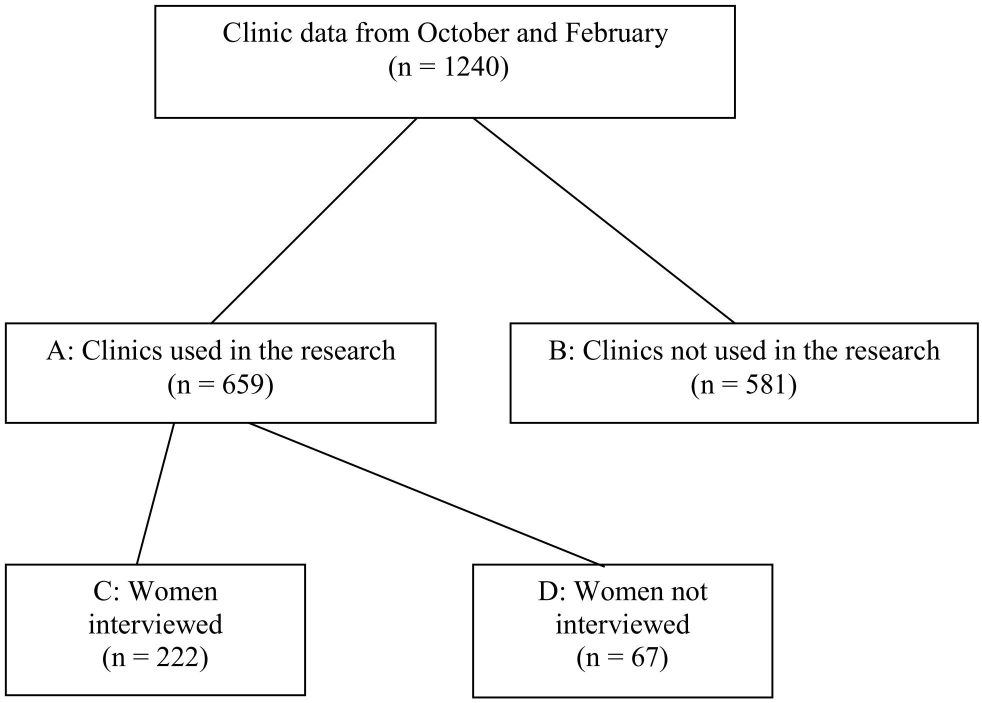
5.4.i Method of comparison with the whole population of pregnant women attending antenatal clinics in Dundee

In order to asses whether the sample was representative of the whole population of pregnant women and whether women interviewed were representative of women attending clinics used in the research, data was collected from antenatal clinic appointment lists. During the complete months of October 1999 and February 2000, details of the date of birth and postcode of every woman with an appointment to attend any antenatal clinic in Dundee was collected from the lists of clinic appointments. The parity of each woman was established by examining her notes. Any woman who had repeated visits during the 2-month period was only included once.

During the month of October 1999 there were 71 antenatal clinics, of which 35 were used in the research. In February 2000 there were 74 clinics, and 39 used in the research. Some of these clinics ran simultaneously in the same session. For example there were three different clinics held every Tuesday afternoon in the same clinic area.

A total of 1240 women had 1883 appointments during this time period. Appendix 12 gives the age, parity and Carstairs deprivation category distribution of all these 1240 women. Figure 5 shows the numbers of women attending clinics that were used for the research (group A) and the number attending other clinics not used in the research (group B). Out of the clinics that were used in the research, not all women were interviewed. Figure 5 also shows the number of women interviewed (group C) and the number of women not interviewed (group D). Some of the interviewed women (group C) were not

Figure 5 Numbers of women attending clinics and women interviewed during October 1999 and February 2000



interviewed during the months of October or February, but their names appeared on those clinic lists as they were still pregnant.

5.4.ii Comparison between clinics used in the research (group A) and other antenatal clinics in Dundee (group B)

To find out whether women attending clinics used in the research (group A) were representative of the whole population of pregnant women, a comparison was made between group A and group B (women attending clinics not used in the research) (Table 5.4). Women attending clinics used in the research were significantly more likely to live in more deprived areas of the city (areas with a higher Carstairs deprivation category rating) (χ^2 (1, n = 1226) = 19.15, p < .0005) and were more likely to be expecting their first baby (χ^2 (1, n = 1226) = 4.04, p = .04). They were also significantly younger

Table 5.4 Results of Chi-square analyses and t-tests for differences in deprivation category, parity and age variables for women attending clinics included in the research (group A) and women attending clinics not included in the research (group B)

	Clinics included in research (group A)		Clinics not included in research (group B)					
	n	**% (column)**	**n**	**% (column)**	**N**	**χ^2**	**df**	**p**
Deprivation category								
4 and over	431	66.0	307	53.6	738	19.15	1	< .0005
3 and under	222	34.0	266	46.4	488			
Parity								
First pregnancy	345	52.4	270	46.5	615	4.04	1	.04
Second or subsequent pregnancy	314	47.6	311	53.5	625			
Age	M	SD	M	SD	t-test			
	27.50	6.23	28.44	6.01	-2.70		1238	.007

(t(1238) = -2.70, p = .007). This result was significant but the effect was small due to the large sample size (η^2 = .006) (Pallant 2001).

5.4.iii Comparison between the women interviewed (group C) and other women attending clinics used in the research who were not interviewed (group D)

To assess whether the women who were interviewed in the research (group C) were representative of women attending the clinics used in the study a comparison was made between group C and group D (women attending clinics used in the research but not interviewed). There was no significant difference between the age, parity and deprivation category of the women who were interviewed in the study (group C) compared with other women attending the same clinics who were not interviewed (group D) (Table 5.5).

Table 5.5 Results of Chi-square analyses and t-tests for differences in deprivation category, parity and age variables for women interviewed (group C) and the rest of women attending clinics used in the research (group D)

	Women interviewed (group C) n	% (row)	Women not interviewed (group D) n	% (row)	N	χ^2	df	p
Deprivation category								
4 and over	142	32.9	289	67.1	431	.00	1	1.00
3 and under	73	32.9	149	67.1	222			
Parity								
First pregnancy	113	32.8	232	67.2	345	.08	1	.78
Second or subsequent pregnancy	107	34.1	207	65.9	314			
Age	M	SD	M	SD	t-test			
	27.6	6.0	27.4	6.4	-.32		657	.75

5.5 Summary of Chapter 5

Very few women who were approached about the study refused to consider participating giving a very high recruitment rate (98.9%). Out of women still pregnant at the time of the return appointment 289 were successfully interviewed giving a response rate of 82.6%.

The socio-demographic details, obstetric details and class attendance of the sample were then established. The average age of the sample was 27 years. Most of the sample lived in areas with postcodes indicating a higher index of deprivation. The majority were (or prior to pregnancy had been) in some kind of paid employment and their occupations put most into the higher three social classes. Just over half had been educated beyond secondary school.

Half the sample was expecting their first baby and just over half of these first time mothers had attended parent education classes. Two thirds of the whole sample had attended classes either during the current or in a previous pregnancy.

A comparison made between the pilot sample and the main sample showed that the two samples did not differ significantly on socio-demographic or parity details (Section 5.3).

Another comparison was then made between the clinics used in the research and those not used. These showed that the women attending the clinics used in the research were younger, from more deprived areas of the city and were more likely to be expecting their first baby compared with women attending clinics not used in the research.

A further analysis investigated whether the women who were interviewed were representative of all the women attending the clinics that were used in the research. This analysis found that there was no difference in age, deprivation category or parity, indicating that a representative sample was achieved from the clinics used in the research.

Chapter 6: Main data collection phase of structured interview survey.

Results 2 – Pelvic floor exercises

6 Introduction to Chapter 6

This chapter presents the results of the structured interview questionnaire relating to pelvic floor exercises. The findings about the number of women who reported receiving information about pelvic floor exercises will be described and the reported sources of information. The demographic and obstetric characteristics of those who did not report receipt of information will be analysed. Similarly the findings about the reported practice of pelvic floor exercises will be presented. Women who reported the practice of the exercises will be compared with those who did not on a number of demographic and obstetric characteristics. A comparison will then be made between the findings regarding knowledge and practice.

The results of the questions relating to reported incontinence will be described next, as well as the relationship between reported incontinence and the practice of pelvic floor exercises. Finally the other information that was gathered in the structured interview regarding relaxation exercises and taking care of the back will be presented.

6.1 Information about pelvic floor exercises

A total of 225 women (77.9%) reported that they had had information about pelvic floor exercises during the current pregnancy. 83.6% (n = 122) of first-time mothers had received information. One hundred and thirty-one women (131) said they had received information during or after a previous pregnancy. A total of 260 women (90.0%) had received information about pelvic floor exercises either during the current pregnancy or around the time of a previous pregnancy. Ninety women (31.1%) said they would have liked more information about pelvic floor exercises.

Women who reported having information about pelvic floor exercises in the current pregnancy were asked where they had got the information. The variety of sources is shown in Table 6.1. Women could mention as many sources as were relevant to them. Books were the most frequently mentioned source of information, followed by magazines. Sixty-four (64) women reported only one source of information: of these 59.4% (n = 38) had got the information from books. Many women specifically mentioned the Health Education Board for Scotland (HEBS) pregnancy book (Health Education Board for Scotland 1998) as the source of their information.

Table 6.1 Sources of information about pelvic floor exercises in the current pregnancy

	Number of women (N = 225)		Number of women for whom sole source (N = 64)	
Information source in this pregnancy	**n**	**%**	**n**	**%**
Physiotherapist (not during a class)	19	8.4		
Midwife	49	21.8		
Doctor	17	7.6		
Health Visitor	13	5.8		
Any health professional	69	30.7	1	1.6
Friends/Relatives	39	17.3	4	6.3
Classes	88	39.1	11	17.2
Leaflets	68	30.2	3	4.7
Books	159	70.7	38	59.4
Magazines	97	43.1	7	10.9
TV/Radio	25	11.1	0	
Other source	5	2.2	0	

A third (n = 69, 30.7%) of women reported that a health professional had given information about pelvic floor exercises. Midwives were mentioned as the source of information by 21.8% of women (n = 49). Only 8.4% of women (n = 19) said that a physiotherapist had given them information about pelvic floor exercises (this does not include women who received information from a physiotherapist in a parent education class).

6.1.i Comparison between those with and without information about pelvic floor exercises

A comparison between women who had received information about pelvic floor exercises either during the current pregnancy or during or after a previous pregnancy showed that women who reported receiving no information about pelvic floor exercises were significantly more likely to be under the age of 20 (Table 6.2). Women without information were also significantly more likely to live in an area of high deprivation, not be in paid employment and not to have continued in education beyond secondary school.

Table 6.2 Results of Chi-square analyses and t-tests for differences in socio-demographic and parity variables for whether women reported receiving information about pelvic floor exercises during the current or previous pregnancy

	Information received							
	No (N = 29)		**Yes (N = 260)**					
	n	**% (row)**	**n**	**% (row)**	**N**	χ^2	**df**	**p**
Deprivation category								
4 and over	24	13.4	155	86.6	179	4.5	1	.03
3 and under	5	4.8	100	95.2	105			
Social Class								
Manual social class (IIIM, IV & V)	7	9.5	67	90.5	74	1.2	1	.27
Non-manual social class (I, II & IIINM)	9	4.8	177	95.2	186			
Job status								
Not in paid employment	17	18.3	76	81.7	93	9.0	1	.003
Paid employment	12	6.1	184	93.9	196			
Education								
Up to secondary	23	16.4	117	83.6	140	11.0	1	.001
Beyond secondary	6	4.0	143	96.0	149			
Age	M	SD	M	SD	t-test*			
	22.01	6.05	28.05	5.69	5.13		287	< .0005

* Following Levene's adjustment for intergroup inequality of variance

Women in their first pregnancy were significantly less likely to know about pelvic floor exercises (Table 6.3). The gestation at the time of interview made no difference to reporting receipt of information. Having attended classes during the current pregnancy was significantly associated with knowing about pelvic floor exercises for first time mothers and class attendance at any time was significant for all women.

Table 6.3 Results of Chi-square analyses and t-tests for differences in obstetric characteristics for whether women reported receiving information about pelvic floor exercises during the current or previous pregnancy

	Information received							
	No (N = 29)		**Yes (N = 260)**					
	n	**% (row)**	**n**	**% (row)**	**N**	**χ^2**	**df**	**p**
Parity								
First pregnancy	24	16.4	122	83.6	146	12.0	1	.001
Second or subsequent pregnancy	5	3.5	138	96.5	143			
Gestation								
Less than 36 weeks	12	10.3	104	89.7	116	.00	1	1.0
Over 36 weeks	17	9.8	156	90.2	173			
Attended any classes in this pregnancy (primigravidae only)								
No	17	29.8	40	70.2	57	10.7	1	.001
Yes	7	7.9	82	92.1	89			
Attended any classes ever								
No	21	18.4	93	81.6	114	13.2	1	< .0005
Yes	8	4.6	167	95.4	175			

6.2 Practice of pelvic floor exercises

Just over half the women (n = 156, 54.0%) reported that they had practised pelvic floor exercises during the past month. Half of those who said they practised pelvic floor exercises (n = 76, 48.7%), said they did them once a day or more (Table 6.4).

Those who reported practising pelvic floor exercises were asked if they found it easy or difficult to remember to do the exercises. More than half (n = 90, 57.7%) said the exercises were very or moderately easy to remember (Table 6.5). When asked if pelvic floor exercises were easy or difficult to do, the majority (n = 141, 90.4%) said they found the exercises easy to do (Table 6.6).

Table 6.4 Frequency of reported practice of pelvic floor exercises

Frequency	n	%
Never	133	46.0
Less often than once a week	10	3.5
Once a week	23	8.0
More than once a week but less than once a day	47	16.3
Once a day	31	10.7
More than once a day	45	15.6

Table 6.5 Reported ease or difficulty of remembering to do pelvic floor exercises

Remembering to do pelvic floor exercises	n	%
Very easy	33	21.2
Moderately easy	57	36.5
Moderately difficult	52	33.3
Very difficult	13	8.3
Missing	1	0.6

Table 6.6 Reported ease or difficulty of doing pelvic floor exercises

Ease or difficulty of doing pelvic floor exercises	n	%
Very easy	69	44.2
Moderately easy	72	46.2
Moderately difficult	12	7.7
Very difficult	2	1.3
Missing	1	0.6

6.2.i Comparison between those who did and did not report the practice of pelvic floor exercises

Women who reported practising pelvic floor exercises were significantly older, lived in less deprived areas of residence, were more likely to be in paid employment and have been educated beyond secondary school (Table 6.7). There was no difference in terms of social class.

Women expecting their first baby were just as likely as those in a second or subsequent pregnancy to report the practice of pelvic floor exercises (Table 6.8). The gestation of the pregnancy made no difference. Women who attended classes either in the current pregnancy (first-time mothers only) or during a previous pregnancy (all women) were more likely to report the practice of the exercises.

Table 6.7 Results of Chi-square analyses and t-tests for differences in socio-demographic and parity variables for whether women reported the practice of pelvic floor exercises in the week before the interview

	Pelvic floor exercises in the week before interview							
	No (N = 133)		**Yes (N = 156)**					
	n	**% (row)**	**n**	**% (row)**	**N**	**χ^2**	**df**	**p**
Deprivation category								
4 and over	98	54.7	81	45.3	179	13.6	1	< .0005
3 and under	33	31.4	72	68.6	105			
Social Class								
Manual social class (IIIM, IV & V)	36	48.6	38	51.4	74	1.4	1	.24
Non-manual social class (I, II & IIINM)	74	39.8	112	60.2	186			
Job status								
Not in paid employment	58	62.4	35	37.6	93	13.8	1	< .0005
Paid employment	75	38.3	121	61.7	196			
Education								
Up to secondary	79	56.4	61	43.6	140	11.0	1	.001
Beyond secondary	54	36.2	95	63.8	149			
Age	M	SD	M	SD	t-test*			
	25.87	6.68	28.79	4.98	-4.15		287	< .0005

* Following Levene's adjustment for intergroup inequality of variance

Table 6.8 Results of Chi-square analyses for differences in obstetric characteristics of women who reported practising pelvic floor exercises in the week before the interview

	Pelvic floor exercises in the week before interview							
	No		Yes					
	n	% (row)	n	% (row)	N	χ^2	df	p
Parity								
First pregnancy	65	44.5	81	55.5	146	.2	1	.69
Second or subsequent pregnancy	68	47.6	75	52.4	143			
Attended any classes in this pregnancy (primigravidae only)								
No	45	78.9	12	21.1	57	42.6	1	< .0005
Yes	20	22.5	69	77.5	89			
Attended any classes ever								
No	83	72.8	31	27.2	114	52.6	1	< .0005
Yes	50	28.6	125	71.4	175			

6.3 Comparison between knowledge and practice of pelvic floor exercises

For each indicator the odds ratio of having no information, and the odds ratio of not practising the exercises was calculated. For age, the sample was split into women under the age of 20 and women over the age of 20. The relative odds (or odds ratio) were calculated by dividing (for example):

'The odds of a woman living in a more deprived area not knowing about pelvic floor exercises (number who had received no information divided by the number who had received information)'

by

'The odds of a woman living in a less deprived area not knowing about pelvic floor exercises (number who had received no information divided by the number who had received information)'

(Streiner and Norman 1996; Moon and Gould 2000)

Expressed in this way the emphasis is on the group of women who might be the target of any intervention i.e. those who missed out on information or were not doing the exercises. The odds ratios were compared between knowledge and practice (Table 6.9).

Table 6.9 The odds ratios of NOT having information compared with the odds ratios of NOT practising pelvic floor exercises

	Knowledge		**Practice**	
	Odds Ratio	**Confidence Intervals**	**Odds Ratio**	**Confidence Intervals**
Under 20	9.1	4.0 – 20.7	4.9	2.4 – 10.1
Social class IIIM, IV and V	2.1	0.7 – 5.7	1.4	0.8 – 2.5
Not in paid employment	3.4	1.6 – 7.5	2.7	1.6 – 4.4
Deprivation category 4, 5 and 6	3.1	1.1 – 8.4	2.6	1.6 – 4.4
Educated only to secondary	4.7	1.8 – 11.9	2.3	1.4 – 3.7
Primigravidae	5.4	2.0 – 14.7	0.9	0.6 – 1.4
No class attendance in this pregnancy (primigravidae only)	5.0	1.9 – 13.0	13.0	5.8 – 29.4
No class attendance ever	4.7	2.0 – 11.0	6.7	4.0 – 11.3

Women under the age of 20 were nine times more likely than women over the age of 20 to report receiving no information about pelvic floor exercises and five times more likely not to report the practice the exercises. Women from more deprived backgrounds (on all measures of social deprivation) were less likely to have information, and were less likely to practise the exercises, however the effect was more marked for information than practice. However the wider confidence intervals for many of these findings relating to knowledge indicate that there was greater population variability in the results for knowledge than there was for practice (Crombie 1996).

In contrast women in their first pregnancy were equally as likely as those expecting a second or subsequent baby to report practising the exercises, in spite of being five times less likely to report receipt of information.

Women expecting their first baby who had not been to classes in this pregnancy were 13 times less likely to practise pelvic floor exercises than first-time mothers who had been to classes were. When non-attendance at classes in any pregnancy was considered, there remained a strong effect for both knowledge and practice. Women who had never been to classes were almost five times less likely than women who had been to classes to know about pelvic floor exercises and were nearly seven times less likely to practise the exercises. Again the width of the confidence intervals for all these findings suggests that the true population values lie within a broad range suggesting a smaller effect size (Crombie 1996).

6.4 Related morbidity – incontinence

6.4.i Incidence, frequency and severity of incontinence

Women were asked whether they had ever suffered from leakage of urine when coughing, laughing or sneezing. In total, ten (n = 10, 3.5%) said they had been incontinent before ever being pregnant for the first time. Six of the ten were primigravidae (6/146, 4.1%), while four (4/143, 2.8%) were expecting a second or subsequent baby. Of women who had been pregnant before, 43.4% (n = 62) said they had suffered leakage of urine during or after previous pregnancies. More than half of women interviewed reported having been incontinent at some time during the current pregnancy (n = 157, 54.3%).

The women who said they had suffered from incontinence during the current pregnancy were asked about the severity and frequency of the incontinence in the past week. Fifty-three women, who had been incontinent earlier in the pregnancy, reported no incontinence in the week preceding the interview.

Of the women who were currently incontinent (n = 104, 36.0% of whole sample), three-quarters (n = 77, 74.0%) were only bothered by mild incontinence (Table 6.10). However the majority were affected several times a week or on a daily basis (n = 76, 73.1%) (Table 6.11).

Table 6.10 Severity of incontinence in the past week

Severity	n	%
Mild (never need to wear sanitary protection)	77	74.0
Moderate (occasionally need to wear sanitary protection)	19	18.3
Severe (always need to wear sanitary protection)	8	7.7
Total	104	100.0

Table 6.11 Frequency of incontinence in the past week

Frequency	n	%
Occasionally	3	2.9
Once a week	25	24.0
Several times per week	48	46.2
Daily	28	26.9
Total	104	100.0

6.4.ii Relationship between incontinence and reported practice of pelvic floor exercises in the past week

Women who had suffered incontinence either during or after a previous pregnancy or at any time during the current pregnancy were no more likely to report the practice of pelvic floor exercises than women who had never suffered from incontinence (Table 6.12).

There was also no effect of frequent incontinence. Women who said their incontinence was moderate or severe were more likely to report practising pelvic floor exercises than women who reported less mild or no incontinence. This result only just reached significance and the number of women who said their incontinence was moderate or severe was small. The frequency of performance of pelvic floor exercises also had no relationship with reported incontinence during pregnancy (Table 6.13).

Table 6.12 Results of Chi-square analyses for differences in incontinence for whether women reported the practice of pelvic floor exercises in the week before the interview

	Pelvic floor exercises in the week before interview (%)							
	No		Yes					
	n	% (row)	n	% (row)	N	χ^2	df	p
During or after previous pregnancies								
Incontinence	25	40.3	37	59.7	62	1.8	1	.18
No incontinence	43	53.1	38	46.9	81			
Any time in the current pregnancy								
Incontinence	70	44.6	87	55.4	157	0.2	1	.68
No incontinence	63	47.7	69	52.3	132			
In the past week								
Once a week or less	101	47.4	112	52.6	213	0.4	1	.51
More than once a week	32	42.1	44	57.9	76			
In the past week								
Mild or no problem	126	48.1	136	51.9	262	4.0	1	0.05
Moderate or severe	7	25.9	20	74.1	27			

Table 6.13 Results of Chi-square analyses for differences in reported frequency of pelvic floor exercises for whether women reported incontinence during the pregnancy

	Incontinence during the pregnancy							
	No/don't know		Yes					
	n	% (column)	n	% (column)	N	χ^2	df	p
Frequency of pelvic floor exercises								
Never or less than once a week	67	50.8	76	48.4	143	.53	3	.91
Once a week	9	6.8	14	8.9	23			
Few times a week	22	16.7	25	15.9	47			
Daily or more	34	25.8	42	26.8	76			

6.5 Relaxation exercises and taking care of the back

Information was collected during the interview relating to relaxation exercises and taking care of the back. The reason for including other topics in the interview schedule was to disguise the true purpose of the study. Pilot work had revealed that there were some women who did not know anything about pelvic floor exercises. In order to avoid alienating these women the study was described in very general terms and named 'Health in Pregnancy'. There was a mixture of similar questions relating to each subject matter, avoiding over-emphasis on any one. Table 6.14 gives the number of women who reported receiving information about each area of knowledge and the number who reported practising each activity. Sources of information about each area of knowledge are shown in Table 6.15. Similar proportions of women reported receiving information about each area of knowledge. There was more variation in the number who reported the practice of each activity.

The complete results for the questions about relaxation exercises are presented in Appendix 13. Results for taking care of the back and backache are presented in Appendix 14.

Table 6.14 Summary of the three areas of knowledge (N = 289)

	Relaxation exercises		Taking care of the back		Pelvic floor exercises	
	n	%	n	%	n	%
Information received in current or a previous pregnancy	253	87.5	239	82.7	260	90.0
Wanted more information	94	32.5	123	42.6	90	31.1
Practised the activity	95	32.9	243	84.1	156	54.0

Table 6.15 Sources of information in the current pregnancy about each area of knowledge

Information source in the current pregnancy	Relaxation exercises (N = 231)		Taking care of the back (N = 218)		Pelvic floor exercises (N = 225)	
	n	%	n	%	n	%
Physiotherapist (not during a class)	6	2.6	33	15.1	19	8.4
Midwife	34	14.7	54	24.8	49	21.8
Doctor	5	2.2	29	13.3	17	7.6
Health Visitor	22	9.5	16	7.3	13	5.8
Any health professional	51	22.1	93	42.7	69	30.7
Friends/Relatives	25	10.8	40	18.3	39	17.3
Classes	94	40.7	81	37.2	88	39.1
Leaflets	84	36.4	60	27.5	68	30.2
Books	144	62.3	135	61.9	159	70.7
Magazines	111	48.1	69	31.7	97	43.1
TV/Radio	25	10.8	18	8.3	25	11.1
Other source	11	4.8	12	5.5	5	2.2

6.6 Summary of Chapter 6

The results of the structured interview questionnaire revealed that three quarters of women said they had received information about pelvic floor exercises during the current pregnancy. In total 90% of women had received information about the exercises either during the current or in a previous pregnancy. However a third said they would have liked more information. A variety of sources of information about pelvic floor exercises were reported with books being mentioned most often. Only a third of women said that a health professional had given them information; just over a fifth mentioned a midwife, while less than 10% indicated a physiotherapist. Women who reported receiving no information were significantly younger, lived in areas of high deprivation, were not in paid employment and had not continued their education beyond secondary school. Class attendance either in the current or in a previous pregnancy significantly increased the chance of knowing about the exercises.

The practice of pelvic floor exercises was reported by just over half the sample, and half of these women said they were doing the exercises once a day or more. More women reported that the exercises were easy to do than said they were easy to remember. Women who reported the practice of the exercises were more likely to be older, live in less deprived areas of the city, be in paid employment and have continued their education beyond secondary school compared with women who said they were not doing the exercises. Women expecting their first baby were just as likely as those in a second or subsequent pregnancy to report the practice of the exercises. Class attendance at any time had a significant relationship with reported practice of the exercises.

When reported knowledge about the exercises was compared with the reported practice of the exercises the relationship between age, measures of social deprivation and education was greater with knowledge compared to with practice. Younger age, more deprivation and less education were more likely to be associated with lack of knowledge than with lack of practice. However although women expecting their first baby were far more likely not to know about the exercises compared with women in a second or subsequent pregnancy, there was no relationship between parity and the reported practice of the exercises. Class attendance either in the current pregnancy (first time mothers only) or in a previous pregnancy was more likely to be associated with the reported practice of the exercises than with reported knowledge.

Reported incontinence was then described. A few women said they had been incontinent before first becoming pregnant, while nearly half the women who had been pregnant before reported incontinence in relation to a previous pregnancy. Just over half the sample said they had suffered from stress incontinence at some time during the current pregnancy. Out of the women who had been incontinent in the week preceding the interview (one-third of the sample) three-quarters only reported mild incontinence however most were affected more than several times a week.

The relationship between reported incontinence and reported practice of pelvic floor exercises was investigated. Women suffering from severe current incontinence were more likely to report the practice of pelvic floor exercises. Frequent current incontinence or previous experience of incontinence had no relationship with reported practice of the exercises. The frequency of reported practice of pelvic floor exercises had no relationship with reported incontinence during the pregnancy.

Finally the findings relating to relaxation exercises and taking care of the back were mentioned.

Chapter 7: Main data collection phase of structured interview survey.

Results 3 – Revised theory of planned behaviour and additional measures of health beliefs

7 Introduction to Chapter 7

This chapter describes the analysis of the data from the questionnaire relating to pelvic floor exercises and the other questionnaires measuring health beliefs (MHLC and HV questionnaires). The self-complete PFE questionnaire contained all the items relating to attitudes and beliefs about pelvic floor exercises designed using the framework of the revised Theory of Planned Behaviour (RTPB). All the variables used in this chapter are cross-sectional and were collected at the time of the interview (in the last trimester of the pregnancy).

The chapter begins with a comparison between the women who completed the PFE questionnaire (n = 247) and those who did not (n = 42). This allowed an assessment of whether the results from this section could be generalised to the whole sample. Following an analysis of missing data, each variable was screened to check for normality. Any violations of normality detected were corrected by the use of appropriate transformations (Tabachnick and Fidell 2001).

The chapter then proceeds to investigate the relationships proposed within the RTPB using the direct determinants to explain intention to practise pelvic floor exercises. The indirect determinants were then used to find out if the direct determinants could be explained. Following this the relationship between other measures and intention were investigated to try to improve the determination of intention. Subsequently, using the measure of current behaviour collected during the structured interview as the outcome variable, the RTPB model was used to explain the behaviour of pelvic floor exercises.

The final section will investigate the differences in some of these measures between women who reported the practice of pelvic floor exercises and those who said they were not practising the exercises.

7.1 Characteristics of women who did not complete pelvic floor exercise questionnaire

In order to assess whether women who completed the PFE questionnaire were representative of all the women interviewed by the research midwife (N = 289), the women who completed this questionnaire (all or part) (n = 247) were compared with those who did not (n = 42) (Figure 6).

Women who did not complete the PFE questionnaire were significantly more likely to be younger, live in more deprived areas of residence, be of lower occupational class, have completed less education and be expecting their first baby (Table 7.1). They were also significantly less likely to practise the exercises.

Figure 6 Diagram of number of women interviewed and number who completed PFE questionnaire

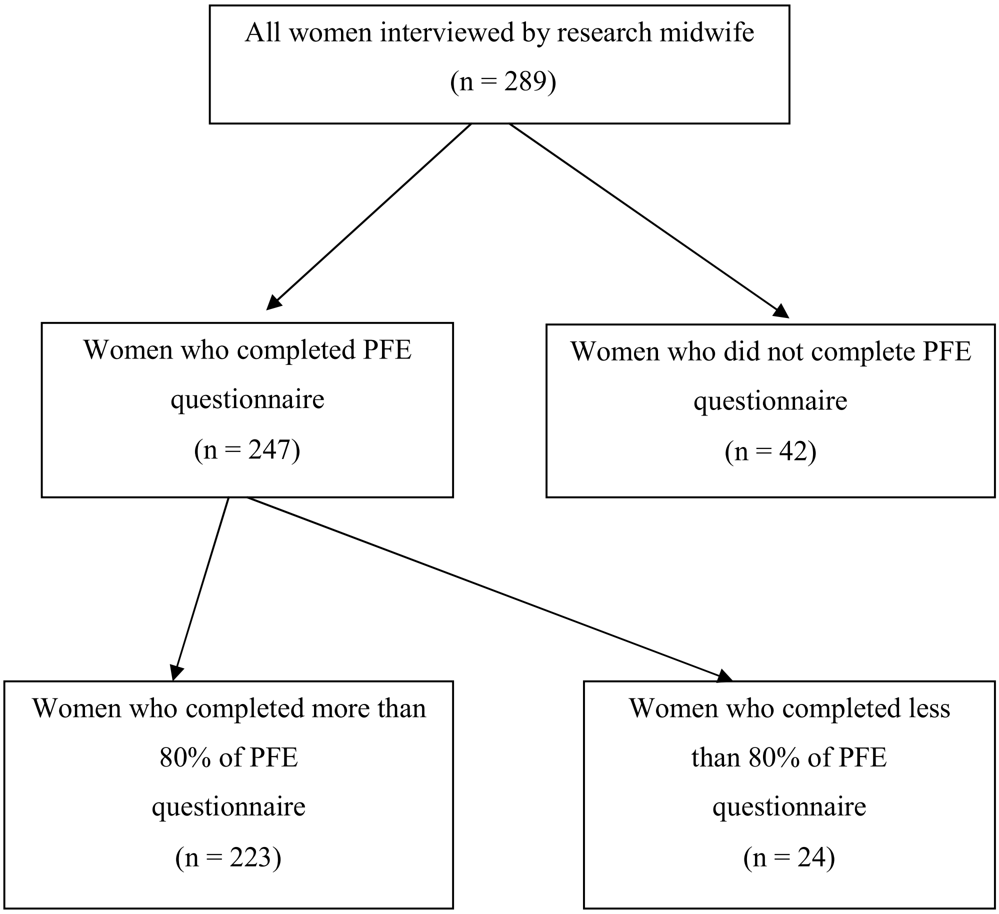


Table 7.1 Results of Chi-square analyses and t-tests for differences in socio-demographic and parity variables and reported practice of the exercises between women who completed the PFE questionnaire and those who did not complete the PFE questionnaire

	PFE questionnaire							
	Completed		**Not completed**					
	n	**% (row)**	**n**	**% (row)**	**N**	χ^2	**df**	**p**
Deprivation category								
4 and over	144	80.4	35	19.6	179	7.7	1	.005
3 and under	98	93.3	7	6.7	105			
Social Class								
Manual social class (IIIM, IV & V)	59	79.7	15	20.3	74	9.4	1	.002
Non-manual social class (I, II & IIINM)	174	93.5	12	6.5	186			
Job status								
Not in paid employment	75	80.6	18	19.4	93	2.0	1	.16
Paid employment	172	87.8	24	12.2	196			
Education								
Up to secondary	108	77.1	32	22.9	140	13.9	1	< .0005
Beyond secondary	139	93.3	10	6.7	149			
Parity								
First pregnancy	116	79.5	30	20.5	146	7.6	1	.006
Second or subsequent pregnancy	131	91.6	12	8.4	143			
Practice of pelvic floor exercises								
Yes	151	96.8	5	3.2	156	33.1	1	< .0005
No	96	72.2	37	27.8	133			
Age	M	SD	M	SD	t-test			
	23.23	5.96	28.16	5.71	-5.15		287	< .0005

7.2 Exploratory data analysis

The questionnaire relating to pelvic floor exercises included 66 items that were designed to explore beliefs about pelvic floor exercises and incontinence using the revised theory of planned behaviour (RTPB) as a framework (see Chapter 4). This section describes the characteristics of each measure within this framework. First the measure of intention will be described, then the direct determinants of intention, followed by the indirect determinants of each direct determinant and then the additional elements in the revised model as suggested by Maddux (1993) which relate to habit theory. Extra measures that were included will also be described: planning, past behaviour and response efficacy.

All items in the questionnaire had a range from 1 to 7 and were scored so that a low score meant the woman was more likely to carry out the behaviour, or thought the behaviour was easier to do, or thought the behaviour was beneficial. For example for the construct of 'attitude to new behaviour' a low score indicated a more positive attitude towards pelvic floor exercises. A high score indicated a more negative attitude. The mid- or neutral point of each item was a score of 4. Following the procedure originally described by Ajzen and Fishbein (1980), the item scores within each construct were summed to form a scale.

Health behaviours may also be affected by personal beliefs about the degree of control that one has over health. This was assessed by the 18-item Multidimensional Health Locus of Control (MHLC) scale (Wallston et al. 1978). The value a person places on good health may also be an important moderator of the relationship between health locus of control and health behaviours and a four-item measure of Health Value was also included (Lau et al. 1986).

7.2.i Missing value analysis

The data was screened for missing values. Tabachnick and Fidell (2001) suggest that if less than 5% of values are missing from each variable this should not cause serious problems. Thirty variables (out of 66 in the questionnaire) had more than 5% of values missing. The patterns of variables missing more than 5% of responses were examined using SPSS Missing Value Analysis. All the variables in each of the sections relating to 'intention', 'cues to decision', 'repetition/routine', 'cues to action', behavioural beliefs in 'attitude to new behaviour', normative beliefs and the single measure of 'planning' had more than 5% of values missing. None were missing more than 10%. Missing values were not replaced, but cases were excluded on a pairwise basis from analyses (Pallant 2001). Results of analyses of scales formed from items with rates of missing values higher than 5% will be identified and will be interpreted with caution.

The missing values were also examined on a case by case basis by creating a new variable to identify women who completed less than 80% of questions in this section (Figure 6). There were 24 women who answered less than 80% of the questions in the PFE questionnaire (out of a total of 66 questions). Eighty percent was chosen as a pragmatic cut-off because it was considered that missing more than 20% of questions might be indicative of women who were substantially different from those who completed most of the questionnaire. In order to investigate whether there was a difference, women who completed more than 80% of the questions were compared with women who completed less than 80% of the questions on various characteristics (Table 7.2). The two groups did not differ significantly in terms of age, Carstairs deprivation category, occupational class, job status, education or parity. However women who had completed less than 80% of the PFE questionnaire were significantly less likely to report the practice of the exercises in the month preceding the interview.

Table 7.2 Results of Chi-square analyses and t-tests for differences in socio-demographic and parity variables and reported practice of the exercises between women who completed less than 80% of the PFE questionnaire and women who completed more than 80% of the PFE questionnaire

	Proportion of PFE questionnaire completed							
	Less than 80%		More than 80%					
	n	% (row)	n	% (row)	N	χ^2	df	p
Deprivation category								
4 and over	14	(9.7)	130	(90.3)	144	.00	1	1.00
3 and under	9	(9.2)	89	(90.8)	98			
Social Class								
Manual social class (IIIM, IV & V)	7	(11.9)	52	(24.9)	59	.04	1	.83
Non-manual social class (I, II & IIINM)	17	(9.8)	157	(90.2)	174			
Job status								
Not in paid employment	7	(9.3)	68	(90.7)	75	.00	1	1.00
Paid employment	17	(9.9)	155	(90.1)	172			
Education								
Up to secondary	13	(12.0)	95	(88.0)	108	.8	1	.39
Beyond secondary	11	(7.9)	128	(92.1)	139			
Parity								
First pregnancy	14	(12.1)	102	(87.9)	116	.9	1	.34
Second or subsequent pregnancy	10	(7.6)	121	(92.4)	131			
Practice of pelvic floor exercises								
Yes	6	(4.0)	145	(96.0)	151	13.0	1	< .0005
No	18	(18.8)	78	(81.3)	96			
Age	M	SD	M	SD	t-test			
	27.09	6.65	28.28	5.60	-0.971		221	.33

7.2.ii Reliability check

Comparison of the answers to the two 'reliability check' questions (items included in the questionnaire twice with the coding reversed, see section 3.10.i) showed that 87% of answers were in the same direction for one question, and 78% were in the same direction for the other question. This demonstrates that the majority of women answered these questions 'correctly' and allows greater confidence in the robustness of the data. All responses were kept in the analysis. Only the first version of each of these questions was used in subsequent analyses.

7.2.iii Intention

The sum of the three items relating to intention to practise pelvic floor exercises (section 4.2.iii) gave scale with an alpha of .92. The mean score for reported intention to perform pelvic floor exercises every day during pregnancy was close to the mid-point of the scale. Distribution of the data was examined for normality (Table 7.3). A z value for skewness was calculated by dividing the skewness statistic by its standard error (Tabachnick and Fidell 2001). Similarly dividing the kurtosis statistic by its standard error assessed the degree of kurtosis. As the critical value of z is 3.29 ($p \leq .001$), this procedure revealed that the measure of intention was slightly platykurtotic. The skewness was normal and the kurtosis minimal. Tabachnick and Fidell (2001, p74) suggest that with a sample of over 200, underestimates of the variance disappear and the impact of kurtosis is diminished, therefore no transformation was applied and the original variable will be used in subsequent analysis.

Table 7.3 Statistical characteristics of intention (n = 218)

	Range	Mean (SD)	Median	Skewness/$SE_{Skewness}$ (z)	Kurtosis/$SE_{Kurtosis}$ (z)
Intention	3 - 21	10.70 (5.59)	11.00	.176/ .165 (1.07)	-1.134/.328 (-3.46)*

*$p \leq .001$ two-tailed ($z \geq 3.29$)

7.2.iv Direct determinants of intention

According to the RTPB (Maddux 1993) there are four direct determinants of intention. These are self-efficacy, attitude to new behaviour, attitude to current behaviour and subjective norm. Exploratory analysis of each of these will be considered in turn.

7.2.iv.1 Self-efficacy

'Self-efficacy' was measured by three items (section 4.2.iv.1). Internal reliability was moderate for the scale of these items (α = .66). Low reliability is not uncommon in scales with few items (Pallant 2001, for example see Moyle 1995) and the scale will be used in subsequent analysis. The scores for self-efficacy were towards the lower end of the range indicating that women tended to believe that they could do the exercises correctly (Table 7.4). The data was not normally distributed. As most respondents believed they could do the exercises correctly, the data was positively skewed. A square root transformation was applied to the data ($X_{new} = \sqrt{X_{old}}$) which reduced the skewness to an acceptable level for analysis.

Table 7.4 Statistical characteristics of the direct determinants of intention: 'self-efficacy' (untransformed and transformed) (n = 237)

	Range	Mean (SD)	Median	Skewness/$SE_{Skewness}$ (z)	Kurtosis/$SE_{Kurtosis}$ (z)
Self-efficacy for new behaviour	3 - 20	7.35 (3.75)	7.00	.768/ .158 (4.86)*	-.037/.315 (-.12)
Self-efficacy for new behaviour (square root transformation)	1.73 – 4.47	2.63 (.68)	2.65	.360/ .158 (2.28)	-.815/ .315 (-2.59)

*$p \leq .001$ two-tailed ($z \geq 3.29$)

7.2.iv.2 Attitude to new behaviour

There were 7 items assessing the beliefs of the woman regarding the practice of pelvic floor exercises (section 4.2.v.1). This 7-item scale had good internal reliability (α = .84) and the mean score indicated that the general attitude to the exercises was positive (Table 7.5). Consequently the data showed a marked positive skew. Application of a logarithmic transformation (X_{new} = log X_{old}) reduced the skewness to within normal limits.

Table 7.5 Statistical characteristics of the direct determinants of intention: 'attitude to new behaviour' (untransformed and transformed) (n = 218)

	Range	Mean (SD)	Median	Skewness/$SE_{Skewness}$ (z)	Kurtosis/$SE_{Kurtosis}$ (z)
Attitude to new behaviour	7 - 42	16.5 (7.3)	15.00	.999/ .165 (6.05)*	.685/ .328 (2.09)
Attitude to new behaviour (log transformation)	.85 – 1.62	1.18 (.18)	1.18	.175/ .165 (1.06)	-.767/ .328 (-2.34)

*$p \leq .001$ two-tailed ($z \geq 3.29$)

7.2.iv.3 Attitude to current behaviour

The two items measuring 'attitude to current behaviour' (section 4.2.vi.1) were significantly correlated ($r = .59$, $p < .001$). The high mean score for 'attitude to the current behaviour' indicated that women tended to rate the chance of becoming incontinent after delivery as slightly low (a high score indicating a low likelihood of the outcome) (Table 7.6). Tests of normality indicated that the item was normally distributed and will be used in further analysis.

Table 7.6 Statistical characteristics of the direct determinants of intention: 'attitude to current behaviour' (n = 234)

	Range	Mean (SD)	Median	Skewness/$SE_{Skewness}$ (z)	Kurtosis/$SE_{Kurtosis}$ (z)
Attitude to current behaviour	2 - 14	9.23 (3.03)	9.00	-.179/ .159 (-1.13)	-.468/ .317 (-1.48)

7.2.iv.4 Subjective norm

A single item measured the belief about the attitude of others to the woman performing pelvic floor exercises (section 4.2.vii.1). This measure of 'subjective norm' was neutral, and was normally distributed (Table 7.7). The original data will be used in further analysis.

Table 7.7 Statistical characteristics of the direct determinants of intention: 'subjective norm' (n = 240)

	Range	Mean (SD)	Median	Skewness/$SE_{Skewness}$ (z)	Kurtosis/$SE_{Kurtosis}$ (z)
Subjective norm	1 - 7	3.56 (1.82)	4.00	.191/ .157 (1.22)	-.919/ .313 (-2.94)

7.2.v Indirect determinants

In order to explain each proximal (or direct) determinant of 'intention', belief-based measures (or indirect determinants) were also included. These were described more fully in Chapter 4. For each of these indirect determinants the scores from two items were multiplied together. One question asked the respondent to make an assessment of a belief about the concept being measured. The other gave a weighting or power to that concept. All individual items scored 1 to 7; hence the multiplicative measures could score from 1 to 49 (1 x 1 to 7 x 7). To form a scale for each construct the multiplicative items were summed.

A number of authors have noted that there are problems with the analysis of variables formed when products are summed (Evans 1991; Lauver and Knapp 1993). For this reason, although internal reliability of the sum of the products in each of the following sections is reported, the summed scale will not be used in subsequent analysis.

7.2.v.1 Indirect determinants of self-efficacy

There were three belief-based determinants of 'self-efficacy'; general difficulty with doing the exercises, difficulty of remembering to do the exercises and time required to do the exercises (section 4.2.iv.2). For each of these a statement relating to the inhibiting factor (or control belief) (c) was multiplied by a statement evaluating the perceived power of that concept (p). The sum of these three products showed moderate reliability (α = .54), a reasonable result considering the low number of items in the scale. The scores for difficulty of doing the exercises and difficulty remembering to do the exercises were both low, suggesting that women were not put off doing the exercises by either of these factors (Table 7.8). The measure assessing time was nearer the mid-point indicating that the exercises were not perceived as being time-consuming.

The first two measures (difficulty and remembering) were moderately positively skewed, so a logarithmic transformation was applied to correct the skew. The transformed data for difficulty and remembering will subsequently be used. The measure relating to time was normally distributed and no transformation was required.

Table 7.8 Statistical characteristics of the indirect determinants: 'self-efficacy' (untransformed and transformed)

Likelihood of practising the exercises if they:	N	Range	Mean (SD)	Median	Skewness/$SE_{Skewness}$ (z)	Kurtosis/$SE_{Kurtosis}$ (z)
Were difficult to do (c x p)	224	1 – 49	15.95 (12.48)	12.00	1.013/ .163 (6.21)*	.244/ .324 (.75)
Were difficult to remember (c x p)	231	1 – 49	14.17 (12.04)	10.00	.988/ .160 (6.18)*	.300/ .319 (.94)
Took up a lot of time (c x p)	234	1 – 49	22.03 (14.23)	20.00	.458/ .159 (2.88)	-.808/ .317 (-2.55)
Were difficult to do (c x p) (log transformation)	224	1 - 7	3.68 (1.54)	3.46	.361/ .163 (2.22)	-.716/ .324 (-2.21)
Were difficult to remember (c x p) (log transformation)	231	1 - 7	3.40 (1.62)	3.16	.285/ .160 (1.78)	-.871/ .319 (-2.73)

*$p \leq .001$ two-tailed ($z \geq 3.29$)

7.2.v.2 Indirect determinants of 'attitude to new behaviour'

Five indirect determinants of 'attitude to new behaviour' were included (section 4.2.v.2). For each, one statement assessed the belief held about pelvic floor exercises in relation to that concept (bn) while another statement evaluated the importance of that belief (en). The two corresponding statements were multiplied. Two out of the five concepts related to perceived negative beliefs (pain and discomfort of the exercises) while three related to perceived positive outcomes (two about improving the delivery and one about the sex life). Cronbach's alpha for the scale produced by the sum of these products was .62. The negative beliefs will be considered first, followed by the perceived positive outcomes.

Table 7.9 gives the mean scores for each of the negative determinants of 'attitude to the new behaviour'. The low scores indicate that if pelvic floor exercises were perceived to cause discomfort or pain then the practice of the exercises would be less likely. The low scores led to both variables being positively skewed. This required logarithmic transformations to ensure sufficient normality for further analysis.

Table 7.9 Statistical characteristics of the indirect determinants: negative beliefs relating to 'attitude to new behaviour'

Likelihood of practising the exercises if they:	**n**	**Range**	**Mean (SD)**	**Median**	**Skewness/$SE_{Skewness}$ (z)**	**Kurtosis/$SE_{Kurtosis}$ (z)**
Caused discomfort (bn x en)	229	1 - 49	11.03 (9.25)	7.0	1.763/ .161 (10.95)*	3.375/ .320 (10.55)*
Caused pain (bn x en)	227	1 - 49	9.18 (8.11)	7.0	2.419/ .162 (14.93)*	6.749/ .322 (20.96)*
Caused discomfort (bn x en) (log transformation)	229	.00 – 1.69	.91 (.35)	.85	-.134/ .094 (-.83)	.094/ .320 (.29)
Caused pain (bn x en) (log transformation)	227	.00 – 1.69	.84 (.31)	.85	.227/ .162 (1.40)	.698/ .322 (2.17)

*$p \leq .001$ two-tailed ($z \geq 3.29$)

The statements about positive outcomes also had low mean scores (Table 7.10). This suggests that a belief in pelvic floor exercises making the delivery easier, or helping to make the muscles of the pelvic floor stretch at delivery or making sex more enjoyable after delivery would all make the practice of pelvic floor exercises more likely.

As all these variables had low mean scores, the data for each was substantially skewed in a positive direction as well as being leptokurtotic. Logarithmic transformations improved the distribution of the data for each variable to within normal limits.

Table 7.10 Statistical characteristics of the indirect determinants: positive beliefs relating to 'attitude to new behaviour' (untransformed and transformed)

Likelihood of practising the exercises if they:	n	Range	Mean (SD)	Median	Skewness/$SE_{Skewness}$ (z)	Kurtosis/$SE_{Kurtosis}$ (z)
Made the delivery easier (bn x en)	232	1 - 30	5.78 (4.72)	4.0	1.884/ .160 (11.78)*	4.85/ .318 (15.25)*
Made the pelvic floor muscles stretch at delivery (bn x en)	226	1 - 30	4.95 (4.42)	4.0	2.074/ .162 (12.80)*	5.768/ .322 (17.91)*
Made sex after delivery more enjoyable (bn x en)	226	1 - 49	10.17 (9.78)	7.0	1.748/ .162 (10.79)*	3.256/ .322 (10.11)*
Made the delivery easier (bn x en) (log transformation)	232	.00 – 1.48	.63 (.35)	.60	-.135/ .160 (-.84)	-.485/ .318 (-1.53)
Made the pelvic floor muscles stretch at delivery (bn x en) (log transformation)	226	.00 – 1.48	.55 (.36)	.60	.015/ .162 (.093)	-.694/ .322 (-2.16)
Made sex after delivery more enjoyable (bn x en) (log transformation)	226	.00 – 1.69	.81 (.44)	.85	-.216/ .162 (-1.33)	-.700/ .322 (-2.17)

*$p \leq .001$ two-tailed ($z \geq 3.29$)

7.2.v.3 Indirect determinants of attitude to current behaviour

The belief-based measures of 'attitude to the current behaviour' focussed on an outcome evaluation of postnatal incontinence (see section 4.2.vi.2). Two beliefs about being incontinent were measured: embarrassment and being unhygienic. For each, two degrees of severity of incontinence were assessed (leaking a few drops of urine and being soaked with urine). There were therefore four belief statements (bc) which were multiplied by the corresponding evaluation statements (ec). The alpha for the scale of these four multiplicative items was .85. In this section the data for these four multiplicative items will be examined; first the two relating to embarrassment, then the two about hygiene.

The scores for both the multiplicative items about embarrassment were low, indicating that most women thought that being incontinent would be embarrassing and was something they wanted to avoid (Table 7.11). The statement regarding being soaked with urine had a lower score than the statement about leaking a few drops of urine. Clearly being soaked with urine was regarded as being more embarrassing than leaking a few drops of urine.

Table 7.11 Statistical characteristics of the indirect determinants of 'attitude to current behaviour': embarrassment

Likelihood of trying to avoid incontinence after delivery if it was:	n	Range	Mean (SD)	Median	Skewness/$SE_{Skewness}$ (z)	Kurtosis/$SE_{Kurtosis}$ (z)
Embarrassing (small amount of leakage) (bc x ec)	239	1 - 49	10.64 (10.61)	8.0	1.550/ .157 (9.87)*	2.121/ .314 (6.76)*
Embarrassing (lot of leakage) (bc x ec)	238	1 - 49	8.31 (9.82)	4.0	1.957/ .158 (12.39)*	3.549/ .314 (11.30)*
Embarrassing (small amount of leakage) (bc x ec) (log transformation)	239	.00 – 1.69	.79 (.49)	.9	-.222/ .157 (-1.41)	-.975/ .314 (-3.11)
Embarrassing (lot of leakage) (bc x ec) (log transformation)	238	.00 – 1.69	.65 (.50)	.6	.166/ .158 (1.50)	-1.07/ .314 (-3.39)*

*$p \leq .001$ two-tailed ($z \geq 3.29$)

Both measures were positively skewed and leptokurtotic; these violations of the assumptions of normality were addressed by logarithmic transformations. The transformation of the multiplicative item relating to embarrassment at leaking a lot of urine remained slightly kurtotic. As the sample size is over 200, the transformed variable will be used in subsequent analysis in spite of the slight kurtosis (Tabachnick and Fidell 2001, p74).

Next the statements about hygiene were considered. Mean scores for these were both low suggesting that the majority of women considered the unhygienic aspects of being incontinent problematic (Table 7.12). Leaking a lot of urine was considered more unhygienic than leaking a few drops of urine. Once again the low mean scores led to very positively skewed and leptokurtotic data. Logarithmic transformations corrected these problems sufficiently to allow further analysis using the transformed data.

Table 7.12 Statistical characteristics of the indirect determinants of 'attitude to current behaviour': hygiene

Likelihood of trying to avoid incontinence after delivery if it was:	n	Range	Mean (SD)	Median	Skewness/$SE_{Skewness}$ (z)	Kurtosis/$SE_{Kurtosis}$ (z)
Unhygienic (small amount of leakage) (bc x ec)	237	1 - 42	6.09 (6.55)	4.0	2.353/ .158 (14.89)*	7.230/ .315 (22.95)*
Unhygienic (lot of leakage) (bc x ec)	230	1 - 42	5.58 (6.04)	4.0	2.332/ .160 (14.58)*	7.525/ .320 (23.52)*
Unhygienic (small amount of leakage) (bc x ec) (log transformation)	237	.00 – 1.62	.58 (.43)	.6	.150/ .158 (.949)	-.953/ .315 (-3.03)
Unhygienic (lot of leakage) (bc x ec) (log transformation)	230	.00 – 1.62	.53 (.43)	.6	.217/ .160 (1.36)	-1.05/ .320 (-3.27)

*$p \leq .001$ two-tailed ($z \geq 3.29$)

7.2.v.4 Indirect determinants of subjective norm

For an explanation of the determinants of the general measure of whether the respondent believed other people thought she should do pelvic floor exercises, belief-based measures relating to four different significant others were included (partner, family, midwife and doctor) (see section 4.2.vii.2). For each significant other, the woman gave her assessment of their opinion about her performing pelvic floor exercises (nb). This was multiplied by her assessment of the importance of complying with that referent's view (mc). The internal reliability of the scale of these four items was .69.

The mean scores for the multiplicative measure for each significant other were low suggesting that if the woman believed that any of these referents thought that pelvic floor exercises were a good thing to do, she would be likely to say that she would comply (Table 7.13).

Table 7.13 Statistical characteristics of the indirect determinants of subjective norm

Likelihood of complying with the opinion of:	n	Range	Mean (SD)	Median	Skewness/$SE_{Skewness}$ (z)	Kurtosis/$SE_{Kurtosis}$ (z)
Partner (nb x mc)	219	1 - 49	9.09 (9.18)	6.0	1.998/ .164 (12.18)*	4.81/ .327 (14.71)*
Family (nb x mc)	229	1 - 49	11.62 (10.31)	8.0	1.406/ .161 (8.73)*	1.564/ .320 (4.89)*
Midwife (nb x mc)	222	1 - 36	4.81 (5.87)	3.0	2.843/ .163 (17.44)*	9.655/ .325 (29.71)*
Doctor (nb x mc)	219	1 - 28	4.75 (4.67)	3.0	1.864/ .164 (11.37)*	4.047/ .327 (12.37)*
Partner (nb x mc) (transformed)	219	.00 – 1.69	.75 (.45)	.78	-.156/ .164 (-.951)	-.819/ .327 (-2.505)
Family (nb x mc) (transformed)	229	.00 – 1.69	.88 (.44)	.90	-.420/ .161 (-2.609)	-.421/ .320 (-1.316)
Midwife (nb x mc) (transformed)	222	.00 – 1.59	.46 (.42)	.48	.460/ .163 (2.822)	-.769/ .325 (-2.366)
Doctor (nb x mc) (transformed)	219	.00 – 1.45	.49 (.41)	.48	.185/ .164 (1.128)	-1.137/ .327 (-3.447)*

*$p \leq .001$ two-tailed ($z \geq 3.29$)

The means of measures relating to health professionals were lower than those for family and partner, indicating that health professionals would be more influential than family members in persuading women to practise the exercises. The low scores led to substantial positive skew and kurtosis for each variable. This was corrected by logarithmic transformations. Some kurtosis remained in the measure relating to the doctor, however the transformed data will be used in further analysis.

7.2.vi Additional measures

As proposed by the model, the initial cognitive prompts that may lead an individual to decide to perform a particular behaviour are termed 'cues to decision'. With repeated practice of the behaviour a routine is likely to become established. Habit theory (Ronis et al. 1989; Maddux 1993) proposes that initiation of the behaviour will then change from being a conscious decision to being triggered by a situational cue (or 'cue to action'). In order to determine the role of habit in the practice of pelvic floor exercises and to find out which situational and habitual cues are important, a number of statements were included in the questionnaire to assess these concepts, as described below.

7.2.vi.1 Cues to decision

Seven different prompts (people or situations) were included in the questionnaire that might trigger or influence the decision to practise pelvic floor exercises. The mean score for each item is reported in Table 7.14. For most of the items the mean score was close to the mid-point of 4, suggesting that there was no clear consensus about the role of these cues in the decision-making process. The statements which related to being told by the physiotherapist or midwife to do the exercises had the lowest mean scores (most agreement with the statement), while the one about being told by the doctor indicated the most disagreement.

The z scores were examined to assess the normality of the data. Three variables (being told by the doctor, leaking urine oneself and hearing about others wetting themselves) had slight positive kurtosis. As the sample size is greater than 200 the data will be used in subsequent analysis (Tabachnick and Fidell 2001).

Table 7.14 Statistical characteristics of measures of 'cues to decision'

I decide to do pelvic floor exercises when…	n	Range	Mean (SD)	Median	Skewness/$SE_{Skewness}$ (z)	Kurtosis/$SE_{Kurtosis}$ (z)
Told by doctor	230	1 - 7	4.29 (2.03)	4.0	-.175/ .160 (-1.094)	-1.120/ .320 (-3.500)*
Told by midwife	229	1 – 7	3.47 (1.97)	3.0	.403/ .161 (2.503	-.956/ .320 (-2.988)
Told by physio	230	1 – 7	3.38 (2.00)	3.0	.476/ .160 (2.975)	-.948/ .320 (-2.963)
Told by someone else	229	1 – 7	3.88 (1.84)	4.0	.227/ .161 (1.410)	-.861/ .320 (-2.691)
Read about doing them	235	1 – 7	3.70 (1.99)	4.0	.343/ .159 (2.157)	-1.016/ .316 (-3.215)
I leak urine myself	224	1 – 7	4.14 (2.13)	4.0	-.019/ .163 (-.167)	-1.302/ .324 (-4.019)*
I hear about others wetting themselves	229	1 – 7	3.77 (2.07)	4.0	.206/ .161 (1.280)	-1.239/ .320 (-3.872)*

*$p \leq .001$ two-tailed ($z \geq 3.29$)

These 7 items were summed to form a scale for 'cues to decision' (Table 7.15). This scale had good internal reliability ($\alpha = .81$) and was normally distributed.

Table 7.15 Statistical characteristics of the 'cues to decision' scale

	n	Range	Mean (SD)	Median	Skewness/$SE_{Skewness}$ (z)	Kurtosis/$SE_{Kurtosis}$ (z)
Cues to decision (7)	187	7 - 49	26.97 (9.59)	26.0	.155/ .178 (.871)	-.485/ .345 (-1.370)

*$p \leq .001$ two-tailed ($z \geq 3.29$)

7.2.vi.2 Repetition/routine

There were three items included in the questionnaire asking women to assess whether they were into a routine for the practice of the exercises. The sum of these three items had good internal reliability ($\alpha = .76$) (Table 7.16). The mean score for the scale was slightly above the mid-point of the range suggesting that women tended to disagree with the concept that a routine was helpful in doing the exercises.

Table 7.16 Statistical characteristics of the 'repetition/routine' scale

	n	Range	Mean (SD)	Median	Skewness/$SE_{Skewness}$ (z)	Kurtosis/$SE_{Kurtosis}$ (z)
Repetition/ routine (3)	213	3 - 21	14.60 (4.50)	15.0	-.335/ .167 (-2.006)	-.763/ .332 (-2.298)

*p ≤ .001 two-tailed (z ≥ 3.29)

7.2.vi.3 Cues to action

Five statements were included in the questionnaire relating to places or factors that might act as triggers to the practice of pelvic floor exercises. Table 7.17 gives the mean scores for each. With the exception of 'doing the dishes' which indicated disagreement with the statement, all were close to the mid-point suggesting women were equivocal about the role of these cues in the practice of the exercises. One item was slightly positively skewed, and three were slightly kurtotic, however transformations were not applied, as the violations were not serious and the sample size sufficient.

Table 7.17 Statistical characteristics of measures of 'cues to action'

I remember to do pelvic floor exercises	n	Range	Mean (SD)	Median	Skewness/$SE_{Skewness}$ (z)	Kurtosis/$SE_{Kurtosis}$ (z)
Whenever I go to the toilet	232	1 - 7	3.95 (2.08)	4.0	.067/ .160 (.419)	-1.246/ .318 (-3.918)*
Because I am aware I am pregnant	226	1 – 7	3.77 (1.97)	4.0	.225/ .162 (1.389)	-1.060/ .322 (-3.292)
While I am watching TV	231	1 – 7	3.94 (1.97)	4.0	.129/ .160 (.806)	-1.072/ .319 (-3.361)*
When I am in bed	230	1 – 7	4.13 (2.09)	4.0	-.062/ .160 (-.388)	-1.312/ .320 (-4.100)*
While I am washing the dishes	227	1 - 7	4.96 (1.97)	6.0	-.536/ .162 (-3.309)*	-1.013/ .322 (-3.146)

*p ≤ .001 two-tailed (z ≥ 3.29)

The sum of these five items formed a scale for cues to action which had good internal reliablity ($\alpha = .83$) (Table 7.18). The scale of the five items was normally distributed.

Table 7.18 Statistical characteristics of the cues to action scale

	n	Range	Mean (SD)	Median	Skewness/$SE_{Skewness}$ (z)	Kurtosis/$SE_{Kurtosis}$ (z)
Cues to action (5)	211	5 - 35	20.49 (7.76)	20.0	.163/ .167 (.976)	-.619/ .333 (-1.859)

7.2.vi.4 Planning

One item in the questionnaire asked the women if they planned to do pelvic floor exercises. The mean score for planning to do the exercises pointed towards slight agreement with the statement (Table 7.19). The measure was slightly kurtotic but the data was not transformed as the violation was minor.

Table 7.19 Statistical characteristics of the measure of planning

	n	Range	Mean (SD)	Median	Skewness/$SE_{Skewness}$ (z)	Kurtosis/$SE_{Kurtosis}$ (z)
Planning (1)	223	1 - 7	3.44 (2.02)	3.0	.326/ .163 (2.000)	-1.101/ .324 (-3.398)*

*$p \leq .001$ two-tailed ($z \geq 3.29$)

7.2.vi.5 Past behaviour

In order to assess whether the practice of pelvic floor exercises in the past was associated with current behaviour, all women were asked about their behaviour before the current pregnancy. The mean score for this measure was high indicating that women tended to disagree with the statement (Table 7.20). Thus it seems that generally women were not in the habit of practising pelvic floor exercises before the index pregnancy. To correct the negative skew, the data was reflected and a logarithmic transformation carried out ($X_{new} = \log (8 - X_{old})$. Although the resulting variable had slight negative kurtosis it will be used in subsequent analysis.

Table 7.20 Statistical characteristics of the measure of behaviour before the current pregnancy (untransformed and transformed)

Reported practice of pelvic floor exercises:	n	Range	Mean (SD)	Median	Skewness/$SE_{Skewness}$ (z)	Kurtosis/$SE_{Kurtosis}$ (z)
Before current pregnancy	242	1 - 7	5.57 (1.83)	6.0	-1.134/ .156 (-7.269)*	.200/ .312 (.641)
Before current pregnancy (transformed)	242	.00 - .85	.28 (.30)	.30	.495/ .156 (3.173)	-1.290/ .312 (-4.135)*

*$p \leq .001$ two-tailed ($z \geq 3.29$)

Women who had been pregnant before were also asked about their behaviour during and after previous pregnancies. The mean score for each was just above the mid-point (Table 7.21) and the data was normally distributed.

Table 7.21 Statistical characteristics of the measures of behaviour during and after previous pregnancies

Reported practice of pelvic floor exercises:	n	Range	Mean (SD)	Median	Skewness/$SE_{Skewness}$ (z)	Kurtosis/$SE_{Kurtosis}$ (z)
During previous pregnancies	131	1 - 7	4.08 (2.05)	4.0	-.028/ .212 (.132)	-1.163/ .420 (2.769)
Following previous pregnancies	127	1 - 7	3.97 (1.99)	4.0	-.005/ .215 (.023)	-1.122/ .427 (2.628)

In order to create a single measure of past behaviour for parous women relating to previous pregnancies, these two measures were summed. The data for this variable was also normally distributed (Table 7.22).

Table 7.22 Statistical characteristics of the summed measure of 'behaviour during and after previous pregnancies'

Reported practice of pelvic floor exercises:	n	Range	Mean (SD)	Median	Skewness/$SE_{Skewness}$ (z)	Kurtosis/$SE_{Kurtosis}$ (z)
During and after previous pregnancies	127	2 - 14	8.02 (3.63)	8.0	-.052/ .215 (-.242)	-.896/ .427 (-2.098)

7.2.vi.6 Response efficacy

Two of the seven items measuring the ‘attitude to new behaviour’ (see section 7.2.iv.2) assessed whether the woman thought that the practice of pelvic floor exercises during pregnancy would be effective in preventing the development of postnatal incontinence. As with other items in the questionnaire relating to incontinence two levels of incontinence were assessed as it was felt that opinions might differ depending on the definition of incontinence. So one statement related to pelvic floor exercises preventing the woman leaking a few drops of urine after delivery (M = 2.40. SD = 1.68, n = 234), while the other asked about the exercises preventing being soaked with urine (M = 2.81. SD = 1.81, n = 237). Responses to these two statements were added together and analysed separately from the other ‘attitude to new behaviour’ statements. (They were also included in the scale of the direct determinant assessing ‘attitude to new behaviour’).

The mean score for response efficacy was low (Table 7.23) suggesting that most women agreed that pelvic floor exercises would be effective in the prevention of postnatal incontinence. This led to the data being highly positively skewed. A square root transformation ($X_{new} = \sqrt{X_{old}}$) reduced the skewness to within normal limits

Table 7.23 Statistical characteristics of the measure of response efficacy (untransformed and transformed)

	n	Range	Mean (SD)	Median	Skewness/$SE_{Skewness}$ (z)	Kurtosis/$SE_{Kurtosis}$ (z)
Response efficacy	228	2 - 14	5.22 (3.05)	5.0	.942/ .161 (5.851)*	.329/ .321 (1.025)
Response efficacy (transformed)	228	1.41 – 3.74	2.19 (.65)	2.24	.460/ .161 (2.857)	-.676/ .321 (2.106)

*$p \leq .001$ two-tailed ($z \geq 3.29$)

7.2.vii Multidimensional health locus of control (MHLC)

The reliability of each of the MHLC sub-scales (Wallston et al. 1978) was assessed using Cronbach's alpha. The Internal health locus of control scale gave a reliability of .65, the Chance scale .67 and the Powerful Others health locus of control scale .66.

Each sub-scale had a range of between 6 and 36. The mean scores for each scale are given in (Table 7.24). The pregnant women in this sample scored moderate on the Internal scale and low on the Chance and Powerful Others scales. The Internal scale was slightly negatively skewed but data transformations were not applied, as the violation was minor and the sample size sufficient. Future analysis was carried out using these variables.

Table 7.24 Statistical characteristics of the measures of the MHLC sub-scales

	n	Range	Mean (SD)	Median	Skewness/$SE_{Skewness}$ (z)	Kurtosis/$SE_{Kurtosis}$ (z)
Internal scale	237	11 - 35	25.49 (4.60)	26	-.579/ .158 (-3.665)*	.369/ .315 (1.171)
Chance scale	236	6 - 33	17.61 (5.51)	18	.034/ .158 (.215)	-.534/ .316 (-1.690)
Powerful Others scale	245	6 - 34	16.31 (5.74)	16	.417/ .156 (2.673)	-.105/ .310 (-.339)

*$p \leq .001$ two-tailed ($z \geq 3.29$)

There was no relationship between the Internal health locus of control scale and either of the other two sub-scales (Table 7.25), however there was a significant correlation between the Chance and Powerful Others scales.

Table 7.25 Relationship between the MHLC sub-scales (Pearson's r)

	Internal scale	Chance scale
Chance scale	-.09	
Powerful Others scale	.01	.44*

*$p < .01$

7.2.viii Health value scale (HV)

The internal reliability of the four-item health value scale (Lau et al. 1986) was .39. This level of reliability is too low to have confidence that in this sample the items were measuring similar concepts, and the scale is not used in subsequent analysis.

7.3 Relationships within the RTPB model

The following sections use the variables described in sections 7.2.iv and 7.2.v to explore the relationship between the RTPB model and intention to practise pelvic floor exercises. Further analysis will investigate the relationship between these direct determinants and the indirect determinants.

7.3.i Direct determinants of intention

The model proposed by Maddux (1993) suggests that ‘intention’ will be determined by ‘self-efficacy’, ‘attitude to new behaviour’, ‘attitude to current behaviour’ and ‘subjective norm’. In this section multiple regression analysis will be performed using these independent variables to explain the dependent variable, ‘intention’.

As described previously the data was first screened for normality and transformations of non-normal data carried out. Multiple regression requires that the independent variables should not be highly correlated (Pearson’s r below .7) and that there should be some relationship between each independent variable and the dependent variable (Pearson’s r at least .3) (Pallant 2001). Table 7.26 and Figure 7 give the inter-correlation between variables. There was a strong and reliable positive correlation between ‘intention’ and ‘self-efficacy’$_{(\text{sq root tranf})}$, ‘attitude to new behaviour’$_{(\text{log transf})}$ and ‘subjective norm’, as predicted by the model. ‘Self–efficacy’$_{(\text{sq root tranf})}$ was highly correlated with ‘attitude to new behaviour’$_{(\text{log transf})}$, and moderately correlated with ‘subjective norm’. ‘Attitude to new behaviour’$_{(\text{log transf})}$ was highly correlated with ‘subjective norm’. None of the inter-

correlations between the dependent variables was over .7, suggesting that there was no multicollinearity between the independent variables (Tabachnick and Fidell 2001).

'Attitude to the current behaviour' had no relationship with any of the other measures, including 'intention'. In other words, perceived vulnerability to postnatal incontinence (which women generally rated as being unlikely) was unrelated to any of the measures about pelvic floor exercises. It had no relationship with whether women thought they could do the exercises, whether they thought other people wanted them to do the exercises, or if they intended to do the exercises. This variable was not therefore entered into the regression equation.

Table 7.26 Relationship between direct determinants and intention in the RTPB model (Pearson's r)

	Intentions	**Self-efficacy$_{(sq\ root\ tranf)}$**	**Attitude to new behaviour$_{(log\ transf)}$**	**Attitude to current behaviour**
Self-efficacy$_{(sq\ root\ tranf)}$	.53**			
Attitude to new behaviour$_{(log\ transf)}$	.68**	.62**		
Attitude to current behaviour	-.02	-.09	.14*	
Subjective norm	.56**	.33**	.55**	.10

* p < .05; ** p < .0005

Standard multiple regression was performed using SPSS Regression with 'intention' as the dependent variable. As no prediction could be made about the order of importance, 'self-efficacy'$_{(sq\ root\ tranf)}$, 'attitude to the new behaviour'$_{(log\ transf)}$, and 'subjective norm' were entered simultaneously as independent variables. To account for missing values, cases were excluded on a pairwise basis as suggested by Pallant (2001). Multivariate outliers were checked using the Mahalanobis distances. None exceeded the critical value of 16.27 for three independent variables (p < .001 criterion) (Pallant 2001) indicating that there were no multivariate outliers. Collinearity diagnostics performed on the coefficients revealed that the tolerance did not approach 0 for any of the variables, confirming that the assumption of non-multicollinearity was not violated. Inspection of the normal probability plot of the regression standardised residuals indicated no major deviation from normality. The scatterplot of the regression standardised residuals also confirmed the absence of outlying residuals.

The results of the regression are presented in Table 7.27. All the independent variables made a unique and statistically significant contribution to the explanation of intention. Squared semi-partial correlations (sr^2) in Table 7.27 indicate the amount of variance each independent variable uniquely contributes to the explained variance of the dependent variable. Together the three variables contributed another 38% to the shared variance. Altogether the model explained 53.1% of the variance in 'intention' (52.4% adjusted). The leading determinant of intention was 'attitude to the new behaviour' followed by 'subjective norm' and 'self-efficacy'.

Table 7.27 Standard multiple regression explaining intention from 'self-efficacy'$_{\text{(sq root tranf)}}$, 'attitude to the new behaviour'$_{\text{(log transf)}}$, and 'subjective norm'.

	Unstandardised β	β	t	sr^2	p
Self-efficacy $_{\text{(sq root tranf)}}$	1.55	.19	3.04	.02	.003
Attitude to new behaviour$_{\text{(log transf)}}$	12.39	.41	5.87	.08	< .0005
Subjective norm	.85	.28	4.80	.05	< .0005

Intercept =-1.10; R = .729; R^2 = .531; Adjusted R^2 = .524; F(3, 202) = 76.29; p < .0005

7.3.ii Indirect determinants

To test the rest of the RTPB model and find out which predeterminants of behaviour might be targeted in order to encourage more women to practise the exercises, an explanatory analysis was carried out. The following sections (7.3.ii.1 to 7.3.ii.4) describe the relationships between the belief-based measures and the direct determinants within each section of the RTPB model. Correlation will be used to explore the relationship between the indirect determinants, as well as between each indirect determinant and the dependent direct measure. Regression will then be carried out using the direct measure as the dependent variable, and the belief-based determinants as the independent variables to understand more clearly the variable with the strongest relationship with each construct.

7.3.ii.1 Indirect determinants of 'self efficacy'

The indirect measures of 'self-efficacy' that were included assessed whether the following factors would be deterrents: difficulty of pelvic floor exercises, difficulty of remembering to do the exercises and the time consuming nature of doing the exercises (see section 4.2.iv.2). These variables had all previously been screened for normality, and transformations carried out as appropriate.

The inter-correlation between all the independent variables and the dependent variable is given in Table 7.28. There was moderate correlation between the direct measure of 'self-efficacy'$_{\text{(sq root tranf)}}$ and both concepts of the exercises being 'difficult to do'$_{\text{(log transf)}}$ and 'difficult to remember'$_{\text{(log transf)}}$ (Table 7.28). The issue of whether the exercises 'took up a lot of time' had weak correlation with 'self-efficacy'$_{\text{(sq root tranf)}}$ (below .3), and was not entered into the regression model. There was moderate correlation between each of the indirect measures, with the strongest relationship being between 'difficult to do'$_{\text{(log transf)}}$ and 'difficult to remember'$_{\text{(log transf)}}$. No inter-correlation between the independent variables exceeded .7, confirming that multi-collinearity was unlikely to be a problem.

Table 7.28 Relationship between the indirect determinants of 'self-efficacy' and with 'self-efficacy'$_{\text{(sq root tranf)}}$ (Pearson's r)

Likelihood of practising the exercises if they:	Self-efficacy$_{\text{(sq root tranf)}}$	Were difficult to do (c x p)$_{\text{(log transf)}}$	Were difficult to remember (c x p)$_{\text{(log transf)}}$
Were difficult to do (c x p)$_{\text{(log transf)}}$	.38**		
Were difficult to remember (c x p)$_{\text{(log transf)}}$	.36**	.52**	
Took up a lot of time (c x p)	.14*	.23**	.38**

* p < .05; **p < .0005

Standard multiple regression was then used to investigate how much the multiplicative items independently explained the variance in 'self-efficacy'. Both independent variables were entered simultaneously. Cases were excluded on a pairwise basis. Using the Mahalanobis distances, no multivariate outliers were identified (critical value 13.82, $p < .001$), and absence of multicollinearity was confirmed by collinearity diagnostics (tolerance well above zero). The scatterplot and the normal probability plot of the regression standardised residuals indicated that the data was normal with no outlying residuals.

Regression revealed that both independent variables ('difficulty of doing the exercises' and the 'difficulty of remembering to do the exercises') made a significant contribution to explaining the variance in self-efficacy (Table 7.29). Squared semi-partial correlations (sr^2) indicated that the two variables uniquely explained 9% of the variance. The model was a poor fit with only 17.9% (17.1% adjusted) of the total variance being explained.

Table 7.29 Standard multiple regression explaining 'self-efficacy' from indirect measures difficulty and remembering

Likelihood of practising the exercises if they:	Unstandardised β	β	t	sr^2	p
Were difficult to do (c x p) $_{\text{(log transf)}}$	.44	.26	3.57	.05	< .0005
Were difficult to remember (c x p)$_{\text{(log transf)}}$	.32	.23	3.11	.04	.002

Intercept = 1.77; R = .423; R^2 = .179; Adjusted R^2 = .171; F(2, 212) = 23.08; p < .0005

7.3.ii.2 Indirect determinants of 'attitude to new behaviour'

There were five indirect determinants included in the questionnaire that were aimed at finding out what explained a woman's attitude to pelvic floor exercises. Two of these related to negative beliefs (pain and discomfort of the exercises) while three assessed perceived positive outcomes (making the delivery easier and making the pelvic floor muscles stretch at delivery and one about postnatal sex life) (section 4.2.v.2). As has been previously described these independent variables had all been screened for normality and transformed to correct any violations from the normal distribution. Similarly the dependent variable 'attitude to new behaviour' had also been transformed.

Table 7.30 gives the results of the inter-correlation. Each of the independent variables had good correlation with the direct measure of 'attitude to the new behaviour'$_{\text{(log transf)}}$ and each correlation exceeded .3 confirming that there was a relationship between the independent and dependent variables.

Table 7.30 Relationship between the indirect determinants of attitude to new behaviour and 'attitude to new behaviour'$_{\text{(log transf)}}$ (Pearson's r)

Likelihood of practising the exercises if they:	**Attitude to new behaviour$_{\text{(log transf)}}$**	**Caused discomfort (bn x en)$_{\text{(log transf)}}$**	**Caused pain (bn x en)$_{\text{(log transf)}}$**	**Made the delivery easier (bn x en)$_{\text{(log transf)}}$**	**Made the pelvic floor muscles stretch at delivery (bn x en)$_{\text{(log transf)}}$**
Caused discomfort (bn x en) $_{\text{(log transf)}}$	.47**				
Caused pain (bn x en)$_{\text{(log transf)}}$	.45**	.64**			
Made the delivery easier (bn x en)$_{\text{(log transf)}}$	.55**	.22**	.15*		
Made the pelvic floor muscles stretch at delivery (bn x en)$_{\text{(log transf)}}$	.55**	.26**	.14*	.76**	
Made sex after delivery more enjoyable (bn x en)$_{\text{(log transf)}}$	.44**	.22**	.004	.37**	.37**

*p < .05, **p < .01

Between the indirect determinants of 'attitude to new behaviour' there was good correlation between the items concerning negative outcomes (discomfort and pain) (r = .64). Similarly the two statements relating to making the delivery easier were highly correlated (r = .76). As a correlation above .7 violates the assumption of multicollinearity, only the first (about making the delivery easier) was entered into the regression equation. There was moderate correlation between each of the delivery statements and the one relating to sex (all three being concerned with positive outcome evaluations). However there was a weak relationship between any of the positive statements and any of the negative statements.

Table 7.31 shows the results of the regression equation to explain 'attitude to new behaviour'. The independent variables were entered simultaneously and missing values excluded on a pairwise basis. One multivariate outlier was detected with a Mahalanobis distance above the critical value of 18.47 ($p < .001$). Case 132 was deleted for the purposes of this analysis.[1] Collinearity diagnostics indicated that there was no multicollinearity and no major deviation from normality.

Table 7.31 Standard multiple regression explaining 'attitude to new behaviour' from indirect measures discomfort, pain, making delivery easier and improving postnatal sex

Likelihood of practising the exercises if they:	**Unstandardised β**	**β**	**t**	**sr^2**	**p**
Caused discomfort (bn x en) $_{\text{log transf}}$	.11	.20	2.97	.02	.003
Caused pain (bn x en)$_{\text{(log transf)}}$	.13	.22	3.30	.03	.001
Made the delivery easier (bn x en)$_{\text{(log transf)}}$	.22	.41	7.51	.14	< .0005
Made sex after delivery more enjoyable (bn x en)$_{\text{(log transf)}}$	.07	.18	3.24	.03	.001

Intercept = .78; R = .700; R^2 = .490; Adjusted R^2 = .480; $F(4, 205) = 49.52$; $p < .0005$

[1] Case 132 had a very low scores on whether pain of the exercises would be off-putting (suggesting that pain would not be a deterrent), a very low score on likelihood of doing things to make sex more enjoyable after delivery (suggesting that improving the sex life would be a strong incentive to doing pelvic floor exercises), and a very low score on general attitude to pelvic floor exercises (a very positive attitude to the exercises). The other two scores were close to the mean. On multivariate analysis the measures for pain and discomfort distinguished this case from the rest of cases.

The concept that made the greatest unique contribution to explaining ‘attitude to the new behaviour’ related to the exercises helping to make the birth of the baby easier (14%). A further 27.4% of the variance was shared by the four variables together. Perceived pain as a deterrent to practising the exercises contributed slightly more to explaining the variance than perceived discomfort. All the variables made a significant contribution to the model and 49.0% (48.0% adjusted) of the variance was explained.

7.3.ii.3 Indirect determinants of ‘attitude to current behaviour’

The indirect determinants (or belief-based measures) of ‘attitude to current behaviour’ related to an outcome evaluation of postnatal incontinence (see section 4.2.vi.2). Two beliefs about being incontinent were measured: embarrassment and being unhygienic. For each, two degrees of severity of incontinence were assessed (leaking a few drops of urine and being soaked with urine). There were therefore four belief statements (bc) which were multiplied the corresponding evaluation statements (ec). The direct determinant of ‘attitude to current behaviour’ assessed perceived vulnerability to postnatal incontinence. As previously described, these measures were screened for normality and logarithmic transformations applied to correct violations of normality.

The two embarrassment items correlated well together, as did the two hygiene items (Table 7.32). There was moderate correlation between the embarrassment and the hygiene statements. Correlation with the scale of the direct determinants of ‘attitude to current behaviour’$_{\text{(log transf)}}$ (rating the likelihood of postnatal incontinence) found poor correlation for all four indirect determinants, so it was not possible to use a regression model to explain ‘attitude to current behaviour’.

Table 7.32 Relationship between the indirect determinants of attitude to current behaviour and 'attitude to current behaviour'$_{(log\ transf)}$ (Pearson's r)

Likelihood of trying to avoid incontinence after delivery if it was:	'Attitude to current behaviour'$_{(log\ transf)}$	Embarrassing (small amount of leakage) (bc x ec) $_{log\ transf)}$	Embarrassing (lot of leakage) (bc x ec) $_{(log\ transf)}$	Unhygienic (small amount of leakage) (bc x ec) $_{(log\ transf)}$
Embarrassing (small amount of leakage) (bc x ec) $_{log\ transf)}$	.13*			
Embarrassing (lot of leakage) (bc x ec) $_{(log\ transf)}$	.08	.86**		
Unhygienic (small amount of leakage) (bc x ec) $_{(log\ transf)}$	.09	.59**	.59**	
Unhygienic (lot of leakage) (bc x ec) $_{(log\ transf)}$	.04	.54**	.59**	.92**

*p < .05, **p < .01

7.3.ii.4 Indirect determinants of 'subjective norm'

For an explanation of the general measure of whether the respondent believed other people thought she should do pelvic floor exercises (direct determinant), four different significant others were included as indirect determinants (see section 4.2.vii.2). For each significant other, the woman gave her assessment of their opinion about her performing pelvic floor exercises (nb). This was multiplied by her assessment of the importance of complying with that referent (mc). The belief-based measures were corrected for skew and outliers by logarithmic transformations. The direct measure of subjective norm was normally distributed.

Table 7.33 Relationship between the indirect determinants of subjective norm and 'subjective norm' (Pearson's r)

Likelihood of complying with opinion of:	Subjective norm	Partner (nb x mc)$_{(log\ transf)}$	Family (nb x mc)$_{(log\ transf)}$	Midwife (nb x mc)$_{(log\ transf)}$
Partner (nb x mc)$_{(log\ transf)}$	.56**			
Family (nb x mc)$_{(log\ transf)}$	.62**	.67**		
Midwife (nb x mc)$_{(log\ transf)}$	.51**	.49**	.48**	
Doctor (nb x mc)$_{(log\ transf)}$	.47**	.51**	.50**	.73**

*p < .05, **p < .01

All the belief-based measures correlated highly with the direct measure (Table 7.33). There was good correlation between the two statements about relations (partner and family) and good correlation between the two statements about health professionals (midwife and doctor). The correlation between midwife and doctor was .73, above the threshold for multicollinearity so the regression was run twice, first using 'midwife', and then 'doctor'.

Table 7.34 displays the results of the regression model to explain the general measure of 'subjective norm' using 'partner', 'family' and 'midwife'. Inspection of Mahalanobis distances revealed one multivariate outlier with a value above the critical distance of 16.27 ($p < .001$). Case 153 was deleted for this analysis.[2] There was no multicollinearity and no major deviation from normality, as indicated by collinearity diagnostics.

Table 7.34 Standard multiple regression predicting 'subjective norm' from salient referents partner, family and midwife

Likelihood of complying with opinion of:	Unstandardised β	β	t	sr^2	p
Partner (nb x mc)$_{(\text{log transf})}$	.89	.22	2.90	.02	.004
Family (nb x mc)$_{(\text{log transf})}$	1.49	.36	4.78	.06	< .0005
Midwife (nb x mc)$_{(\text{log transf})}$	.99	.23	3.77	.04	< .0005

Intercept = 1.15; R = .678; R^2 = .460; Adjusted R^2 = .451; F(3,200) = 56.70; p < .0005

In the regression model all the independent variables made a significant contribution to explaining subjective norm. The statement about the family made the largest contribution, uniquely contributing 6% of the explained variance. The model explained 46.0% (45.1% adjusted) of the total variance.

[2] Case 153 had a very high score for the measure of likelihood of complying with her partner (suggesting that her partner would have little effect in persuading her to do the exercises), and a low score for the measure of likelihood of complying with her family (indicating her family would be influential in motivating her to practise the exercises). The results of this regression analysis may not generalise to women (such as case 153) whose partners have little influence, while their family has a strong influence.

A similar procedure was followed using ‘partner’, ‘family’ and ‘doctor’ (‘instead of ‘midwife’) as the independent variables, and ‘subjective norm’ as the independent (Table 7.35). Case 153 was again identified as a multivariate outlier (for the same reasons as in the preceding regression) and was deleted for the purposes of this analysis. Collinearity diagnostics confirmed the absence of multicollinearity or major deviations from normality.

Table 7.35 Standard multiple regression explaining ‘subjective norm’ from salient referents partner, family and doctor

Likelihood of complying with opinion of:	**Unstandardised β**	**β**	**t**	**sr^2**	**p**
Partner (nb x mc)$_{(log\ transf)}$	.93	.23	3.04	.03	.003
Family (nb x mc)$_{(log\ transf)}$	1.54	.37	4.81	.07	< .0005
Doctor (nb x mc)$_{(log\ transf)}$	.77	.17	2.69	.02	.008

Intercept = 1.14; R = .665; R^2 = .442; Adjusted R^2 = .433; F(3,197) = 51.95; p < .0005

Although the model was able to explain 44.2% (43.3% adjusted) of the total variance and all the independent variables made a significant contribution, the inclusion of ‘doctor’ rather than ‘midwife’ explained less of the total variance of the general measure of ‘subjective norm’. The measure relating to the ‘doctor’ accounted for 2% of the unique variance, while in the preceding model the ‘midwife’ explained 4%.

7.4 Other relationships with intention

There were a number of additional items included in the survey that were measured because of possible influence on intention and behaviour, as suggested in the literature. These were past behaviour (during and after previous pregnancies, and before the current pregnancy), planning, MHLC and the items relating to habit formation (see sections 7.2.vi to 7.2.vii). The relationship between each of these variables and intention is described in the following sections. Any variable having a significant relationship with intention is used to find out if the explanation of intention could be improved.

7.4.i Relationship between past behaviour and intention

There were three measures of past behaviour. These were assessed by questions asked in the self-completed PFE questionnaire and related to the practice of the exercises before the current pregnancy, and for parous women, during and after previous pregnancies (see 7.2.vi.5). (These measures should be distinguished from the measure of current behaviour, or behaviour during the month before the interview, which was the question asked in the structured interview completed with the researcher.)

Pearson's product moment correlation coefficient was used to assess the relationship between these variables and intention to practise pelvic floor exercises. Each of the measures of past behaviour correlated significantly with intention. Pearson' r between intention and the practice of pelvic floor exercises 'behaviour before the current $\text{pregnancy}_{\text{(reflect and log)}}$', was -.43 ($n = 218$, $p < .0005$).

Only women who had previously been pregnant answered the other two questions relating to behaviour before and after previous pregnancies. There was a significant correlation between intention and carrying out pelvic floor exercises during previous pregnancies ($r = .61$, $n = 118$, $p < .0005$) and between intention and pelvic floor exercises after previous pregnancies ($r = .53$, $n = 117$, $p < .0005$). Similarly the measure created by summing the answers to these two questions correlated highly with intention ($r = .63$, $n = 117$, $p < .0005$).

7.4.ii Planning

A single statement asked women if they planned to do pelvic floor exercises every day during pregnancy. The measure of planning correlated significantly with intention ($r = .84$, $n = 211$, $p < .0005$). The high correlation with the measure of intention suggests that the two measures were assessing the same concept, therefore 'planning' was not included in further analysis.

7.4.iii Relationship between MHLC and intention

Each MHLC sub-scale was correlated with the sum of the intention scores. There was no significant relationship between any of the health locus of control sub-scales and intention to perform pelvic floor exercises (Table 7.36).

Table 7.36 Relationship between reported intention to practise pelvic floor exercises and health locus of control sub-scales (Pearson's r)

Health locus of control sub-scale	Intention (r)	n	p
Internal	- .13	211	.07
Chance	- .008	209	.9
Powerful others	- .04	213	.6

7.4.iv Habit development

As proposed by the model, the initial cognitive prompts that lead an individual to decide to perform a particular behaviour are termed 'cues to decision'. With repeated practice of the behaviour a routine becomes established. Habit theory (Ronis et al. 1989; Maddux 1993) proposes that initiation of the behaviour will then change from being a conscious decision to being triggered by a situational cue (or 'cue to action'). In order to determine the role of habit in the practice of pelvic floor exercises and to find out which situational and habitual cues are important, the relationships between the variables designed to investigate each factor were explored, as described below.

7.4.iv.1 Cues to decision

The relationship between each of the seven cues to decision items with the scale of the repetition/routine items was examined using Pearson's product moment correlation coefficient (Table 7.37). The statement about being told by someone else to do the exercises had the strongest relationship with routine. There was also a moderate relationship between hearing about others wetting themselves and getting into a routine.

Being incontinent oneself did not have any relationship with getting into a routine. Of the statements relating to health professionals, the strongest relationship was with the one relating to being told about the exercises by a midwife.

Table 7.37 also gives the correlation co-efficient for the relationship between each of the items for cues to decision. Inter-correlation was moderate between all the variables, as might be expected with such similar mean scores and standard deviations.

Table 7.37 Relationship between cues to decision items and with scale of 'repetition/routine' (Pearson's r)

I decide to do pelvic floor exercises when…	Repetition /routine scale	Told by doctor	Told by midwife	Told by physio	Told by some one else	Read about doing them	I leak urine myself
Told by doctor	.17*						
Told by midwife	.26**	.49**					
Told by physio	.21**	.41**	.43**				
Told by some one else	.39**	.40**	.44**	.35**			
Read about doing them	.22**	.43**	.45**	.34**	.36**		
I leak urine myself	.09	.35**	.29**	.28**	.32**	.41**	
I hear about others wetting themselves	.30**	.35**	.43**	.22**	.42**	.35**	.32**

* $p < .005$; ** $p < .0005$

The revised TPB model proposed by Maddux (1993) indicates that there should be some relationship between 'cues to decision' and the determinants of intention. The correlation between the scale of 'cues to decision' and each of the direct determinants is given in Table 7.38 and Figure 7[3]. There was no relationship between being prompted to practise the exercises and whether women thought they could do the exercises (self-efficacy).

[3] It must be noted that the model suggests that 'cues to decision' should have a relationship with the indirect determinants. Thus the relationship between 'cues to decision' and the direct determinants should be mediated by the indirect determinants. However this relationship was not tested due to the previously noted problem of forming the indirect determinants into a scale and the difficulty of analysing multiplicative composites (see sections 4.2.i and 7.2.v).

However there was a significant, albeit weak, relationship between the cues to decision scale and the attitude to pelvic floor exercises, the perception of the risk of incontinence ('attitude to current behaviour') and subjective norm.

Table 7.38 Relationship between 'cues to decision' and direct determinants of intention (Pearson's r)

	r	n	p
Self-efficacy$_{\text{(sq root tranf)}}$	.05	185	.48
Attitude to new behaviour$_{\text{(log transf)}}$	.24	180	.001
Attitude to current behaviour	.28	183	< .0005
Subjective norm	.23	182	.002

7.4.iv.2 Repetition/routine

The model also proposes that 'cues to decision' should have a relationship with 'routine', and 'routine' with 'cues to action'. These relationships were tested using bivariate correlation (Pearson's r).

The scale of 'cues to decision' items was moderately correlated with the scale of 'repetition/routine' ($r = .31$, $n = 182$, $p < .0005$). Between the scale of 'repetition/routine' and the scale of 'cues to action' there was high correlation ($r = .63$, $n = 205$, $p < .0005$) (see Figure 7).

7.4.iv.3 Cues to action

The RTPB model suggests that 'cues to action' will have an effect directly on the behaviour. This was tested using the five 'cues to action' variables as independent variables and the dichotomous measure of current behaviour as the dependent variable. These five variables had previously been screened for normality. All were entered simultaneously into the model as no prediction could be made about the order of importance.

Logistic regression requires that the independent variables should not be highly correlated (Pearson's r should be below .7). Examination of the inter-correlation between the independent variables assessed collinearity: none exceeded .7. Collinearity statistics (using linear regression) confirmed that the tolerance values were all substantially above zero, indicating that there was no multicollinearity. Examination of residuals was not required, as the model fit was adequate.

Tested against a constant-only model, the full model was statistically reliable χ^2 (5, n = 211) = 82.05, p < .0005, indicating that the independent variables as a set reliably distinguished between women who reported the practice of pelvic floor exercises and women who did not. The model accounted for 30.8% of the variance in exercise behaviour (Model Chi-square/original-2LL (Field 2000, p195)). The success of the variables was good, with an overall success rate of 78.7%.

Table 7.39 Logistic regression analysis of 'cues to action' variables on the reported practice of pelvic floor exercises

						95% Confidence Interval for Odds Ratio	
I remember to do pelvic floor exercises…	**β**	**SE**	**Wald test (z-ratio)**	**p**	**Odds Ratio**	***Upper***	***Lower***
Whenever I go to the toilet	-.48	.12	17.07	<.0005	1.62	1.29	2.04
Because I am aware I am pregnant	-.03	.12	.06	.81	1.03	.82	1.29
While I am watching TV	-.14	.15	.94	.33	1.15	.87	1.54
When I am in bed	-.40	.12	10.39	.001	1.49	1.17	1.90
While I am washing the dishes	.08	.13	.34	.56	.93	.72	1.19
Constant	4.86	.71	46.45	<.0005	.008		

Table 7.39 shows regression coefficients, Wald statistics, odds ratios and 95% confidence intervals for odds ratios for each of the five independent variables. Being prompted to do the exercises when going to the toilet (z = 17.07, p < .0005) and when in bed (z = 1.39, p

= .001) significantly explained the practice of the exercises. The reference category was practice of pelvic floor exercises, so the odds ratio of 1.6 for doing the exercises when going to the toilet indicated that a one-point increase in the score for ‘going to the toilet’ as the trigger led to 1.6 times the chance of doing the exercises. Similarly a one-point improvement in the score for ‘when in bed’ increased the chances of practising the exercises by 1.5. The other three variables did not significantly contribute to the model.

7.4.v Explanation of intention using other significant findings

Having investigated the relationship between intention and past behaviour, planning and the MHLC variables, the only factor with a significant relationship with intention was past behaviour. Sutton (1994) suggests that past behaviour can have a significant influence on current behaviour. Past behaviour was therefore included in the regression model to find out if the explanation of intention was improved. Two analyses were carried out; one using the measure of behaviour before the current pregnancy, and another using the composite measure of behaviour during and after previous pregnancies (parous women only).

7.4.v.1 Explanation of intention using RTPB variables and behaviour before current pregnancy

Hierarchical regression was carried out to find out if the measure of ‘behaviour before the current pregnancy’ improved the explanation of ‘intention’ over and above the model using the RTPB variables alone (‘self-efficacy’, ‘attitude to new behaviour’, and ‘subjective norm’) (see section 7.3.i).

The variables included in the analysis had all previously been screened for normality and transformations carried out as required. As described in section 7.4.i, there was a significant relationship between the dependent variable 'intention' and the additional variable of 'behaviour before the current pregnancy$_{(reflect\ and\ log)}$' (r = -.43, n = 218, p < .0005). No correlation between 'behaviour before the current pregnancy$_{(reflect\ and\ log)}$' and any of the other independent variables exceeded .7, confirming the absence of multicollinearity. This was also checked using collinearity diagnostics that showed the tolerance did not approach 0 for any of the variables. Using Mahalanobis distances no multivariate outliers were identified (p < .001 criterion).

Table 7.40 shows the results of the hierarchical multiple regression. With the addition of 'behaviour before the current pregnancy$_{(reflect\ and\ log)}$' the full model explained 57.1% of the variance (56.2% adjusted) (R^2 = .571, F(4, 201) = 66.769, p < .0005). The addition of 'behaviour before the current pregnancy$_{(reflect\ and\ log)}$' reliably improved the model by 3.9% (ΔR^2 = .039, F_{inc} (1, 201) = 18.436, p < .0005).

Table 7.40 Hierarchical multiple regression explaining intention from 'self-efficacy'$_{(sq\ root\ tranf)}$, 'attitude to the new behaviour'$_{(log\ transf)}$, 'subjective norm' and 'behaviour before the current pregnancy$_{(reflect\ and\ log)}$'.

	Unstandardised β	β	t	sr^2	p
Step 1					
Self-efficacy $_{(sq\ root\ tranf)}$	1.55	.19	3.04	.02	.003
Attitude to new behaviour$_{(log\ transf)}$	12.39	.41	5.87	.08	< .0005
Subjective norm	.85	.28	4.80	.05	< .0005
Step 2					
Self-efficacy $_{(sq\ root\ tranf)}$	1.18	.14	2.38	.01	.02
Attitude to new behaviour$_{(log\ transf)}$	12.05	.40	5.95	.08	< .0005
Subjective norm	.74	.24	4.27	.04	< .0005
Behaviour before the current pregnancy$_{(reflect\ and\ log)}$	-3.92	-.21	-4.29	.04	< .0005

Step 1: Intercept =-10.10; R = .732; R^2 = .531; Adjusted R^2 = .524; F(3, 202) = 76.29; p < .0005

Step 2: Intercept =-8.15; R = .755; R^2 = .571; Adjusted R^2 = .562; F(4, 201) = 66.77; p < .0005

7.4.v.2 Explanation of intention using RTPB variables and 'behaviour during and after previous pregnancies'

A similar procedure was carried out using the composite variable ('behaviour during and after previous pregnancies') created by summing the two measures asking parous women about their behaviour during and after previous pregnancies (see section 7.2.vi.5). Hierarchical regression was carried out to find out if the addition of the measure of 'past behaviour during and after previous pregnancies' improved the explanation of 'intention' over and above the model using the RTPB variables alone ('self-efficacy', 'attitude to new behaviour', and 'subjective norm') (see section 7.3.i).

All data had previously been screened for normality and transformed as appropriate. There was a significant correlation between 'past behaviour during and after previous pregnancies' and the dependent variable 'intention' ($r = .63$, $n = 117$, $p < .0005$). The measure also correlated significantly with the other independent variables, however none of these were above the .7 threshold for multicollinearity. This was also assessed by a check of collinearity diagnostics that confirmed the absence of multicollinearity. There were no multivariate outliers, as identified by Mahalanobis distances and standardised residuals.

Table 7.41 Hierarchical multiple regression explaining intention from 'self-efficacy'$_{\text{(sq root tranf)}}$, 'attitude to the new behaviour'$_{\text{(log transf)}}$, 'subjective norm' and 'behaviour during and after previous pregnancies'.

	Unstandardised β	β	t	sr^2	p
Step 1					
Self-efficacy $_{\text{(sq root tranf)}}$	1.55	.19	2.27	.02	.02
Attitude to new behaviour$_{\text{(log transf)}}$	12.39	.41	4.39	.08	< .0005
Subjective norm	.85	.28	3.59	.05	< .0005
Step 2					
Self-efficacy $_{\text{(sq root tranf)}}$	1.24	.15	2.09	.01	.04
Attitude to new behaviour$_{\text{(log transf)}}$	10.53	.35	4.26	.06	< .0005
Subjective norm	.49	.16	2.32	.02	.02
Behaviour before the current pregnancy$_{\text{(reflect and log)}}$	.60	.39	6.16	.12	< .0005

Step 1: Intercept =-10.10; R = .729; R^2 = .531; Adjusted R^2 = .519; $F(3, 113) = 42.68$; $p < .0005$

Step 2: Intercept =-11.52; R = .806; R^2 = .650; Adjusted R^2 = .637; $F(4, 112) = 51.99$; $p < .0005$

Table 7.41 shows that the addition of 'behaviour during and after previous pregnancies' to the model including only the RTPB variables enabled a total of 65.0% (63.7%

adjusted) of the variance to be explained ($R^2 = .650$, $F(4, 112) = 51.99$, $p < .0005$). An additional 11.9% of the variance was explained by the inclusion of this variable into the model ($\Delta R^2 = .119$, F_{inc} (1, 112) = 37.99, $p < .0005$).

7.5 Explanation of behaviour using the RTPB model

The RTPB model suggests that behaviour can be explained by 'self-efficacy' for the behaviour, 'intention' and 'cues to action'. Current behaviour was measured in the structured interview preceding completion of the pelvic floor exercises questionnaire. Women were asked how often they had practised pelvic floor exercises in the month before the interview. Responses were not normally distributed and could not be normalised (there were too many women (39%) who said they did not do the exercises), so the measure was dichotomised into a yes or no response. A 'yes' response means that they reported the practice of pelvic floor exercises a minimum of less often than once a week. A logistic regression model using the transformed RTPB variables[4] was used to explain this dichotomised measure.

Inter-correlation between determinant variables was examined to check for multicollinearity. 'Cues to action' and 'intention' were highly correlated (r = .74, n =

[4] The transformed variable 'self-efficacy$_{(sq\ root\ tranf)}$' was used in this analysis for consistency with the other analyses used in this chapter. Logistic regression does not require predictor variables to be normally distributed (Tabachnick and Fidell 2001). The regression was run using the original variables and again the model was reliably different to the constant only model χ^2 (3, $\underline{N}$ = 202) = 106.99, $p < .0005$. This model accounted for 41.9% of the variance and explained 83.2% of cases correctly. Each of the variables made a significant contribution ('self-efficacy' – OR 1.20 [1.06, 1.35], p = .003; 'intention' – OR 1.28 [1.13, 1.44], p < .0005; 'cues to action' – OR 1.09 [1.00 – 1.18], p = .04).

204, p < .0005). However the tolerance values were all above .1 indicating that there was not a serious problem with collinearity (Field 2000, p201). All independent variables were entered into the logistic regression model. Examination of residuals was not required, as the model fit was adequate (Tabachnick and Fidell 2001, p562).

The model with all three variables was significantly different to a constant only model χ^2 (3, N = 202) = 106.48, p < .0005. These three variables together were able to reliably distinguish between women who practised the exercises and those who did not. The model accounted for 41.7% of the variance in exercise behaviour (Model Chi-square/original-2LL (Field 2000, p195)). There was a good overall success rate with 82.7% of cases correctly explained.

Table 7.42 shows regression coefficients, Wald statistics, odds ratios and 95% confidence intervals for odds ratios for each of the three variables. All the variables made a significant contribution to the explanation of behaviour, although 'cues to action' only just reached significance (z = 4.53, p = .03). A hierarchical model with 'cues to action' added after 'intention' and 'self-efficacy' confirmed that 'cues to action' only added an extra 3.5% to the percentage of correctly explained cases.

Table 7.42 Logistic regression analysis of 'self-efficacy$_{(sq\ root\ tranf)}$', 'intention' and 'cues to action' on the reported practice of pelvic floor exercises

						95% Confidence Interval for Odds Ratio	
	β	**SE**	**Wald test (z-ratio)**	**p**	**Odds Ratio**	***Upper***	***Lower***
Self-efficacy$_{(sq\ root\ tranf)}$	1.01	.35	8.49	.004	2.74	1.39	5.39
Intention	.24	.06	15.34	<.0005	1.27	1.13	1.43
Cues to action	.09	.04	4.53	.03	1.09	1.01	1.18
Constant	-8.24	1.26	42.95	<.0005	.000		

7.6 Differences between those who did and did not practise the exercises

This survey used cross-sectional data. Opinions about pelvic floor exercises as well as behaviour were measured at a single point during the last trimester of pregnancy. There was an unexpected lack of relationship between 'attitude to current behaviour' (perceived vulnerability to postnatal incontinence) and 'intention' (see section 7.3.i). However some women were already practising pelvic floor exercises when they filled in the questionnaire. The attitudes of the women already practising pelvic floor exercises may have been influenced by their current behaviour.

In order to assess whether current practice of pelvic floor exercises affected the various measures, women who reported the current practice of pelvic floor exercises were compared with women who reported not practising the exercises.

7.6.i Socio-demographic and parity comparisons between those who did and did not practise the exercises

The results of socio-demographic and parity comparisons between women who reported the practice of the exercises and those who were not exercising are presented in Table 7.43. Women not reporting the practice of pelvic floor exercises were significantly more likely to live in a more deprived area, not be in paid employment and be expecting their first baby. There was no difference between the ages, educational level attained and the social class of women in the two groups. Further analysis was therefore undertaken to look at the two groups separately to determine whether other differences might also explain the difference in reported behaviour.

7.6.ii Comparisons of RTPB measures between those who did and did not practise the exercises

Table 7.44 gives the results of comparisons between the two groups on the measures in the RTPB and the measure of response efficacy (see section 7.2.vi.6). Women not reporting current practice of the exercises scored significantly higher on all measures apart from ‘attitude to current behaviour’.

Table 7.43 Results of Chi-square analyses and t-tests for differences in socio-demographic and parity variables for whether women reported the practice of pelvic floor exercises in pregnancy (women who completed the pelvic floor exercises questionnaire)

	Practice of pelvic floor exercises during pregnancy							
	No/don't know		Yes					
	n	**% (row)**	**n**	**% (row)**	**N**	χ^2	**df**	**p**
Deprivation category								
4 and over	65	45.1	79	54.9	144	5.3	1	.02
3 and under	29	29.6	69	70.4	98			
Social Class								
Manual social class (IIIM, IV & V)	24	40.7	35	59.3	59	0.1	1	.71
Non-manual social class (I, II & IIINM)	64	36.8	110	63.2	174			
Job status								
Paid employment	56	32.6	116	67.4	172	8.6	1	.003
Not in paid employment	40	53.3	35	46.7	75			
Education								
Up to secondary	49	45.4	59	54.6	108	2.9	1	.09
Beyond secondary	47	33.8	92	66.2	139			
Age	M	SD	M	SD	t-test			
	27.33	6.60	28.69	5.01	-1.843		245	.07
Parity								
First pregnancy	36	31.0	80	69.0	116	5.1	1	.03
Second or subsequent pregnancy	60	45.8	71	54.2	131			

Table 7.44 Group means (standard deviations) and t-tests comparing women who reported the practice of pelvic floor exercises to women who reported not practising pelvic floor exercises on the measures included in the RTPB as well as response efficacy

Variable		Practice of pelvic floor exercises during pregnancy No/don't know	Yes	t	df	p
Intention						
	Mean (SD)	15.23 (4.31)	8.32 (4.64)	10.69	216	< .0005
	n	75	143			
Self-efficacy$_{(sq\ root\ tranf)}$						
	Mean (SD)	3.06 (.62)	2.37 (.57)	8.65	235	< .0005
	n	88	149			
Attitude to new behaviour$_{(log\ transf)}$						
	Mean (SD)	1.32 (.16)	1.10 (.14)	10.03	216	< .0005
	n	79	139			
Attitude to current behaviour						
	Mean (SD)	9.37 (3.05)	9.14 (3.03)	.57	232	.567
	n	91	143			
Subjective norm						
	Mean (SD)	4.32 (1.88)	3.07 (1.60)	5.51	238	< .0005*
	n	94	146			
Response efficacy$_{(sq\ root\ tranf)}$						
	Mean (SD)	2.57 (.67)	1.97 (.52)	7.54	226	< .0005*
	n	84	144			

* Following Levene's adjustment for intergroup inequality of variance

To further investigate this finding, the relationship between 'intention' and 'attitude to current behaviour' was examined separately using Pearson's correlation coefficient for the two groups of women.

In the group of women who were already doing the exercises there was a weak negative relationship ($r = -.27$, $n = 135$, $p = .002$) between intention and the likelihood of postnatal incontinence (ACB) (for example, the higher the intention the lower the perceived chance of incontinence).

In the group of women who reported not practising the exercises there was a weak positive relationship (r = .26, n = 73, p = .027) between a belief in the chance of postnatal incontinence (ACB) and intention (so that for example low intention corresponded with low belief in the likelihood of incontinence). The positive correlation in one half of the sample cancelled out the negative correlation in the other half and led to no overall relationship (r = -.023, n = 210, p = .736).

7.7 Summary of Chapter 7

This section will summarise the main findings from Chapter 7.

The initial analysis in this chapter examined whether the women who completed the pelvic floor exercises questionnaire were representative of all the women who were interviewed in the main data collection phase. This found that women completing the pelvic floor exercises questionnaire were more likely to be older, live in more affluent areas, be of higher occupational class, have completed more education and be more likely to be in their second or subsequent pregnancy. They were also more likely to report the practice of the exercises.

Analysis of missing values was carried out on a variable-by-variable basis and revealed that some variables were missing more than 5% of values (although none more than 10%). This will be considered when interpreting the results of analyses involving these variables. Similarly a case-by-case analysis indicated that 24 women had missed more than 20% of questions. Further analysis showed that apart from being less likely to report the practice of the exercises these women did not differ significantly from women who completed more than 80% of questions. A further check of the reliability of answers (the two questions that were included twice with coding reversed) suggested that all responses should be retained in the analysis.

Items were summed as indicated by the RTPB model and the resulting scales checked for reliability using Cronbach's alpha. Each scale was screened for normality and transformations were applied as appropriate.

The mean scale score for each of the variables were considered next. Following this the variables relating to the direct determinants were used to explain intention. The direct determinants were then analysed in turn using the appropriate indirect determinants (or belief-based measures) to explain each.

The score for intention to practise the exercises was close to the mid-point of the scale. Mean scores for the direct determinants of intention indicated women believed they were able to do the exercises correctly ('self-efficacy') and had a positive attitude to the exercises ('attitude to new behaviour'). They thought that postnatal incontinence was unlikely ('attitude to current behaviour') and were neutral in their beliefs about whether they thought other people would want them to practise the exercises ('subjective norm'). The measure assessing perceived vulnerability to incontinence ('attitude to current behaviour') had no relationship with the measure of 'intention'. Each of the other measures ('attitude to the new behaviour', 'subjective norm' and 'self-efficacy') made a unique and significant contribution to explaining 'intention'. 'Attitude to the new behaviour' made the greatest contribution. The direct determinants were able to explain 53.1% (52.4% adjusted) of the variance in 'intention'

Self-efficacy was measured indirectly by three concepts. The scores for whether the difficulty of the exercises and the difficulty of remembering to do the exercises would be off-putting suggested that these factors were not deterrents. The aspect of whether the exercises were time-consuming was scored neutrally. This last variable had a weak relationship with the direct measure of self-efficacy. The other two indirect determinants ('difficulty of doing the exercises' and the 'difficulty of remembering to do the exercises') each made a unique and significant contribution to explaining 'self-efficacy', however the model was a poor fit and only 17.9% (17.1% adjusted) of the variance in 'self-efficacy' was explained.

The indirect measures of attitude to pelvic floor exercises suggested that women who perceived that pelvic floor exercises would cause pain or discomfort would be dissuaded from doing them. Beliefs about the exercises making the delivery easier or improving the sex life after delivery were associated with a more positive attitude to the exercises. Each of the behavioural belief statements assessing these concepts had more than 5% of values missing suggesting that some women may have had difficulty expressing an opinion about the effect of the exercises on these outcomes.

When used to explain the direct measure of attitude to the exercises ('attitude to new behaviour'), the four measures (assessing the likelihood of practising the exercises if they were thought to 'cause discomfort', 'cause pain', 'make the delivery easier' and 'make sex after delivery more enjoyable') explained 49.0% (48.0% adjusted) of the variance. The concept that made the greatest contribution to explaining a positive attitude to the exercises was if women thought the exercises would make the birth of the baby easier.

Indirect measures of ‘attitude to the current behaviour’ assessed the beliefs about the effects of postnatal incontinence. Mean scores suggested that women who thought postnatal incontinence would be embarrassing or unhygienic would be likely to take measures to avoid these outcomes. Leaking a lot of urine was rated worse than leaking a few drops of urine. There was good inter-correlation between each of these four measures. However none had a strong relationship with the direct measure of ‘attitude to current behaviour’ so could not be used to try to explain this direct determinant.

Belief-based (indirect) measures of subjective norms indicated that if a woman tended to think that significant others (family, partner, midwife or doctor) wanted her to do pelvic floor exercises, then she would be likely to comply with their opinions. The missing value analysis indicated that nearly 10% of women did not complete each of the four normative belief statements, suggesting that women may have been unsure of the opinion of the referents about the issue. The analysis to explain the direct measure of subjective norm was carried out twice due to inter-correlation between two of the independent variables. Using ‘partner’, ‘family’ and ‘midwife’, 46.0% of the variance in ‘subjective norm’ was explained (45.1% adjusted), while using ‘partner’, ‘family’ and ‘doctor’, 44.2% was explained (43.3% adjusted). All the variables made a significant contribution to the model, with the opinion of the ‘family’ accounting for the greatest proportion of the variance in each analysis.

Items assessing the role of prompts to initiating the behaviour (‘cues to decision’) were generally scored close to the mid-point, indicating ambivalence about these cues. Being told by a midwife or physiotherapist were scored slightly more positively pointing towards the possible importance of these health professionals. The mean score for repetition/routine suggested that getting into a routine was not considered important when doing the exercises. More than 5% of women missed each of the items in these two sections, suggesting that they may have had difficulty answering these questions. When the relationship between each of these measures of 'cues to decision' and the measure of 'repetition/routine' was investigated, 'being told by someone else' had the strongest relationship with getting into a routine, while there was no relationship between being incontinent oneself and the measure of routine.

The scale of these seven 'cues to decision' items had only a moderate correlation with the direct determinants (attitude new behaviour', 'attitude to current behaviour' and 'subjective norm') and there was no relationship with the measure of 'self-efficacy'. There was moderate correlation between 'cues to decision' and the scale of the 'repetition/routine' items. 'Repetition/routine' correlated highly with 'cues to action'.

The items relating to the role of 'cues to action' were scored at or just above the mid-point suggesting that they were not particularly useful in helping women to remember to do the exercises. The two variables that were able to significantly explain the reported current practice of the exercises were remembering to do the exercises 'when going to the toilet' and 'while in bed'.

Additional concepts were also measured in the questionnaire. 'Planning' scored slightly positively but was not used in further analysis due to high correlation with 'intention'. An assessment of whether women thought that pelvic floor exercises would prevent postnatal incontinence ('response efficacy') indicated women overall tended to think that the exercises would be effective as a preventive measure.

The measures of past behaviour suggested that most women were not in the habit of practising pelvic floor exercises before the current pregnancy. Similarly women who had been pregnant before did not report that they had been in the habit of practising pelvic floor exercises every day during or after previous pregnancies. All the measures of past behaviour correlated significantly with the measure of 'intention'. When reported behaviour before the current pregnancy was included into the RTPB model an additional 4% of the variance in 'intention' was explained above that already accounted for by the RTPB variables. Similarly for parous women the addition of a measure of reported behaviour during and after previous pregnancies added an extra 11.9% to the explanation of 'intention'.

The MHLC suggested this group of pregnant women had high scores on the Internal scale and low scores on both the Chance and Powerful Others scale. None of these sub-scales had a relationship with the measure of 'intention'. The health value scores gave a very low measure of internal reliability and was not subsequently used.

A logistic regression model was used to explain the reported behaviour of the exercises (cross-sectional data). The RTPB variables ('self-efficacy', 'intention' and 'cues to action') were able to reliably distinguish between women who reported the practice of the exercises and those who did not, and explained 41.7% of the variance. All the variables made a significant contribution, however 'cues to action' only just reached significance and only added 3.5% to the percentage of correctly explained cases. Reported intention to practise the exercises made the most significant contribution to the prediction of the behaviour (OR 1.27 [1.13, 1.43], $p < .0005$).

Women who completed the pelvic floor exercises questionnaire were divided into those who had or had not reported the practice of pelvic floor exercises during the structured interview. Women not reporting the practice of the exercises tended to be from more deprived areas, not be in paid employment and be expecting their first baby. Their scores on the RTPB measures indicated lower intention to practise the exercises, lower belief in their ability to do the exercises correctly and a more negative attitude to the exercises. They were less likely to believe that others would want them to do the exercises and had a lower belief in the effectiveness of the exercises. However they did not differ from women who reported the practice of the exercises on whether they thought that postnatal incontinence was likely ('attitude to current behaviour'). The relationship between the scores for 'intention' and 'attitude to current behaviour' showed a weak negative correlation for women not doing the exercises. This correlation was positive for women who were doing pelvic floor exercises.

Chapter 8: Follow-up Study

8 Introduction to Chapter 8

The structured interview study used cross-sectional data to investigate reported information received about pelvic floor exercises and practice of the exercises during pregnancy. The motivation of pregnant women towards the exercises was explored using the revised theory of planned behaviour (RTPB) model. However as the RTPB asks respondents about their intention to perform a *future* behaviour it was decided to follow up the women to find out about their reported behaviour at the end of the pregnancy and following delivery. A postal follow-up study of the women who participated in the main interview study was therefore planned to find out if the RTPB model was able successfully to predict future behaviour. The follow-up study also aimed to establish the prevalence of postnatal incontinence.

8.1 Methods

The following sections describe the procedures that were used in the follow-up study.

8.1.i Study permission

Ethical approval for the follow-up study was gained from Tayside Committee on Medical Research Ethics for the women living in Tayside (n = 250) (Reference number 66/00), and from Fife Health Board Ethics Committee for the women living in Fife (n = 39) (Reference number 06060014). Permission in Tayside was granted on condition that only one reminder letter was sent to the women. This was therefore the procedure adopted for all participants.

8.1.ii Preliminary hospital checks

The computerised hospital records were examined to retrieve the date of delivery, mode of delivery and unique hospital number of each woman who had been interviewed. A check of the hospital records was made to ensure that that there were no records of any problems with any baby, and that all women had gone home with a live baby. The address at the time of discharge, and the name and address of the GP were also noted.

One woman who delivered in Dundee was recorded as living in Aldershot. For another (from Fife) there was no record of her delivery in Dundee. These two were therefore excluded from the follow-up. Out of the 289 women who were interviewed, a total of 287 (38 from Fife, 249 from Tayside) were available for follow-up.

8.1.iii Permission from the GP

A letter was sent to the GP of each woman (Appendix 15) to find out if the GP had any objection to the woman being contacted. A copy of the planned questionnaire (Appendix 16) and a summary of the project (Appendix 17) accompanied the letter. A tear-off section was attached to the end of the letter and a stamped addressed envelope included for the GP to respond. If there was no reply from the GP after two weeks, a reminder fax was sent to the practice (Appendix 18). Additional phone calls were made in 25 cases because the tick box on the tear-off slip relating to whether the GP had any objections had not been marked. One practice with 11 women was too busy to respond, so a list of all the women in that practice was sent to the Health Visitors, who were able to provide the information needed.

Letters were sent out to GPs in monthly batches organised by the date the women delivered. This ensured that there was at least five months between the date of delivery and the GP contact.

8.1.iv Response from the GPs

Letters were sent to the GPs of the 287 women available for follow-up. Replies were received for 283 women (98.6%). Of the 283, 19 were no longer registered with that GP or had moved away from the area. Six of the 19 women were from Fife, comprising 15.8% (6/38) of Fife interviewees. Thirteen (13) were from Tayside (5.2%, 13/249). Thus a higher proportion of people from Fife had moved between the initial interview and the follow-up. There were not sufficient numbers in these sub-groups of women who were not available to follow-up to allow a comparison of socio-demographic variables.

Contact was not permitted with 4 women. No reason was given in three cases; in the other the baby had died. This left 260 (90.6%) women who could be sent the follow-up questionnaire. See Table 8.1.

Table 8.1 Details of women available for follow-up

	Number of women		**%**
Number of women interviewed initially and available for follow-up		287	
Replies not received from GP	4		
Women NOT to be contacted	4		
Women no longer registered with GP or moved from area	19		
Total	27		
Number of women available for follow-up		260	90.6%

8.1.v Data collection tool

A questionnaire was specially designed for the follow-up study (Appendix 16). To encourage a response the questionnaire was kept brief and questions were confined to one side of A4. Most of the questions used a similar format to the questions that were used in the structured interview survey. Women were asked about the practice of pelvic floor exercises during the last month of pregnancy, the day before delivery (in case women were interviewed close to the day of delivery), the first month after delivery, and the month before completion of the questionnaire. Two questions related to incontinence: one about any incontinence since delivery, and another about severity and frequency if women were incontinent at time of questionnaire completion. As pregnancy can affect incontinence rates, women were also asked whether they were currently pregnant. Further questions asked about the date of delivery and the date of questionnaire completion.

Midwifery colleagues commented on the questionnaire, but it was not piloted with postnatal women as most of the questions had previously been used in the structured interview study.

8.1.vi Procedure for patient mailing

Two hundred and sixty (260) letters were sent out to women. Letters were sent in batches at least six months after the date of delivery. The covering letter (Appendix 19) explained the study to the woman and was accompanied by the questionnaire and stamped addressed envelope. Thirteen letters (13) were returned by the Post Office as 'addressee unknown'. For each of these, the GP surgery was contacted by phone to confirm the current address of the woman. A different address was obtained for 10 women and a further copy of the first mailing sent to these addresses. A new address was not available for the remaining three returned letters. Out of the 260 letters sent, 257 were assumed to have been received by the addressee. If there was no reply within two weeks of the first mailing, a reminder letter (Appendix 20), questionnaire and stamped addressed envelope were sent.

8.2 Response rate and characteristics of respondents

8.2.i Response rate

The first approach yielded 94 replies (94/257, 36.6%). Reminder letters (n = 171) resulted in a further 71 replies (71/171, 41.5%). The final total of 165 replies included two blank questionnaires. The 163 useable returns gave a total response rate of 63.4% (163/257).

8.2.ii Characteristics of respondents

The following sections describe the demographic and obstetric characteristics of respondents.

8.2.ii.1 Demographic characteristics of respondents

The demographic and parity details of respondents using collapsed categories are given in Table 8.2. (Full details are presented in Appendix 21)

Table 8.2 Details of respondents

		n	%
Carstairs deprivation category			
	4 and over	86	52.7
	3 and under	73	44.8
	Missing	4	2.5
Employment status			
	Not in paid employment	39	23.9
	In paid employment	124	76.1
Occupational classification			
	Manual social class (IIIM, IV & V)	41	25.1
	Non-manual social class (I, II & IIINM)	112	68.6
	Missing	10	6.1
Education			
	Up to secondary	68	41.7
	Beyond secondary	95	58.3

The women ranged in age (age at time of completion of follow-up questionnaire) from 16 years 11 months to 41 years 8 months (M = 29.45, SD 5.78). More than half (n = 86, 52.7%) lived in the three most deprived areas of residence. Most women were in some kind of paid employment (n = 124, 76.1%) and worked in non-manual occupations (n = 112, 68.6%). More than half had been educated beyond secondary school (n = 95, 58.3%).

8.2.ii.2 Obstetric details of respondents

Half the women who returned the postnatal questionnaire had delivered their first baby (n = 83, 50.9%), while the rest had one or more children prior to the index pregnancy. Table 8.3 gives details of the mode of delivery for each woman. Four women delivered twins, with each twin being delivered by a different method (for example one by Spontaneous Vaginal Delivery (SVD) and one by emergency caesarean section); these are classed as 'other'.

Table 8.3 Details of delivery

Type of delivery	n	%
SVD	81	49.7
Forceps	30	18.3
Ventouse	12	7.4
Elective caesarean section	13	8.0
Emergency caesarean section	23	14.1
Other	4	2.4
Total	163	100.0

8.2.iii Comparison of responders to non-responders

The 163 responders were compared with the 126 from the survey that did not complete the follow-up questionnaire (Table 8.4). Responders were significantly older (age at time of structured interview), from more affluent areas of residence, more likely to have been in paid employment and were more likely to have been educated beyond secondary level. There was no significant difference between the occupational class or parity of the two groups. Responders were more likely to have had an operative delivery, although this result only just reached significance (Table 8.5).

Table 8.4 Results of Chi-square analyses and t-tests for differences in socio-demographic and parity variables for responders and non-responders to follow-up

Socio-demographic variables	Non-responders n	Non-responders % (row)	Responders n	Responders % (row)	N	χ^2	df	p
Deprivation category								
4 and over	93	52.0	86	48.0	179	11.5	1	.001
3 and under	32	30.5	73	69.5	105			
Job status								
Not in paid employment	54	58.1	39	41.9	93	10.8	1	.001
In paid employment	72	36.7	124	63.3	196			
Occupational class								
Manual social class (IIIM, IV & V)	33	44.6	41	55.4	74	0.3	1	.57
Non-manual social class (I, II & IIINM)	74	39.8	112	60.2	186			
Education								
Up to secondary	72	51.4	68	48.6	140	6.2	1	.01
Beyond secondary	54	36.2	95	63.8	149			
Age	M	SD	M	SD	t-test			
	25.73	5.83	28.77	5.80	-4.40		287	< .0005
Parity								
First pregnancy	63	43.2	83	56.8	146	.001	1	.97
Second or subsequent pregnancy	63	44.1	80	55.9	143			

Table 8.5 Results of Chi-square analyses for differences in type of delivery for responders and non-responders to follow-up

	Non-responders n (expected)	Non-responders % (row)	Responders n (expected)	Responders % (row)	N	χ^2	df	p
Type of delivery								
SVD	76 (69.1)	48.4	81 (87.9)	51.6	157	6.2	2	.046
Operative delivery	18 (26.4)	30.0	42 (33.6)	70.0	60			
Caesarean section	31 (29.5)	46.3	36 (37.5)	53.7	67			

8.3 Results of postal follow-up

This section presents the descriptive data from the follow-up questionnaire. First the data relating to the time interval between delivery of the baby and completion of the follow-up questionnaire is presented. Next the reported frequencies of the practice of pelvic floor exercises are presented followed by the prevalence and severity of postnatal incontinence.

8.3.i Time interval from delivery to completion of questionnaire

A delivery to follow-up interval of six months was planned. There were problems obtaining a current address for some women. A delay in receiving a response from the GP led to a longer delivery/follow-up interval for other women. The interval between delivery of the baby and completion of the postnatal questionnaire ranged from 25.3 weeks to 58.3 weeks (M = 32.5, SD 5.9). The majority of questionnaires (n = 142, 87.2%) were completed less than 40 weeks after delivery (Table 8.6).

Table 8.6 Number of weeks between delivery of the baby and completion of the postnatal questionnaire

Delivery to questionnaire time interval	n	%
Under 30 weeks	79	48.5
30 – 39 weeks	63	38.7
40 – 49 weeks	19	11.7
Over 50 weeks	2	1.2

Only 1.8% (n = 3) of respondents were pregnant again at the time of completing the postnatal questionnaire. This is too small a number to have affected results, and so these women were included in the analysis.

8.3.ii Frequency of pelvic floor exercises

In the follow-up women were asked how often they did pelvic floor exercises in the final month of pregnancy, the day before delivery, the first month after delivery and the month before completion of the questionnaire. Results are presented in Table 8.7 using collapsed categories (full details are given in Appendix 22). Not all respondents answered all the questions. Percentages are calculated using the number who completed each question as the denominator. For comparison, the frequency of the exercises reported in the survey by the women who responded to the follow-up is also included.

Table 8.7 Frequency of reported practice of pelvic floor exercises

Time period	Once a week or less		More than once a week but less than once a day		Once a day or more		Any frequency		Never/don't know/can't remember	
	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)
Survey data										
Month before survey (mean 36.5 weeks gestation)	23	(14.1)	29	(17.8)	47	(28.8)	99	(60.7)	64	(39.3)
Follow up data										
Final month of pregnancy	42	(26.0)	25	(15.5)	56	(34.7)	123	(76.2)	38	(23.6)
Day before delivery	n/a		n/a		42	(26.4)	42	(26.4)	117	(73.6)
First month after delivery	31	(19.3)	29	(18.0)	74	(45.9)	134	(83.2)	27	(16.8)
Month before completing questionnaire (mean 32.5 weeks postnatal)	46	(28.8)	22	(13.8)	28	(17.5)	96	(60.0)	64	(40.0)

When asked about the day before delivery, most women (n = 117, 73.6%) did not know, couldn't remember or said they had not done any. The results of this question have not been used in subsequent analyses.

The proportion of women reporting that they practised any pelvic floor exercises increased from the report of the month before the survey to the report of practice in the final month of pregnancy in the follow-up, and increased again to the report for the month after delivery. More women reported the practice of pelvic floor exercises after delivery than during pregnancy (83.2% compared with 60.7% (survey) and 76.2% (follow-up)). Thereafter the percentage decreased to 60.0% who said they were still doing them in the month before completion of the postal questionnaire. The percentage who reported frequent practice of the exercises (once a day or more) also increased between these same time periods (45.9% compared with 28.8% (survey) and 34.7% (follow-up)), and then decreased to 17.5% in the month before completing the questionnaire.

8.3.iii Incontinence since delivery

Fifty-four women (n = 54, 33.1%) said they had suffered from leakage of urine when coughing, laughing or sneezing at some time since they had the baby. If they said they were currently suffering from incontinence, they were then asked to indicate the severity and frequency in the preceding week. More women responded to the question about severity than frequency: between 14.1 – 19.0% of women had been incontinent in the week preceding completion of the questionnaire. A few women reported moderate or severe incontinence (n = 6, 19.3% of responders to severity question, 3.7% of all respondents) (Table 8.8), and for eight women the incontinence was once a week or more (34.7% of responders to frequency question, 4.9% of all respondents).

The response rate was 63.4%. The effect of women not replying to the follow-up may have led to an over- or under-estimate of the true prevalence of the condition, depending on whether non-responders were continent or incontinent. A re-calculation of the prevalence was made to account for this possible bias. If all non-responders (n = 126) had been incontinent at some time since delivery, the percentage of the whole sample of women who had been stress incontinent would have been 62.3% [56.7, 67.9]. If all non-responders had been continent, then the minimum rate of postnatal incontinence would have been 18.7% [14.2, 23.2]. Therefore the prevalence of any degree of incontinence in the first postnatal year lies in the range of 18.7% to 62.3%.

Table 8.8 Severity and frequency of incontinence in the past week

	n	% of those with incontinence in past week	% of responders
Severity			
Mild (never need to wear sanitary protection)	25	80.6	
Moderate (occasionally need to wear sanitary protection)	5	16.1	
Severe (always need to wear sanitary protection)	1	3.2	
Total	31		19.0
Frequency			
Once a week	15	65.2	
More than once during the week	5	21.7	
Daily	3	13.0	
Total	23		14.1

8.4 Antenatal practice of pelvic floor exercises

Women were asked the same question in the follow-up as in the survey about how often they did pelvic floor exercises. There was a change in the number of women reporting the practice of pelvic floor exercises during pregnancy when asked at interview (survey data) compared with when asked in the postnatal questionnaire (Table 8.9). The majority of respondents (n = 120) were consistent in the responses given at the different time points. Very few women (n = 8) who said that they did pelvic floor exercises when asked during pregnancy, reported in the follow-up that they did not do them in the last month of pregnancy. Far more women (n = 33) who had said they did not do them in the month before the interview reported in the follow-up that they did them in the final month of pregnancy. No relationship was found between frequency of reported practice of pelvic floor exercises during pregnancy (survey data) and postnatal incontinence (Table 8.10).

Table 8.9 Comparison between survey report and follow-up report about antenatal practice of pelvic floor exercises

Follow-up results		Pelvic floor exercises during pregnancy (survey results) No n	(%)	Yes n	(%)	N
Pelvic floor exercises in final month of pregnancy						
	No or don't know	30	(78.9)	8	(21.1)	38
	Yes	33	(26.8)	90	(73.2)	123

Table 8.10 Results of Chi-square analyses for differences in reported frequency of pelvic floor exercises (survey data) for whether women reported incontinence following delivery

Survey results	Incontinence since delivery No/don't know n	% (column)	Yes n	% (column)	N	χ^2	df	p
Frequency of pelvic floor exercises								
Never or less than once a week	47	43.1	23	42.6	70	.11	3	.99
Once a week	11	10.1	6	11.1	17			
Few times a week	20	18.3	9	16.7	29			
Daily or more	31	28.4	16	29.6	47			

8.5 Practice of pelvic floor exercises at different time points reported in follow-up

In the follow-up women were asked about the practice of pelvic floor exercises before delivery, in the first month after delivery and in the month before completing the questionnaire (mean 32.5 weeks postnatal). In the next two sections the differences in the reports are compared to examine change in behaviour across the different time points.

8.5.i Antenatal and postnatal practice of pelvic floor exercises (follow-up data)

The reported practice of pelvic floor exercises before delivery was compared with the reported practice in the first month after delivery (Table 8.11). Half the women (n = 19) who said they did not do the exercises in pregnancy said they did them in the first month after delivery. Very few of the women (n = 9) who said they did them before delivery reported that they did not do them after delivery.

Table 8.11 Comparison between antenatal report of practice of pelvic floor exercises (follow-up data) and postnatal reports

	Pelvic floor exercises in final month of pregnancy (follow-up data)				
	No/don't know		Yes		
	n	(%)	n	(%)	N
Pelvic floor exercises in first month after delivery					
No/don't know	18	(66.7)	9	(33.3)	27
Yes	19	(14.4)	113	(85.6)	132

8.5.ii Postnatal practice of pelvic floor exercises

A third of the women (n = 42) who said they did pelvic floor exercises in the first month after delivery had not done any in the month before completing the questionnaire (Table 8.12). A few (n = 5) who did not do them immediately after delivery had been doing them in the month preceding questionnaire completion.

Table 8.12 Comparison between reported practice of pelvic floor exercises in the first month after delivery and reported practice of pelvic floor exercises in the month before completion of the questionnaire

	Pelvic floor exercises in first month after delivery				
	No		Yes		
	n	(%)	n	(%)	N
Pelvic floor exercises in the month before completing the questionnaire					
No	22	(34.4)	42	(65.6)	64
Yes	5	(5.2)	91	(94.8)	96

As time from delivery to completion of the follow-up questionnaire increased, the proportion of respondents who reported practising pelvic floor exercises increased (Table 8.13).

Table 8.13 Number of women (%) who reported the practice of pelvic floor exercises according to length of time between delivery and completion of questionnaire

	Number of women reporting the practice of pelvic floor exercises in the month preceding completion of the questionnaire		
	n	%	N
Delivery to questionnaire time interval	43	(55.8)	79
30 – 39 weeks	39	(62.9)	63
Over 40 weeks	14	(66.7)	21

8.6 Practice of pelvic floor exercises (follow-up data)

Reports of practice of the exercises at the three different time points (in the month before delivery, the month after delivery and the month before completion of the questionnaire) will next be examined to find out which factors are associated with the practice of the exercises. For each time period, the women who reported the practice of the exercises are compared with those who did not practise the exercises on various socio-economic, obstetric and incontinence variables. Next the change in reported practice between the different time points will be examined in relation to the report of postnatal incontinence to find out if reported practice of the exercises was influenced by experiencing incontinence. Finally the relationship between the type of delivery and postnatal incontinence will be investigated to confirm whether mode of delivery influenced the prevalence of incontinence.

8.6.i Practice of pelvic floor exercises in pregnancy (follow-up data)

In the follow-up, women who reported practising pelvic floor exercises in the final month before delivery were significantly older and live in less deprived areas (Table 8.14). There was no difference in social class, whether in paid employment or level of education reached.

Table 8.14 Results of Chi-square analyses and t-tests for differences in socio-demographic variables for reported practice of pelvic floor exercises in pregnancy (follow-up data)

	Pelvic floor exercises in final month of pregnancy (follow-up data)							
	No/don't know		**Yes**					
Survey data	**n**	**%**	**n**	**%**	**N**	**χ^2**	**df**	**p**
Deprivation category								
4 and over	26	(30.6)	59	(69.4)	85	4.3	1	.04
3 and under	11	(15.3)	61	(84.7)	72			
Social Class								
Manual social class (IIIM, IV & V)	11	(26.8)	30	(73.2)	41	0.5	1	.48
Non-manual social class (I, II & IIINM)	22	(19.8)	89	(80.2)	111			
Job status								
Paid employment	25	(20.3)	98	(79.7)	123	2.4	1	.12
Not in paid employment	13	(34.2)	25	(65.8)	38			
Education								
Up to secondary	19	(28.8)	47	(71.2)	66	1.2	1	.3
Beyond secondary	19	(20.0)	76	(80.0)	95			
Age	M	SD	M	SD	t-test*			
	26.83	6.76	29.42	5.33	2.17		159	.04

*Following Levene's adjustment for intergroup inequality of variance

Women with no previous children were no more likely than were parous women to report doing pelvic floor exercises at the end of the pregnancy (Table 8.15). Class attendance in the current pregnancy or at any time was significantly associated with the reported practice of pelvic floor exercises in the last month of pregnancy.

Incontinence, either before ever pregnant or during or after previous pregnancies, did not have a relationship with whether women said they did pelvic floor exercises at the end of pregnancy (Table 8.16). Women who reported frequent incontinence or moderate/severe incontinence in the week preceding the interview were significantly more likely to report postnatally that they did the exercises at the end of pregnancy.

Table 8.15 Results of Chi-square analyses for differences in obstetric variables for reported practice of pelvic floor exercises in pregnancy (follow-up data)

Survey data	Pelvic floor exercises in final month of pregnancy (follow-up data) No/don't know n	(%)	Yes n	(%)	N	χ^2	df	p
Parity								
First pregnancy	24	(29.3)	58	(70.7)	82	2.4	1	.12
Second or subsequent pregnancy	14	(17.7)	65	(82.3)	79			
Attended any classes in this pregnancy (primigravidae only)								
No	15	(51.7)	14	(48.3)	29	9.3	1	.002
Yes	9	(17.0)	44	(83.0)	53			
Attended any classes ever								
No	23	(45.1)	28	(54.9)	51	17.4	1	< .0005
Yes	15	(13.6)	95	(86.4)	110			

Table 8.16 Results of Chi-square analyses for differences in incontinence variables (survey data) for reported practice of pelvic floor exercises in pregnancy (follow-up data)

Survey data	Pelvic floor exercises in final month of pregnancy (follow-up data) No/don't know n (expected)	(%)	Yes n (expected)	(%)	N	χ^2	df	p
Incontinence								
Never	5 (4.6)	(21.7)	18 (18.4)	(78.3)	23			.78*
Either before, during or after any pregnancy	18 (18.4)	(19.6)	74 (73.6)	(80.4)	92			
Severity of current incontinence								
Mild or no problem	38 (34.5)	(26.0)	108 (111.5)	(74.0)	146			.02*
Moderate or severe	0 (3.5)	(0.0)	15 (11.5)	(100.0)	15			
Frequency of current incontinence								
Once a week or less	35 (27.9)	(29.7)	83 (90.1)	(70.3)	118	7.9	1	.005
More than once a week	3 (10.1)	(7.0)	40 (32.9)	(93.0)	43			

* Fisher's Exact Test (2-tailed)

There was a significant relationship between reported frequency of pelvic floor exercises during pregnancy (follow-up data) and postnatal incontinence (Table 8.17). On visual inspection of the data, exercising daily or more often during pregnancy was associated with less incontinence than would be expected, while women who said they exercised between once a week and a few times a week reported more incontinence than would be expected. However not practising the exercises was also associated with less incontinence than would be expected. This analysis uses cross-sectional data and results only just reached significance. Analysis of the longitudinal data (reported practice of pelvic floor exercises as measured in the survey – Table 8.10) found no significant relationship between the frequency of antenatal pelvic floor exercises and postnatal incontinence.

Table 8.17 Results of Chi-square analyses for differences in reported frequency of pelvic floor exercises (follow-up data) for whether women reported incontinence following delivery

	Incontinence since delivery							
	No/don't know		**Yes**					
Follow-up data	**n (expected)**	**% (row)**	**n (expected)**	**% (row)**	**N**	χ^2	**df**	**p**
Frequency of pelvic floor exercises in pregnancy								
Never or less than once a week	42 (39.6)	(71.2)	17 (19.4)	(28.8)	59	8.3	3	.040
Once a week	13 (14.1)	(61.9)	8 (6.9)	(38.1)	21			
Few times a week	11 (16.8)	(44.0)	14 (8.2)	(56.0)	25			
Daily or more	42 (37.6)	(75.0)	14 (18.4)	(25.0)	56			

8.6.ii Practice of pelvic floor exercises in first month after delivery

Age, deprivation category, social class, job status or educational attainment did not have any relationship with the reported practice of pelvic floor exercises in the first month after delivery (Table 8.18).

Women were equally likely to report having practised pelvic floor exercises in the first month after delivery regardless of whether they had just delivered their first or a subsequent baby (Table 8.19). Attendance at classes at any time (all women) significantly increased the chances of reporting the practice of the exercises after delivery.

Table 8.18 Results of Chi-square analyses and t-tests for differences in socio-demographic variables for reported practice of pelvic floor exercises in first month after delivery

	Pelvic floor exercises in the first month after delivery (%)							
	No		Yes					
Survey data	**n**	**(%)**	**n**	**(%)**	**N**	χ^2	**df**	**p**
Deprivation category								
4 and over	14	(16.5)	71	(83.5)	85	.003	1	.96
3 and under	13	(18.1)	59	(81.9)	72			
Social Class								
Manual social class (IIIM, IV & V)	7	(17.5)	33	(82.5)	40	.0	1	1.00
Non-manual social class (I, II & IIINM)	18	(16.2)	93	(83.8)	111			
Job status								
Paid employment	22	(18.0)	100	(82.0)	122	.3	1	.61
Not in paid employment	5	(12.8)	34	(87.2)	39			
Education								
Up to secondary	13	(19.7)	53	(80.3)	66	.4	1	.54
Beyond secondary	14	(14.7)	81	(85.3)	95			
Age	M	SD	M	SD	t-test			
	27.62	6.13	29.01	5.71	-1.14		159	.26

Table 8.19 Results of Chi-square analyses for differences in obstetric variables and reported practice of pelvic floor exercises in first month after delivery (follow-up data)

	Pelvic floor exercises in the first month after delivery (%)							
	No		Yes					
Survey data	**n**	**%**	**n**	**%**	**N**	χ^2	**df**	**p**
Parity								
First pregnancy	16	(19.8)	65	(80.2)	81	.7	1	.42
Second or subsequent pregnancy	11	(13.8)	69	(86.3)	80			
Attended any classes in this pregnancy (primigravidae only)								
No	9	32.1	19	67.9	28	3.0	1	.08
Yes	7	13.2	46	86.8	53			
Attended any classes ever								
No	14	(27.5)	37	(72.5)	51	5.0	1	.03
Yes	13	(11.8)	97	(88.2)	110			

Women who had an operative delivery were significantly more likely than would be expected (p = .01) to report the practice of pelvic floor exercises (Table 8.20). Women who had a normal delivery or a caesarean section were less likely than would be expected to report practising the exercises.

Table 8.20 Results of Chi-square analyses for differences in type of delivery and reported practice of pelvic floor exercises in first month after delivery (follow-up data)

	Pelvic floor exercises in first month after delivery							
	No		Yes					
Follow-up data	**n (expected)**	**% (row)**	**n (expected)**	**% (row)**	**n**	χ^2	**df**	**p**
Type of delivery								
SVD	17 (13.6)	(21.5)	62 (65.5)	(78.5)	79	9.1	2	.01
Operative delivery	1 (7.2)	(2.4)	41 (34.8)	(97.6)	42			
Caesarean section	9 (6.2)	(25.0)	27 (29.8)	(75.0)	36			

Having suffered from incontinence either before ever pregnant, or during or after any pregnancy (including the current pregnancy) did not mean that women were more likely to report the practice of postnatal pelvic floor exercises (Table 8.21). Women with severe incontinence at the time of the antenatal interview were not more likely to report the practice of the exercises after delivery (although only one woman with moderate or severe antenatal incontinence did not do the exercises after delivery). Frequent antenatal incontinence was also not significant (again only four women with frequent antenatal incontinence did not do the exercises after delivery).

Table 8.21 Results of Chi-square analyses for differences in antenatal incontinence (survey data) and reported practice of pelvic floor exercises in first month after delivery (follow-up data)

	Pelvic floor exercises in the first month after delivery (%)							
	No		**Yes**					
Survey data	**n (expected)**	**(%)**	**n (expected)**	**(%)**	**n**	χ^2	**df**	**p**
Any incontinence								
Never	5 (3.2)	(21.7)	18 (19.8)	(78.3)	23			.31*
Either before, during or after any pregnancy	11 (12.8)	(11.8)	82 (80.2)	(88.2)	93			
Severity of antenatal incontinence								
Mild or no problem	26 (24.5)	(17.8)	120 (121.5)	(82.2)	146			.47*
Moderate or severe	1 (2.5)	(6.7)	14 (12.5)	(93.3)	15			
Frequency of antenatal incontinence								
Once a week or less	23 (19.4)	(19.7)	94 (97.4)	(80.3)	117	1.9	1	.17
More than once a week	4 (7.4)	(9.1)	40 (36.6)	(90.9)	44			

* Fisher's Exact Test (2-tailed)

The reported practice of pelvic floor exercises in the first month after delivery had no relationship with having suffered from incontinence at any time since delivery (Table 8.22).

Table 8.22 Results of Chi-square analyses for differences in any incontinence since delivery and reported practice of pelvic floor exercises in first month after delivery (follow-up data)

	Pelvic floor exercises in the first month after delivery (%)							
	No		Yes					
Follow-up data	**n**	**%**	**n**	**%**	**N**	**χ^2**	**df**	**p**
Any incontinence since delivery								
Yes	6	(11.1)	48	(88.9)	54	1.3	1	.25
No or don't know	21	(19.6)	86	(80.4)	107			

8.6.iii Relationship between pelvic floor exercises in month preceding follow-up questionnaire and incontinence variables

Women who reported moderate or severe incontinence in the week preceding completion of the questionnaire were no more likely to report recent practice of pelvic floor exercises than were women whose incontinence was mild or who did not have any incontinence (Table 8.23). There was also no relationship between frequency of incontinence and reported practice of the exercises.

8.6.iv Relationship between change in reported frequency of pelvic floor exercises and postnatal incontinence

The lack of a significant relationship between incontinence and the practice of pelvic floor exercises may be confounded by other factors. Women who have suffered from incontinence might have practised pelvic floor exercises in order to control the incontinence and may have been successful. Or it may also be that women who have been practising pelvic floor exercises have been successful in preventing incontinence.

Table 8.23 Results of Chi-square analyses for differences in severity and frequency of incontinence in week preceding completion of questionnaire and practice of pelvic floor exercises in month preceding completion of questionnaire

	Pelvic floor exercises in the month preceding completion of the questionnaire (%)					
	No		Yes			
Follow-up data	n (expected)	(%)	n (expected)	%)	n	p
Severity of incontinence in week preceding completion of questionnaire						
Mild or no problem	62 (61.6)	(40.3)	92 (92.4)	(59.7)	154	1.00*
Moderate or severe	2 (2.4)	(33.3)	4 (3.6)	(66.7)	6	
Frequency of incontinence in week preceding completion of questionnaire						
Once a week or less	62 (60.4)	(41.1)	89 (90.6)	(58.9)	151	.32*
More than once a week	2 (3.6)	(22.2)	7 (5.4)	(77.8)	9	

* Fisher's Exact Test (2-tailed)

In order to find out whether the practice of pelvic floor exercises was influenced by postnatal incontinence, a comparison was made between the reported frequency of the exercises at the different time points. New variables were created according to whether after delivery the reported frequency increased, remained the same or decreased compared with the reported frequency during pregnancy. The same procedure was used for both the frequency reported in the survey and in the follow-up.

Comparison of these variables with postnatal incontinence revealed no significant relationship (Table 8.24 and Table 8.25). Although not reaching significance, in both comparisons the trend was for incontinent women (but not continent women) to report more frequent practice of the exercises in the immediate postnatal period compared with the frequency during delivery.

Table 8.24 Results of Chi-square analyses for differences in changes in frequency of performance of pelvic floor exercises postpartum (from pregnancy follow-up data) and relationship with continence status after delivery

(Compared with rate (%) during pregnancy - follow-up data)

Postnatal continence status	Pelvic floor exercises in first month after delivery: More n	%	Same n	%	Less n	%	n	χ^2	df	p
Incontinent	21	(39.6)	23	(43.4)	9	(17.0)	53	3.68	2	.16
Continent	27	(25.5)	61	(57.5)	18	(17.0)	106			

	Pelvic floor exercises in month before completing questionnaire: More n	%	Same n	%	Less n	%	n	χ^2	df	p
Incontinent	3	(5.6)	23	(42.6)	28	(51.9)	54	.012	2	.99
Continent	6	(5.7)	46	(43.4)	54	(50.9)	106			

Table 8.25 Results of Chi-square analyses for differences in changes in frequency of performance of pelvic floor exercises postpartum (from pregnancy survey data) and relationship with continence status after delivery

(Compared with rate (%) during pregnancy - survey data)

Postnatal continence status	Pelvic floor exercises in first month after delivery: More n	%	Same n	%	Less n	%	n	χ^2	df	p
Incontinent	26	(48.1)	17	(31.5)	11	(20.4)	54	3.04	2	.22
Continent	41	(38.3)	49	(45.8)	17	(15.9)	107			

	Pelvic floor exercises in month before completing questionnaire: More n	%	Same n	%	Less n	%	n	χ^2	df	p
Incontinent	8	(14.8)	26	(48.1)	20	(37.0)	54	0.13	2	.94
Continent	16	(15.1)	48	(45.3)	42	(39.6)	106			

8.6.v Relationship between type of delivery and prevalence of incontinence

Comparison of rates of incontinence for women who delivered normally, by operative delivery and by caesarean section revealed no significant difference (Table 8.26). Women who had an operative delivery reported the highest rate of incontinence (42.9%), with a normal vaginal delivery next (33.3%), and finally women who had a Caesarean section reported the lowest prevalence of incontinence (22.2%). There were insufficient numbers to allow analysis of the effect of different types of operative delivery (forceps or ventouse) or if there was a difference between elective and emergency caesarean section.

Table 8.26 Results of Chi-square analyses for differences in type of delivery and incontinence since delivery

	Incontinence since delivery							
	No		Yes					
Follow-up data	**n**	**(%)**	**n**	**(%)**	**N**	**χ^2**	**df**	**p**
Type of delivery								
SVD	54	(66.7)	27	(33.3)	81	3.7	2	.16
Operative delivery	24	(57.1)	18	(42.9)	42			
Caesarean section	28	(77.8)	8	(22.2)	36			

8.7 Relationship between reported intention to practise pelvic floor exercises and reported practice of the exercises

Finally the longitudinal data from the follow-up will be used to find out whether the measures from the revised theory of planned behaviour (from Chapter 7) were able to predict the practice of pelvic floor exercises during pregnancy as reported in the follow-up.

The intention score of women who reported the practice of pelvic floor exercises in pregnancy (both survey data and follow-up data) were compared with those who did not report doing the exercises (Table 8.27). Only 126 women who responded to the follow-up had completed the intention questions in the pelvic floor exercises questionnaire during pregnancy. There was a significant relationship between reported intention to practise pelvic floor exercises in pregnancy and the report of the practice of pelvic floor exercises established in the interview. Similarly there was a significant relationship between intention during pregnancy and the report of the practice of pelvic floor exercises when asked in the postnatal questionnaire.

Table 8.27 Group means (standard deviations) and t-tests comparing women who reported the practice of pelvic floor exercises to women who reported not practising pelvic floor exercises (both survey data and follow-up data) on intention score

		Practice of pelvic floor exercises in month before the interview (survey data)				
		No	**Yes**	**t**	**df**	**p**
Intention score*						
	Mean	15.2	8.3	10.7**	216	< .0005
	SD	4.3	4.6			
	n	75	143			

		Practice of pelvic floor exercises in final month of pregnancy (follow-up data)				
		No	**Yes**			
Intention score*						
	Mean	15.5	9.4	4.9**	124	< .0005
	SD	4.2	5.4			
	n	22	104			

* A low score means high intention
** Following Levene's adjustment for intergroup inequality of variance

The intention scores for the women who said in the interview that they were not doing the exercises were further examined to find out whether the intention score predicted reported practice at the end of pregnancy. A score for intention was not available for all respondents. There was no significant difference between the groups (Table 8.28).

Table 8.28 Group means (standard deviations) and t-test comparing reported the practice of pelvic floor exercises in the final month of pregnancy (follow-up data) (women who were not doing the exercises in the month before the survey only) on intention scores

		Pelvic floor exercises in final month of pregnancy (follow-up data)				
		No	**Yes**	**t**	**df**	**p**
Intention score*						
	Mean	16.8	14.9	1.34	36	.19
	SD	3.7	5.1			
	n	17	21			

*A low score means high intention

8.7.i Prediction of behaviour using the RTPB model

In section 7.5 behaviour was predicted according to the RTPB model using the measure of behaviour ascertained in the cross-sectional survey data. To find out if the model was successful in predicting future behaviour (behaviour in pregnancy as reported in the follow-up), the logistic regression was re-run using the follow-up measure of the practice of pelvic floor exercises in the final month of pregnancy as the dependent variable. 'Self-efficacy', 'intention' and 'cues to action' were entered as the independent variables.

Multicollinearity between the determinant variables was assessed: 'cues to action' and 'intention' were highly correlated ($r = .72$, $n = 120$, $p < .0005$). The tolerance values were checked using linear regression and confirmed that collinearity was not a serious problem as all values were above .1 (Field 2000). All three variables were entered into the model. Model fit was adequate. The three variables together were able to distinguish between women who reported the practice of the exercises from those who did not (χ^2 (3, $\underline{N}$ = 118) = 22.34, $p < .0005$). However only 20.8% of the variance was explained (Model Chi-square/original-2LL (Field 2000, p195)). Although the model with the variables predicted 83.1% of cases correctly, this did not represent an improvement over the constant only model.

Table 8.29 Logistic regression analysis of 'self-efficacy', 'intention' and 'cues to action' on the reported practice of pelvic floor exercises in the final month of pregnancy (follow-up data)

Variables	β	SE	Wald test (z-ratio)	p	Odds Ratio	95% Confidence Interval for Odds Ratio	
						Upper	*Lower*
Self-efficacy	.18	.08	5.13	.02	1.19	1.02	1.39
Intention	.15	.09	3.01	.09	1.16	.98	1.37
Cues to action	.004	.06	.004	.95	1.00	.90	1.12
Constant	-4.90	1.07	21.19	<.0005	.007		

Regression coefficients, Wald statistics, odds ratios and 95% confidence intervals for odds ratios for each of the three variables are presented in Table 8.29. Only self-efficacy made a significant contribution to explanation of the behaviour ($z = 5.13$, $p = .02$)

8.8 Summary of Chapter 8

Chapter 8 described the postnatal postal follow-up of the women who were interviewed during the last trimester of pregnancy. First the procedure used in the follow-up and the data collection tool were described. Then results were presented.

The study achieved a 63.4% response rate. When compared with women interviewed during pregnancy, who did not complete the follow-up questionnaire, responders were older, from more affluent areas of residence, more likely to be in paid employment, and have been educated beyond secondary school. They were more likely to have had an operative delivery. The two groups did not differ significantly in terms of social class or parity.

More women reported the practice of pelvic floor exercises in the month after delivery (83.2%) than during pregnancy (60.7% - survey data; 76.2% - follow-up data). Similarly more women reported practising the exercises once a day or more after delivery (45.9%)

than during pregnancy (28.8% - survey data; 34.7% - follow-up data). In the month before completing the questionnaire fewer women said they were doing any exercises (60.0%) and only 17.5% said they were doing them once a day or more.

Incontinence at any time since delivery of the baby was reported by 33.1% of responders. When the effect of non-response was taken into account the true prevalence of any incontinence in the first postnatal year might be between 18.7% (if all non-responders had been continent) and 62.3% (if all non-responders had been incontinent). Moderate or severe incontinence in the week preceding completion of the questionnaire was reported by 3.7% of responders, while current incontinence once a week or more was reported by 4.9% of responders. Women who had an operative vaginal delivery reported the highest rate of incontinence, then women who had a normal delivery and women who were delivered by caesarean section had the lowest rate. These differences were not statistically significant and might have arisen by chance.

Reported practice of pelvic floor exercises was compared across the various time points. First the survey were results were compared with the follow-up results. More women said they did the exercises in pregnancy when asked after delivery then when asked during pregnancy. There was no relationship between the frequency of practice of pelvic floor exercises reported during the survey and whether the women reported incontinence after delivery.

Next the responses in the follow-up were compared. More women who had not exercised in pregnancy started doing the exercises after delivery (compared with the number of women who said they did them in pregnancy then stopped after delivery). More women said they had stopped doing the exercises after the initial postnatal month than said they started doing them subsequent to this time. There was an increase in the proportion of respondents who reported the practice of the exercises as the time from delivery to completion of the questionnaire increased.

The next set of analyses looked at each time point in the follow-up and compared the women who reported the practice of the exercises to those who said they did not do the exercises.

Those who reported the practice of pelvic floor exercises during pregnancy were older and from a less deprived area than those who did not. Having attended classes at any time and reporting frequent incontinence or moderate/severe incontinence at the end of the pregnancy were also more likely among women who reported practice of the exercises. Women who reported daily practice of pelvic floor exercises and also those who reported not practising the exercises at the end of pregnancy were more likely to report postnatal continence.

Those who reported the practice of pelvic floor exercises in the first month after delivery were more likely to have attended classes at any time or had an operative vaginal delivery compared with those who did not.

Reported practice of the exercises in the month preceding completion of the questionnaire was investigated next. None of the incontinence variables distinguished women who reported the practice of pelvic floor exercises in the month preceding completion of the questionnaire from those who reported not practising the exercises.

Further analyses were carried out to investigate the reason for the lack of relationship between incontinence and the practice of pelvic floor exercises. For this purpose variables representing the change in the reported frequency of pelvic floor exercises were created. The postnatal report of incontinence was found not to be associated with any increase or decrease in the reported practice of the exercises.

Finally the measures from the RTPB model (collected in the pelvic floor exercises questionnaire during pregnancy) were related to the findings from the follow-up. Women who reported that they had practised pelvic floor exercises during pregnancy (both survey data and follow-up data) scored significantly lower on the summed measure of intention (meaning they reported higher intention) than women who did not report the practice of the exercises. However women who did not report the practice of the exercises at the time of the survey, but reported high intention were not subsequently more likely to report that they carried out the exercises at the end of pregnancy when asked at follow-up compared with those who reported low intention.

The RTPB model was then used to predict behaviour in the final month of pregnancy (as reported in the follow-up). The model predicted that the variables ‘self-efficacy’, ‘intention’ and ‘cues to action’ would be able to distinguish women who reported practising the exercises from those who said they did not practise the exercises. Although the three variables successfully predicted the behaviour, the model only explained 20.8% of the variance in behaviour, and was not able to improve prediction of cases over the constant only model. Only self-efficacy significantly contributed to explaining the behaviour.

Chapter 9: Discussion

9 Introduction to the Discussion

The research questions that were addressed in the thesis as described at the end of the introduction were:

1. How many pregnant women in Dundee report having information about pelvic floor exercises?
2. How many of these women report practising pelvic floor exercises during pregnancy (Primary research question) and after pregnancy?
3. What distinguishes women who practise pelvic floor exercises from those who do not?
4. How applicable is the revised theory of planned behaviour to intention to practise pelvic floor exercises during pregnancy?
5. How applicable is the revised theory of planned behaviour to the practice of pelvic floor exercises during pregnancy?
6. How applicable is the Multidimensional Health Locus of Control measure and Health Value measure to the practice of pelvic floor exercises during pregnancy?

The findings relating to each of these questions will be discussed in turn, drawing on the findings from all the relevant chapters as appropriate. This will be followed by a general discussion of some of the methodological issues arising from the thesis. Finally implications for practice and directions for future study will be suggested.

9.1 Main Findings

9.1.i How many pregnant women in Dundee report having information about pelvic floor exercises?

All women did not report having had information about pelvic floor exercises: 77.9% of women reported they had information about pelvic floor exercises in the current pregnancy (section 6.1). This finding will be placed in the context of other studies that have reported on similar research, however it is relevant here to describe a recent doctoral study by Mason (1999) which will be referred to throughout this discussion. An initial approach to women regarding participation in the study was made to both primigravidae and multigravidae women in the antenatal clinic early in pregnancy; 1008 agreed to participate. A postal questionnaire was sent at 34 weeks gestation to 918 women (following hospital checks to ensure the pregnancy was continuing). A 78% response rate was achieved. A second questionnaire was sent at 8 – 10 weeks postpartum to all women who agreed to participate initially (excluding women who had had a miscarriage, stillbirth, or neonatal death, or if the outcome of the pregnancy was not known). The second questionnaire was sent to 894 women and achieved a 64% response rate. Both questionnaires asked about symptoms of stress incontinence and the instruction that had been provided about pelvic floor exercises. A sub-sample of women who reported the symptoms of stress incontinence after delivery were interviewed at 8 weeks postpartum (42/179 (23%) of symptomatic women). The interview covered the experience of stress incontinence after childbirth, instruction in pelvic floor exercises and help sought for the incontinence. The findings from the thesis have been subsequently published: Mason et al (1999b) – prevalence of stress incontinence, Mason et al (1999a) – experience of stress incontinence after childbirth, and Mason et al (2001a) – instruction about pelvic floor exercises. Women who reported incontinence at 8 weeks postpartum were subsequently followed-up one year after delivery (59% response rate). Of the 69 who were still symptomatic, 15 agreed to be interviewed. Findings from this one-year follow-up interview have also been published: Mason et al (1999a) – experience of stress incontinence after childbirth and Mason et al (2001b) – reluctance of women to seek help for stress incontinence.

In contrast to the findings about reported information provision in the current study, Mason et al (2001a) found that 55.3% of women said they had received some information about pelvic floor exercises during pregnancy. Similarly Logan (2001) sent 240 women a postal questionnaire 6 – 12 months after delivery (only 41% response rate). Of the 99 responders, 53% reported that they had received any information or instruction about pelvic floor exercises. A higher proportion of women in the current study reported having information (77.9%). This may be due to the different method (interview rather than postal questionnaire (Oppenheim 1992)). In the interview it was possible to clarify the questions and allow women to elaborate. The study by Mason et al (2001a) asked if women had been *given* information, and the next question included only professional sources of information. In the current study women were asked if they had *had* information, and other sources such as books and magazines were included in the subsequent question. Books were mentioned most often as the source of information, which may explain the higher proportion of women who reported having information. Logan (2001) does not give details of the questions asked, but her study may have been affected by the time delay between the pregnancy and the questionnaire, and the poor response rate. The differing rates might also be explained by better information provision in Dundee compared with the areas where the other studies were conducted.

Herbert (2000) reported that in 1998, 98% of 48 randomly selected women attending a postnatal group were aware of pelvic floor exercises, mostly via antenatal education sessions. These women are probably atypical as they were attending a postnatal group, and most seem to have attended classes during pregnancy. Most said they had been given a leaflet about pelvic floor exercises, however descriptions of what a pelvic floor muscle contraction entailed revealed inaccuracies and misconceptions about the exercises.

Research evaluating changes in knowledge following programmes of antenatal education have been carried out (for example (Redman et al. 1991)), however investigations into levels of reported information provision on specific topics are unusual, so comparison with recall of other topics of information provided in the antenatal period is not possible. The question in the current study about information provision was a relatively crude measure and did not evaluate the results of a specific intervention (unlike Redman et al (1991) which found significant improvements in knowledge following attendance at education classes).

In the current study women who had been pregnant before were likely to report having received information either during or after a previous pregnancy, so that overall 90.0% of women knew something about pelvic floor exercises. However younger women, those in their first pregnancy and from more deprived backgrounds were significantly less likely to know about the exercises (section 6.1.i), suggesting that these groups of women should be targeted in future interventions. The findings relating to the socio-demographic differences between those with and without information reflect the fact that the measure of reported information provision was strongly related to social class differences and lower levels of education. Although the results tend to reinforce traditional stereotypes, it is acknowledged that women from more deprived backgrounds have similar expectations and needs compared with women who are more articulate and able to access information from many different sources (Nolan 1997; Green et al. 1998). Indeed when the odds ratios of not knowing about pelvic floor exercises were calculated (Table 6.9) the width of the confidence intervals for the findings relating to measures of age and social deprivation indicated that there was wide variability within the sample and that the group was not homogenous.

Reported sources of information provision (as described in Table 6.1) will now be considered.

Books were mentioned most often as the source of information. For women who only mentioned one source of information, books were also most often the only source. Although not specifically identified on the interview schedule, many women cited the HEBS book (Health Education Board for Scotland 1998) which is provided at the start of pregnancy to all first-time mothers. Clearly this is an important source of information, a finding confirmed by a recent large-scale survey of women in the last trimester of pregnancy (Singh and Newburn 2000). In this survey of 1188 pregnant women living in England and Wales, The Pregnancy Book (equivalent to the HEBS book) was most frequently mentioned as the most useful source of information during pregnancy. However in the HEBS book the section on pelvic floor exercises suggests that the exercises should be done after delivery, and only recommends their use in pregnancy for women suffering from stress incontinence (Health Education Board for Scotland 1998).

Magazines were mentioned by 43.1% of women as being a source of information. The popularity of such information sources has been noted by other studies, particularly for younger women (Singh and Newburn 2000).

Thirty-nine percent of women reported receiving information in a parent education class. Women who had been to classes were significantly more likely to know about the exercises (section 6.1.i); this information route seems to be effective in communicating the message about pelvic floor exercises. Women who attend classes are more likely to be older, more educated and from more affluent backgrounds (Redman et al. 1991; Nichols 1995), they are also likely to find information from many different sources. It is notable that while 88 women reported that they had information about pelvic floor exercises in a class, only 11 said that the class was the only source of information (Table 6.1). However 39.4% of women in this study had never attended classes; these women are being missed. While classes may be helpful in providing information about pelvic floor exercises to those who attend them, there is clearly a requirement to address the information needs of those who do not attend classes.

A third of women said that they had had information from a health professional about pelvic floor exercises, but only a fifth (21.8%) said that the information had come from a midwife. A similar figure was reported by Mason (2001a) who found that 15.4% of women had been given information by a hospital midwife and 28.3% of women by a community midwife. In contrast, Chiarelli and Campbell (1997) reported that only 13% of women said they were told about pelvic floor exercises during pregnancy by a healthcare professional, and only 5% by a midwife. This was in response to a question about bladder control, perhaps accounting for the lower figures.

There is a lot of information that could be communicated during pregnancy by health professionals, and often a need to prioritise. The evidence from this study suggests that few women (21.8%) reported receiving information about pelvic floor exercises during pregnancy from a midwife. This may be because midwives regard pelvic floor exercises as the remit of the physiotherapist. Only 8.4% of women reported receiving information from a physiotherapist (not including women who had information from a physiotherapist during a parent education class). A slightly higher percentage was reported by Mason (2001a), however that study made no distinction between contact with a physiotherapist during a class or otherwise. Generally women have no contact with a physiotherapist during pregnancy (except if they attend parent education classes or have a physical problem necessitating referral), and consequently do not get this information.

A further issue that needs to be addressed is the instruction about how to do the exercises given in the information and the method of communication. Bump (1991) suggested that verbal or written information may be insufficient to ensure that women know how to correctly perform the exercises (section 1.4.iii). Comments made by women in the qualitative interviews (such as 'I don't think I did them properly though…….it was sore') suggest that misconceptions may exist among pregnant women about how to do the exercises. This finding has been confirmed in other studies of pregnant women (Logan 2001; Mason et al. 2001a). The current study did not make detailed enquiry about the nature of the information (how detailed was the instruction, strength and frequency of contraction to perform, etc.), the method of communication (verbal or written) or the level of understanding. Nonetheless a third of the women in this study said they would have liked more information about the exercises, perhaps indicating that the information they had been given was inadequate.

The exploratory interview study (Chapter 2) suggested that some women did not know anything about pelvic floor exercises. The findings from the main study have quantified that suggestion and confirmed that not all women report having information about pelvic floor exercises during pregnancy, particularly younger women from more deprived backgrounds. Few women reported having received information from midwives or other health professionals. In addition the importance of information sources such as the HEBS book has been highlighted. Pelvic floor exercises are promoted as the most important exercise a woman can practise during pregnancy (Balaskas 1990). It is clear from the results of this study that some women do not report having any information about the exercises. Without information there is no chance of practising the exercises.

9.1.ii How many pregnant women in Dundee report practising pelvic floor exercises during pregnancy (Primary research question) and after pregnancy?

This section will first discuss the findings relating to reports of antenatal practice of pelvic floor exercises from both the survey and the follow-up (section 9.1.ii.1), and then go on to look at the reports of postnatal practice of pelvic floor exercises from the follow-up (section 9.1.ii.2).

9.1.ii.1 How many women report the antenatal practice of pelvic floor exercises?

Only just over half the women reported that they had practised pelvic floor exercises in the month before the interview (section 6.2). The study by Mason (1999), and the postnatal postal questionnaire by Wilson et al (1996) are the only other studies that have investigated the reported practice of pelvic floor exercises during pregnancy. A comparison of findings is made in Table 9.1.

Table 9.1 Comparison of reported frequencies of practice of antenatal pelvic floor exercises

Frequency of reported practice of antenatal pelvic floor exercises	(Wilson et al. 1996)	(Mason 1999)	This study (survey data) (Table 6.4)	This study (follow-up data) (Appendix 22)
	% of respondents			
Never	}46.3	30.5	46.0	19.3
Less often than once a week		23.6	3.5	13.0
Once a week	7.0	5.0	8.0	13.0
More than once a week but less than once a day	29.7	21.5	16.3	15.5
Once a day	}16.9	17.0	10.7	16.1
More than once a day			15.6	18.6

The survey data from the current study and the findings of Mason (1999) should be comparable in that women were asked about the practice of pelvic floor exercises during pregnancy, although this study asked women face-to-face during an interview and Mason's data (1999) was collected by postal questionnaire. Mason was unable to collect any data about non-responders. Responders to postal questionnaires are often more educated and from more affluent backgrounds (Cartwright 1986b; MacArthur et al. 1993; Wilson et al. 1996; Brown and Lumley 1998). It is possible that this bias may also have affected responders in the study by Mason (1999) who were therefore more motivated to report the practice of the exercises. These factors may account for the slightly higher reported rate of practice found by Mason (1999). The findings of the current study are likely to be more accurate as women were unaware of the focus of the study at the time of the interview. In addition the current study over-sampled from clinics attended by younger women, those expecting their first baby and those from more deprived backgrounds (see section 9.3.ii). One can speculate that if more women from more affluent areas had been included in the sample, that reported rates of practice may in fact be slightly higher than found in this study.

The follow-up data and the Wilson et al (1996) study both used postnatal postal questionnaires asking women to remember their behaviour at the end of pregnancy. All women in the Wilson et al (1996) study completed the questionnaire three months after delivery, while the delivery to follow-up interval in the current study ranged from 6 – 12 months.

Comparing first the survey data from this study to the studies by Mason (1999) and Wilson et al (1996), all three studies reached very similar conclusions for the proportion of women reporting the practice of the exercises less than once a week or not at all (Table 9.1). The current study found that more women reported practising the exercises once a day or more. Differing obstetric and midwifery practice (relating to awareness, instruction and reinforcement of the exercises) in each area may account for differences, while the study by Wilson et al (1996) may have been affected by the longer time gap between the questionnaire and the time period of interest (three months). However the similar percentages of women who reported practice of the exercises at least once a week confirms that approximately half of all pregnant women make some effort to do the exercises. Some women commented during the interview that they had thought that they were only supposed to do the exercises after delivery, a finding confirmed by the work of Logan (2001). This misconception may have affected the results for antenatal practice of the exercises.

The findings of the follow-up suggest that a higher percentage of women report practising the exercises in pregnancy and an even higher percentage report exercising frequently (compared with the reports of practice in the survey) (Table 8.7 and Table 9.1). A number of sources of bias may have influenced this result. The higher proportion responders who were older and those from more affluent backgrounds (section 8.2.iii, Table 8.4) (women who were found in the survey to report higher rates of practice – Table 6.7) means that this result may be an over-estimate of the true percentage. Also as the purpose of the follow-up was explicit it probably reflects responses from women particularly interested in incontinence or pelvic floor exercises. In addition some women may have answered ‘yes’ in the follow-up because they felt guilty, wanted to please or to present a favourable impression (social desirability (Oppenheim 1992)). Another reason for the increased reporting of the exercises may be that having taken part in the interview women were prompted to start doing the exercises. The change in reporting is in the expected direction. Only 8 women who said they did them in the interview said they did not do them in the last month when asked after delivery, whereas more (n = 33) changed from no to yes (Table 8.9). The general consistency in responses (or if different, they were in the expected direction) helps to validate further the results of the survey.

The percentage of respondents who reported the practice of the exercises increased as time from delivery to completion of the follow-up questionnaire increased (Table 8.13). The reason for this is not clear but it may be that these women were particularly interested or motivated to practise the exercises, and therefore more motivated to respond.

While the self-reports of practice of the exercises appear to show some consistency it is still probable that actual practice of the exercises is less than the levels reported in the study because of the effect of social desirability. This effect was minimised in this study by concealing the true area of interest until after data had been collected in the structured interview. However some women may have inflated responses to all questions in an attempt to appear ‘good patients’ or to tell the researcher what they think is wanted. Face to face interviews may be more prone to this effect than the anonymity afforded by postal questionnaires (Oppenheim 1992). Further work is required to replicate the current study using some measure of pelvic floor muscle strength to verify reports of practice. Alternatively a sub-sample could be asked to record practice in a daily diary. However the act of doing this might act as a trigger, and hence improve compliance.

Higher rates of practice have been reported more recently. A recently published trial of antenatal pelvic floor exercises found that two thirds of the control group (65.8%) (who received no intervention apart from usual antenatal care) were reported to have practised pelvic floor exercises (Jones 2000). The control group included a higher proportion of parous women, the study does not make clear whether this frequency was during or after pregnancy and women in this study had reportedly low levels of compliance. In the group that were given antenatal instruction regarding pelvic floor exercises, only 22.4% practised the exercises daily, and 13% did none at all. Women who have agreed to participate in a randomised trial are likely to have higher rates of practice even if allocated to the control group. Another smaller postnatal survey 6 – 12 months after delivery reported that 67% (n = 66) of respondents had tried pelvic floor exercises during the pregnancy (Logan 2001). No information was given about the frequency of exercising, and the study only achieved a 41% response rate.

The current study found that during pregnancy ninety percent of women had some knowledge of the exercises. The percentage of women reporting the practice of pelvic floor exercises was much lower suggesting that many women who knew about the exercises did not practise them. Other studies have also reported a discrepancy between knowledge and practice (Mason 1999; Herbert 2000; Jones 2000). This confirms the finding from the qualitative interviews about inconsistency between knowledge and practice about the exercises.

9.1.ii.2 How many women report the postnatal practice of pelvic floor exercises?

The findings from the follow-up will now be discussed: first the percentage of women who reported exercises in the immediate postnatal period, then in the month before completing the questionnaire ($\underline{M}$ = 32.5 weeks after delivery, SD 5.9).

Table 9.2 gives the rates of practice of pelvic floor exercises in the immediate postnatal period in the studies that have collected comparable data. The current study found that most women (83.2%) reported that they did pelvic floor exercises in the month after delivery of the baby (Table 8.7), an almost identical finding to that of Mason (1999) who found that 82.2% said they did pelvic floor exercises following delivery. Wilson et al (1996) reported a lower figure but only included those who said they did the exercises more than once a week (66%).

Table 9.2 Comparison of reported frequencies of practice of pelvic floor exercises after delivery

Frequency of reported practice of pelvic floor exercises after delivery	(Wilson et al. 1996)	(Mason 1999)	This study
	% of respondents		
Never	}34.0	17.7	16.8
Less often than once a week		29.9	10.6
Once a week	6.3	5.1	8.7
More than once a week but less than once a day	34.2	24.5	18.0
Once a day	25.5	19.7	18.6
More than once a day			27.3

It is unsurprising that more women reported doing the exercises in the immediate postnatal period as this is a time of high exposure to health professionals, and most women are seen by a physiotherapist in the postnatal ward before they go home. Provision of leaflets about pelvic floor exercises supplements direct contact with a physiotherapist (Mason et al. 2001a). Many women believe that they are only supposed to do the exercises after delivery. After delivery women are highly motivated to try to regain pre-pregnancy bodily functions and fitness. Other commentators have suggested that the presence of a young baby may distract from the practice of the exercises (Norton 1994), or that perineal discomfort may be a deterrent (Peschers et al. 1997). The consistently high proportion of women reporting doing the exercises (and exercising frequently) suggests that these disincentives are relatively unimportant.

The current study found a much higher percentage of women who reported frequent exercising than did either of the other studies (Table 9.2). This may be due to the high number of older and more affluent responders to the follow-up questionnaire. The study by Mason (1999) was not permitted by the ethics committee to collect data from the medical records of non-responders so no comparison was made on demographic details between responders and non-responders. Wilson et al (1996) reported that non-responders were younger, but made no other comparison on the basis of socio-demographic details. In the current study it was possible to compare respondents and non-respondents to the follow-up across a wider range of socio-demographic variables (section 8.2.iii). The bias in respondents to the follow-up found in the current study may also have affected the postnatal postal questionnaires of both the studies by Mason and by Wilson. The reported percentage of frequent exercisers is likely to be an over-estimate in all studies.

When asked about the day before delivery, most women did not know, couldn't remember or said they had not done any pelvic floor exercises (Table 8.7). This result gives some validity to the findings, as it might be expected that the memory of this particular day would not be clear. In retrospect it may have been unrealistic to ask this question.

In the month before completion of the postnatal questionnaire (M = 32.5 weeks after delivery, SD 5.9) fewer women reported the practice of the exercises compared with the number who reported exercising in the immediate postnatal period. This finding was also noted by both Mason (1999) and Wilson et al (1996) (Table 9.3). The current study found that the proportion saying they never practised the exercises or did them less than once a week in the month before the questionnaire was lower than that reported by both Wilson et al (1996) at 3 months and Mason (1999) at 12 months. The timing of completion of the questionnaire in the current study ranged from 6 months to 12 months postnatal. As the time interval between delivery and completion of the questionnaire increased, the proportion of women reporting the practice of the exercises increased (section 8.5.ii, Table 8.13). One can speculate that those performing pelvic floor exercises may have been more motivated to reply, perhaps because they were more likely to be suffering from incontinence. Herbert (2000) reported 49% of postnatal women reported daily pelvic floor exercises after delivery but only 10% had continued beyond 2 weeks.

Table 9.3 Comparison of reported frequencies of practice of pelvic floor exercises in month before questionnaire

Frequency of reported practice of pelvic floor exercises month preceding questionnaire	(Wilson et al. 1996) (three months p/n)	(Mason 1999) (one year p/n)	This study (6 – 12 months p/n)
	% of respondents		
Never	}30.5	55.7	38.1
Less often than once a week			20.0
Once a week	17.1		8.8
More than once a week but less than once a day	37.5	} 44.3	13.8
Once a day	14.9		9.4
More than once a day			8.1

An indication of the proportion of women who practise pelvic floor exercises after delivery can also be taken from the control arm of trials of the exercises in the postnatal period. Sleep and Grant (1987) reported 68% at 10 days and 42% at three months in the control group said they had done the exercises. Chiarelli and Cockburn (2002) recently published a large Australian randomised trial of pelvic floor exercises after delivery to prevent incontinence in at risk women (forceps or ventouse delivery, or a baby of 4000gm or more). Out of 328 women in the control arm of the trial (who received usual postnatal care) at three moths after delivery 83.9% reported performing pelvic floor exercises three times a week or more. This figure is higher than the comparable proportions for the reported practice of the exercises more than once a week in the current study, and compared to the other studies reported above. However higher rates might be expected in the control group of women as they knew they were taking part in a trial of the exercises, and (presumably) knew they had been asked to participate because they were at risk.

The reported frequency of the exercises increased in the immediate postnatal period, and then decreased in the month before the questionnaire was completed. These changes are in the expected direction and lend validity to the results. As time passes following delivery of the baby, physical recovery gradually takes place, the immediate need to practise all the recommended postnatal exercises diminishes, and life gradually returns to 'normality'. Possibly only those women particularly motivated due to having experienced incontinence or those more aware due to other family members suffering incontinence might continue to exercise. Those already in the habit of exercising might continue to practise pelvic floor exercises, as suggested by the findings relating to the effect of past behaviour on intention (section 7.3.i).

9.1.iii What distinguishes women who practise pelvic floor exercises from those who do not? – demographic factors

The following two sections will discuss the findings relating to the demographic differences between women who reported the practice of pelvic floor exercises and those who did not. First the findings relating to antenatal practice of the exercises will be discussed (both the results from the survey as well as the follow-up) (section 9.1.iii.1). Next the results of the follow-up relating the reports of postnatal practice of the exercises will be discussed (section 9.1.iii.2).

9.1.iii.1 What distinguishes women who practise antenatal pelvic floor exercises from those who do not? – demographic factors

The women who reported not doing pelvic floor exercises in pregnancy (section 6.2.i, Table 6.7) were more disadvantaged in terms of area of residence, level of education achieved and being in paid employment. They were also significantly younger. Mason (1999) similarly found that women who reported antenatal practice of pelvic floor exercises were significantly older than were those who did not practise the exercises. In addition she found that practice of the exercises was associated with being Caucasian, being less likely to smoke, taking other forms of exercises, breast-feeding the baby, using entonox for pain relief, not having a spinal anaesthetic, delivering a heavier baby and having labour induced. Other demographic variables were not included in her analysis, although some of these significant findings (such as relating to smoking and breast-feeding) are likely to be closely related to affluence.

In contrast the data collected in the follow-up found only that women who reported doing the exercises in pregnancy were differentiated from those not doing the exercises by age and deprivation category (section 8.6.i, Table 8.14), however results only just reached significance. The difference in findings between the survey and the follow-up can be explained by the finding that women who responded to the follow-up were older and from more affluent areas (section 8.2.iii) (the groups of women most likely to report practice in the survey – section 6.2.i, Table 6.7). It is also likely that they were more motivated to respond as they had a particular interest in incontinence or pelvic floor exercises. A number of women (n = 33) who said they did not do the exercises when asked in the interview, reported in the follow-up having done them during pregnancy (section 8.4, Table 8.9). These changes account for the differences between the findings in the follow-up and the survey. The survey findings are more likely to reflect a true picture of antenatal practice of the exercises (although as discussed in section 9.3.ii, the over-sampling of women from more deprived areas means that the reported rate of practice of antenatal pelvic floor exercises may be lower than the rate for the whole population of pregnant women attending antenatal clinics in Dundee).

The current study found that first-time mothers were just as likely to report practising the exercises during pregnancy, compared with women who had children already (noted both in the survey – section 6.2.i, Table 6.8; and the follow-up – section 8.6.i, Table 8.15). This was in spite of the fact that parous women were significantly more likely to know about the exercises. The reason for this finding is not clear. One can speculate that women in their second or subsequent pregnancy might be busier and have less time to think about looking after themselves. It may be that first-time mothers are more conscientious about preparing for labour and delivery and the postnatal period (suggested by the comment during the exploratory interview 'with the first you tend to be a bit more attentive'). They are more likely to attend parent education classes where pelvic floor exercises are generally taught. This is confirmed by the finding that class attendance in the current pregnancy by primigravidae was significantly associated with the practice of the exercises (section 6.2.i, Table 6.8). However as parous women are more likely to have been troubled by incontinence in the past, or to be currently suffering from incontinence, and are more aware of pelvic floor exercises, it might be expected that they would be more likely to do the exercises. An explanation might be that having tried pelvic floor exercises in the past with little effect, they might be more cynical about the efficacy of the exercises.

The survey (section 6.2.i, Table 6.8) and the follow-up (section 8.6.i, Table 8.15) both found that women who had been to classes were significantly more likely to report the practice of the exercises. This might suggest that classes are an effective way to communicate about pelvic floor exercises. However it may also reflect the fact that the women who attend classes are generally more motivated to take care of their health. The wide confidence intervals relating to the chance of class attendance (especially by primigravidae) leading to the practice of the exercises (Table 6.9) may diminish the significance of this result.

9.1.iii.2 What distinguishes women who practise postnatal pelvic floor exercises from those who do not? – demographic factors

Regardless of background, education, age, parity or experience of incontinence women (83.2%) reported practising pelvic floor exercises in the immediate postnatal period (section 8.6.ii, Tables 8.18 and 8.19). The message regarding the importance of postnatal pelvic floor exercises appears to have been effective (in this group of women). However as non-responders were younger and from more deprived backgrounds it is likely that the true rate of practice of the exercises after delivery was lower, and that if non-responders had also been included the demographic differences between exercisers and non-exercisers would have persisted. Other studies have not reported on the relationship between pelvic floor exercises and these factors.

Women who had an operative delivery were significantly more likely to report the practice of the exercises in the first month after delivery (section 8.6.ii, Table 8.20). This may have been because they received extra input from the physiotherapists and midwives after delivery, and were aware of the higher risk of incontinence due to the method of delivery. Although only approaching significance, women who had an operative delivery reported a higher rate of postnatal incontinence (section 8.6.v, Table 8.26). It is possible that more women were practising the exercises because of suffering from incontinence, rather than practising the exercises to prevent incontinence.

9.1.iv What distinguishes women who practise pelvic floor exercises from those who do not? - relationship between pelvic floor exercises and incontinence

The relationship between antenatal pelvic floor exercises and incontinence was also investigated (section 6.4.ii). The cross-sectional data collected at the time of the interview during pregnancy revealed that only severe current incontinence had a significant relationship with the practice of pelvic floor exercises during pregnancy, although this result only just reached significance (Table 6.12). Surprisingly, previous incontinence either during or after an earlier pregnancy, or at any time in the current pregnancy, did not have a significant relationship with the reported practice of the exercises. Although there was a significant effect for moderate or severe current incontinence, frequent current incontinence was not significantly associated with a higher number of women reporting the practice of the exercises. From this data it is not possible to establish cause and effect. It may be that women who had previously been incontinent were not doing pelvic floor exercises and their incontinence had resolved spontaneously (however pregnancy induced incontinence does not generally resolve until after delivery). Women who reported practising the exercises may also have been controlling symptoms of incontinence with pelvic floor exercises (although there was no significant relationship with incontinence earlier in the current pregnancy).

In contrast, the findings from the follow-up revealed that women who had said they had frequent or moderate/severe incontinence in the week before the interview were more likely to say in the follow-up that they did the exercises at the end of pregnancy (section 8.6.i, Table 8.16). It may be that the interview highlighted pelvic floor exercises to these women resulting in more practising the exercises. Another explanation may be that the postal follow-up was explicit about the topic of interest being pelvic floor exercises, thus making incontinent women feel they ought to have been doing the exercises, and leading to a subsequent higher rate of reporting.

There was a change in reported practice of the exercises in pregnancy from the interview to the follow-up. As described in the previous two paragraphs, the relationship between the report of current incontinence and practice of pelvic floor exercises reported in the interview (section 6.4.ii, Table 6.12) was consequently different to the relationship between the report of current incontinence in the interview and the report of practice during pregnancy in the follow-up (section 8.6.i, Table 8.16). It is possible that the interview itself prompted some women to start doing the exercises. Ashworth and Hagan (1993a) found that some women who were incontinent felt guilty that their non-practice of pelvic floor exercises contributed to the incontinence. If a short-lived interview during the latter stages of pregnancy can increase practice to such an extent, it provides an important pointer to the effect that could be achieved if a brief reminder was incorporated into routine care during pregnancy.

A further interesting finding from the follow-up was the relationship between frequency of pelvic floor exercises during pregnancy (follow-up data) and the postnatal report of incontinence. Women who said they were doing the exercises daily or more often in pregnancy were more likely to report postnatal continence (section 8.6.i, Table 8.17). This finding was also reported by both Wilson et al (1996) and Mason (1999). Concurring with the findings of Mason (1999) the current study also found that women who said they did not do the exercises in pregnancy were more likely to report postnatal continence. This may be due to the fact that women not doing the exercises in pregnancy (follow-up data) were less likely to be incontinent during the pregnancy, whereas women doing the exercises during pregnancy were already experiencing some degree of incontinence (section 8.6.i, Table 8.16). This suggests that the antenatal practice of the exercises was in reaction to incontinence rather than as a preventive measure. However the current findings agree with those of both Wilson et al (1996) and Mason (1999) that the exercises need to be performed on at least a daily basis if they are to reduce the prevalence of postnatal incontinence (reported practice once a week or a few times a week was not associated with postnatal continence). It also lends further weight to the evidence provided by Sampselle et al (1998) in a small RCT that practice of the exercises may result in fewer urinary symptoms during the first 6 months after delivery.

However the significant findings relating to frequency of practice of antenatal pelvic floor exercises and postnatal incontinence were only found using the cross-sal data (report of antenatal practice from the follow-up questionnaire), and results only just reached significance (Section 8.6.i, Table 8.17). There was no significant relationship between frequency of antenatal pelvic floor exercises reported in the survey and postnatal incontinence (section 8.4, Table 8.1). This may be because the responders to the postnatal questionnaire were suffering from incontinence, and perhaps more motivated to practise the exercises. These findings should be treated with caution.

The analysis conducted on the change in frequency of pelvic floor exercises from the antenatal report to the postnatal reports confirmed that postnatal continence status did not significantly affect the reported frequency of practice of pelvic floor exercises (section 8.6.iv). However the trend towards women who reported any postnatal incontinence being more likely to increase their postnatal reported frequency of pelvic floor exercises from their antenatal frequency, suggests that the increase in frequency may have been in response to the incontinence. This is similar to the findings of (Wilson et al. 1996) who concluded that the greater frequency of reported practice of pelvic floor exercises after delivery was a consequence of incontinence.

There is no consensus in the literature about the frequency of pelvic floor exercises that should be performed and other studies have found that women are given different advice about how often the exercises need to be practised (Mason et al. 2001a). Similarly Logan (2001) surveyed midwives about the exercises and found a range of differing methods of teaching the exercises, some of which she suggests may be unsuccessful and lead to ineffective practice of the exercises. The current study suggests that at least daily exercises during pregnancy may be needed to reduce the postnatal prevalence of incontinence.

The current study made no attempt to verify that the women who reported the practice of the exercises were performing a correct muscle contraction, or that the verbal reports of frequency of exercising were accurate. The number of daily contractions, the number of sessions per day and the type of contraction (fast or sustained) were not confirmed either. Reports of stress incontinence were not confirmed by urodynamic testing. Neither was any attempt made to assess the impact of the reported incontinence on quality of life. These are limiting factors in this study. However the purpose of the study was not to test the effectiveness of the exercises, but to investigate motivation towards practising the exercises; hence it was not appropriate to measure these aspects.

Recently published research has provided further evidence that postnatal pelvic floor exercises may be effective in the prevention of postnatal incontinence, particularly in women who are at higher risk of developing incontinence. Chiarelli and Campbell (2002) conducted a study in Australia and confirmed the efficacy of the exercises as a preventative measure in vulnerable women (n = 720). They randomised women 'at risk' of developing incontinence after delivery (women who had had a forceps, ventouse delivery or delivery of a baby of over 4000gm), into two groups. One group was instructed by a physiotherapist in the postnatal ward followed by further contact at eight weeks postnatal (either at home or in hospital). The other group had usual care. The intervention reduced the prevalence of incontinence three months after delivery (31.0% compared with 38.4% in the control group).

A smaller trial carried out in Switzerland by Meyer et al (2001) examined 107 nulliparous women during pregnancy (mean 29 weeks, SD 7). At each visit all women were asked detailed questions about urinary and faecal incontinence, and had ultrasound assessment of the perineum, urodynamic testing and measures of pelvic floor muscle strength using digital assessment and using an air-filled intravaginal and intra-anal balloon connected to a pressure transducer. The assessments were repeated at nine weeks (SD 2 weeks) postpartum when women were assigned to either normal care or 12 sessions (over six weeks) of intensive pelvic floor education including biofeedback. Method of group allocation is not stated. They found that at follow-up 10 months after delivery the trained group achieved a significant improvement in reported urinary incontinence. However the trained group reported a greater prevalence of incontinence at the time of group allocation and there was no difference in prevalence of incontinence between the groups at 10 months. None of the other measures of pelvic floor muscle strength or bladder neck position showed any difference between the groups, and there was wide variation between participants. Correlation between pressure measurements and continence status is not reported. Attendance at the sessions or compliance with the proposed exercise regimen is not stated. The study does not state clearly the primary outcome measure, or how the sample size was calculated. It was possibly too small to detect a difference in incontinence between groups.

The current study was designed to measure beliefs about pelvic floor exercises and find out what factors were associated with the practice of the exercises. The question of the efficacy of the exercises for all women as a preventive measure (either antenatal or postnatal) remains unanswered. Stronger evidence for the efficacy of the exercises during pregnancy as a preventative measure is required before the exercises can be confidently recommended to all pregnant women. Further study is also required to confirm the minimum level and intensity of exercises during pregnancy required to confer a protective effect (particularly for continent women).

The findings of this study indicate that some women who are currently experiencing incontinence may be motivated to practise the exercises as a remedy rather than as a preventive measure. However many women who had no current or previous experience of incontinence also reported practising the exercises. Clearly the reasons that motivate women to practise the exercises are more complex than just incontinence.

9.1.v How applicable is the revised theory of planned behaviour to intention to practise pelvic floor exercises during pregnancy?

This section will discuss the results of Chapter 7. First the findings relating to the relationship between the direct determinants of intention and the measure of intention will be discussed. Next the results pertaining to the relationship between the indirect determinants (or belief-based measures) and each of the direct determinants will be considered. Finally the results relating to habit theory and past behaviour will be examined.

9.1.v.1 Direct determinants of intention

Intention to practise pelvic floor exercises every day during pregnancy was explained by 'attitude to the new behaviour' (beliefs about pelvic floor exercises), 'subjective norm' (a general measure of the importance of other people's views about the referent performing pelvic floor exercises) and 'self-efficacy' (the woman's belief in her ability to do pelvic floor exercises) (section 7.2.i). These are the variables originally proposed by Ajzen (1988) in the Theory of Planned Behaviour (TPB). The TPB model was able to explain 53.1% of the variance in intention (52.4% adjusted). This compares with an average explained variance of 40.9% found in other studies that have used the TPB model for predicting health related behaviours (ranging from 32.0% for eating behaviours to 46.8% for oral hygiene behaviours) (Godin and Kok 1996). The additional variable proposed by Maddux (1993) in the revised TPB model was 'attitude to current behaviour' (perceived vulnerability to postnatal incontinence). This variable had no relationship with intention to practise pelvic floor exercises.

The score for 'intention' for the whole sample was neutral (near the mid-point of the scale), suggesting that either all were ambivalent in their intention to practise the exercises, or that there was an equal spread between intenders and non-intenders. More than 5% of values were missing for this variable. Some women indicated after the interview that they had thought that they were only supposed to do pelvic floor exercises after delivery, and consequently they may have had no opinion either way about whether they would do the exercises during pregnancy. It is also possible that some women who knew about the exercises were unsure about what they entailed and so missed these items. Additionally there may have been a degree of ambivalence by others regarding the subject matter (Conner and Sparks 1995): if women did not hold strong views about pelvic floor exercises or regard them as important, they may have found the questionnaire difficult to complete. The measure of intention may reflect only the opinions of those who held definite views about whether they would or would not do the exercises, indicated by the slightly platykurtotic nature of the data.

The greatest unique contribution to explaining intention to practise pelvic floor exercises was made by ‘attitude to new behaviour’ i.e. positive beliefs about the exercises. This has implications for future interventions. If the beneficial aspects of pelvic floor exercises are emphasised and a positive attitude towards the exercises encouraged, then intention to practise the exercises is likely to be enhanced.

The general measure assessing the importance of subjective norm also made a significant unique contribution to the explanation of intention to practise pelvic floor exercises. This shows that the opinion of other people is still valued in relation to behaviour seemingly of only personal relevance.

An application of the Revised Theory of Planned Behaviour (RTPB) model has recently been reported by Palmer (2000). While not about incontinence, it investigated motivation to exercise in a small group (n = 20) of elite under-21 netball players. Participants were given a questionnaire based on the RTPB to complete prior to a seven-week period of training. Intention was assessed by six items. Self-efficacy was assessed by five items evaluating the confidence of the players in their ability to train when faced with identified barriers such as lack of time or exams. Attitude to the new behaviour was assessed by four items evaluating attitude to the next training period. Attitude to the current behaviour was assessed by four items evaluating attitude to continuing training as in a previous training period, as well as a single item measuring perceived vulnerability. Social norm was measured by four items. Finally cues-to-action was measured by attendance during a previous period of training (average percentage of training sessions completed).

Palmer (2000) found that the four measures from the RTPB did not significantly predict intention to train. Some of the scores appeared to be highly skewed, particularly the measures of intention, attitude to the new behaviour and perceived social norms. Corrections of these violations of normality were made prior to regression, however significant skew remained. In addition there was a very small sample size and very low correlation between the dependent variable and some of the independent variables. These factors throw doubt on the suitability of the data for multiple regression.

Another recent study in the Netherlands involved sending questionnaires to 129 women who were incontinent, aged between 27 and 82 years, investigating their intention to practise pelvic floor exercises prior to commencing a treatment programme for incontinence (Alewijnse et al. 2001). The Attitude-Social influence-self-Efficacy (ASE) model was used. This includes many similar components to the TPB and proposes that behavioural intention is determined by factors such as attitudes, social influences and self-efficacy expectations. In addition the influence of modelling and social pressure/support are also included. Before the treatment programme measures of intention and the determinants of intention were made. In this model external variables (such as frequency of incontinence and socio-demographic variables) can influence intention directly as well as through the ASE determinants. Cross-sectional data only was presented. This study found that the three variables that significantly predicted intention were large amounts of urine lost per wet episode, perceived ability to perform the exercises and ability to perform the exercises in various situations. Only 22% of the variance in intention was explained.

In the current study self-efficacy made the least significant contribution to the explanation of intention. This is surprising, particularly in view of the results of Alewijnse et al (2001) who used a similar model for the same behaviour and found the two measures directly related to self-efficacy were the only variables from the model that significantly predicted intention. Similarly the exploratory interviews (Chapter 2) indicated that uncertainty about how to do the exercises was a concern for some women, a finding supported by the work of others (Ashworth and Hagan 1993a). Nonetheless self-efficacy explained the least percentage of the variance in intention after attitude to new behaviour and subjective norm.

Comparison between results from this study and the wider literature is hampered by differences in the measures used. Alewijnse et al (2001) used measures of self-efficacy pertaining to the opinion of the women about the 'difficulties' of performing pelvic floor exercises, and their 'abilities' to practise pelvic floor exercises. Not all items in each scale are given, but the measures of difficulties (n = 9) seem to be equivalent to the indirect determinants of self-efficacy included in the current study (for example ease or difficulty of remembering). In contrast the measures of abilities (n = 9) related more to external constraints such as being too busy to practise pelvic floor exercises, and as such are perhaps more like measures of PBC, which were not assessed in the current study. In addition the population studied by Alewijnse and colleagues only included women already suffering from incontinence who had agreed to take part in a study of the effectiveness of pelvic floor exercises to treat the condition. They may therefore have already had a good idea what the exercises entailed, and been motivated to overcome any perceived difficulties. In contrast some of the current sample may not have had a clear idea of what was meant by pelvic floor exercises (in spite of the score for self-efficacy indicating a generally positive belief in the ability to do the exercises every day during pregnancy).

In the current study the scale of the three items measuring self-efficacy scored only .66 for Cronbach's alpha, suggesting that the scale was moderately reliable. Two of the measures of self-efficacy related to confidence in ability to do the exercises correctly, whereas the other assessed whether the women thought they could do the exercises easily every day during pregnancy. These are slightly different concepts and may explain this result for reliability. However less clear is the reason for the reliability being considerably lower than that achieved in the pilot sample (.76) using the same items and an apparently similar sample of women. Valois and Godin (1991) have suggested that low internal consistency of a scale may contribute to a poor relationship with the behaviour: this may have been a factor in the present findings. However the use of scales with similar reliability has been reported (Moyle 1995) and such reliability is not uncommon in scales with few items (Pallant 2001). A recently published study reported on the development and testing of a scale to measure self-efficacy for pelvic floor exercises (Shelton Broome 1999). The scale was tested for reliability and validity in a sample of women over the age of 50 who had reported symptoms of incontinence, however it may be that some of the items used in that scale could be applicable in a study of pregnant women.

A further surprising finding from the study was that perceived vulnerability to postnatal incontinence ('attitude to current behaviour') had no relationship with intention to practise pelvic floor exercises. The model proposed by Maddux (1993) failed to improve on the original theory of planned behaviour in explaining the variance in intention to practise pelvic floor exercises. This lack of relationship was further investigated in the analyses in sections 7.5.i and 7.5.ii. Women who reported the practice of the exercises were compared with those who did not on various measures from the RTPB to find out if the current behaviour had a moderating effect on the RTPB measures.

This analysis found that the women who reported not practising the exercises had lower intention to practise the exercises. They were also less likely to have confidence that they knew how to exercise correctly, had a less positive general attitude to the exercises and were less likely to think that other people wanted them to do the exercises. The results for 'response efficacy' suggested that they were less likely to think that the exercises would prevent postnatal incontinence. There was no significant difference between the groups on whether they thought incontinence was likely after delivery ('attitude to current behaviour'). However women already practising the exercises indicated that they had greater confidence that pelvic floor exercises would prevent postnatal incontinence ('response efficacy'), and so it is possible that by practising the exercises they would feel less vulnerable to being incontinent after having the baby.

This argument is further supported by the correlation between the scores for 'intention' and 'attitude to current behaviour' (section 7.5.ii). There was a positive relationship in the group of women not doing the exercises (so that for example low intention corresponded with low belief in the likelihood of incontinence). In the group of women doing the exercises the relationship was negative (for example, the higher the intention the lower the perceived chance of incontinence). This comparison may help to explain the reason for the overall lack of relationship between 'intention' and 'attitude to current behaviour'. The current behaviour (practice of pelvic floor exercises) may have led to a change in beliefs about perceived vulnerability to postnatal incontinence. It is likely that if the women who were practising the exercises had confidence in the protective effect of the exercises then they would no longer think that incontinence after delivery was likely. Thus the current behaviour moderated the relationship between 'intention' and 'attitude to current behaviour'. One can speculate that had perceived vulnerability to postnatal incontinence been assessed before they began doing pelvic floor exercises (or if the question had been asked in a different way) then they might have reported high vulnerability to incontinence.

In part the lack of relationship between 'intention' and 'attitude to current behaviour' arose because the direct measures asked about the likelihood of postnatal incontinence. The measures could have included a qualifying initial section as suggested by Maddux (1993) such as 'if I do not do pelvic floor exercises every day during pregnancy, the likelihood of developing postnatal incontinence is…'. A further consideration regarding perceived risk is that the concept of risk may not be easily defined by a single (or a couple) of measures. There may be a number of additional factors that would affect the perceived risk of a condition such as incontinence that the woman might be aware of. These might include the type of delivery, the size of the baby or the practice of pelvic floor exercises before and after delivery. An element of unrealistic optimism may also influence responses whereby even when the risk is known, the subject prefers to believe that it will not happen to them (Harris and Middleton 1994).

The problem of perceived high susceptibility leading to the preventive behaviour in question, and hence lowering the perceived risk has been addressed by Weinstein and Nicolich (1993). They caution against misinterpreting data that has been collected some time after the introduction of the health message. The correlation between the degree of perceived risk and behaviour might be low due to the number of people who have already initiated the behaviour. They advise that this does not mean that the results indicate that the amount of risk involved in the behaviour (or in the case of pelvic floor exercises, the absence of behaviour) is not influential in persuading people to adopt the behaviour. It simply implies that those who have already adopted the behaviour consider themselves to be at low risk as a result of their actions. This appears to be the case in this study. The different results for the correlation between intention and perceived vulnerability according to whether women were or were not practising the exercises reveals that reports of perceived vulnerability were probably affected by some women having already initiated the behaviour. Any study that measures beliefs about behaviour that has possibly already been tried and initiated, needs to take into account the effect of past (or in this case concurrent) behaviour on beliefs and attitudes (Conner and Armitage 1998). For example Dawson et al (2000) incorporated an assessment of current exercise level when assessing future exercise intentions. Although the TPB does not usually include a measure of perceived vulnerability or perceived susceptibility, it is likely that any of the other measures in the TPB will be influenced by previous experience of the behaviour in question.

However, regardless of whether women reported the practice of pelvic floor exercises, the scores for ‘attitude to current behaviour’ indicated that women generally did not think that incontinence was likely after delivery. This general lack of knowledge of the risk of postnatal incontinence suggests that pregnant women should be warned that incontinence is a common problem after delivery.

9.1.v.2 Role of the indirect determinants in explaining each of the direct determinants

Each of the indirect determinants of intention will be considered in turn.

Both the concepts of whether the 'difficulty of doing the exercises' and the 'difficulty of remembering to do the exercises' would be off-putting for women when considering practising the exercises. These were both significant in explaining self-efficacy (section 7.3.ii.1). The concept of whether the time consuming nature of the exercises would be a deterrent did not have a relationship with self-efficacy. However surprisingly only 17.9% of the variance in self-efficacy was explained by the indirect determinants. The process of operationalising the indirect determinants of self-efficacy was difficult, as there were few examples in the literature to base items on. Additionally the confusion in many studies and overlap between the concepts of self-efficacy and perceived behavioural control may lead to ambiguity (see section 1.5.iv). The items used may have been hard to understand. Further work is required to refine the tools used to measure these concepts. The poor internal reliability of the direct measure may have also contributed to the lack of relationship between indirect and direct determinants.

The most significant variable that contributed to explaining 'attitude to the new behaviour' was a belief that the exercises would make the birth easier (section 7.3.ii.2). If women thought that pelvic floor exercises would make the delivery easier then they would be likely to do the exercises. This result is perhaps not surprising. Anecdotal evidence suggests that pregnant women have difficulty in focussing beyond the delivery. The time after delivery seems remote, and the possibility of problems such as incontinence unlikely. Concerns about a painful labour and a difficult delivery are paramount. Common sense suggests that any strategy that to make this process easier would seem attractive. There is some suggestion that a strong pelvic floor enhances the mechanism of labour (Sweet and Tiran 1997; Parsons 1998), and that pelvic floor exercises may help to make the delivery easier by increasing the stretch in the perineum (Frahm 1985; Montgomery 1986; Dolman 1993). The findings from this study indicate that if this message could be supported by stronger evidence, then this would be a powerful message in persuading women to practise the exercises.

The attitude to pelvic floor exercises was also influenced by other concepts. If pelvic floor exercises were thought to cause pain or discomfort then this was likely to deter their practice. Health professionals could reassure women that the exercises should not cause any pain or discomfort. The prospect that pelvic floor exercises might improve postnatal sex was also significant in explaining the general measure of attitude to pelvic floor exercises. If this claim were substantiated then this message could also be incorporated into practice, but as yet it is unsupported by evidence.

Overall 49.0% of the variance in the direct measure of 'attitude to the new behaviour' was explained by the indirect determinants. This confirms that the indirect measures were effectively measuring concepts that explained the scale of the direct measure. However each of the behavioural belief statements had more than 5% of missing values. This indicates that a number of women had difficulty answering these items in the questionnaire. For example they may not have been sure whether pelvic floor exercises would have an effect on making the delivery easier. While these results are important and apply to the women who answered these questions, there were other women who could not express an opinion on these matters.

None of the measures used to assess the indirect determinants of attitude to current behaviour had any relationship with the direct measure of attitude to the current behaviour (section 7.3.ii.3). The indirect measures were selected according to the suggestion by Maddux (1993, p133) that there should be an assessment of 'the perceived severity component…..of the importance of the negative health consequences of maintaining one's current health behaviour'. There were four measures relating to the embarrassment and unhygienic aspects of postnatal incontinence however there was no correlation between any of the four and the direct measure. The concepts being measured by the direct determinant and the indirect determinants were conceptually quite different so it is perhaps not surprising there was little relationship. The belief-based measures evaluated what it might be like to be incontinent, whereas the direct determinant related to the likelihood of being incontinent. The indirect determinants thus did not really explain the direct determinant of intention in the same way as the other sections in the model.

For subjective norm the perceived views of all four significant others included as indirect determinants were highly correlated with the direct measure and 44.2% – 46.0 % of variance in the direct measure was explained (section 7.3.ii.4). The perceived view of the family was the most significant factor in explaining the direct measure of subjective norm. It might have been expected that the perceived view of the partner would make a more significant contribution in comparison to the family. Data on the marital status or co-habitation status of participants was not collected in this study. One can speculate that there may have been a lot of girls without partners, as the percentage of births to unmarried women and the high teenage pregnancy rate in the area might suggest (ISD Scotland 2000b). It is possible that female family members are more important to women in this area. The term 'family' may be ambiguous, and open to various interpretations, such as partner, husband, sister, etc. The wide range of possible definitions may have increased the salience of this variable.

The normative belief statements all had more than 5% of cases with missing values. This may have been because women were not very sure what the opinion of some of the referents regarding pelvic floor exercises was. Alternatively if the referent was not relevant to them (such as having no partner, or not having contact with family or the doctor during pregnancy) then the question may have been missed. Additionally the number of apparently similar questions throughout the questionnaire may have induced a degree of irritation. This may have led to women either missing these questions because they thought they had already answered the question, or else ticking anything to speed up the process of questionnaire completion.

The regression model was repeated twice using first 'midwife' then 'doctor'. With midwife in the model more of the variance was explained than when 'doctor' was included. This is perhaps not surprising as women generally have more contact with midwives during a normal pregnancy than with a doctor, and it might have been easier for women to have an idea about the opinion of midwives. They may also have felt more strongly that midwives would want them to do the exercises.

9.1.v.3 Habit theory

Maddux (1993) suggested that a measure of habit should be incorporated into the RTPB. This proposed that behaviour is initially prompted by 'cues-to-decision'. As the behaviour is repeatedly carried out it becomes incorporated into the person's routine ('repetition/routine'), and subsequently is automatically triggered by 'cues-to-action'. These three elements were measured separately in this study.

The measures assessing ‘cues-to-decision’ were correlated with the scale of the ‘repetition/routine’ items (section 7.4.iv.1, Table 7.37). All had some relationship with getting into a routine, except being incontinent oneself. This result is counter-intuitive, as suffering from incontinence might seem an obvious circumstance that would lead to the routine practice of pelvic floor exercises. A third of the sample were experiencing incontinence at the time of completing the questionnaire: possibly this question was only relevant to these women. Supporting this explanation is the fact that nearly 10% of women missed this question. If the question had been couched hypothetically: ‘I would decide to do pelvic floor exercises if I leaked urine myself.’ this might have elicited a more appropriate response.

The highest correlation was between ‘being told by someone else’ and repetition/routine. This is similar to the finding that subjective norm was a significant variable in explaining intention, and lends further support to the importance of other people in persuading women to practise the exercises.

As with the indirect determinants of subjective norm, the statement about the midwife had a higher correlation with repetition/routine than either of the statements about the doctor or physiotherapist. This confirms that midwives could play an important role in promotion of the exercises.

The statement relating to ‘hearing about others wetting themselves’ also correlated highly with the scale of the repetition/routine items. This finding perhaps suggests that unrealistic optimism may characterise opinions about postnatal incontinence among pregnant women. They may tend to believe that incontinence is a remote possibility, and hearing about others with the condition may be a powerful message about the real possibility of being incontinent themselves.

There was weak correlation between the scale of cues to decision and each of the direct determinants of intention except self-efficacy (self-efficacy did not have any relationship with cues to decision) (Table 7.38). The moderate reliability of the self-efficacy scale may have affected this result, or the previously noted problems with the measures of self-efficacy. However it seems counter-intuitive that the decision to practise the exercises (even if women already practising the exercises only answered these questions) should not in some way be related to a belief in ability to do the exercises. Further work is warranted to explore this issue.

The cues to action were used to explain the measure of current behaviour as described in the RTPB (section 7.4.iv.3). ‘When going to the toilet’ and ‘while in bed’ were found to be significant variables in explaining the current behaviour. Women are advised that the exercises can be done any time and in any place (Halksworth 1994; Brayshaw and Wright 1996; Woodham 1998; Association of Chartered Physiotherapists in Women's Health leaflet, not dated). These results indicate that successful practice of the exercises is associated with particular times of the day. It may be better to suggest to women that they choose a particular trigger which they will remember, perhaps a time of day when they have fewer distractions and more time, such as when going to the toilet, or while in bed, and to stick to those times. The broad prescription of ‘any time, any place’ may in fact be too nebulous and fail to provide the necessary structure for remembering to exercise.

Each of the items relating to ‘cues to decision’, repetition/routine’ and ‘cues to action’ had more than 5% of missing values. These items may not have been relevant for women not doing the exercises and hence they were missed out. The results of these sections may only apply to women already practising the exercises.

The correlation between each of the elements in the habit section provides some support for the RTPB model. While the RTPB model was developed to pertain to exercise behaviour, there are clearly possible avenues for future research into health protective behaviours that require some degree of routine in order to be successful.

9.1.v.4 Past behaviour

Each of the measures of past behaviour significantly improved the explanation of intention over and above the TPB variables. Behaviour before current pregnancy improved the explained variance by 4%. Behaviour during and after previous pregnancies (for parous women only) improved the variance by 11.9%. These findings lend strong support to the contention of Sutton (1994) and Conner and Armitage (1998) that past behaviour should be included as an independent variable. This study found that parous women were not more likely than primigravidae to report the practice of the exercises. It appears that parous women who practised the exercises during or after a previous pregnancy were more inclined to practise them again in a subsequent pregnancy. If women can be persuaded to start practising the exercises in their first pregnancy, then the chances of continuing in future pregnancies may be increased. First time mothers need to be particularly targeted to initiate the use of pelvic floor exercises.

In the TPB and TRA it is proposed that past behaviour influences intentions indirectly by acting on the antecedents of intentions. However this study found that past behaviour can influence intentions directly. It has been noted that this represents something of an intellectual cul-de-sac in that it does not help understand the factors that led to the behaviour in the first place (Conner and Sparks 1995). It is hard to know how in practice this conundrum can be avoided. There must be very few behaviours where it is possible to 'catch' participants before they ever have the chance 'to intend to behave' or 'behave'. Examples might be first-time mothers intentions regarding feeding or caring for their new baby (Manstead et al. 1983; Manstead et al. 1984) or intentions of women prior to a first invitation to attend breast-screening (Vaile et al. 1993; Rutter 2000). Many of the behaviours studied in the health psychology literature involve activities that the participants will have some prior experience of, such as healthy eating, safe sex behaviour, taking exercise and oral hygiene. When past behaviour has not been measured, results of such studies should be considered accordingly.

9.1.vi How applicable is the revised theory of planned behaviour to the practice of pelvic floor exercises during pregnancy?

The RTPB model was used to explain the practice of pelvic floor exercises both using the measure of current behaviour obtained in the interview, and also using the measure of behaviour in pregnancy obtained in the follow-up questionnaire. Using the cross-sectional data, the model was successful in explaining the current behaviour, with a high percentage of the variance in the behaviour being accounted for (section 7.5, Table 7.42). Although cues to action only just reached significance, all the independent variables made a significant contribution to explaining behaviour, with intention making the most significant contribution.

In contrast the findings from the same analysis, using the data collected in the follow-up regarding behaviour in pregnancy, were quite different (section 8.7.i, Table 8.29). The model using the measure of reported practice of the exercises in pregnancy from the follow-up as the dependent variable only accounted for half the variance in behaviour when compared with the variance explained by the model using the survey data. In addition, from this prospective data, self-efficacy emerged as the only significant predictor of behaviour.

There are a number of possible reasons for such different findings (cross-sectional results compared with longitudinal results). The follow-up questionnaire was completed between 25 and 58 weeks after delivery ($\underline{M}$ = 32.5, SD 5.9): a longer delivery-questionnaire interval may have affected recall of behaviour during pregnancy. The higher response rate among older and more affluent respondents may have affected results. There were 33 women who said they did not do the exercises when asked in the interview, but responded positively to the question when asked in the follow-up. This change in reported behaviour may also help to account for the different findings. The women whose report of behaviour altered may have been distinguished by their confidence in their ability to do the exercises correctly, thus accounting for the significance of self-efficacy in the follow-up findings. Scores for intention were not available for all women who responded to the follow-up. This may also have affected results.

A surprising finding was that intention to practise pelvic floor exercises measured at the time of the interview in pregnancy was not significant in predicting the follow-up report of antenatal practice of the exercises. The intention score was able to distinguish between practice and non-practice of the exercises in both the interview and the follow-up (confirming both the concurrent and predictive validity of the measure of intention) (Table 8.27). However when the intention scores of those who reported non-practice of the exercises in the interview were compared on follow-up report of practice, there was no difference between the groups (Table 8.28). Women who were not doing the exercises at the time of the interview and who subsequently reported that they did the exercises in pregnancy were no more likely to have a high intention score than those who reported in the follow-up not doing the exercises in pregnancy. So the intention score did not discriminate between non-exercisers and exercises in the follow-up if they did not report practice of the exercises in the interview. This confirms the findings from the logistic regression using the RTPB variables.

Intention and cues to action may both have been affected by the higher percentage of cases with missing values, thus helping to explain the lack of significance found.

Recently Hayn et al (2000) reported on a follow-up study of patients (n = 120) who had undergone a programme of pelvic muscle rehabilitation for urinary incontinence 12 – 24 months previously. The follow-up was designed to investigate whether patients continued the exercises and if they were still troubled by incontinence. It was only possible to contact 32 patients, all of whom had reported improvement of their symptoms of incontinence at the end of the treatment. At follow-up 21 of the 32 patients (66%) reported continuing to practise the exercises. More of the patients continuing to practise the exercises said their incontinence symptoms were the same or better (90%) compared with those not performing the exercises (27%). The patients still practising the exercises reported doing at least 10 to 20 exercises per day. Reasons most commonly given for discontinuing the exercises were that they found the exercises unhelpful, were unable to remember how to do them properly or that they forgot to do them. These findings highlight that confidence in ability to do the exercises correctly, as well as the difficulty of remembering to exercises, are important issues not only for pregnant women but also for patients who have suffered from incontinence.