Social Influence and Social Learning in Young Children and Infants

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Thesis Summary

This thesis examines the motivations underlying social influence and behaviour matching in young children. In my General Introduction, I argue that, in adults, behaviour matching is often motivated by goals to learn from and affiliate with other group members (or by a combination of these two factors). In addition to explicit forms of behaviour matching, however, adults also subconsciously assimilate their behaviour to those around them. I argue that imitation in young children may be similarly motivated by goals to learn from and affiliate with others. In other words, that imitation performs an instrumental and a social function in development. Further, I argue that young children may also subconsciously assimilate their behaviour to those around them. The following experimental chapters test aspects of these claims. Chapter 2 investigates verbal imitation. Focusing on the instrumental aspects of this ability, I test whether young children copy the perceived intentions behind speech. Results show that children correct the ungrammatical utterances of an intentional model, but copy the utterances of a non-intentional model exactly. Chapter 3 investigates social imitation. In that chapter, I test whether children increase their imitation when they have a goal to affiliate. Results show that children who have been given a goal to affiliate (through priming with social exclusion) copy the actions of a model significantly more closely than children who have been given a neutral prime. Chapter 4 investigates unintentional, or subconscious, behaviour matching and tests whether even infants assimilate their behaviour to social primes. Results show that infants primed with affiliation are significantly more likely to help an experimenter than infants primed with individuality. Taken together, these experiments demonstrate that behaviour matching is a diverse and important phenomenon in development. It occurs both intentionally and unintentionally, and enables children to learn from and affiliate with those around them.

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Chapter 1

General Introduction

1.1 Introduction

Human beings are intensely social creatures, spending many hours each day engaged in social interaction. In each interaction we engage in, we influence and are influenced by our social partners. Consequently, many of our thoughts, judgments and actions are strongly dependent on what our group members think and do (Forgas & Williams, 2001). As adults, we adopt the innovations produced by those around us (Goldstone, Roberts, & Gureckis, 2008), conform to the opinions and values of our group members (Asch, 1955), accept the attitudes of perceived experts (Petty & Cacioppo, 1984) and obey the commands of authority figures (Milgram, 1974). So susceptible are we to social influence, that we do not even need to interact with our group members in order to be influenced by them: their implied presence is sufficient to alter our social behaviour (e.g., Bargh, Chen, & Burrows, 1996; Garcia, Waever, Moskowitz, & Darley, 2002). Social influence is thus a huge area and has been studied extensively in adults and, to a lesser extent, in children (e.g., Aboud, 2003; Corriveau & Harris, 2009; Walker & Andrade, 1996).

Despite this, one area has remained curiously detached from the field of social influence, and that is social learning and, in particular, imitation. As adults, we are prolific imitators: we copy our group members in order to learn new skills from them and in the hope of being accepted by them and fitting in (Deutsch & Gerard, 1955). So deep is our tendency to match the behaviour of others that we even do it subconsciously;

automatically mimicking the gestures, mannerisms, and even accents of our group members (Chartrand & Bargh, 1999; Chartrand & van Baaren, 2009). Infants and young children are also prolific imitators (Tomasello, 1999), copying others' instrumental and social behaviours from early in development (e.g., Kuczynski, Zahn-Waxler, & Radke-Yarrow, 1987). While adults' tendency to match the behaviour of others has been discussed in terms of social influence (e.g., Dijksterhuis, 2001), such a focus has rarely been applied to the developmental study of imitation.

In this thesis, I attempt to apply some insights from the field of social influence to the developmental study of behaviour matching. In this review chapter, I outline traditional social influence research and describe the classic distinction between informational and normative social influence (Deutsch & Gerard, 1955). The following sections discuss the extent to which instrumental and social imitation in young children and infants can be seen as analogous to these two forms of influence. Following on from this discussion, Chapter 2 investigates the instrumental function of imitation and Chapter 3 investigates the social function of imitation. In the later sections of this review, I broaden my focus and discuss forms of social influence and behaviour matching which occur without the formation of explicit intentions, more specifically, mimicry and social priming. These themes are further developed in Chapter 4. In that chapter, I investigate the influence of social priming on infant behaviour.

1.1.1 Social influence

Broadly speaking, social influence is the study of how our actions, thoughts and judgments are affected by those around us. Although some researchers adopt more

stringent definitions (e.g., Turner, 1991), others are content with a very general definition (e.g., Forgas & Williams, 2001; Dijksterhuis, 2001). Traditionally, however, research on social influence has focused on a number of key topics such as conformity, persuasion, compliance and obedience (Forgas & Williams, 2001).

A great deal of research has focused on the goals and intentions which underlie responses to social influence attempts. Cialdini and Trost (1998) have argued that the recipients of social influence processes such as compliance and conformity are motivated by a relatively small number of goals. Individuals may adopt the behaviour of their group members because they desire to act effectively, because they desire to build and maintain positive social relationships or because they seek to maintain a positive self-concept. This conceptualisation is closely related to Fiske's core motive approach. Fiske (2004) claims that there are five core motives underlying social influence (and indeed social behaviour more generally). The root motive among these is the need to belong and be accepted by other group members. The remaining four motives, the need to understand, the need to feel in control, the need to enhance the self and the need to believe in a benevolent world, are all derived from this basic desire.

Perhaps the best known conceptualisation of the motives underlying responses to social influence, however, was provided by Deutsch and Gerard (1955). The authors identified two forms of social influence: informational influence and normative influence. Informational influence occurs when we accept information obtained from another because we believe it to be evidence about reality (Deutsch & Gerard, 1955). It is often referred to as 'true influence' because it leads to private acceptance, internalisation and attitude change (Deutsch & Gerard, 1955). The most famous experimental example of

informational influence is Sherif's (1936) autokinetic study. In this experiment, Sherif placed a group of individuals in a darkened room in which a single light beam was directed at one of the walls. Although the light was stationary, the situation created a visual illusion such that it appeared to be moving. When asked to rate the extent of the movement in the light, participants tended to conform to the judgments of the other individuals in the room, presumably because they were personally uncertain of the correct answer and the group provided the only other source of information available.

Normative influence occurs when we accept information from others in order to conform to their positive expectations. It is motivated by the need for social approval and the desire to avoid rejection (Deutsch & Gerard, 1951). The exact nature of this form of influence is, however, controversial. For Turner (1991) (and other researchers working within a self categorisation perspective) normative influence is conceptualised as a power process: individuals respond to social pressure in order to avoid punishment from other group members. For other researchers, however, normative influence is conceptualised as a form of affiliation (Cialdini & Goldstein, 2004): individuals seek to build and maintain social bonds through matching their behaviour to that of others (Cialdini & Trost, 1998). The classic experimental example of normative influence is Asch's (1955) conformity paradigm. Asch (1955) placed a single participant in a room with seven confederates. The eight individuals were asked to perform a simple perceptual task; judging which of three lines was the longest. On the critical test trials, the seven confederates unanimously chose one of the incorrect lines. Participants conformed to the majority's opinion approximately 30% of the time, even though they never performed incorrectly when asked to make the judgment on their own. Further support for the claim

that this behaviour represents a form of normative influence was provided by Deutsch and Gerard (1955) who demonstrated that participants within the Asch paradigm are more likely to conform when their answers are given in public, and when they are made to feel that they and the confederates form a group.

Although the distinction between normative and informational influence was developed in the context of research on conformity, variants of this model have subsequently been applied to many other areas of social influence including norm-based behaviour (Cialdini, 2003) and persuasion (Eagly & Chaiken 1984; Petty & Cacioppo, 1986). Thus we can think of informational influence, more generally, as a desire to use information from other group members in order to reach accurate decisions about the external world. Normative influence can also be thought of more generally, as behavioural change motivated by a desire to be accepted and liked by group members.

1.1.2 Behaviour matching and imitation

This review is concerned with a particular form of social influence: behaviour matching. Before going any further, it is necessary to justify my use of this term, rather than the more standard 'imitation'. My use of the term 'behaviour matching' reflects two motivations. First, it allows me to sidestep (to some extent at least), the debate about what counts as 'genuine' imitation. Different forms of social learning have proved notoriously difficult to define, and imitation is no exception. For some researchers, imitation merely involves reproducing actions after watching them done (Nielsen, in press), for others it involves learning novel actions (Thorpe, 1963), and for others still it involves reproducing actions in terms of their goals and intentions (Tomasello, 1999;

Tomasello, Carpenter, Call, Behne, & Moll, 2005). The term 'behaviour matching' is useful in this context because it enables me to discuss different forms of social learning (and imitation) under the general framework of social influence, whilst retaining the option of using more specific terms when necessary.

Second, my use of this term reflects the breadth of the perspective I seek to take. Call and Carpenter (2002) (see also Carpenter & Call, 2002; Carpenter & Call, in press) attempted to clarify the definition of imitation, and other social learning processes, by outlining three elements which could be copied from a demonstration. Call and Carpenter argued that, from watching a demonstration, an individual could learn about the results that demonstration produced on the environment, the actions used to produce those results and/or the goals underlying those actions. These distinctions have proved very useful in distinguishing different cases of social learning (see, for example, Call, Carpenter, & Tomasello, 2005). However, when considering social influence more generally, it is useful to adopt a broader perspective. Within complex social behaviour there are many more elements of a model's behaviour which may be copied: in addition to copying a model's goals, for example, an individual may adopt their opinions, attitudes, character traits and even beliefs. Following Dijksterhuis (2001), I intend the term behaviour matching to include these more abstract forms of copying, as well as the more standard copying of actions and goals.

1.1.3 Social goals in behaviour matching

As outlined above, social influence researchers have devoted considerable time and energy to investigating the goals which underlie behaviour matching. This situation

is in notable contrast to developmental research on social learning which has shown a relative neglect of the social goals which underlie imitation (Nielsen, in press). In the following sections, I will attempt to compensate for this neglect by discussing whether different forms of imitation in development can be thought of as analogous to informational and normative social influence.

Almost 30 years ago, Užgiris (1981, 1984) made a distinction between two forms of imitation in development. Užgiris (1981) argued that when a child copies an action they may have either instrumental goals – to learn about the objects and actions involved in the demonstration or social goals – to affiliate, or affirm a shared state with a model. In defining these two forms of imitation, Užgiris (1981) drew on the distinction between informational and normative influence. Užgiris argued that when a child copies a model in order to find a correct solution to a problem, their behaviour may be analogous to informational influence. When a child copies a model's action because they are socially 'attracted' to them, their behaviour may be analogous to normative influence. (Thus for Užgiris (1981), as well as for Cialdini (Cialdini & Goldstein, 2004; Cialdini & Trost, 1998), normative influence is closely related to affiliation). In this review, I expand on Užgiris' comparison. In order to ascertain the validity of the analogy between informational and normative influence and instrumental and social imitation, I outline a set of criteria for informational and normative influence and assess the extent to which children's imitation adheres to these criteria.

1.2 Is instrumental imitation analogous to informational influence?

Although many different social learning processes (including low level processes such as stimulus enhancement and response facilitation) can be thought of as basic forms of informational influence, the traditional definition of this form of influence involves the attainment of specific criteria (see Turner, 1991):

- The stimulus must be objectively ambiguous or hard to understand, making it difficult to find an individual solution to the problem at hand.
- The resulting uncertainty leads individuals to seek a social solution to their problem. The individual looks to others for valid information about reality.
- The result is 'true' influence; the individual adopts the solutions of those around them. The knowledge the individual acquires can be used immediately or at a later date.
- Models are believed to the extent that they appear to be reliable, trustworthy and experts within a particular domain.

Implicit within these criteria for informational influence is another requirement: in order to fulfill the above criteria, an individual must be able to understand those around them in terms of their goals and intentions. Although more basic forms of influence can occur without intention understanding, this is not true for the case outlined above. In order for this form of informational influence to occur, an individual must recognise that their own strategy is inadequate to achieve their goal. Following this realisation, they must analyse whether those around them have the same goal. Only then can they make a decision about whether to copy their strategy. Although it might be possible to take

intention understanding for granted in adults, the same is not true for young children and infants.

Below I discuss whether young children and infants understand others as intentional agents like the self and whether they use this understanding in order to imitatively learn novel acts. The subsequent questions, whether children are more likely to imitate when a stimulus is difficult to understand, whether children internalise solutions learned by imitation and whether they are sensitive to reliability and expertise when deciding who to learn from, are beyond the scope of this thesis but, as they are critical to the general argument, will be discussed very briefly following the discussion of intention-based imitation.

1.2.1 Are young children and infants able to understand others in terms of their goals and intentions?

In adults, informational influence is possible because we understand others as intentional agents like the self. In this section, I discuss whether the same is true for young children and infants. Classic research into intention understanding used verbal techniques in order to probe the extent of children's understanding. For example, Piaget (1932) showed children picture books in which an actor either caused harm accidentally or on purpose. In one scenario, a little boy helped his mother wash up and inadvertently broke several plates. In the other scenario, the little boy deliberately smashed a single plate whilst stealing a cookie. Whereas 7-year-old children tended to attribute the most blame to the boy who caused the most harm, 9-year-old children attributed greater blame to the boy with malicious intent. In a similar vein, Baird and Moses (2001) presented 4-

and 5-year-old children with stories in which two characters performed the same action but with different intentions. For example, both characters were shown running but one did so in order to reach their destination quickly and the other did so in order to keep fit. Whereas 5-year-olds were able to attribute different intentions to the same action, 4-year-olds were not. Baird and Moses (2001) interpret this as evidence that 4-year-olds have difficulty separating internally represented intentions from actions.

Non-verbal techniques, however, suggest that intention understanding emerges considerably earlier. Woodward (1998), for example, has suggested that the basics needed for later intention-understanding emerge as early as 6 months. In one study, Woodward habituated infants to a scene in which an arm repeatedly reached for one of two objects (a teddy bear or a ball) on a small stage. At test, the locations of the two objects were switched and the hand either reached towards the same location or towards the same object. Results showed that infants looked longer (and so were presumably more surprised) when the arm reached towards the novel object than when it reached towards the novel location. One interpretation of these results is that infants had encoded the goal of the actor's reach and were surprised when this goal changed, but there is an alternative, more parsimonious account of these data: it is possible that, rather than encoding the goal of the action, infants had encoded the object of the actor's reach. They were surprised when the arm reached towards the novel toy because they expected the actor to be consistent in their interaction with the test objects (Tomasello et al., 2005).

Although the Woodward study is suggestive, it is not conclusive. There is, however, converging evidence that infants understand goals and intentions by 9 months (Tomasello, 1999). Baldwin, Baird, Saylor and Clark (2001) used a looking time

paradigm to measure whether infants parse dynamic action into discrete goals. Baldwin et al. familiarised 10-month-olds with video clips in which a woman performed a series of actions, for example, picking up a towel from the floor and placing it on a towel rail. At test, Baldwin et al. introduced a series of pauses into the videos. In one condition, the videos were paused at the end of each goal-directed action, for example, immediately after the woman grasped the towel. In the other condition, the videos were paused such that they interrupted goal-directed actions, for example, as the woman was moving towards the towel rail. Infants showed renewed interest in the videos which had been paused in the midst of goal-directed action, but remained habituated to the videos which were paused at the completion of goal-directed actions. This can be interpreted as evidence that infants, like adults, parse actions into chunks corresponding to the fulfilment of an actor's goals. However, as Baldwin et al. point out, it is also possible that infants were demonstrating sensitivity to the statistical regularities in the environment without necessarily inferring the intentions behind them.

Further evidence that infants around this age understand goals and intentions has been provided by Gergely and Csibra (2003; see also Gergely, Nádasdy, Csibra, & Bíró, 1995). Gergely and Csibra (2003) habituated infants to a scene in which a small circle moved across the screen towards a larger circle, jumping a barrier in order to do so. At test, the barrier was removed and the small circle either continued to make the same jumping movement as before or moved in a straight line towards the larger circle. In intentional terms, the jumping movement became inexplicable once the barrier was removed; were the small circle an intentional agent it should take the most rational path towards its goal. Results suggested that infants interpreted the actions in just these terms:

infants showed renewed interest in the scene where the small circle continued to make the same jumping movement as before. Although many have interpreted this as evidence that infants understand others' goals (e.g., Tomasello et al., 2005), Gergely and Csibra themselves have a lower level explanation: infants were adopting a teleological interpretation of the scene. Based on an analogy to Dennett's (1987) design stance, Gergely and Csibra argue that infants interpret actions not in terms of internal goals, but in terms of the endstates they are designed to achieve.

Behne, Carpenter, Call and Tomasello (2005) have provided convincing behavioural evidence that infants understand intentional action by 9 months. Behne et al. presented infants with a model who was either unwilling to give them a toy (e.g., because she wanted to play with it herself) or unable to do so (e.g., because she accidentally dropped it). Results showed that 9-month-olds, but not 6-month-olds, were significantly more impatient when the experimenter was unwilling to give them the toy than when she was unable to do so. This held true even though, on test trials, infants were never given the toys themselves. Thus, there is accumulating evidence that infants understand goals by 9 months. In the following section, I discuss whether this understanding impacts upon children's imitative behaviour.

1.2.2 Is instrumental imitation based on intention understanding?

The definition of informational influence outlined above implies that it is a cognitively sophisticated process in which an actor analyses the goals of a model within a particular situation and uses similar actions when they themselves have the same goal. Intention understanding is thus important for informational influence for two reasons.

First, it is helpful in order to decide who to copy within a given situation: if an individual seeks a solution to an instrumental problem, then it is important to copy someone who has a similar goal as themselves. Second, it is important in order to decide what to copy from within a demonstration: intention understanding allows an individual to filter out irrelevant behaviours as well accidents and mistakes. It follows, that in order to determine whether the analogy between informational influence and instrumental imitation is valid, it is necessary to ascertain whether imitation is (at least at times) based on intention understanding.

There is now a considerable body of research suggesting that infants and young children copy the actions of others based on an understanding of their goals and intentions (e.g., Carpenter, Ahktar, & Tomasello, 1998; Meltzoff, 1995). In one demonstration of this, Carpenter et al. (1998) presented infants with a demonstration in which a model performed two very similar actions. The model marked one of these actions as intentional by saying 'There!' as she performed it and marked the other as accidental, by saying 'Whoops!' as she performed it. Results showed that infants copied the actions marked as intentional more often than those marked as accidental.

In similar work, Bekkering, Wohlschläger and Gattis (2000) showed that 3- to 6-year-old children will copy exactly the same action differently depending on its perceived goal. Bekkering et al. presented children with one of two demonstrations. In one condition, a model placed her hand on one of two dots painted on a table. In the other condition, the model placed her hand on the same location in space, but there were no dots present. When asked to imitate, children in the 'dot' condition tended to touch the same dot as the experimenter, but made errors in which hand they used to do so.

Children in the 'no dot' condition, on the other hand, tended to match the experimenter's actions exactly; using the same hand as she had done. Bekkering et al. interpreted this as evidence that actions are hierarchically organised (containing multiple goals) and that the children choose to reproduce only those goals they consider to be most important. Carpenter, Call, and Tomasello (2005) found an analogous pattern of results with 12- and 18-month-old infants.

Further evidence suggests that infants understand the rationality behind goal-directed actions (Gergely, Bekkering, & Kiraly, 2002). Gergely et al. presented 14-month-old infants with a demonstration in which an experimenter performed an unusual action in order to operate a light box: bending at the waist to turn on the light with her head. When the model chose this action freely, infants tended to copy it exactly (see also Meltzoff, 1988). However, when the model's hands were constrained by a blanket which she held around herself as though she were cold, infants tended to turn on the light using their hands. Presumably infants in the latter condition inferred that the model would have used her hands to turn on the light had they been available. As this constraint did not apply to them, they adopted the most rational means to achieve the same goal of turning on the light.

Carpenter, Call and Tomasello (2002) have provided evidence that children use their understanding of more complex prior intentions, as well as intentions-in-action, in order to imitatively learn novel acts. Carpenter et al. (2002) presented 2-year-old children with a demonstration of how to open a box, by first removing a pin, and then opening the lid. Whereas some children saw this demonstration alone, other children were given information about the model's prior intention before observing the

demonstration. For example, children in one condition observed a model successfully open three other boxes before approaching the target box. Children who saw the demonstration on the target box alone performed poorly when offered the opportunity to open the box themselves. Children who had knowledge of the model's prior intention, however, were able to successfully open the box, even though they had had exactly the same exposure to the target box itself.

Although many are now convinced by the intention-based account of imitation, others have argued that such a rich interpretation of these data is unwarranted. Heyes (2001), for example has argued that a great deal of imitation can be explained by low level associative processes. According to the Associative Sequence Learning model, imitation is based on a series of excitatory vertical links between sensory and motor representations. These links are generated through concurrent observation and execution of the same actions (Bird & Heyes, 2005). This account is compatible with evidence suggesting that non-human animals can be trained to imitate (Heyes, 2001). Custance, Whiten and Bard (1995), for example, taught two chimpanzees to imitate novel arbitrary gestures using a 'Do this!' procedure. The two chimpanzees were first trained to imitate 48 actions on command. Subsequent to this training, one subject was able to spontaneously copy 17 novel gestures, and the other 13 novel gestures.

Although the Associative Sequence Learning model does not explicitly deny that intention understanding may play a role in guiding behaviour (imitative or otherwise), Heyes and colleagues do question whether existing imitation studies are best explained by an intention-based account. For example, Heyes (2001) criticises Carpenter et al. (1998) for confounding intention understanding with previous training. Heyes (2001)

argues that, although adults understand the words 'Whoops!' and 'There!' as indicating accidental and intentional actions, it is not clear that infants understand them in the same way. It is equally possible, according to Heyes, that before infants understand intentions they recognise that reproducing actions previously associated with the word 'There!' is more likely to have rewarding consequences than reproducing actions previously associated with the word 'Whoops!'. Moreover, Bird, Brindley, Leighton and Heyes (2007) have argued that the results of Bekkering et al. (2000) can be more parsimoniously explained in terms of perceptual salience: rather than copying the goals behind the actions, children were copying those actions which were perceptually easiest to discriminate. Thus, although there is a considerable body of evidence suggesting that infants and young children understand goals and intentions and use this understanding in order to imitatively learn novel acts, this claim remains controversial, with some researchers arguing that intention understanding does not play an integral role in imitation. Chapter 2 seeks to shed fresh light on this question by moving away from the traditional focus on action imitation and developing a verbal paradigm. This verbal paradigm avoids many of the confounds which have been previously highlighted by researchers within the associationist tradition.

1.2.3 Are children more likely to imitate when a stimulus is objectively ambiguous or difficult to understand?

According to the criteria outlined above, informational influence occurs when a problem is objectively difficult to understand. Thus children should be more likely to imitate when a problem is (or appears to be) hard to solve alone. This proposal will not

be discussed in detail here, but it is worth noting that Williamson, Meltzoff, and Markman (2008) have provided evidence in favour of this particular claim. Williamson et al. (2008) randomly assigned three-year-olds to have either an easy or a difficult experience achieving a goal. Whereas children in the easy prior experience condition were able to successfully open the top drawer of a cabinet, children in the difficult prior experience condition were unable to open the drawer, as it was jammed. Children in both conditions were then given a demonstration in which a model used a distinctive action style in order to open another drawer. Children who had been led to believe that the task was difficult to solve alone were more likely to copy the distinctive action style used by the model. Presumably children in this task used imitation in an attempt to find an optimal solution to the problem at hand.

1.2.4 Do children internalise (and later reproduce) instrumental solutions learned by imitation?

Informational influence is often referred to as 'true influence' in that it leads to genuine behavioural (and/or attitudinal) change (Deutsch & Gerard, 1955). That is to say, individuals internalise the solutions to problems and can then apply these solutions at different times and in different contexts. Once again, this claim will not be discussed in detail here, but it is nonetheless important to note that infants also internalise the solutions to problems and apply them at later times and within different contexts in a phenomenon known as 'deferred imitation'. Meltzoff (1985) measured 14-month-old infants' ability to reproduce an instrumental action after a 24-hour delay. Infants in the experimental condition were presented with a demonstration of how to pull a toy

dumbbell apart, whereas infants in the control condition were shown an irrelevant action on the same toy. Infants' ability to solve the problem was assessed the next day. Whereas 70% of infants in the experimental condition successfully pulled the toy apart, only 25% of infants in the control condition did likewise. Herbert, Gross and Hayne (2006) demonstrated deferred imitation after a 24-hour delay in 9-month-olds using a very similar paradigm; 6-month-olds, however, were not able to solve the problem after the delay. Klein and Meltzoff (1999) investigated retention after longer intervals and showed that 12-month-olds are able to reproduce an observed act even after a delay of four weeks.

In related research, Chen, Sanchez and Campbell (1997) have demonstrated that infants are able to apply solutions learned via imitation to novel contexts. Chen et al. (1997) presented 10- and 13-month-old infants with a problem which required two actions to reach a solution (pulling a cloth in order to acquire a string, which would enable them to drag a toy within reach). After observing the model perform these actions, the 13-month-olds were able to transfer the solution to superficially dissimilar (although structurally isomorphic) problems. Ten-month-olds were also able to transfer the novel solution, but only if there was high perceptual similarity between the modelled solution and the problem they were presented with.

1.2.5 Do children modify their behaviour depending on the trustworthiness of a model?

According to the criteria for informational influence outlined above, not all models are equally influential: they are believed to the extent that they appear to be reliable, trustworthy and experts within a particular domain. Recently there has been a

great deal of research demonstrating that children also monitor expertise and reliability. Below, I briefly discuss some of the key findings.

Moore, Bryant and Furrow (1989) presented evidence that preschool children make inferences about expertise when deciding who to trust. Four-year-old children were more likely to search in the location suggested by an experimenter who indicated confidence in their claim, by saying 'I *know* it's in the blue box', than in the location suggested by an experimenter who indicated their uncertainty, by saying 'I *think* it's in the red box'.

Related research has shown that young children also monitor reliability when deciding who to trust (e.g. Clément, Koenig & Harris, 2004; Corriveau, Pasquini & Harris, 2005; Koenig, Clément & Harris, 2004; Koenig & Harris, 2005). Koenig et al. (2004), for example, presented 3- and 4-year-olds with two informants – one who consistently labelled familiar objects correctly (e.g., labelling a ball a ball) and one who consistently labelled them incorrectly (e.g., labelling a ball a shoe). During the test phase, the informants provided different labels for a novel object. Children of both ages consistently endorsed the label offered by the previously reliable informant over the previously unreliable informant. Koenig and Harris (2005) have demonstrated that preschoolers use similar strategies when learning instrumental tasks. As in the experiment described above, Koenig and Harris (2005) presented 3- and 4-year-old children with two models; one who consistently labelled familiar objects correctly and one who consistently labelled them incorrectly. Subsequent to this familiarisation phase, the two models offered conflicting demonstrations of how to use a novel object. For example, whereas one model brought the object to her lips and blew it as though it were a

recorder, the other model swept it along the top of the table. Children were then asked to demonstrate the proper function of the object themselves. Results showed that both the 3- and 4-year-old children tended to reproduce the demonstrations offered by the previously reliable model.

Recent research has suggested that 14-month-old infants also take reliability into account when deciding who to imitate (Zmyj, Buttelmann, Carpenter, & Daum, 2009). Zmyj et al. presented infants with a video demonstration in which a model consistently acted in a competent manner (for example, successfully putting shoes on his feet and gloves on his hands) or an incompetent manner (for example, putting shoes on his hands and gloves on his feet). Subsequent to this, the model demonstrated an instrumental action using an unusual style (e.g., turning on a light inside a box using his head). Infants were significantly more likely to copy the specific actions of the competent model than the incompetent model.

1.2.6 Summary

This section discussed whether instrumental imitation can be seen as analogous to informational influence. In order to do this, I outlined a set of criteria for the attainment of informational influence and analysed the extent to which instrumental imitation adhered to this criteria. During this discussion, I briefly touched on whether children are more likely to imitate when a stimulus is difficult to understand, whether they internalise solutions to instrumental problems and whether they monitor reliability when deciding who to copy. The main focus of this section, however, was on whether infants and young children understand others as intentional agents like the self, and whether they use this

understanding to inform their imitation. I concluded that, although there is considerable evidence that infants and young children imitate the goals and intentions of others, this claim is controversial. Chapter 2 deals with this issue: in that chapter I outline a set of experiments designed to determine whether imitation (at least at times) is based on intention understanding. The first advantage of the verbal paradigm I develop in that chapter is methodological – it avoids some of the pitfalls of previous research. The second advantage is theoretical: it extends the study of intention-based imitation into a new domain and investigates whether young children use an understanding of communicative intentions in order to decide what to copy.

1.3 Is social imitation analogous to normative influence?

Normative influence occurs when an individual is motivated to act in accord with the behaviour of their group members in order to fulfill social goals. As pointed out in the introduction, the exact nature of normative influence is controversial. Here, following Cialdini and Trost (1998) and Užgiris (1981), I adopt the following criteria:

- It is motivated by a need to belong which creates a desire to adhere to the positive expectations of others (Cialdini & Trost, 1998; Deutsch & Gerard, 1955, Užgiris, 1981).
- This leads individuals to match the behaviour of other group members in an attempt to 'fit in' and be accepted by them.

Thus in order to establish whether imitation in young children and infants is analogous to normative influence it is necessary to ascertain whether they possess a need to belong and a drive to affiliate. Following this, it is necessary to determine whether they

understand the social goals and intentions of others (for example, whether they can recognise goals to affiliate and reject, and modify their social behaviour accordingly) and, finally, whether their imitative performance is influenced by affiliation goals.

1.3.1 Does the drive to affiliate influence behaviour in development?

As adults, we have a fundamental need to belong to the group (Baumeister & Leary, 1995). According to Baumeister and Leary, this need to belong has two key features. First, individuals need to believe that the social bonds they form are marked by stability and affective concern, and will continue for the foreseeable future. Second, individuals need to experience frequent and pleasant social interactions.

One indication of just how important belonging to a group is to us is that, as adults, we form social bonds very easily (Baumeister & Leary, 1995). Tajfel (1970), for example, found that mere allocation to a group, even if that group is formed on the basis of seemingly meaningless criteria, is sufficient to lead participants to allocate rewards to ingroup members over outgroup members. Similarly, adults are reluctant to break social bonds once they have been formed (Baumeister & Leary, 1995). Conformity research can be seen as indicative of this reluctance: once a group has been established, individuals are unwilling to question the opinions of their group members in case it threatens their membership of the group (Asch, 1955; Deutsch & Gerard, 1955).

Another indication of just how important belonging is to us, is that we are incredibly sensitive to cues which indicate our exclusion from the group. For example, involvement in a relatively brief game in which two confederates neglect to throw a ball to an adult participant is sufficient to invoke feelings of sadness and exclusion (Williams

& Sommer, 1997). The same effect holds when the other players are not even physically present: participants also feel sad when they are excluded from an online ball game (Williams, Cheung, & Choi, 2000). In fact, a sense of ostracism can even be evoked without any interaction at all, through priming: participants who have been subliminally presented with words related to rejection (e.g., *ignored, dumped, abandoned*) during an unrelated computer task appraise themselves more negatively than participants who have been subliminally presented with words related to acceptance (e.g., *welcomed, attached, bonded)* (Sommer & Baumeister, 2002).

Like adults, young children appear to form social bonds very easily. Spielman (2000), for example, found that mere allocation to a group is sufficient to produce ingroup bias in 6-year-olds. However, unlike adults, children only show this bias when competitively primed (Spielman, 2000). Furthermore, young children also seem reluctant to break bonds once they have been formed: three-year-olds show conformity within the Asch paradigm; at times accepting a majority's opinion even though they know it to be false (Corriveau & Harris, 2009; Walker & Andrade, 1996). Despite an increasing body of research on children's understanding of group membership, we know very little about how children react when their belongingness within a group is threatened. Chapter 3 investigates this question. In that chapter, I test whether children modify their behaviour in response to subtle cues to social exclusion.

As adults, our need to belong generates a fundamental and pervasive drive to affiliate with our group members (Lakin, Jefferis, Cheng, & Chartrand, 2003; Schachter, 1959). Although very few studies have directly addressed affiliation in infancy, there is great deal of indirect evidence to suggest that infants engage in affiliative behaviours. I

will discuss just a few examples here. Human infants are social animals from soon after birth (Grossman & Johnson, 2007; Tomasello, Kruger, & Ratner, 1993). From around 6 weeks of age, infants begin to smile at human faces and engage in rhythmic interactions with others (Tomasello et al., 1993). Infants also show a primitive form of empathy from early in development, crying in response to hearing another baby cry (Sagi & Hoffman, 1976; Simner, 1971). Simner found that 2-day-old infants are more likely to cry in response to the sound of another baby crying than in response to a control sound of the same intensity.

Turning to older infants, it is possible to view declarative pointing as an affiliative behaviour. Liszkowski, Carpenter, Henning, Striano and Tomasello (2004) demonstrated that infants point declaratively in order to share experience with a social partner. Liszkowski et al. placed 12-month-olds in situations which were likely to elicit pointing gestures. Once an infant pointed, the experimenter would react in one of four different ways. In one condition, the experimenter reacted positively towards the target of the infants' points, but did not attend to the infants themselves. In a second condition, she reacted positively towards the infants, but did not attend to the target of their points. In a third condition, she did not react at all and in the final condition she alternated her attention between the infants and the targets of their pointing gestures. Results suggested that infants were only satisfied when the experimenter alternated her attention between them and the event to which they pointed.

The above evidence suggests that the drive to affiliate may influence behaviour from early in development. In adults, however, some of the strongest evidence that the drive to affiliate influences behaviour comes from studies in which experimenters have

attempted to induce the drive to affiliate and measured the impact on subsequent behaviour (e.g., Lakin & Chartrand, 2003). As yet, no studies have used such a design with infants or young children. In Chapter 4 of this thesis, I describe an experiment which manipulates the importance of affiliation to infants and measures the impact on their social behaviour.

1.3.2 Are young children and infants able to understand the social goals and intentions of those around them?

In order for normative influence to occur, individuals must understand more than others' goals and intentions towards objects, they must understand their social goals and intentions, for example, intentions to affiliate and reject. Such understanding is important because it enables individuals to modify their own social behaviour in order to maximise their chances of positive interactions with other group members. Evidence in favour of infants' ability to understand others' social intentions comes predominantly from looking time studies. Premack and Premack (1997), for example, found that 12-month-old infants were able to discriminate between two agents who were engaged in a positive interaction (for example, helping or hugging each other) from two agents who were engaged in a negative interaction (for example, hitting or hindering each other).

In similar research, Hamlin, Wynn and Bloom (2007) investigated infants' understanding of helping behaviour more specifically. Hamlin et al. presented 10-month-old infants with scenes in which one shape, for example a yellow triangle, appeared to help a red circle up a hill. A blue square, on the other hand, appeared to hinder the circle's ascent up the hill. At test, the circle either approached the helper (the triangle) or

the hinderer (the square). Results showed that infants looked significantly longer at scenes in which the circle approached the hinderer. Hamlin et al. interpreted this as evidence that the infants had formed expectations about the social relationships between the three shapes and expected the circle to seek out the company of the helper rather than the hinderer.

Recently, Vaish, Carpenter and Tomasello (2009) investigated infants' understanding of social intentions using a more active dependent measure. Vaish et al. presented 18-month-old infants with scenarios in which an experimenter caused harm to a third party. For example, the experimenter deliberately tore up a picture that the third party had drawn. Even though the third party showed no emotional cues indicative of distress, infants gave her significantly more concerned looks than in a control condition where the experimenter tore up an object which did not belong to her (see also Hobson, Harris, Garcia-Perez, & Hobson, 2009). Furthermore, when offered the opportunity to help either the victim or a neutral person, infants were significantly more likely to help the victim. These results suggest that infants had understood the nature of the third party interaction and were thus able to sympathise with the victim even though she showed no emotional cues indicating her distress.

1.3.3 Do social goals influence the imitative behaviour of young children and infants?

In order to be considered analogous to normative influence, children's imitation would need to be influenced by social goals, specifically goals to affiliate. Evidence in favour of this proposition comes from research demonstrating that infants and young children sometimes copy the specific actions used by a model even though reproduction

of those actions is not necessary to achieve the same result. For example, Horner and Whiten (2005) presented 3- and 4-year-old children and chimpanzees with a demonstration of how to open a transparent box. Some of the actions involved in this demonstration were causally necessary to open the box, and some were unnecessary. Whereas chimpanzees copied only those actions which were causally necessary, children copied both the necessary and unnecessary actions. In similar research, Nagell, Olguin and Tomasello (1993) presented 2-year-old children and chimpanzees with a demonstration in which a model retrieved a toy using a rake. In one condition the model used this rake tool efficiently and in the other, she used it inefficiently. Children, but not chimpanzees, copied the specific actions of the model even when this resulted in less efficient performance on their part. This case is particularly interesting because, in an apparent analogy to Asch's conformity experiment, the operation of social goals induced children to perform sub-optimally.

In cases such as these, social motivation has been taken as a default explanation; if children choose not to copy selectively, then their motivation for imitating must be social rather than instrumental. Perhaps not surprisingly then, these data are open to alternative explanations. For example, Horner and Whiten (2005) suggested that children in their study interpreted the irrelevant actions as intentional and so copied them for that reason. This explanation is made more plausible by the fact that Horner and Whiten demonstrated the action sequence on the box a total of three times. Thus children had an opportunity to watch the model repeatedly perform the irrelevant actions. However, chimpanzees also have some understanding of intentional action (e.g., Call, Hare, Carpenter, & Tomasello, 2004) and yet did not copy the irrelevant actions used by the

model, so this explanation alone cannot explain the differences in their copying behaviour.

Another possible explanation is that children reinterpreted the causal structure behind the action sequences such that they came to view the irrelevant actions as causally necessary (Lyons, Young, & Keil, 2007). Lyons et al. claim that when children observe a model demonstrating a series of actions, they have a strong tendency to encode all of those actions as causally necessary and so implicitly revise their causal understanding of the objects involved in the demonstration. This revision of their causal understanding leads them to imitate all of the demonstrated actions. Based on this theory, Lyons et al. predicted that overimitation should be unavoidable. In order to test this prediction, Lyons et al. showed 3- to 5-year-old children demonstrations which included irrelevant actions. Prior to these demonstrations, children participated in a training phase in which they were reinforced for identifying actions which were 'silly and unnecessary'. Even though children were correctly able to identify the unnecessary actions, they still overimitated (copying both the relevant and irrelevant actions) when offered the opportunity to act on the box. In a further experiment, Lyons et al. showed that, even when the experiment appeared to be finished, children maintained a tendency to overimitate. Lyons et al.'s general argument is supported by Whiten (in press) who claims that children may use a 'copy all – refine/correct later' heuristic in their imitation. Whiten argues that this heuristic is an evolutionarily adaptive strategy which enables children to learn about causally opaque objects and artifacts.

However, we know from other research that children do sometimes copy selectively, for example, they copy intentional over accidental actions (Carpenter et al.,

1998) and complete failed attempts (Meltzoff, 1995). If we accept Whiten (in press) and Lyon et al.'s (2007) argument, then we are left with an apparent paradox in which children sometimes copy selectively and sometimes copy exactly. Another element to the puzzle is that overimitation appears to increase with age, with 5-year-olds showing more overimitation than 3-year-olds, and adults showing even greater levels of overimitation than 5-year-olds (Whiten, in press, although see Horowitz, 2003, for a different perspective on adults' imitation). If we accept the social hypothesis, however, this apparent paradox disappears: children copy selectively when they have instrumental goals and copy more exactly when they have social goals. Moreover, if overimitation is a social skill, then it is no surprise that the tendency to copy exactly increases with age.

Indeed, there is a growing body of evidence in favour of this social hypothesis. Eckermann, Davis, and Didow (1989), for example, found that during the second year of life, infants begin to coordinate play with peers, choosing to play with similar objects as their peers, and to use those objects in similar ways. Eckermann et al. speculate that the function of these imitative exchanges may be to help generate and sustain interaction between the two infants (Eckermann et al., 1989; Eckermann & Didow, 1989). Although this argument seems highly plausible, experimental evidence is necessary in order to fully understand the relationship between imitation and affiliation.

Nielsen (2006) provided the first direct test of the connection between affiliation and imitation in infants and young children (although see Bandura & Huston, 1961, for a similar test with older children). Nielsen (2006) invited children to watch a demonstration in which a model opened a box using a tool. What varied between conditions was the nature of the model: in one condition the model was warm and

friendly and in the other condition they were cold and aloof. The results varied with age: 18-month-olds opened the same number of boxes in each condition, but were significantly more likely to copy the style with which the model performed the action in the social condition. The results for the twenty-four-month-olds were more ambiguous: they opened significantly more boxes in the social condition, but showed no difference in their tendency to copy the model's style. These results suggest that imitation varies according to social factors, but the specific nature of the effect is not clear. Furthermore, it is not clear whether children imitated the actions of the warm model more closely because they liked her more or because they sought to affiliate with her.

An experiment by Nielsen, Simcock and Jenkins (2008) provides further support for the claim that children vary their imitation depending on the social availability of the model. Nielsen et al. compared 24-month-olds' imitation of an interactive model, who communicated with them through a closed circuit TV system, to imitation of a non-interactive model, whose actions were presented on video. Children in the 'interactive' condition were significantly more likely to copy the specific actions of the model than children in the 'non-interactive' condition. Although these data clearly demonstrate that imitation varies according to social factors, once again the specific nature of the effect is not clear: it is not clear from this study whether children imitated the interactive model more closely because they preferred her or because they sought to affiliate with her.

An earlier study by Thelen, Miller, Fehrenbach, Frautschi and Fishbein (1980) suggests that older children may use imitation strategically in order to affiliate, or ingratiate themselves, with other individuals. Thelen et al. (1980) asked 10-year-old children to play a game with another child. Children in a 'social influence' condition

were told that they would later be expected to persuade this child to do something unpleasant (eat some unappealing looking crackers). Children in this 'social influence' condition were significantly more likely to copy the second child than children in a control condition. Thelen et al. interpret this as evidence that children in the 'social influence' condition were using imitation strategically in order to ingratiate themselves with the other child. This study is convincing because the model's behaviour was held constant across conditions and the children's own goals were manipulated. However, the control condition chosen by Thelen et al. complicates the interpretation of the results. Whereas children in the experimental condition were told they would later have to convince the model of something, children in the control condition were not told anything about the model. Thus it is possible that children in the experimental condition were paying more attention to the model simply because they would have to interact with her later, rather than because they had a goal to ingratiate themselves with her.

1.3.4 Summary

This section discussed whether social imitation in development can be seen as analogous to normative influence. I analysed whether infants and young children have a need to belong to the group and a drive to affiliate with their group members. Following this, I investigated whether they understand the social goals and intentions of those around them and whether their own social goals influence their imitation. This discussion raised a number of important questions for future research. First, although there is some evidence that the need to belong influences children's behaviour, few experiments have been designed to directly test this question. Chapter 3 deals with this

issue: in that chapter, I investigate whether exposure to ostracism influences the social behaviour of young children. Chapter 4 complements this research by investigating the influence of affiliation on behaviour in infancy. Second, although it appears that children's imitation varies according to social factors, it is not yet clear whether children increase their imitation when affiliation is important to them. Chapter 3 deals with this issue by testing whether children increase their imitation when their sense of belongingness has been threatened.

1.4 The co-occurrence of instrumental and social imitation

Thus far, I have described informational and normative influence, and the instrumental and social functions of imitation, as though they operate separately. The reality of the situation is more complex: informational and normative forms of influence are commonly found together (Cialdini & Trost, 1998; Deutsch & Gerard, 1955). Behaviour in the Asch paradigm, for example, appears to reflect both forms of influence. This is evidenced by the fact that, when asked to make their decisions in private, participants still show some conformity, thus suggesting that informational as well as normative influence plays a role in guiding their responses (Deutsch & Gerard, 1995).

Indeed Turner (1991) has argued that the two forms of influence are inseparable. Cases which appear to reflect informational influence, for example, learning to use tools, have a strong social component: tools are socially created and their appropriate use is socially determined. Moreover, cases which appear to reflect purely normative influence also have a strong informational component: we do not accept the opinions of our group members merely to affiliate with them; we accept their opinions because we believe them

to be correct and appropriate. In formulating Self Categorisation Theory, Turner (1984, 1991; Turner, Hogg, Oakes, Reicher, & Wetherell, 1987) argued that influence is a unitary phenomenon. As Self Categorisation Theory is primarily a theory of intergroup relations, it is difficult to combine with the developmental study of imitation, which has primarily been studied in dyadic interaction. However, Turner's critique of the normative/informational distinction is highly relevant to our discussion.

Just as the informational and normative forms of influence overlap, so do the instrumental and social functions of imitation (Carpenter, 2006). Indeed, in many situations, they appear to be inseparable. One such situation is teaching. Within a teaching situation, an experienced individual may demonstrate an instrumental skill to a child with the help of social cues. To the extent that the child participates in the learning situation and responds to the model's social cues, their imitation is neither purely instrumental nor purely social. Gergely and Csibra (2006) have found that 14-month-old infants are responsive to social/teaching cues when learning instrumental actions. Gergely and Csibra (2006) presented infants with a model who performed an unusual action; turning a light box on with her head. In one condition, the model communicated that this information was important by ostensively shifting her gaze between the infant and the light box whereas, in the other condition, she gave no such cues. Infants who had observed the ostensive cues were significantly more likely to reproduce the unusual means used by the model than infants who did not observe the ostensive cues.

Another area in which the instrumental and social functions overlap is normative behaviour (Turner, 1991). Learning appropriate social behaviour is similar to learning instrumental skills in that there is a correct way to perform the actions involved.

However, norms are inherently social because the rules they embody are socially constituted. Rakoczy, Warneken and Tomasello (2008) showed that 3-year-old children are sensitive to normative rules. Rakoczy et al. (2008) presented 2- and 3-year-old children with a demonstration of how to play a 'daxing' game. This game had a particular rule such that to 'dax' it was necessary to push a block across a board towards a gutter. Once children had been shown the rule, a puppet was introduced. This puppet violated the rules of the game; announcing his intention to 'dax' and then carrying out an inappropriate action (tipping the board on which the block was placed). The 3-year-old children, and to some extent the 2-year-old children, protested about this rule violation, sometimes with explicit normative protests "No! It does not go like this!" and sometimes with imperative protests "No! Not in this hole!" Children did not protest in a control condition where the puppet conducted the same action outside of the game context.

Perhaps the paradigmatic example of a form of social learning which is neither purely social nor instrumental is language learning. Language is a normative system, created by people in order to achieve social goals. Thus, language is an intrinsically social activity. As with any other normative system, however, there is a correct way for language to be spoken. In this respect, learning a language mirrors the acquisition of conventional instrumental actions. It follows that, although children's early communication is a means by which to affiliate with their social partners, it would be highly beneficial for children to analyse the goals and intentions behind utterances and imitate them selectively when offered the chance to do so. As outlined above, Chapter 2 addresses this very issue.

1.5 Unintentional social influence

Thus far, I have discussed only relatively direct and explicit forms of behaviour matching. This mirrors traditional research on social influence which has concentrated on 'conscious' processes (see Bargh, 2008, for further elaboration of this point) and reflects the vast majority of developmental research on imitation, which has concentrated on relatively direct forms of social interaction. However, research in social psychology has shown that a great deal of social influence and behaviour matching occurs without the formation of conscious intentions.

One example of subconscious social influence is adults' tendency to mimic the mannerisms of their conversation partners. This tendency was most clearly demonstrated by Chartrand and Bargh (1999). Chartrand and Bargh (1999) asked participants to interact with a confederate who surreptitiously engaged in one of two behaviours, either rubbing their face or tapping their foot. Analysis of the participants' behaviour revealed that they automatically matched the behaviour of the confederate. A subsequent funneled debriefing session revealed that participants were not aware of their mimicry. Other research has shown that adults mimic the facial expressions (Lundqvist & Dimberg, 1995; Zajonc, Adelmann, Murphy, & Niedenthal, 1987), emotions (Ramanathan & McGill, 2008) and syntax (Levelt & Kelter, 1982) of their social partners.

This subtle form of social influence appears to be motivated by the same goals as more explicit forms of influence. The tendency for adults to mimic their social partners is closely related to the need to belong and the drive to affiliate. In one demonstration of this, Lakin, Chartrand and Arkin (2008) showed that adults increase their tendency to mimic when their belongingness within a group had been threatened. Participants who

had been excluded from an online ball game subsequently showed a greater tendency to mimic the mannerisms of a model than participants who had been included in the ball game. Lakin et al. (2008) argued that participants who had been ostracised used mimicry as a means by which to affiliate with others, and so recover their position within the group. In a related experiment, Lakin and Chartrand (2003) gave participants either a conscious or a nonconscious goal to affiliate. Participants given either type of affiliation goal increased their tendency to mimic the mannerisms of a confederate relative to participants in a control group who were not given an affiliation goal.

It is not clear when children first show this tendency to subconsciously mimic the mannerisms of their conversation partners. Bargh (2008) and Dijksterhuis (2001) have explicitly compared mimicry in adults to neonatal matching of facial expressions. Meltzoff and Moore (1977) presented infants with a model who alternated between bouts of protruding his tongue and opening his mouth. Infants tended to protrude their tongue during tongue protrusion models and open their mouths during mouth opening models. However, these results are highly controversial. In a review of several studies, Anisfeld (2005) found that tongue protrusion was the only behaviour to be reliably imitated. Moreover, empirical work by Jones (1996, 2006) has suggested that the tongue protrusion effect is caused by increased arousal rather than the model's behaviour per se: infants also stick out their tongue in response to observing a pen move towards their face (see Heyes, 2001) and in response to interesting events in the environment such as a music playing (Jones, 2006). Thus, contrary to the claims of Dijksterhuis (2001) and Bargh (2008), neonatal tongue protrusion may not be equivalent to adults' tendency to match the behaviour of their social partners. One interesting possibility, however, is that older

infants' and children's tendency to copy the style with which a model performs an action may be motivated by the same goals as adults' tendency to mimic the mannerisms of their conversation partners. The relation between these two forms of copying behaviour is further discussed in Chapter 3.

Another form of subtle influence is social priming. In social learning research, priming has often been contrasted with imitation as an alternative, lower level explanation for apparent matching behaviour. For example, Byrne and Russon (1998), as well Huang, Heyes and Charman (2002) and Want and Harris (2001), have pointed out the need to distinguish stimulus enhancement (where an internal representation of an object is primed as a result of observing a conspecific interact with it) from imitation.

In adult work, however, priming has been conceptualised rather differently. Bargh and colleagues have shown that it is possible to prime high level social concepts, character traits, goals and stereotypes (e.g., Bargh et al., 1996). Djiksterhuis and Bargh (2001; see also Dijksterhuis, 2001, 2005) have described this form of priming as a type of behaviour matching, similar to imitation. Dijksterhuis (2005) points out that, as adults, we 'see' a lot more in our social partners than is visually available. When observing a social partner, we make inferences about their character traits and behavioural predispositions. Through social priming, we match our behaviour to these activated traits, goals and stereotypes. Macrae and Johnson (1998), for example, primed participants with the concept of helpfulness, by asking them to unscramble a series of sentences which contained words related to that concept (see Srull and Wyer, 1979, for the first demonstration of this priming technique). At a later point, an experimenter 'accidentally' dropped some pens on the floor. Results showed that participants primed

with helpfulness picked up significantly more pens than participants given a neutral prime. In similar work, Bargh et al. (1996) primed participants with either rudeness or politeness using the scrambled sentence paradigm. Participants who had been exposed to words related to politeness were more polite within a subsequent social interaction than participants exposed to words related to the trait of rudeness.

Further work has demonstrated that traits do not need to be activated directly in order to influence social behaviour. Bargh et al. (1996) presented participants with words related to the concept of the elderly. Participants who had been presented with this elderly prime subsequently walked more slowly down the corridor than participants presented with a neutral prime. In this experiment, 'slowness' was not directly primed; it was activated through its association with the stereotype of the elderly. In a related experiment, Bargh et al. (1996) primed participants with subliminally presented photographs of African American faces. Non-African American participants who had been primed with these images were subsequently more aggressive than participants in a control condition. In this experiment, photographs of members of a particular social group were sufficient to lead participants to match their behaviour to the perceived stereotype of that group.

1.5.1 Summary

In this section I moved away from traditional social influence research and discussed more subtle forms of social influence and behaviour matching, especially social priming. To date, there has been no research investigating this type of subtle social influence in infants and young children. Chapter 4 addresses this point. In that chapter, I

investigate the influence of priming affiliation on infants' helping behaviour. The theme of subtle social influence is also relevant in Chapter 3 where I investigate the influence of priming ostracism on children's social behaviour.

1.6 Summary and overview of this thesis

This review sought to unite the literature on social learning with the literature on social influence. In the first two sections of this review, I outlined traditional research on social influence suggesting that adults' tendency to adopt the behaviour of others is motivated by goals to learn from, and affiliate with others. I argued that imitation in young children may be motivated by similar goals; in other words, that imitation serves both an instrumental and a social function in development. In the latter part of this review, I argued that, in addition to explicit forms of behaviour matching, adults often subconsciously match the behaviour of their group members. I moved on to discuss whether young children and infants show a similar tendency to subconsciously assimilate their behaviour to those around them. In the following chapters, I investigate a series of questions which have been raised by this review. Chapters 2 and 3 explore the instrumental and social functions of imitation in children. In Chapter 2, I investigate whether children analyse the behaviour of others in order to decide what to imitate. In particular, I investigate whether verbal imitation is based on intention understanding. In Chapter 3, I investigate whether children are motivated to imitate for social reasons, in order to fulfill a need to belong. In order to do this, I prime children with scenes indicating social exclusion and measure the impact on their imitative performance. In Chapter 4, I continue the theme of priming and investigate whether even infants will

assimilate their behaviour to subtle social cues in the environment. In particular, I test whether subtle cues to affiliation are sufficient to increase helping behaviour in 18-month-olds.

Chapter 2

Instrumental Behaviour Matching: Is Verbal Imitation Based on Intention Understanding?

2.1 Introduction

In my General Introduction, I argued that in order to be considered analogous to informational influence, instrumental imitation needed to be based on understanding the goals and intentions of a model. The claim that imitation is based on intention understanding is, however, controversial. In contrast to the intention-based account, some researchers have argued that imitation is primarily based on direct matching (Iacobini, Woods, Brass, Bekkering, Mazziotta, & Rizzolatti, 1999) or associative learning (Heyes, 2001). To date, this debate has concentrated almost exclusively on action imitation. In this chapter, I attempt to shed fresh light on the topic by investigating the relatively neglected domain of verbal imitation.

2.1.1 What are the cognitive mechanisms underlying imitation?

There are three main accounts of the cognitive mechanisms underlying action imitation; the direct matching account (Iacaboni et al., 1999), the associationist account (Heyes, 2001), and the intention-based account (Bekkering et al., 2000; Carpenter et al., 1998). Direct matching accounts claim that humans possess an innate imitation mechanism through which visual input from observed actions is matched to proprioceptive feedback from self-produced actions (Meltzoff, 1993). The strongest support for directing matching accounts has come from the discovery of mirror neurons

(Iacaboni et al., 1999; Rizzolatti, Fadiga, Fogassi, & Gallese, 2002; Rizzolatti, Fadiga, Gallese, & Fogassi, 1996). These neurons, located in the ventral premotor cortex of the macaque, fire both when a monkey observes an action and when it performs a similar action itself (Rizzolatti et al., 2002). Imaging studies have shown that there is a comparable 'mirror system' in humans which could provide a neurological basis for common coding between observed and produced acts (Meltzoff & Decety, 2003). However, the strong formulation of this account is incompatible with results suggesting that imitation is experience dependent; changing both with development (Over, Petschauer, & Tomasello, 2009; Perra & Gattis, 2008) and with relatively brief training (Gillmeister, Catmur, Liepelt, Brass, & Heyes, 2008).

In contrast to the direct matching account, the associationist account claims that imitation is highly experience dependent (Heyes, 2001). According to this account, imitation results from a series of excitatory vertical links between sensory and motor representations. These links are generated through concurrent observation and execution of the same actions (Bird & Heyes, 2005). When compared to the direct matching account, this account gains strong support from data showing that the 'mirroring' properties of the mirror system are not necessarily innate, but can change and even reverse with training (Catmur, Walsh, & Heyes, 2007; Catmur, Gillmeister, Bird, Liepelt, Brass, & Heyes, 2008). In one demonstration on this, Catmur et al (2008) trained a group of adult participants to imitate a series of hand and foot actions presented on a computer screen. A second group of participants were trained to counterimitate; that is, respond to hand stimuli with foot responses and foot stimuli with hand responses. fMRI data revealed that, after counter-imitative training, the properties of the mirror system were

reversed; brain areas which showed greater responding to hand actions in the compatible group showed greater responding to foot actions in the incompatible group. The associative account is also compatible with evidence suggesting that non-human animals can be trained to imitate (Heyes, 2001; Mui, Hazelgrove, Pearce, & Heyes, 2008) and with studies demonstrating that adults automatically imitate the gestures and mannerisms of their social partners (Chartrand & van Baaren, 2009). Although associations no doubt play an important role in imitation, they cannot be the whole story: there is a growing body of research suggesting that imitation is a selective, interpretative process based on understanding the goals and intentions of a model.

The intention-based account proposes that the mapping between perception and action is cognitively-mediated. Behaviours are not replicated as unified motor patterns, but are broken down and reconstructed in terms of their goals (Bekkering et al, 2000; Gattis, Bekkering, & Wohlschläger, 2002). This account is compatible with a large body of empirical evidence suggesting that both children's and adults' imitations systematically deviate from modeled behaviour depending on their interpretation of the model's goals and intentions. For example, infants (Carpenter et al., 2005), young children (Bekkering et al., 2000; Gleissner, Meltzoff, & Bekkering, 2000) and adults (Wohlschläger, Bekkering, & Gattis, 2003) imitate the same action differently depending on its perceived goal. Moreover, infants copy intentional actions but not mistakes (Carpenter et al., 1998) or failed attempts (Meltzoff, 1995). Further research has suggested that, not only do young children use an understanding of intentions-in-action in their imitation, they also use an understanding of more complex prior intentions (Carpenter et al., 2002).

Although many are now convinced by the intention-based account (Carpenter et al., 1998; Carpenter et al., 2002; Carpenter et al., 2005; Meltzoff, 1995), some researchers within the associationist tradition maintain that such a rich interpretation of these data is unwarranted (e.g. Heyes, 2001). Many of the apparently convincing demonstrations of intention-based imitation can, in reality, be explained by lower level processes such as stimulus enhancement (increased attention towards an object as a result of seeing a conspecific interact with it), emulation (learning the affordances of objects in a demonstration) (Huang et al., 2002; Huang, Heyes, & Charman, 2006) and perceptual salience (Bird et al., 2007).

2.1.2 Is verbal imitation based on intention-understanding?

Compared to the debate surrounding action imitation, there has been relatively little discussion of the mechanisms underlying verbal imitation. Most strikingly, there has been very little discussion of whether verbal imitation is based on understanding the goals and intentions of a model (although see Tomasello, 1999). There is, however, some evidence to suggest that verbal imitation is cognitively mediated. Research using elicited imitation paradigms has shown that children do not always copy utterances exactly; as they acquire knowledge of their native grammar, they start to correct ungrammatical sentences (e.g., Akhtar, 1999; Bohannon, 1975; Love & Parker-Robinson, 1972; Scholes, 1969; Slobin & Welsh, 1973; Weener, 1971). For example, Slobin and Welsh (1973) found that, when their subject was presented with sentences which included ungrammatical repetitions, she would correct them in her imitation (by omitting the repetitions). Similar results were found by Love and Parker-Robinson (1972) who

showed that children were more accurate in their imitation of grammatical sentences than ungrammatical sentences. Results such as these have been taken as evidence that children, like adults, remember the gist of linguistic information. When asked to imitate, they use their grammatical knowledge in order to produce a 'best guess' about the original form of the sentence. This best guess leads them to produce grammatical sentences in place of the ungrammatical models (Hulme, Maughan, & Brown, 1991; Gathercole, Frankish, Pickering, & Peaker 1999). According to this account, verbal imitation relies on memory processes and grammatical knowledge, but not on intention understanding (see Tessari and Rumiati, 2004, for a similar view of action imitation).

However, the literature on action imitation suggests an alternative and even richer interpretation of these data. As mentioned above, starting from infancy, children appear to copy intentional actions but not mistakes (Carpenter et al., 1998) or failed attempts (Meltzoff, 1995). An ungrammatical sentence can be seen as equivalent to a failed attempt to perform an action; although there is a failure in the surface form of the utterance, it succeeds nonetheless in conveying an intention to the listener. Based on this analogy, it is possible that children's tendency to correct ungrammatical sentences is based not solely on their grammatical knowledge, but also on a tendency to copy the perceived intentions behind speech.

If this interpretation of the existing data were valid, it would be particularly interesting because it would suggest that young children take communicative intentions, as well as prior intentions and intentions-in-action, into account when deciding what to copy. We know from previous research that infants understand communicative intentions

from at least 12 months (Behne, Carpenter, & Tomasello, 2005), but we do not yet know whether they use this understanding when deciding what to imitate.

2.1.3 The current experiments

In this series of studies, I tested whether verbal imitation is based on understanding the intentions of a speaker. In doing so, I simultaneously investigated whether imitation more generally involves intention understanding, and whether children take a model's communicative intentions into account when deciding what to copy.

In order to answer these questions, I drew on Meltzoff's (1995) behavioural reenactment paradigm. Meltzoff (1995) compared 18-month-olds' imitation of successful actions and failed attempts. Infants in a *Demonstrate (target)* condition observed a model perform a successful action; for example pulling two-halves of a toy dumbbell apart. Infants in a second, *Demonstrate (intention),* condition observed a 'failed attempt' to perform the same action; they watched the model's hands repeatedly slip from the ends of the dumbbell. When offered the opportunity to imitate, infants in both conditions reproduced the goal of the action (pulling the toy apart) in equivalent numbers, and did so significantly more often than infants in a control condition who observed an irrelevant action on the toy. In other words, infants in the *Demonstrate (intention)* condition reproduced the intended goal of the action rather than the surface behaviour they observed.

Further evidence in favour of this interpretation was provided by a second experiment in which Meltzoff compared imitation of a human model to imitation of a mechanical device. In a *Demonstrate (intention)* condition, the scenario was identical to

the one outlined above; infants watched a human model try to pull two halves of the toy dumbbell apart. In a second, *Demonstrate (mechanical slippage)* condition, infants watched a pair of mechanical pincers perform a similar movement; the two claws repeatedly slipped from the end of the toy. When offered the opportunity to imitate, infants were significantly more likely to complete the action of the human model (pulling the toy apart) than that of the mechanical device. Meltzoff interpreted this as evidence that infants had attributed an intention to the human model but not to the mechanical device.

In these studies, I combined the logic of Meltzoff's experiments with an elicited imitation paradigm. In my first two experiments I replicate and extend previous results on elicited imitation showing that children correct ungrammatical sentences. In my critical third experiment I test whether children treat ungrammatical sentences differently when they are spoken by an 'intentional' model versus a 'non-intentional' model. If verbal imitation is based on intention understanding, then children should correct the ungrammatical utterances of the intentional model, but repeat the same utterances exactly when they are spoken by the 'non-intentional' model.

2.2 Experiment 1

In this experiment my main goal was to replicate previous research showing that young children correct ungrammatical sentences. Following Slobin and Welsh (1973), I chose to compare children's imitation of grammatically correct sentences to their imitation of sentences with ungrammatical repetitions. In keeping with previous research on elicited imitation, I chose to test this prediction with 3-year-olds.

2.2.1 Method

Participants

Participants were 20 children between the ages of 3, and 3 years, 11 months (*mean age* = 3 years, 5 months). Ten of these children were female and 10 male. A further 2 children were excluded as a result of equipment failure, and 2 for failure to complete the practice trials. Children were dropped for failure to complete the practice trials if they failed to repeat three or more sentences consecutively. Children did not have to repeat the practice trials exactly in order to be included; any response (whether grammatical or ungrammatical) was sufficient for inclusion in the data set. This meant that only children too shy to speak at all were excluded from the final data set. In all three studies, children were recruited from nurseries in the Cardiff area as well as from the city's science museum and a database of families who had expressed an interest in participating in child development studies.

Materials

The five ungrammatical sentences were taken from the previously mentioned case study by Slobin and Welsh (1973). Each of these sentences included ungrammatical repetitions, for example, 'I need need the ball' and 'Mark fell fell off the horse'. In order to compare performance on these test trials to children's baseline tendency to copy sentences exactly, five control sentences were generated. These sentences were matched in terms of grammatical complexity rather than sentence length, for example, 'I need the ball', 'Mark fell off the horse' (see Table 2.1 for further details). Ten grammatically correct filler sentences were also created, each containing five words. In order to overcome children's shyness in speaking to the experimenter, nine practice trials were

generated. These sentences increased in length so that the first three sentences contained only 1 word, the next three sentences contained 2 words, and the final three sentences contained 3 words (red, boo, door, small mouse, blue car, big dog, he fell down, a brown cat, a big apple). The test sentences were presented in two fixed orders such that half of children heard the sentence 'Mark fell (fell) off the horse' first, and half of children heard the sentence 'I need (need) the ball' first.

Table 2.1. *The test sentences used in Experiment 1*

Test sentences: Grammatical condition	Test sentences: Ungrammatical condition
I need the ball	I need need the ball
Mark fell off the horse	Mark fell fell off the horse
Mozart fell off the table	Mozart fell off off the table
I can eat	I can can can eat
Kitty was perking the ice cream	Kitty was perking perking perking the ice cream

Design

Children heard either the grammatically correct sentences or sentences with grammatical errors in a between-subjects design. The accuracy with which children reproduced the utterances was analysed.

Procedure

Each child was invited into a quiet room and asked to sit on the floor with the experimenter (E). After a brief warm up session, E introduced the copying game by asking 'Can you say what I say'? Once the child understood the game, she/he heard and imitated the 9 practice sentences followed by the 5 test sentences. Each of the test

sentences was preceded by two grammatically correct filler sentences. During the practice and test trials children were praised for each response they gave regardless of whether their response was grammatical or ungrammatical. Children were thus reinforced for speaking rather than for offering a particular type of response. If a child refused to repeat a sentence, it was presented up to three times. After the third attempt, E told the child they would try another sentence, and the game continued.

Coding

Children's responses were coded from audio-tape by the experimenter. Two coding categories were created: children could either copy the sentences exactly ('exact') or alter the sentences to an alternative grammatically correct form ('alter'). In all three experiments, children also gave a small number of other responses (such as repeating only the final or most salient word in the sentence). As these responses are not relevant to the hypotheses, they are not discussed further. Twenty percent of the tapes were analysed by a second coder. Agreement between the two coders was 100%, Cohen's Kappa = 1.

2.2.2 Results

Figure 2.1 indicates the median number of times children produced exact copies and alterations of grammatical and ungrammatical sentences. Mann Whitney planned comparisons revealed that children were significantly more likely to copy the grammatical as opposed to ungrammatical sentences exactly ($U = 1.5$, N1 = 10, N2 = 10, $p<.001$, two-tailed, $r = .85$). Moreover, they were significantly more likely to alter the ungrammatical sentences to an alternative grammatically correct form ($U = 15$, N1 = 10,

N2 = 10, p=.002, two-tailed, r = .70). Children corrected the ungrammatical sentences either by dropping the repeated words, substituting the repeated words, or adding additional words to the sentences. For example, when presented with the ungrammatical sentence 'I need need the ball' some children chose to omit the meaningless repetition 'I need the ball', while others chose to substitute another word for the repetition, for example 'I do need the ball'. These results replicate the results of previous elicited imitation studies and suggest that children correct sentences which include ungrammatical repetitions.

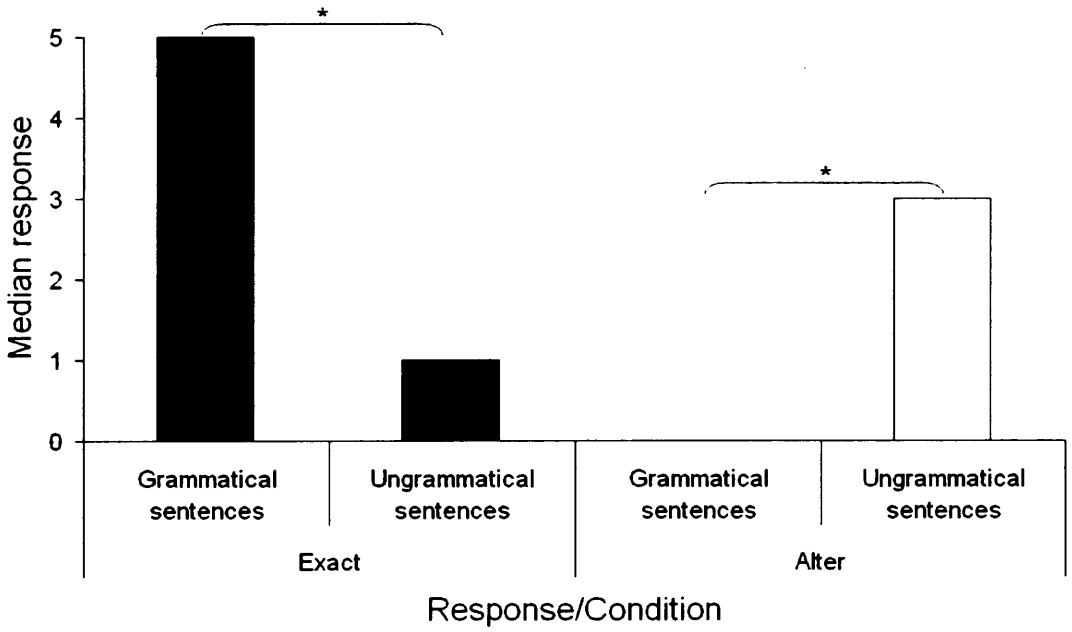

Figure 2.1. The results from Experiment 1: children's reproductions of grammatical and ungrammatical sentences. The black bars indicate children's tendency to copy the model sentences exactly. The white bars indicate children's tendency to alter the sentences to an alternative, grammatically correct form. * indicates a statistically significant difference.

2.3 Experiment 2

In this experiment I sought to further refine my paradigm. I interpreted the data from Experiment 1 as evidence that children correct ungrammatical sentences (and so may copy the perceived intentions behind speech). However, an alternative interpretation of these data is that children failed to notice the ungrammatical repetitions (Slobin & Welsh, 1973). In this experiment, another sample of 3-year-olds were asked to imitate sentences which included either grammatical repetitions or ungrammatical repetitions. If children fail to notice repetitions, then they should omit the repetitions from both the grammatical and the ungrammatical sentences. However, if children correct ungrammatical sentences, then they should omit only the ungrammatical repetitions.

2.3.1 Method

Participants

Participants were 20 children between the ages of 3, and 3 years, 11 months (*mean age* = 3 years, 6 months). Fourteen were female and 6 male. A further 2 children were excluded for failure to complete the practice trials. As in experiment 1, children were not expected to repeat the practice trials exactly; they were excluded only if they failed to offer 3 consecutive responses on the practice trials (regardless of whether those responses were grammatical or ungrammatical).

Materials

Eight test sentences were constructed. Four of these sentences included grammatical repetitions, e.g., 'Sam was a big big cat', and 4 contained ungrammatical repetitions, e.g., 'The cat was too big big for the chair' (see Table 2.2 for further details).

The 9 practice trials, as well as 8 grammatically correct filler sentences were taken from Experiment 1.

Table 2.2. *The test sentences used in Experiments 2 and, on the right, those also used in Experiment 3*

Test sentences: Grammatical condition	Test sentences: Ungrammatical condition
He was in a dark dark house	It was dark dark outside
There there don't cry	There there is the park
He said bye bye to his horse	He went to buy buy a horse
Sam was a big big cat	The cat was too big big for the chair

Design

As in Experiment 1, children heard either grammatically correct sentences or sentences with grammatical errors in a between subjects design.

Procedure

The instructions, practice trials, and testing procedure were all identical to those used in Experiment 1.

Coding

Children's reproductions were coded in to the same categories as Experiment 1: a child could either repeat the sentences exactly ('exact') or alter the sentences to an alternative grammatically correct form ('alter'). As in Experiment 1, the data was coded from audio-tape by the experimenter and 20% of the dataset was analysed by a second coder. Agreement between the two coders was 100%, Cohen's Kappa = 1.

2.3.2 Results

Figure 2.2 indicates the median number of times children produced exact copies and alterations of sentences with grammatical and ungrammatical repetitions. Mann Whitney planned comparisons revealed that children were significantly more likely to copy sentences with grammatical as opposed to ungrammatical repetitions exactly ($U = 7$, N1 = 10, N2 = 10, $p<.001$, two-tailed, $r=.75$). Moreover, they were significantly more likely to alter sentences with ungrammatical repetitions to an alternative grammatically correct form ($U=6$, N1 = 10, N2 = 10, $p<.001$, two-tailed, $r=.79$). These data demonstrate that children's tendency to correct the ungrammatical sentences from Experiment 1 was not due to a failure to notice repetitions. This conclusion is consistent with a large body of work suggesting that children of this age correct ungrammatical sentences more generally (see Vinther, 2002).

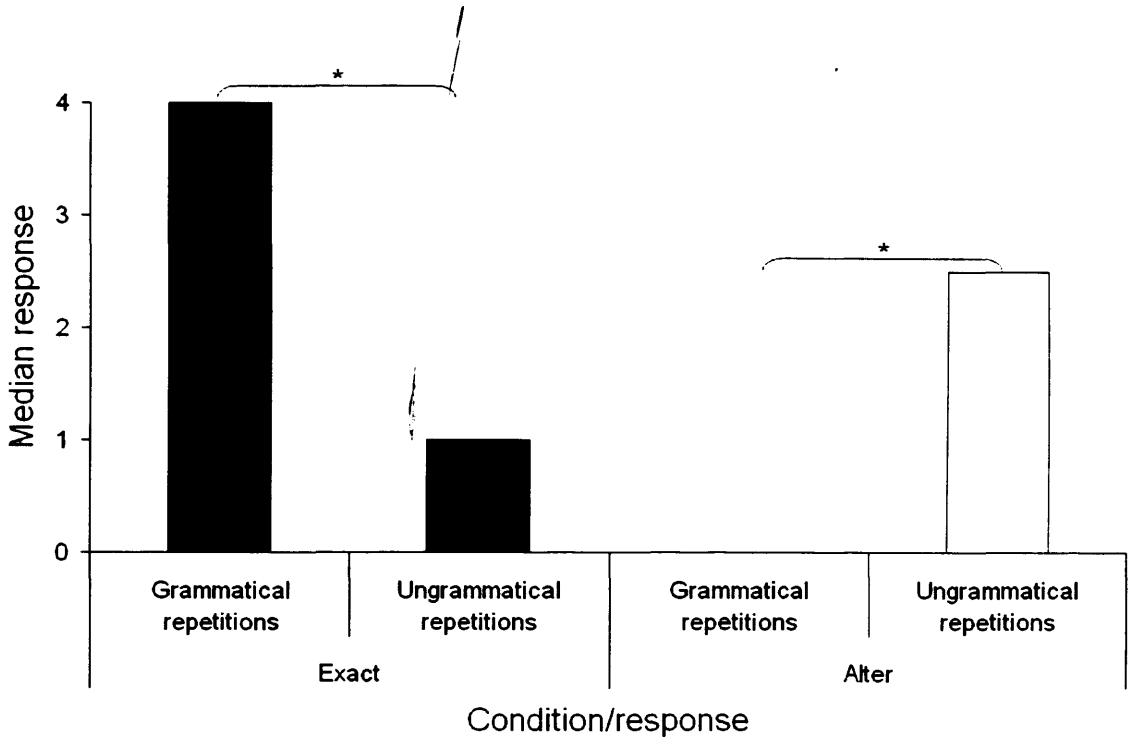

Figure 2.2. The results from Experiment 2: children's reproductions of sentences with grammatical and ungrammatical repetitions. The black bars indicate children's tendency to copy the model sentences exactly. The white bars indicate children's tendency to alter the sentences to an alternative, grammatically correct form. * indicates a statistically significant difference.

2.4 Experiment 3

This experiment provided the critical test of the intention-based hypothesis. In this experiment, I compared imitation of ungrammatical sentences delivered by an apparently intentional agent, to imitation of the same sentences delivered by a non-intentional agent (as in Meltzoff, 1995). If children's tendency to correct ungrammatical sentences is based solely on their grammatical knowledge and memory constraints, then they should correct both the intentional and the non-intentional model. However, if

children imitate the intentions behind speech, then they should correct only the intentional model.

2.4.1 Method

Participants

Participants were 20 children between the ages of 3, and 3 years, 10 months (*mean age* = 3 years, 5 months). Ten were female and 10 male. A further 3 children were excluded for failure to complete the practice trials, and 1 for parental interference during the test phase.

Materials

A single recording of the audio stimuli was produced. The recording included the 4 ungrammatical test sentences from Experiment 2, along with the 8 grammatically correct filler sentences and 6 of the practice sentences. The non-intentional agent was a green and yellow cardboard box, approximately 8 inches tall. The tape recorder was placed on a small shelf at the back of the box so that it was concealed. The intentional agent was a green and yellow soft toy frog, also 8 inches tall. The tape recorder was concealed in a small rucksack on the toy's back. In order to ensure that the sound quality was held constant across conditions, the speakers were always left uncovered.

Design

Children heard the recording delivered by either the intentional or the non-intentional model in a between subjects design. The manipulation of perceived intentionality was based on research demonstrating that when either of two critical cues are present, children will attribute intentionality to an inanimate object. First, children

will attribute intentionality to an inanimate object if it engages in a contingent interaction with them. For example, Johnson, Slaughter and Carey (1998) showed 12-months-olds an inanimate object (a furry brown object about the size of a beach ball) which either bleeped in response to infants' babbling, or bleeped at random intervals. Infants were significantly more likely to follow the gaze of the inanimate object when its actions were contingent upon theirs. Second, children will attribute intentionality to an object if it has features resembling a face: infants in the same Johnson et al. (1998) study were significantly more likely to follow the gaze of the inanimate object if it had facial features (see also Johnson, Booth, & O'Hearn, 2001). Consequently, the perceived intentionality of the model was manipulated in two ways in this experiment: firstly by altering its physical appearance, and secondly by altering the nature of the children's interaction with the toy. Whereas the toy frog had a face, the box had similar features arranged in a non-face-like configuration. Whereas the frog engaged in a social interaction with the child prior to speaking the test sentences, the box did not (see Figure 2.3 for photographs of the intentional and non-intentional models).

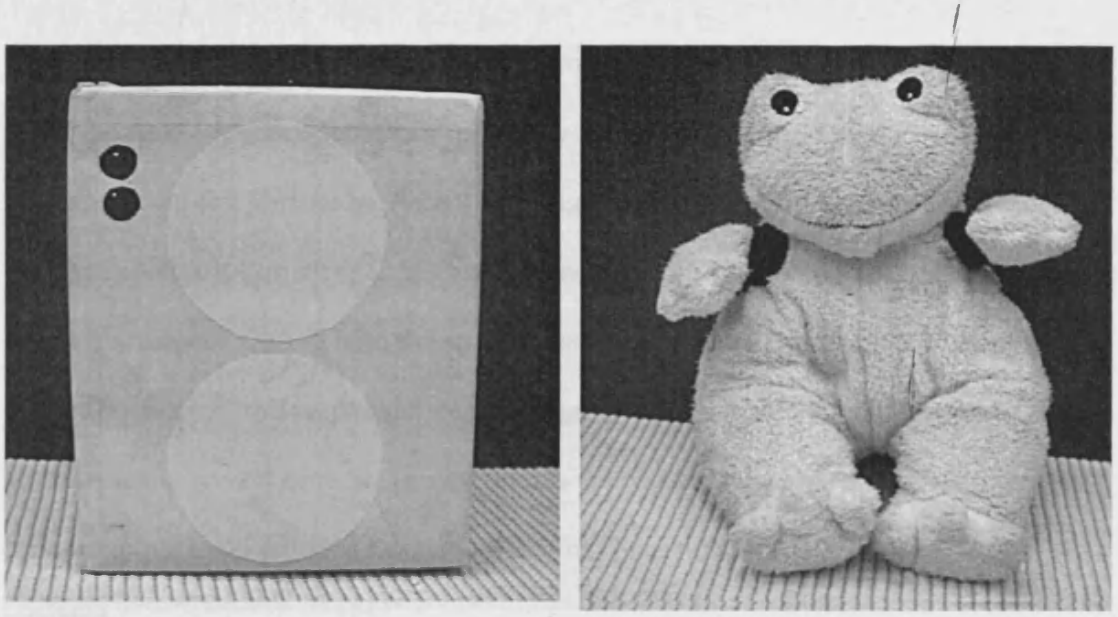

Figure 2.3. The models from Experiment 3. The left-hand panel shows the non-intentional model; a cardboard box. The right-hand panel shows the intentional model; a soft toy frog which engaged in a social interaction with the children.

Procedure

In both conditions, the copying game began identically: E asked the child to sit on the floor with them and, after a brief warm-up session, asked the child 'Can you say what I say?' Once the child understood the game, they completed the first three practice trials with E. After this, the model was introduced. The nature of this introduction varied according to condition. In the non-intentional condition, E introduced the model by saying 'Now look at this. This is just a box, and boxes can't really speak can they? But if I press these buttons I can make it sound like the box is speaking. Can you say what the box says?' In the intentional condition, the E introduced the child to the model by saying 'This is my friend Froggie. Can you wave to him?' [child waves then Froggie waves] 'Froggie would really like to play this game with you. Can you say what Froggie says?'

Once the child agreed, E told the child that Froggie was really excited. The child then heard the final 6 practice sentences spoken by the model, followed by the 4 ungrammatical test sentences. Each of the ungrammatical test sentences was preceded by two grammatically correct filler sentences. Once the child repeated a sentence, E played the next sentence. During both the practice sentences and the test phase, children were praised by E after each response they gave regardless of whether they produced a grammatically correct sentence or not. In this experiment, test sentences were presented only once: if a child failed to respond on the first presentation, the sentence was not repeated.

Coding

Twenty percent of the dataset was analysed by a second coder who was blind to experimental condition. Agreement between the two coders was 94%, Cohen's Kappa = .881.

2.4.2 Results

Figure 2.4 indicates the median number of times children produced exact copies and corrections in response to the intentional and non-intentional models. Results supported the prediction that verbal imitation is based on intention understanding. Mann Whitney planned comparisons revealed that children were significantly more likely to copy the box than the frog exactly (U = 16, N1 = 10, N2 = 10, p=.008, two-tailed, r=.59). Moreover, they were significantly more likely to correct the frog than the box (U = 23, N1 = 10, N2 = 10, p= .033, two-tailed, r=.47).

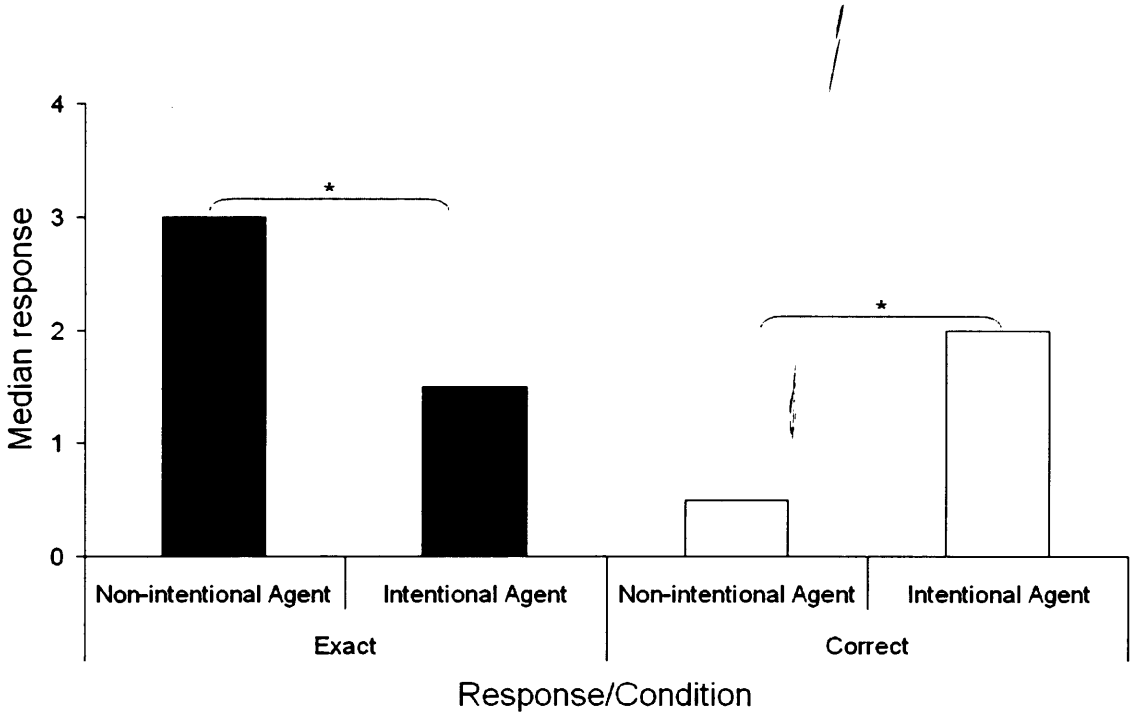

Figure 2.4. The results from Experiment 3: children's reproductions of the ungrammatical sentences spoken by the non-intentional versus the intentional model. The black bars indicate children's tendency to copy the model sentences exactly. The white bars indicate children's tendency to correct the model sentences. * indicates a statistically significant difference.

One possible objection to these results is that children could have been paying more attention in one of the conditions. Although every effort was made to make the frog and the box as visually similar as possible, the nature of the manipulation meant that there were dissimilarities between the two models. Thus, despite the fact that children heard an identical recording of the ungrammatical sentences in the two conditions, it is possible that children may have found either the frog or the box more interesting. The inclusion of grammatically correct filler sentences within the stimuli allowed me to test

for this possibility. If children were paying more attention in one of the conditions, then they would have been more accurate in repeating the filler sentences in that condition. However, a Mann Whitney test revealed no significant difference between the two conditions ($U = 37$, N1 = 10, N2 = 10, $p = .35$, two-tailed).

2.5 General discussion

In three experiments, I tested whether verbal imitation is based on intention understanding. In order to do this, I applied the logic of a well-known action imitation paradigm to the verbal domain. Meltzoff (1995) compared imitation of successful actions to imitation of failed attempts and found that, whereas infants copy successful actions exactly, they tend to correct failed attempts. In my first two experiments, I replicated and extended previous results showing an apparently analogous pattern of results in the verbal domain; whereas children copy grammatical sentences exactly, they tend to correct ungrammatical sentences. This held true even when both the grammatical and ungrammatical sentences contained repeated words.

Experiment 3 provided the critical test of the intention-based hypothesis. Again the paradigm was analogous to one used in the action domain. Meltzoff (1995) compared imitation of unsuccessful actions delivered by an intentional agent (a human model), to the same actions delivered by a non-intentional agent (a pair of mechanical pincers). Results showed that, whereas infants tended to correct the failed attempts of the human model, they copied the same actions exactly when performed by the pair of mechanical pincers. Meltzoff interpreted this as evidence that infants had attributed an intention to the human model but not to the mechanical device. In my third experiment, I compared

imitation of unsuccessful (i.e., ungrammatical) utterances delivered by an intentional agent and a non-intentional agent. Children in both conditions heard the same audio-recording of four ungrammatical sentences. The only thing which varied between conditions was the perceived intentionality of the model. In the non-intentional condition, the model was an inanimate cardboard box which the experimenter could make talk by pressing a series of buttons. In the intentional condition, the model was a soft toy frog which engaged in a contingent social interaction with the child and the experimenter (see Johnson et al., 1998). Consistent with the intention-based hypothesis, children tended to correct the utterances of the apparently intentional frog, but repeat the utterances of the non-intentional box exactly.

At first glance, it seems possible to argue that, rather than being indicative of intention understanding, the results of Experiment 3 could be explained in terms of differential attention in the two conditions: perhaps children paid more attention to either the frog or the box, and varied their copying behaviour accordingly. However, closer inspection of the data makes this interpretation implausible. If children were paying more attention in one condition than the other, then we would have expected them to perform differently not only on the ungrammatical test sentences, but also on the grammatically correct filler sentences. When children's reproduction of the grammatically correct filler sentences was analysed, children were found to be equally accurate in both conditions. Nevertheless, in future research it would be informative to equate the two conditions more closely. One means by which to do this would be to hold the identity of the model constant across conditions and manipulate social contingency alone (that is, present children with a soft toy frog which either did or did not engage in a

contingent interaction with them). However, although this modification to the design would be a step closer to eliminating the attention-based explanation, it would not be entirely conclusive as contingent social interactions (and intentional agents) are presumably more interesting to children than non-contingent interactions (and non-intentional agents).

These data provide an important contribution to our understanding of the cognitive mechanisms underlying verbal imitation. There has been a great deal of research showing that children correct ungrammatical sentences of various forms (e.g., Akhtar, 1999; Slobin & Welsh, 1973; Vinther, 2002). The standard interpretation of these data is that children remember the gist of linguistic information. When asked to imitate, they use their grammatical knowledge in order to produce a 'best guess' about the original form of the sentence, leading them to correct ungrammatical sentences. According to this interpretation, verbal imitation relies on memory processes and grammatical knowledge, but not on intention understanding. The results of Experiment 3 provide support for the claim that, although memory limitations may influence sentence reproduction, in the case of ungrammatical repetitions at least, children's understanding of the intentionality of the speaker also plays a role. Children interpret ungrammatical repetitions as failed attempts and use their grammatical knowledge in order to accurately reproduce the perceived intentions behind the utterances. In the future, it would be interesting to extend these results to other forms of grammatical errors but, nevertheless, interpretation of past results using elicited imitation paradigms ought to be re-evaluated in light of these results.

These studies also contribute to our understanding of imitation more generally. Despite many apparently convincing demonstrations of intention-based imitation, several individual studies have been criticised for confounding intention-based imitation with lower level processes. To take just one example, Meltzoff's (1995) behavioural re-enactment paradigm has been criticised for confounding intention-based imitation with stimulus enhancement and emulation (Huang et al., 2002; 2006). Huang et al. (2002) showed that, when these two factors were controlled for, infants who observed a failed attempt were no more likely to produce the target action than infants in a control condition (although see Meltzoff, 2007, for an alternative viewpoint). When the data from these studies are combined with studies from the action domain (e.g., Bekkering et al., 2000; Carpenter et al., 1998; Gergely et al., 2002), they provide strong support for the claim that intention-understanding plays an integral role in imitation. Thus they present a serious challenge to those who claim that associative learning alone can explain imitation. Furthermore, these results go beyond previous results from the action domain by suggesting that children take communicative intentions, as well as prior intentions (Carpenter et al., 2002) and intentions-in-action (Carpenter et al., 1998; Meltzoff, 1995), into account when deciding what to copy.

Imitation is thus a powerful mechanism for learning how to achieve instrumental goals. In the physical domain, intention-based imitation enables children to learn the efficient use of tools and other objects, filtering out irrelevant actions and mistakes from the demonstrations they observe. Similarly within language, intention-based imitation may enable children to learn about the pragmatics of communication; filtering out

mistakes and accidents from the linguistic demonstrations they hear in order to learn how to efficiently achieve their communicative goals.

2.6 Suggestions for future research

2.6.1 Is verbal imitation based on intention understanding in younger children?

In this chapter, I sought to compare imitation in 3-year-old children to previous research with infants (e.g., Meltzoff, 1995). In future research, it would be interesting to investigate whether younger children also base their verbal imitation on intention understanding.

In an initial attempt to answer this question, I piloted a small number of 2-year-olds on their reproduction of the ungrammatical test sentences from Experiment 1. Unfortunately, the results were inconclusive. The most serious difficulty with this pilot was that the test sentences exceeded children's production ability/working memory capacity. This meant that when they were asked to imitate a sentence such as 'I need need the ball', children tended to repeat either the final word or words of the sentence (for example, 'ball', 'the ball') or the most salient word (for example, 'need'). A second problem was that these younger children were often to shy to repeat the utterances of the experimenter. This meant that very few children completed the practice sentences, let alone the test sentences.

In future research, it would be interesting to compare children's imitation of grammatically correct two-word utterances, such as 'More juice', to their imitations of grammatically incorrect two-word utterances, such as 'Juice more'. If 2-year-olds show a tendency to correct these simple ungrammatical test sentences (as previous research has

suggested they might, e.g., Akhtar, 1999; Slobin & Welsh, 1973), it would then be possible to investigate whether they base their verbal imitation on intention understanding. As in Experiment 3, I could test whether 2-year-old children are more likely to correct the ungrammatical utterances of an apparently intentional model than those of a non-intentional model. An experiment such as this would also need to include a longer warm-up period to enable children to become more comfortable with the experimenter and test situation (and so more willing to imitate the models).

2.6.2 Do young children and infants take the knowledge state of a model into account when deciding what to copy?

There has been a great deal of research investigating whether imitation is based on intention understanding (e.g., Carpenter et al., 1998; Huang et al., 2002; Meltzoff, 1995). The experiments presented in this chapter went beyond previous research by showing that children use an understanding of communicative intentions, as well as prior intentions (Carpenter et al., 2002) and intentions-in-action (e.g., Meltzoff, 1995), when deciding what to imitate. Perhaps surprisingly, however, there has been very little discussion of whether children take other forms of mental states, such as knowledge and beliefs, into account when deciding what to copy.

Previous research using other response measures has, however, suggested that infants are able to distinguish between an experimenter who is knowledgeable and an experimenter who is ignorant. For example, 12-month-olds are more likely to helpfully point to the location of a fallen object when an experimenter is ignorant about its location than when he is knowledgeable about it (Liszkowski, Carpenter, & Tomasello, 2008).

Recent evidence suggests that infants may even be able to understand true and false beliefs. Research using looking time measures has suggested that 15-month-old infants are able to pass the false belief task (Onishi & Baillargeon, 2005). More recently, Buttelmann, Carpenter and Tomasello (2009) demonstrated similar understanding in 18-month-olds using a more active dependent variable. Buttelmann et al. (2009) showed that infants use their understanding about an experimenter's true or false belief in order to decide what he needs help with as he attempts to open a box.

In an initial attempt to ascertain whether young children and infants take a model's belief state into account when deciding what to copy, I created an imitation analog of the false belief task (Wimmer & Perner, 1983). In this study, an experimenter demonstrated how to use a tool in order to retrieve one of a number of toys from a box. A second experimenter then demonstrated a far simpler means of opening the box, retrieving a second toy by opening a concealed lid on the top of the box. Subsequent to this, the first experimenter retrieved another toy from the box, once again using the more complex tool-use technique in order to do so (see Figure 2.5 for photographs of the method used by each experimenter). The first experimenter then offered the child a chance to retrieve the final toy themselves. The critical manipulation was whether the first experimenter was present or absent during the second experimenter's demonstration, and so whether she had a true or a false belief about the best means to retrieve toys from the box. I predicted that, if young children and infants take the model's belief state into account when deciding what to copy, then they should copy her specific actions with the tool when she had a true belief, but not when she had a false belief.

Figure 2.5. The two means of retrieving toys from the box. The left hand panel shows the first experimenter using the more complex method: retrieving a toy using the tool. The right hand panel shows the second experimenter using the simpler method: retrieving a toy by opening the concealed lid.

I tested a total of 75 children between the ages of 14- and 30-months on various versions of this task. At no age did children distinguish between the different belief states of the model. Among the 22 oldest children tested (all 30 months old), only 5 performed correctly in both conditions. One interpretation of these results is that infants and young children do not discriminate between belief states. Such an interpretation would fit with traditional accounts suggesting that children do not pass the false belief task until the age of four (e.g., Wimmer & Perner, 1983), but is incompatible with more recent accounts suggesting that even infants understand false belief (e.g., Buttelmann et al., 2009). An alternative interpretation is that extraneous task demands were responsible for children's failure to pass the task. For example, the procedure placed considerable demands on working memory; if children could not remember the models' previous experience with the apparatus, then they would have failed the task regardless of whether

they had made inferences about the model's belief state or not. Another problem may have been that children saw demonstrations from two different experimenters and so may have been unsure which experimenter to copy.

In future research, it would be interesting to investigate children's imitation of knowledgeable vs. ignorant experimenters. This could be achieved using a much simpler paradigm than the one described above. One option would be to present children with an experimenter who opens a box behind an opaque screen (so that the children cannot see their actions). A second experimenter would either observe this demonstration or not, and then show the child how to open the box using a series of distinctive action steps. Based on a similar logic to that outlined above, I would predict that children would copy the second experimenter's distinctive action style more often when she is knowledgeable about how to open the box (when she had seen the first demonstration) than when she is ignorant about how to open it (that is, when she had not seen the first demonstration). Although testing a simpler question, this paradigm has a number of advantages over the one outlined above. First, children would observe only one demonstration (rather than three), reducing the demands on their working memory and removing the decision about who to copy. Furthermore, the model would act on only one location on the object rather than two, removing noise associated with children's preference for one of the two methods.

2.6.3 Do infants understand the intentional structure behind third party interactions?

Another interesting question for future research is whether young children and infants can understand and imitate the intentional structure behind third party

interactions. The vast majority of imitation research has been conducted in ostensive contexts (Gergely & Csibra, 2006), where a model performs an action *for* the child. We know from previous research that young children and infants are very good at learning from dyadic interactions of this type (e.g., the experiments described in this chapter, Carpenter et al., 1998; Meltzoff, 1995).

Nevertheless, if children are to take maximum advantage of the learning opportunities provided by the environment, then it would be highly beneficial for them to learn from observing third party interactions, as well as from interactions in which they are directly involved. Research into language acquisition has suggested that young children are able to learn novel words through overhearing two other individuals speak (Akhtar, Jipson, & Callanan, 2001) and related research on infants' understanding of communicative intentions has shown that 14- and 18-month-olds are able to use communicative gestures directed towards a third party in order to locate a hidden toy (Gräfenhain, Behne, Carpenter, & Tomasello, 2008).

In an initial attempt to test just how much infants understand about third party interactions, I investigated whether infants would imitate a model differently depending on her intentions towards a third party. I predicted that when a model used an unusual action style in order to help a third party, infants would not copy her specific actions (because the same constraints did not apply to them), but when the model freely chose the unusual action style, infants would copy her specific actions. I tested a total of 45 14-month-olds on various versions of this task. Despite various changes designed to simplify the procedure, infants did not vary their behaviour according to the nature of the third party interaction they observed. One possible reason for this is that the task

remained too difficult for 14-month-olds to solve. Consequently, in future research, it might be interesting to try a similar task with older children. Another possibility, however, would be to test the same age group with a task that involved simpler constraints (e.g., those used in Zmyj, Daum and Aschersleben, 2009).

In future research it would also be interesting to investigate other aspects of infants' understanding, and imitation, of third party interactions. One interesting question is whether infants and young children choose to copy demonstrations directed towards themselves and towards third parties in the same way. The social bond between the child and experimenter is greatly reduced (if not removed completely) in third party interactions. Based on the hypothesis that imitation serves an affiliative function in development, I would predict that children and infants would be significantly less likely to copy the style with which a model performs an action when they witness it within the context of a third party interaction.

Chapter 3

Social Behaviour Matching: Does Priming Third Party Ostracism Increase Affiliative Imitation in Children?

3.1 Introduction

In my General Introduction, I argued that, in order to be considered analogous to normative influence, children's imitation must be motivated by a drive to affiliate. I presented some evidence to suggest that young children possess a drive to affiliate and that this drive influences their imitation. However, I also pointed out that these claims are controversial (see, for example, Lyons et al., 2007, and Whiten, in press). In this chapter, I use insights from adult social psychology in order to (1) investigate aspects of the need to belong in development and (2) test whether the need to belong and the drive to affiliate influences children's imitation.

3.1.1 Does the need to belong influence behaviour in development?

As discussed in the General Introduction, adults possess a profound need to belong (Baumeister & Leary, 1995). One indication of just how important belonging is to us is that we are incredibly sensitive to cues which indicate our social exclusion from the group. For example, exclusion from a relatively brief online game is sufficient to invoke feelings of sadness in adult participants (Williams et al., 2000). Williams et al. asked participants to play an online game in which they were led to believe that they were throwing a ball to two other participants. In reality, however, the computer was programmed to either include or exclude the participant from the ball game. Williams et

al. found that participants who had been excluded from the game subsequently reported significantly lower mood than participants who had been included in the game.

Further research has shown that a sense of ostracism can even be evoked without any interaction at all, through priming. Sommer and Baumeister (2002) asked participants to rate whether a series of words presented on a computer screen were examples of people, places or things. Between these naming trials, prime words were flashed on the screen for a period of 90 milliseconds. For some participants, these words were related to social inclusion (e.g., *welcomed, attached, bonded*), and for some they were related to exclusion (e.g., *ignored, dumped, abandoned*). Sommer and Baumeister found that participants who were low in self-esteem (but not those who were high in self-esteem) rated themselves more negatively following exposure to the ostracism primes.

Previous research has shown that infants and young children are sensitive to some aspects of group relations (e.g., Corriveau & Harris, 2009; Kinzler, Dupoux, & Spelke, 2007; Walker & Andrade, 1996). For example, infants prefer to look at and accept toys from individuals who speak their native language (i.e., ingroup members) over individuals who speak a different language (i.e., outgroup members) and older children prefer native language speakers as friends (Kinzler et al., 2007). Furthermore, research using survey-based methods has demonstrated that preschool children can be victims of ostracism (Crick, Casas & Ku, 1999; Crick, Casas & Mosher, 1997). However, we do not yet know how sensitive young children are to cues indicating social exclusion. In this chapter, I attempt to prime ostracism in 5-year-olds. I do so using an even subtler manipulation than those used in research on adults: for the first time I prime third-party

ostracism, and do so using short videos of moving shapes rather than human actors. Thus, I also provide a test of just how sensitive humans in general are to social exclusion.

3.1.2 Do children increase their imitation when affiliation is important to them?

Our need to belong to the group has created a profound drive to affiliate with those around us (Baumeister & Leary, 1995; Lakin et al., 2003). For adults at least, this drive is closely connected to a tendency to match the behaviour of those around us. In one demonstration of this, Lakin and Chartrand (2003) gave adult participants either a conscious or a nonconscious goal to affiliate. Participants in the conscious goal condition were told that they would later be required to engage in a cooperative task with another individual (actually the confederate) and that it would be "very important that the two of them get along well". Participants in the nonsconscious goal condition, on the other hand, were primed with a series of words related to affiliation (e.g., *affiliate, friend, partner* and *together*). After this goal induction, participants watched a video in which the confederate performed mundane clerical tasks while repeatedly rubbing her face. Participants given either type of affiliation goal increased their tendency to mimic the mannerisms of the confederate relative to participants in a control group who were not given an affiliation goal. There were no significant differences in mimicry between participants in the conscious and nonconscious goal conditions.

Lakin et al. (2008) further tested the relation between mimicry and affiliation by exposing their participants to ostracism. They reasoned that an experience of social exclusion would threaten adults' belongingness needs and so lead them to seek reintegration into the group by engaging in affiliative mimicry. In support of their

hypothesis, Lakin et al. found that participants who had been excluded from an online ball game subsequently mimicked the mannerisms of a conversation partner to a significantly greater extent than participants who had been included in the ball game. In a related study, Williams et al. (2000) found that participants who were excluded from an online ball game were subsequently more likely to conform to the majority opinion in an Asch-style test of conformity than participants who were not excluded. In accordance with Lakin et al. (2008), Williams et al. (2000) argue that participants' conformity was an attempt to affiliate with other group members and so re-establish themselves within the group.

The extent to which children's imitation is motivated by social factors has been a topic of considerable debate. Previous theory and research has suggested that children's tendency to copy the style with which a model performs an action may sometimes reflect a tendency to copy for social reasons (Carpenter, 2006; Carpenter, in press; Nielsen, 2006; Nielsen et al., 2008; Užgiris, 1981). In support of this hypothesis, Hobson and Lee (1999) found that typically developing children, but not children with autism, will reproduce the harsh versus gentle style with which a model runs a stick along a pipe rack. Further, Nagell et al. (1993) found that, at times, typically developing children will copy the specific actions of a model even when it results in less efficient performance on their part.

However, the social interpretation of these results is somewhat controversial. Other researchers have argued that children's tendency to copy style can be explained by nonsocial factors. According to Lyons et al. (2007), for example, children have a strong tendency to encode all of a model's actions as causally necessary. When they see an

action which seems causally irrelevant, they revise their implicit understanding of the objects involved in the demonstration accordingly. Consequently they choose to copy seemingly irrelevant actions in their imitation. This general standpoint is supported by Whiten (in press) who argues that humans have evolved a 'copy all – correct/refine later' heuristic which enables them to learn about causally opaque cultural artifacts.

Nielsen et al. (2008), however, have provided more direct evidence that children sometimes copy style for social reasons. Nielsen et al. presented 24-month-olds with a video demonstration in which a model opened a box using a distinctive and unnecessary action style. In one condition, this model communicated with children through a closed circuit television link prior to giving the demonstration. In the other condition, the model was videotaped and so could not engage in a social interaction with children. Results showed that children were significantly more likely to copy the actions of the live, interactive, model than the pre-recorded model. Although these data suggest that imitation varies according to social factors, the specific nature of the effect is not clear: children may have copied the model's actions more closely in the interactive condition either because they sought to affiliate with her or because they liked her more.

In this chapter, I describe an experiment in which the model's behaviour is held constant and the children's own goals within the situation are manipulated across conditions. This paradigm allows us to ascertain whether children increase their imitation when affiliation is important to them.

3.2 The current experiment

Thus, in the current experiment, I had two main aims. My first aim was to investigate aspects of the need to belong by testing just how sensitive young children are to ostracism. My second aim was to look for links between ostracism and affiliative imitation in children and, in doing so, test whether children's imitation is influenced by the drive to affiliate.

In order to investigate these two questions, I primed children with a very minimal display of ostracism – two short videos in which one shape was excluded by a group of other shapes – and measured the effect of this prime on children's subsequent imitation of a model's exact behaviours. I chose to test these predictions with 5-year-olds. As 5-year-olds spend considerable time interacting with friends and peer groups, they may have already experienced social exclusion (Crick et al., 1999; Bamer-Barey, 1986) and so have developed behavioural strategies to compensate for its negative effects.

3.2.1 Method

Participants

Participants were 28 children between the ages of five and six years (*mean age* = 5 years, 5 months). Seventeen of the children were female and 11 male. An additional two children were tested but excluded from the data set; one as a result of equipment failure and one for failure to pay attention during presentation of the videos. All children were native German speakers and were recruited from a number of kindergartens in the Leipzig area, after their parents had given permission for them to participate in child development studies.

Design and Materials

Children were randomly assigned to one of two conditions in a between-subjects design. Depending on the condition, they observed either two videos depicting ostracism or two control videos. After observing the videos, each child participated in an imitation task.

During the experiment, children sat on the floor on a small blue mat placed approximately 80cm from the experimenter and 25cm from a laptop computer. The laptop sat on a small chair so that the screen was approximately eye-level for the children. The priming stimuli were created using the 'custom animation' function in PowerPoint and were presented on a Macbook with a 13 inch screen, the resolution of which was 1280 x 800 pixels.

The priming stimuli in each condition consisted of two short videos played consecutively. The scenarios in the videos were inspired by the classic Heider and Simmel (1944) movies which cause both adults and children to attribute social intentions to the movements of geometric shapes (see, for example, Abell, Happé, & Frith, 2000). Each video depicted four shapes moving around the screen (blue pentagons in the first video, and green, horizontal teardrop shapes in the second video). These shapes did not have facial features, nor did they speak or make any sounds during the videos. Each of the videos was rated by three adult observers (blind to the purpose of the experiment), all of whom interpreted the ostracism videos, but not the control videos, as depicting social exclusion. The movements made by the shapes during each video were as follows (see also Figure 3.1).

In the first video in the ostracism condition, three pentagons entered the scene and appeared to play together as a group. After a short delay, a fourth pentagon entered the scene and approached the group. The three pentagons moved away from the fourth shape on four separate occasions in a series of moves which suggested its exclusion from their group. In the final section of the video, the fourth shape gave up its attempts at inclusion, moved away from the group, and came to a halt at the far side of the screen.

In the second video in the ostracism condition, two teardrop shaped objects entered the scene and appeared to play ball together. After a short delay, a third object (with the same shape) entered the scene and tried to join the game. The two shapes refused to pass the ball to the third object, but passed it between themselves a further three times. Subsequent to this, the two shapes abandoned their game and moved away from the third object. The third object then made two more attempts to join the two shapes but was rebuffed both times. As in the first video, the scene ended with the rejected object moving away from the group and coming to a halt at the far side of the screen.

Children's behaviour in the ostracism condition was compared to their behaviour in a baseline control condition in which the videos were very similar to those in the ostracism condition, but did not involve any social exclusion. Critically, the actions made by the group were identical in both conditions. This meant that both the ostracism videos and the control videos contained equivalent information about affiliation, but only the ostracism video contained additional information about social exclusion. In each of the two control videos, the rejected object was replaced by a different type of object, one that was less likely to be seen as being socially excluded. Instead of attempting to be

included in the group, this object (a blue, fly-like object in the pentagon videos and a green, butterfly-like object in the ball game videos) made random movements around the screen. This object was approximately the same size and colour as the rejected object in the ostracism condition and the number of movements it made was matched to the movements made by the rejected object. Social contingency was also held constant across conditions: every time the group moved, this object moved as well (see Figure 3.1 for further details).

It is worth noting that it was surprisingly difficult to come up with a control condition that adult observers did not see as suggesting ostracism while, at the same time, retaining the basic features of the videos from the ostracism condition. In my first attempt, I kept the group's movements constant and made the individual shape follow a different, random path instead of repeatedly approaching the group. However, adult observers still interpreted the videos in terms of social exclusion. In my second attempt, I changed the identity of the individual shape to something that might be seen as moving around with no social relationship to the group: a butterfly or fly. I attempted to match the movement of this new shape to that of the rejected shape in the ostracism condition but, again, adult observers described the scenarios in terms of social exclusion. The sensitivity of the adult raters to even the slightest cues suggesting social exclusion meant that it was necessary to manipulate both the identity of the relevant shape and the movements it made around the screen. An alternative possibility might have been to delete the rejected shape from the control video completely, leaving only the actions of the group. However, this would have been a relatively weak control as both the total

number of movements and the number of socially contingent movements made by the shapes would have varied across conditions.

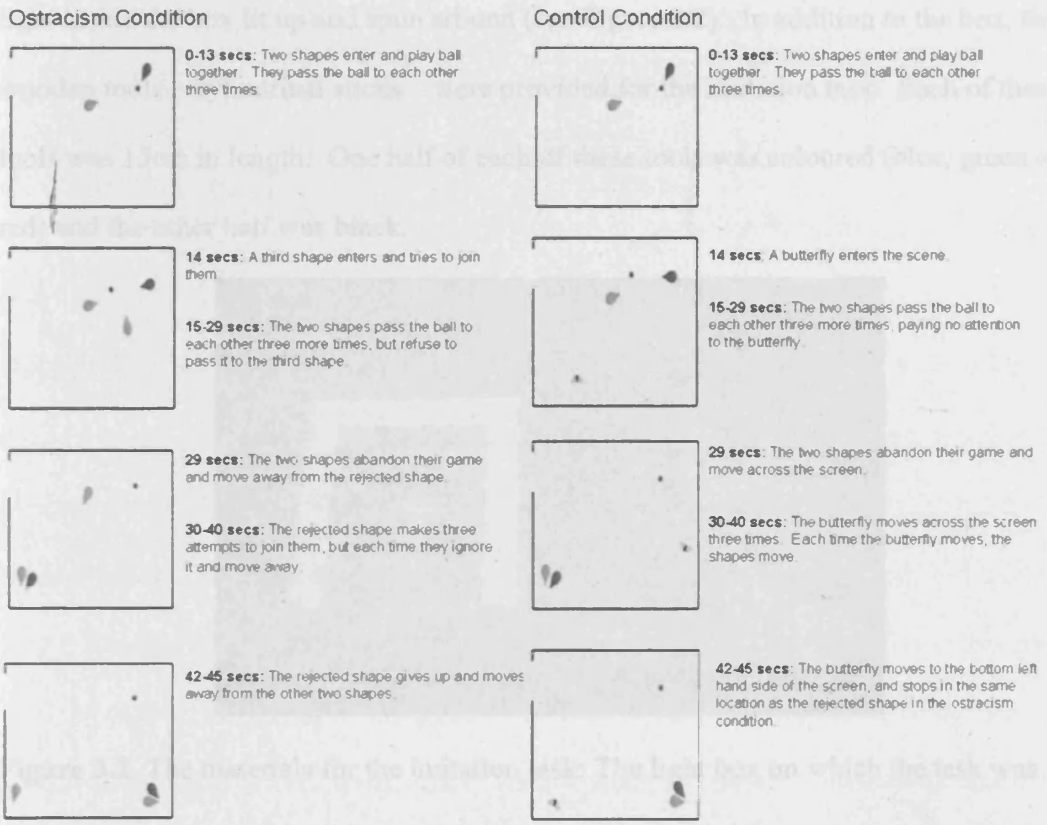

Figure 3.1. Summary of Events in the Ball Game scenario. The left hand panel shows events in the Ostracism Condition and the right hand panel shows events in the Control Condition.

In addition to these videos, a final 30-second video depicting seven shapes playing together was shown to each child at the end of the test session (subsequent to the imitation task). This video did not form part of the manipulation; its sole purpose was to alleviate any negative feelings which may have been induced by the ostracism videos (and to model inclusive behaviour to children).

The box on which the imitation task was performed was made from clear Perspex and was 20cm x 30cm x 30cm in size. When the top of the box was pressed, an orange light inside the box lit up and spun around (see Figure 3.2). In addition to the box, three wooden tools – cylindrical sticks – were provided for the imitation task. Each of these tools was 15cm in length. One half of each of these tools was coloured (blue, green or red) and the other half was black.

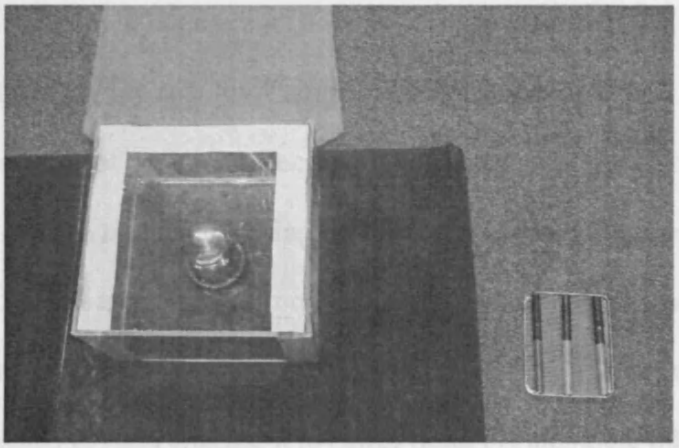

Figure 3.2. The materials for the imitation task: The light box on which the task was performed and, to the right, the three wooden tools provided for the task.

Procedure

Testing was conducted by an experimenter (E) who was blind to the hypothesis of the experiment, the content of the videos, and the condition to which each child had been assigned. E invited children individually into a quiet room in their kindergarten and asked them to sit opposite her on a small mat. After an initial warm-up phase which involved drawing pictures and answering questions (identical in both conditions), E told children she needed to read something, but that they could watch a video while she did. Throughout the test session the laptop screen was orientated away from E so that she

could not see the content of the videos. It was therefore necessary for a second experimenter to activate the videos. This second experimenter, sitting unobtrusively in the corner of the room, surreptitiously activated the video via remote control. The two videos were played consecutively, always in the same order: first the pentagons followed by the ball game. The ball game video started automatically, as soon as the pentagons video was complete. After the videos were finished, as indicated by a soft click, E put down her magazine, brought out the light box, and said to children, "Oh, your video has ended, then I'll show you my new toy," after which she proceeded to act on the box. The demonstration consisted of 8 components: first E chose the green tool from among the set of three coloured tools (1). After choosing this tool, she rolled it between her hands several times (2). She then rotated the tool in her hands such that the black end was facing towards the floor (3), and grasped it in her right fist (4). Subsequent to this, she held the tool vertically (5) and dragged it (6) three times (7) along the lid of the box, always in the same direction (8): making a line from the corner of the box closest to the child to the corner of the box closest to her own body, each time turning on the light. E always looked at the child at the start of the demonstration, but when she was acting on the box she looked only at the apparatus. After the demonstration was complete, E looked up at the child, pushed the box and the three tools towards the child, and said, "Now you." The response phase lasted until the child had finished acting on the box. After the response phase was complete, E asked the child to watch the final video in which seven shapes played together.

Coding

Children's responses were coded from videotape. Each child was given a score between 0 and 8 depending on how many components of the demonstration they reproduced (see Table 3.1 for scoring procedures). Data from 6 children (21% of the data set) were independently coded in order to assess inter-rater reliability. The second coder was blind to the hypothesis of the experiment, the content of the videos, and the condition to which each child had been assigned. Agreement between the two coders was 100%, Cohen's Kappa = 1.

Table 3.1. *Description of each component of the demonstration and the percentage of children in each condition who reproduced it.*

Component of action	Description of model's behavior	Operational criteria for a correct response	Percentage of children who reproduced the action component	
			Ostracism condition	Control condition
1. Tool choice	E chooses the green tool.	The first tool P uses to operate the box is green.	28.6	28.6
2. Roll tool	E rolls the tool between her hands before using it to operate the box.	P rolls the tool between his/her hands at any point during the response phase.	78.6	50.0
3. Tool orientation	E rotates the tool to use the black part to contact the box.	P uses the black part of the tool to contact the box at any point during the response phase.	92.9	71.4
4. Tool grip	E holds the tool in her fist.	P contacts the box while grasping the tool in his/her fist at any point during the response phase.	92.9	78.6
5. Tool angle	E holds the tool perpendicular to the box.	P holds the tool at an angle which is within 10° of vertical while contacting the box at any point during the response period.	100	100
6. Drag tool	E drags the tool along the box such that the tool moves approximately 10cm across the lid.	P drags the tool more than 3cm along the lid at any point during the response phase.	92.9	78.6
7. Number of touches	E uses the tool to activate the box a total of 3 times.	P makes exactly 3 attempts to activate the light inside the box.	35.7	21.4
8. Line of touches	E's three actions make a line along the box such that her first action is closest to P and her last action is closest to herself.	P's actions on the box form a line either travelling from himself/herself to E or vice versa.	28.6	21.4

3.2.2 Results

Figure 3.3 indicates the mean imitation score of children in the ostracism and control conditions. As predicted, children in the ostracism condition reproduced significantly more components of the demonstration than children in the control condition ($t(26)= 3.02$, two-tailed $p= .006$, $rY\lambda=.51$). An inspection of the individual components revealed that this effect was not driven by a tendency to reproduce any particular element from the demonstration (see Table 3.1).

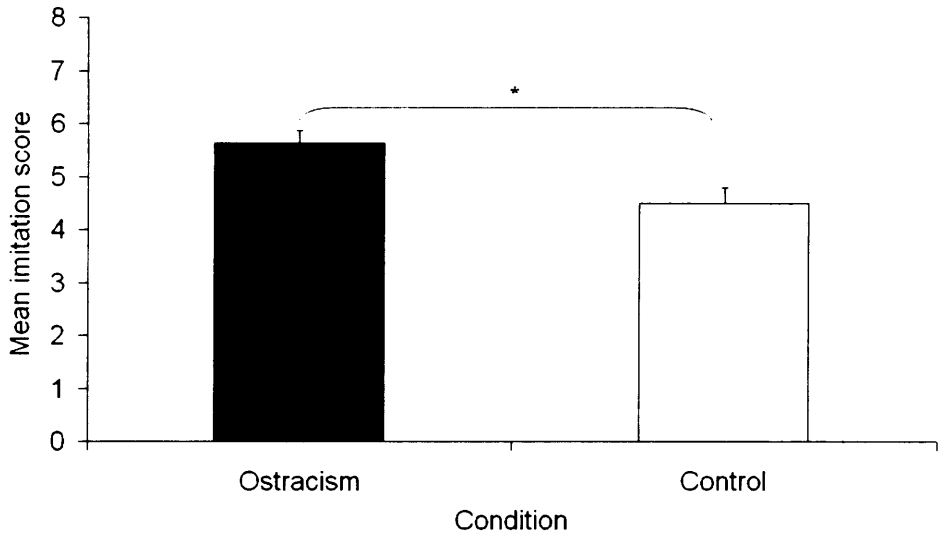

Figure 3.3. The mean number of components from the demonstration that children reproduced in the ostracism and control conditions. Errors bars represent + 1 SE, * indicates a statistically significant difference.

It is important to note that almost all children – 13 out of 14 in the ostracism condition, and 12 out of 14 in the control condition – succeeded in turning on the light at least once, and there was no difference in this measure between conditions ($\chi^2(1)=0.37$,

p=.54). The remaining three children all showed a clear attempt to turn on the light. Thus, children in both conditions were equally motivated to act on the light box and interested in the imitation task, but children in the ostracism condition copied E's specific actions more closely than children in the control condition.

3.2.3 Discussion

The present experiment investigated whether children increase their affiliative behaviour following indirect exposure to social exclusion. Results showed that children primed with ostracism imitated the actions of a model significantly more closely than children given a neutral prime. Interestingly, however, children in the two conditions did not differ in their tendency to turn on the light – every child did, or attempted to do this. It is thus possible to conclude that, from relatively early in development, the need to belong exerts a powerful influence on children's social behaviour, leading them to increase their imitation in response to surprisingly subtle cues indicating exclusion from the group.

These results represent the first demonstration that it is possible to prime ostracism in children. Perhaps especially striking is the fact that the prime was composed of a scene in which a third party was ostracised. This is a contrast to paradigms used with adults in which participants have always experienced ostracism directly; for example, by exclusion from a ball game, or an online chat (e.g., Lakin et al., 2008; Williams et al., 2000; Williams & Sommer, 1997). Moreover, the children in this experiment did not even experience human actors being ostracised, with all of the emotional and other cues that might be present in such a display. Instead they were primed with short videos in which a small shape appeared to be excluded from a group of

other shapes. These shapes did not have facial features, nor did they talk, or make any sounds throughout the videos. Humans, it seems, are so sensitive to the possibility of social exclusion that the mere hint that an object is being excluded from a group (even if that object is only a moving shape) is sufficient to impact upon their social behaviour.

Furthermore, these results provide strong evidence that imitation performs a social function in development. This finding accords with previous research suggesting that imitation varies according to social factors (e.g., Nielsen, 2006; Nielsen et al., 2008). It goes beyond previous findings in demonstrating that children increase their imitation when affiliation is important to them. Consequently, the present research also has important implications for our understanding of the relationship between nonconscious mimicry in adults and imitation of style in children. Previous theory and research has suggested that both forms of copying behaviour are related to affiliation (Carpenter, 2006; Lakin & Chartrand, 2003; Nielsen, 2006; Užgiris, 1981). This research goes beyond that and shows (together with Lakin et al., 2008) that both forms of copying behaviour vary according to the same social factor: ostracism. It would be interesting for future research to investigate more fully the similarities and differences between both forms of copying behaviour, as well as their developmental origins and trajectories.

An unanswered question remains, however: through what means did the ostracism prime lead to increased imitation? One possibility is that the children who received the ostracism prime used imitation strategically in order to ingratiate themselves with another group member (see Lakin et al., 2008). According to this interpretation, the ostracism prime induced a goal to affiliate, which in turn led children to imitate the actions of the model more closely, presumably in an attempt to communicate their similarity to her

(Užgiris, 1981, 1984). A second possibility is that the ostracism prime altered the way in which children processed incoming social information, and so affected their imitation. Previous research has demonstrated that an experience of ostracism enhances recall of social information. For example, Gardner, Pickett, and Brewer (2000) found that, after being excluded from an online chat, adult participants recalled significantly more social information from a series of diary entries than participants who had been included in the chat. Gardner et al. (2000) interpreted this result as evidence that an experience of social exclusion creates a sort 'social hunger' which leads people to increase their attention to, and recall of, social information. In the context of this experiment, it is possible that children who observed the ostracism prime noticed and/or recalled more aspects of the demonstration than children given the neutral prime, and this led them to reproduce the model's actions more precisely (see also Wilkowski, Robinson, & Friesen, 2009). These two interpretations are not mutually exclusive and, in theory, could even operate in parallel, but further research would be needed to determine the relative influence of the two factors.

In summary, this experiment, along with related research, contributes important information to our understanding of the basic human need to belong. Previous research has demonstrated that, even as young children, we prefer members of our ingroup (Kinzler et al., 2007) and conform to the opinions of those around us (Corriveau & Harris, 2009; Walker & Andrade, 1996). This experiment goes beyond previous research in demonstrating that, even as children, we are incredibly sensitive to cues which indicate our exclusion from the group. Furthermore, we are able to use behavioural strategies

such as imitation in order to affiliate with those around us and so re-establish our position within the group.

3.3 Suggestions for future research

3.3.1 What is the relationship between imitation of style and nonconscious mimicry?

In this experiment, I attempted to draw parallels between children's tendency to copy the style with which a model performs an action and adults' tendency to subconsciously mimic the mannerisms of their conversation partners. In future research, it would be interesting to further investigate the similarities and differences between these two forms of copying behaviour. The first priority for future research would be to investigate when in development children begin to subconsciously mimic the mannerisms of their conversation partners.

In an initial attempt to answer this question, I conducted a small pilot study in which I tested whether observing ostracism primes would increase 5-year-old children's tendency to mimic the mannerisms of a model. In this pilot study, eleven 5-year-olds watched either the ostracism videos or the control videos from the experiment outlined above. Subsequent to this, a model engaged the children in conversation, asking them a series of questions about their family and daily lives. During this conversation, the model repeatedly touched her face (as in the experiments of Chartrand & Bargh, 1999). I compared the amount of time children spent touching their faces during this test period to the amount of time they spent touching their face in a baseline period before observing the videos. Results showed no main effect of condition and no condition x time period

interaction. That is, in neither condition did children increase their tendency to touch their faces above baseline levels.

Naturally this null result is difficult to interpret. One interpretation is that children do not mimic the mannerisms of their conversation partners. This interpretation is compatible with previous research suggesting that children do not engage in some forms of mimicry until relatively late in development. Anderson and Meno (2003), for example, found that children are not susceptible to contagious yawning until they are 5- or 6-years-old (Anderson & Meno, 2003). However, in other respects this null result is surprising, especially considering that some researchers have claimed that children's tendency to copy style is based on the same cognitive mechanism as adults' tendency to mimic the mannerisms of their conversation partners (e.g., Dijksterhuis & Bargh, 2001; Heyes, 2001). In future research, it would be informative to test children's capacity for nonconscious mimicry in a wider range of situations and using a wider range of target behaviours.

If it were possible to find subconscious mimicry in children, it would be interesting to explore whether children who have a strong tendency to mimic also have a strong tendency to copy the style with which a model performs an action. In addition to investigating these basic individual differences, it would be interesting to investigate the developmental emergence of these different forms of behaviour matching and explore how they relate to the emergence of other affiliative behaviours in childhood.

3.3.2 Is children's social imitation communicative?

In the experiment described in this chapter, I demonstrated that children increase their imitation when affiliation is important to them. However, it is not clear whether the children were using imitation as a means by which to communicate with the model or whether the increase in imitation was more automatic. In future research, it would be interesting to investigate whether children use imitation as a form of communication with a social partner, in order to convey the message 'I am like you' (see Carpenter, 2006; Carpenter, in press).

One means by which to test this question would be to manipulate the visual availability of children's social partner within an imitative interaction. In a previous study with adults, Bavelas, Black, Lemery and Mullett (1986) found that participants were significantly more likely to mimic the pained expression of an experimenter if that experimenter was looking at them as they received their apparent injury. In future research, it would be interesting to apply a similar paradigm to research with children. If children use imitation as a means by which to communicate social information, then they should monitor the effects of their imitation on their social partner. Thus they should only copy their partner's specific when their social partner is looking at them.

3.3.3 When does affiliative imitation emerge in development?

In future research, it would be interesting to investigate at what age affiliative imitation emerges. We know from previous research that infants start to copy the style with which a model performs an action from around 12 months. In a longitudinal study, Over et al. (2009) presented 6- 9- and 12-month-old infants with demonstrations in which

a model performed a series of instrumental actions using a distinctive action style, for example, turning on a light using her fist rather than the palm of her hand. Results showed that 12-month-olds copied the style with which the model performed the action in this experimental condition but not in a manipulation control condition. Six and 9-month-old infants, on the other hand, showed no tendency to copy the style with which the model performed the action. These data suggest that affiliative imitation may emerge as early as 12 months.

However, infants in this study may have been copying style for non-social reasons (see Lyons et al., 2007; Whiten, in press). In future research it would be interesting to manipulate infants' social goals within an experiment such as this and measure the impact upon their imitation. It is important to note, however, that ostracism primes may not be suitable for infants as, by 12 months, they have not yet experienced social exclusion from groups. As we shall see in the next chapter, however, it might be informative to use more straightforward affiliation primes with infants.

Chapter 4

Unintentional Behaviour Matching: Do Eighteen-Month-Old Infants Show Increased Helping Following Priming with Affiliation?

4.1 Introduction

In my General Introduction, I argued that, in addition to explicit behaviour matching, adults also show a tendency to subconsciously assimilate their behaviour to social primes. The theme of social priming was reintroduced in the previous chapter, and is further developed here. The experiment I describe in this chapter had two goals. My first goal was to test whether even infants are susceptible to the influence of social primes. My second goal was to explore aspects of affiliation in early development. More specifically, I aimed to test whether the connections between affiliation and prosocial behaviour are so fundamental that they are seen even in infants.

4.1.1 Unintentional social influence

In my General Introduction (and the following two chapters), I discussed a large body of research aimed at investigating the goals underlying social influence. I argued that imitation (and indeed behaviour matching more generally) is motivated by goals to learn from, and affiliate with, others. However, social psychologists have demonstrated that internally generated goals are not always the primary cause of our behaviour (Bargh, 2006, 2008). Social priming research has shown that goals and other mental representations can be more or less directly produced by the environment (Bargh, 2006, 2008). The environmental activation of these internal mental representations leads to

changes in our social behaviour without the formation of conscious intentions to act (Bargh, 2008).

In one of the first demonstrations of behavioural priming effects, Bargh et al. (1996) investigated the impact of priming social concepts on subsequent social behaviour. In order to do this, Bargh et al. presented adult participants with a scrambled sentence task in which some of the words were either related to the trait concept of rudeness (e.g., *intrude, bother, aggressively*) or to the trait concept of politeness (e.g., *patiently, cordially, sensitively*). Subsequent to this priming manipulation, Bargh et al. measured how long it would take participants to interrupt an ongoing conversation between the experimenter and a confederate. Results showed that participants primed with the concept or rudeness interrupted the conversation significantly more quickly than participants primed with the concept of politeness. A funnelled debriefing demonstrated that participants were unaware of the connection between the priming manipulation and their subsequent behaviour.

In another study, Bargh et al. (1996) found that subtle activation of social stereotypes could also influence behaviour. In this experiment, Bargh et al. presented participants with a scrambled sentence task which either contained words related to the stereotype of the elderly (e.g., *old, lonely, grey*) or not (e.g., *thirsty, private, clean*) and measured the impact on their walking speed. Results showed that participants primed with the stereotype of the elderly subsequently walked more slowly down the corridor than participants given the neutral prime. Importantly, this effect occurred even though the prime words themselves did not contain any reference to the trait of slowness. Once

again, a funnelled debriefing suggested that participants were unaware of the connection between the primes and their subsequent behaviour.

In further research, Bargh, Gollwitzer, Lee-Chai, Barndollar and Trötschel (2001) investigated whether priming goals influences social behaviour. They demonstrated that participants who had been surreptitiously presented with words related to the goal of achievement (e.g., *succeed, compete, win*) were more successful in a word search puzzle than participants who had been given a neutral prime. A second experiment showed that participants who had been primed with words related to the goal of cooperation (e.g., *honest, cooperative, fair*) replenished a commonly held resource within a computerised fishing game more willing than participants given a neutral prime. Furthermore, there were no significant differences in cooperation between participants who had been primed with the goal to cooperate and participants in another condition who had made an explicit commitment to that goal.

Priming research has thus demonstrated that very subtle cues in the environment are sufficient to modify adult's social behaviour. Reading a few words related to the elderly is sufficient to lead participants to walk more slowly down the corridor (Bargh et al., 1996) and reading a few words related to cooperation is sufficient to make participants more cooperative (Bargh et al., 2001). Although an impressive number of priming effects have been catalogued in adults, we know very little about the influence of social primes on young children. In the previous chapter, I demonstrated that priming ostracism increases affiliative imitation in 5-year-olds. My first aim in this chapter was to test whether even infants are susceptible to the influence of social primes.

4.1.2 Affiliation and prosocial behaviour in infancy

Social priming is an interesting phenomenon in its own right, but it is also a useful method by which to investigate the relations between goals and other mental representations and behavioural responses (see Bargh & Chartrand, 2000). Lakin and Chartrand (2003), for example, used priming as a means by which to explore the connections between mimicry and affiliation. By priming words related to affiliation, they were able to ascertain that adults increase their behavioural mimicry when affiliation is important to them. Similarly, in the previous chapter, I used priming in order to show that children's tendency to copy the style with which a model performs an action is also motivated by affiliation goals. In this chapter, I use social priming as a means to explore aspects of affiliation in infancy.

Compared to research in adults, we know very little about the role of affiliation in infancy. In my General Introduction, I presented some indirect evidence that affiliation may play a role in early development. For example, Lizskowski et al. (2004) demonstrated that 12-month-old infants point in order to share attention and interest with a social partner. Although this experiment was not designed to test the existence of affiliation goals in infancy, the behaviour it revealed can be interpreted as affiliative. Another example of a behaviour which has been interpreted as affiliative is imitation. Over et al. (2009) demonstrated that from 12 months of age, infants go beyond copying the actions which are necessary to reproduce the same end result as a model and copy the specific style she used in producing the action. Again, this experiment was not designed to test for the presence of affiliation goals in infancy, but the behaviour it reveals can be viewed as affiliative (see Carpenter, 2006).

Another behaviour which could be related to affiliation is helping. Helping is a particularly interesting behaviour because, unlike affiliative behaviours such as imitation, it incurs a cost. In order to be helpful, an individual must sacrifice time and resources in pursuit of another's survival (Trivers, 1971). Although this behaviour seems puzzling from an evolutionary perspective (see Sober & Wilson, 1998), researchers have postulated that there are a number of reasons why we help those around us. As adults, we help others in order to gain personal rewards and avoid punishments (e.g. Bar-Tal, 1982; Dovidio, Piliavin, Schroeder, & Penner, 2006), to maintain or create positive mood states (e.g. Snyder & Omoto, 1992), to uphold moral standards (e.g. Fiske, 2004) and in the hope that those we help will reciprocate later (Trivers, 1971). In addition to these motives, it appears that our tendency to help is related to affiliation; we are helpful in order to create and maintain social bonds with those around us (Baumeister & Leary, 1995). Evidence in favour of this proposal comes from studies suggesting that we are significantly more likely to help people we know, and people we consider similar to ourselves, such as ingroup members (Baumeister & Leary, 1995).

Research has shown that infants are also willing to help those around them. Warneken and Tomasello (2006) presented 18-month-old infants with a series of situations in which an experimenter needed help, for example, in order to reach an object he had dropped. Infants' behaviour in these scenarios were compared to control tasks in which the experimenter performed similar actions, but did not need help in order to achieve his goal. For example, the experimenter deliberately dropped an object on the floor. Results showed that infants helped the experimenter (for example, by picking up

the dropped object and offering it to him) significantly more often in the experimental condition than in the control condition.

Infants' tendency to help is now well established (see, for example, Warneken, Hare, Melis, Hanus, & Tomasello, 2007; Warneken & Tomasello, 2007; Warneken & Tomasello, 2008). However, the motivations underlying this behaviour are not yet well understood. One possibility is that infants' tendency to be helpful is influenced by affiliation. Recent research using a looking-time measure has suggested that one-year-old infants associate helping behaviour with affiliation. Kuhlmeier, Wynn and Bloom (2003), for example, tested 12-month-old infants' understanding of helping and affiliation through the use of a habituation paradigm. In order to do this, Kuhlmeier et al. created habituation videos in which one shape (for example, a yellow triangle) helped another shape (a red circle) up a hill. A third shape (a blue square), on the other hand, hindered the red circle's ascent up the hill. In the test videos, the red circle either moved next to the helper shape or the hinderer shape. When adults were asked to explain these test videos, they interpreted the scene in which the red circle moved towards the helper shape as a coherent continuation of the previous video. They described this test video in terms of affiliation, claiming that the red circle preferred the helper to the hinderer. Results from the habituation experiment suggested that infants may have interpreted the videos in the same way: infants were surprised when the red circle moved towards the hinderer, but not when it moved towards the helper shape. Hamlin et al. (2007) recently found a similar pattern of results with 10-month-olds. Although these results suggest that infants have some understanding of the connection between affiliation (in the form of physical

proximity) and helping, we do not yet know whether infants increase their own tendency to help when affiliation is important to them.

Consequently, my second aim in this chapter was to investigate the connections between affiliation and helping behaviour in infancy. In order to do this, I manipulated the presence of affiliation information and measured the impact on infants' tendency to be helpful.

4.2 The current experiment

I had two aims in the current experiment. My first aim was to test whether even infants are susceptible to the influence of social primes. My second aim was to investigate whether infants increase their helping behaviour when affiliation is important to them.

I thus primed 18-month-old infants with photographs evoking affiliation (two small dolls standing next to each other in the background of photographs of other objects) and measured the influence of the primes on infants' tendency to be helpful. Infants' helping responses in this 'together' prime condition was compared to their responses in three other conditions. First, the together condition was compared to a condition in which infants were primed with individuality or 'aloneness'. In this condition, infants saw a single doll standing in the background of otherwise identical photographs. If there are connections between affiliation and helping, then infants primed with two dolls should be more likely to later help an experimenter than infants primed with one doll standing alone. Second, in order to test whether affiliation primes increase helping (or individual primes decrease it), the together condition was compared to a measure of infants' baseline tendency to help: a condition in which the doll primes were replaced

with two neutral, nonsocial stimuli, small stacks of blocks. Finally, in order to determine which aspect of the affiliation primes increase helpfulness, the together condition was compared to a condition in which there were also two dolls, but this time standing in a non-affiliative relation to each other: back-to-back. This condition was designed to determine whether it is the mere presence of two dolls or their affiliative interaction that increases helpfulness.

4.2.1 Method

Participants

Participants were 60 infants between the ages of 18 months, 0 days and 18 months, 29 days. Thirty three of these infants were female and 27 were male. Participants were recruited from a database of parents living in the Leipzig area who had expressed an interest in participating in child development studies. Fifteen infants were randomly assigned to each condition. An additional 7 infants were tested but excluded from analyses for parental interference (n=3), crying during the test (n=2), experimenter error (n=1), and refusal to observe the photographs (n=1).

Design and materials

Infants were shown one of four sets of eight colour photographs which were 28.5 x 19cm in size. Each of these photographs contained a familiar household object (e.g., a teapot, a book, or a shoe) and a prime. In each case, the household object appeared in the foreground of the photograph and the prime appeared in the background. In the together condition, each prime consisted of two small wooden dolls facing each other in close proximity. In the alone condition, each prime consisted of a single wooden doll standing

by itself. In the baseline condition, each prime consisted of two small stacks of blocks roughly the same size as the dolls, and in the back-to-back condition, each prime consisted of two wooden dolls facing in opposite directions (see Figure 4.1 for an example from each condition).

The eight photographs were identical in the four conditions except for the primes, and were presented in the same order for all infants. In half of the photographs, the prime appeared to the right of the foreground object and in the other half, to the left. Within the together condition, various combinations of dolls were used, with each pair being drawn from a possible set of six dolls. Within the alone condition, two sets of photographs were used: for any given picture, half of infants saw the doll from the right side of the together picture, and half of infants saw the doll from the left side of the together picture. Within the baseline condition, each photograph contained a unique configuration of four coloured blocks. Finally, within the back-to-back condition, each photograph contained the same dolls as in the together condition but rotated so that they faced away from each other. Importantly, the same proportion of the dolls' facial features was visible in the together and back-to-back conditions.

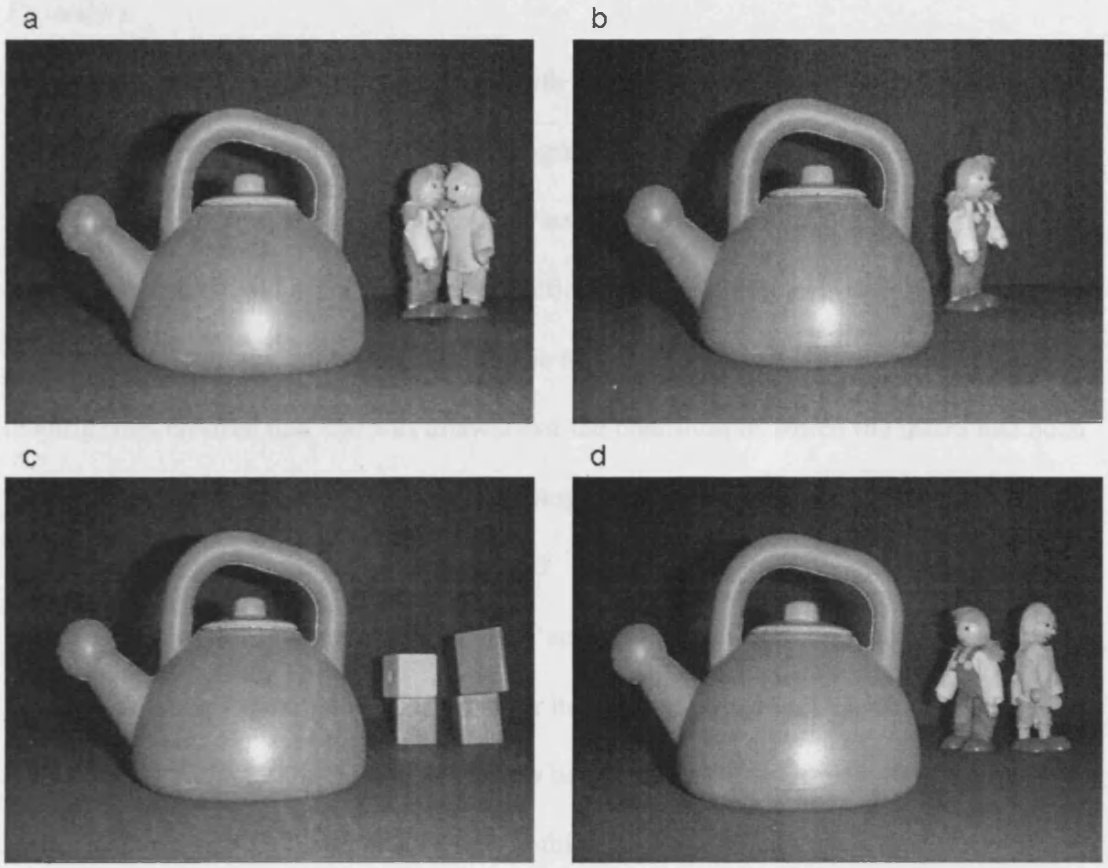

Figure 4.1. The stimuli in each condition. A sample photograph from the a) together condition, b) alone condition, c) baseline condition, and d) back-to-back condition.

In order to assess infants' mood, immediately after the presentation of the primes, parents were asked to complete a mood evaluation consisting of three scales: happy-sad, good-bad, and cheerful-gloomy. Scores on each scale ranged from 0 (negative) - 7 (positive) (scale adapted from van Baaren, Holland, Kawakami, & van Knippenberg, 2004).

Procedure

After a brief warm-up play phase with both experimenters, which was identical in all conditions, E2 showed each of the photographs in turn to the infant following a predefined script. For each photograph, E2 named the foreground object and then commented on its colour and finally its function, completely ignoring the prime. During this time, E1 sat in the opposite corner of the room, with her back to the interaction, reading (this ensured that she was unaware of the condition to which the infant had been assigned). After the presentation of the photographs, E2 asked the infant to play with E1 and turned away from the interaction to read. E1 then briefly left the room and returned with a bundle of six small sticks which she 'accidentally' dropped on the floor while kneeling down at a small table (for a similar helping task see MacCrae & Johnston, 1998). To give the infant the opportunity to help spontaneously, during the first 10 seconds after dropping the sticks E1 said nothing, just alternated her gaze between the fallen sticks and the infant's face. During the next 10 seconds, if the infant had not already begun helping, E1 looked towards them, called their name and said, "My sticks, they've fallen on the floor," then made two unsuccessful attempts to reach the sticks herself. During the next 10 seconds, E1 looked at the infant, called their name and said, "My sticks, I need them back," and made two more attempts to reach the sticks. During the final 10 seconds, E1 looked at the infant, said, "Please will you help me?" and held out her hand, palm up.

Coding

The main dependent measure was whether infants helped E1 spontaneously, that is whether they picked up at least one stick and offered it to her within the first 10 seconds of the test phase (before she either spoke to infants or reached for the sticks herself). In addition, a more general measure of helping was scored if infants picked up at least one stick and offered it to E1 at any point during the test phase (i.e., including after E1 asked for help). To assess interrater reliability, a randomly-chosen 20% of the videotapes were scored independently by a rater blind to condition and experimental hypothesis. Agreement was perfect for both measures (Cohen's Kappas = 1.00).

4.2.2 Results

Main analyses

Figure 4.2 presents the percentage of infants who helped E1 spontaneously (within the first 10 seconds of the test phase) in each of the four conditions. Three times as many infants helped spontaneously in the together condition as in each of the other three conditions. As the percentage of infants who helped in the three control conditions was identical, and the expected values in the 2 x 4 contingency table were low, the data from these three conditions was pooled and then compared to the together condition. Infants were significantly more likely to spontaneously help E1 in the together condition than in the pooled control conditions ($\chi^2(1)=8.57$, two-tailed $p=.003$, $phi=.38$).

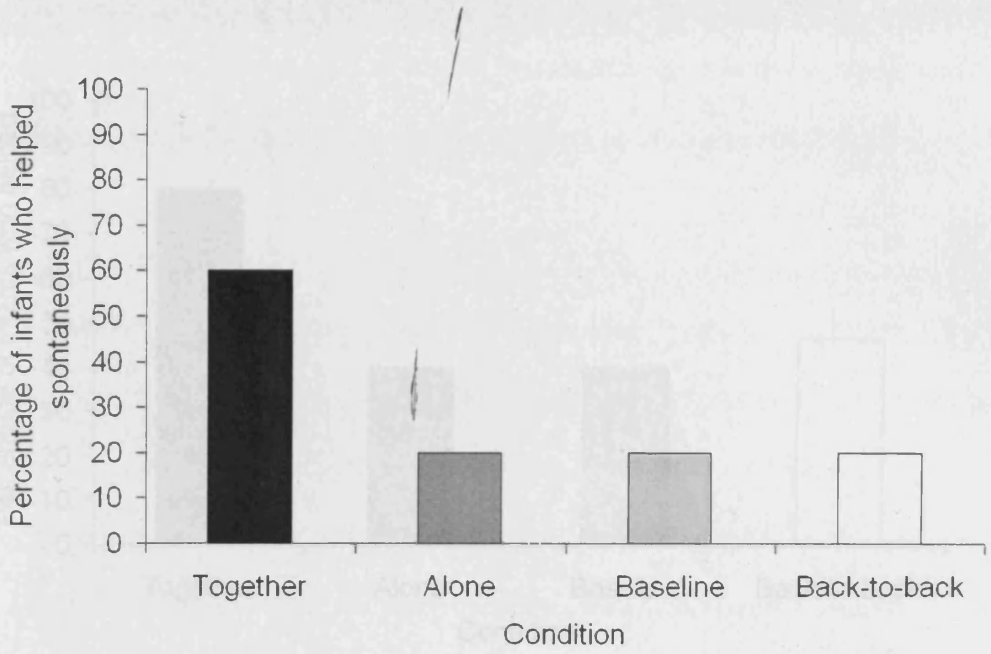

Figure 4.2. The percentage of infants who helped E1 spontaneously (in the first 10 seconds) in the four conditions.

Figure 4.3 presents the percentage of infants in each condition who helped E1 at any point during the test phase (i.e., including after E1 asked for help) in each of the four conditions. Again infants were significantly more likely to help in the together condition than in the pooled control conditions ($\chi^2(1)= 6.43$, two-tailed $p=.011$, $phi=.33$). There were no significant differences between the three control conditions ($\chi^2(2)=.18$, $p=.91$).

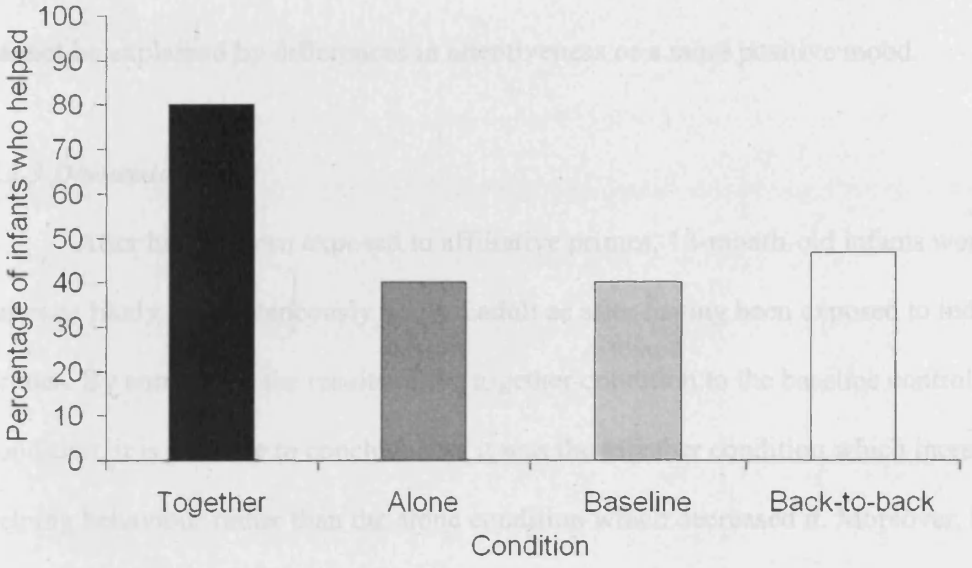

Figure 4.3. The percentage of infants who helped E1 at any point during the test phase in the four conditions.

Other measures

In order to ascertain whether infants paid equal attention to the presentation of the primes in the four conditions, a third of the infants from each condition were randomly selected and the number of seconds they spent looking at the photographs was coded. There were no significant differences between conditions ($F(3, 16)=1.58$, $p=.23$). The average number of seconds spent looking at the photographs was 102.2 in the together condition, 92.8 in the alone condition, 89.6 in the baseline condition, and 101.4 in the back-to-back condition.

There were also no significant differences in infants' mood across the four conditions ($F(3, 56)=.155$, $p=.93$). The average rating of infants' mood was 5.04 in the together condition, 4.97 in the alone condition, 5.0 in the baseline condition, and 5.27 in

the back-to-back condition. Thus, infants' increased helping in the together condition cannot be explained by differences in attentiveness or a more positive mood.

4.2.3 Discussion

After having been exposed to affiliative primes, 18-month-old infants were three times as likely to spontaneously help an adult as after having been exposed to individual primes. By comparing the results of the together condition to the baseline control condition, it is possible to conclude that it was the together condition which increased helping behaviour rather than the alone condition which decreased it. Moreover, by comparing the results of the together condition to the back-to-back condition, it is possible to conclude that it was the affiliative stance depicted in the photographs, rather than the mere presence of two dolls that increased helping.

One possible objection to this account is that the rates of helping in the baseline control condition are somewhat lower than those reported in a previous helping experiment with 18-month-olds (Warneken & Tomasello, 2006). This raises the possibility that the together condition represents a true baseline and the other three conditions depressed helping below baseline levels. However, a direct comparison between these two experiments is complicated by some important differences in the procedures. For example, in Warneken and Tomasello (2006), infants were presented with many different helping tasks (and several trials within each task). They had also been interacting with the experimenter who needed help immediately prior to the test phase. In contrast, infants in this experiment were presented with only one chance to help, and had been interacting with a different experimenter immediately prior to the test phase, which is likely to have reduced their tendency to help across all four conditions.

Thus, the pattern of results across the different conditions is more informative than a comparison across experiments.

These results are the first to demonstrate that infants are susceptible to the influence of social primes. Previous research with adults has shown that very subtle cues in the environment are sufficient to modify participants' social behaviour. For example, participants who have been asked to read a few words related to the stereotype of the elderly subsequently walk more slowly down the corridor (Bargh et al., 1996). The effect described in this experiment was also produced by a surprisingly subtle manipulation: the only difference between the together and back-to-back conditions, for example, was whether infants saw the same two dolls facing towards or away from each other in the background of otherwise identical photographs. Furthermore, the angle at which the dolls were placed meant that infants in these two conditions were exposed to exactly the same proportion of the dolls' faces (that is, they saw the same number of eyes, and same proportion of the dolls' smiles), thus controlling for possible effects of lower-level social stimuli on helping behaviour. Thus, the presentation of very subtle cues is sufficient to influence social behaviour from early in development.

These results also represent the first demonstration that the connections between affiliation and prosocial behaviour are present from early in development. Previous research has demonstrated that 18-month-olds are helpful in a range of situations (Warneken & Tomasello, 2006) and that 10-month-olds expect individuals to approach those who have previously helped them (Hamlin et al., 2007). However, until now, no research has investigated the motives underlying helping behaviour in infancy. This

study goes beyond previous research by demonstrating that infants increase their own tendency to help when cues to affiliation are present.

Furthermore, these data provide an important insight into infants' understanding of affiliative relationships. Infants in this experiment were able to distinguish between two dolls facing towards each other and two dolls facing away from each other. Previous research on older children's understanding of affiliative relationships has suggested that four-year-olds are able to make judgments about affiliation on the basis of physical proximity, but not on the basis of more subtle cues such as eye contact (Post & Hetherington, 1974, see also Abramovitch & Daly, 1978). Very recent research with infants, however, suggests that even 10-month-olds are able to discriminate between mutual and averted gaze (Beier & Spelke, 2009). This experiment goes beyond previous research in showing that, not only do infants discriminate between very subtle cues such as bodily orientation, they associate particular configurations with affiliation and vary their social behaviour accordingly.

The paradigm developed in this chapter has far-reaching implications for research. As the first successful demonstration of social priming in infants, this work provides a novel non-verbal method for developmental psychologists. Social priming in adults has been used as a means by which to understand a wide range of social processes including, but not limited to, cooperation (Bargh et al., 2001), affiliation (Lakin & Chartrand, 2003), aggression (Anderson, Benjamin, & Bartholow, 2002), intergroup attitudes (Spears, Gordjin, Dijksterhuis, & Stapel, 2004) and prejudice (Bargh et al., 1996). Currently there is a great deal of interest in the development of inter- and intra-group cognition and behaviour, with increasing research focus on the developmental

origins of conformity, ingroup bias, and prejudice (e.g., Corriveau & Harris, 2009; Fusaro & Harris, 2008; Kinzler et al., 2007). The paradigm developed in this paper offers a new method through which these and other social processes can be studied in infants.

Finally, it is worth pointing out that these data have intriguing practical implications. This experiment has shown the ease with which it is possible to dramatically increase prosocial behaviour in infants. Consequently, the data suggest that surprisingly subtle changes to our social environment may promote prosocial behaviour in our children.

4.3 Suggestions for future research

4.3.1 What is being primed?

The experiment described in this chapter demonstrated that priming affiliation increases helping behaviour in infants. However, it is not clear from this experiment alone exactly *what* was being primed. Did the primes activate a goal to affiliate or something more akin to a concept of affiliation? This ambiguity mirrors a problem in priming research more generally, in which it is not always clear which representation (or representations) are activated by the priming stimuli. For example, MacCrae and Johnson (1998) report that priming helpfulness increases helping behaviour in adults, but it is not clear whether the primes activated a goal to be helpful or the concept of helpfulness more generally.

Bargh et al. (2001) have, however, provided an empirical distinction between conceptual and goal activation in social priming. Building on previous work by Atkinson and Birch (1970), Bargh et al. argued that, if a set of social primes activates behavioural goals, then the activation associated with them should increase over time until the goal is

fulfilled. If, on the other hand, the primes activate social concepts, then the activation associated with them should either remain constant or decay over time. In order to test the nature of the activation associated with their primes, Bargh et al. introduced a delay between the priming manipulation and the experimental task. In their experiment, participants were primed with words related to achievement and then given a word finding task. In one condition, participants worked on this word finding task immediately after the priming manipulation and, in the other condition, participants worked on this task after a 5 minute delay. Results showed that the influence of the primes was stronger after the delay, suggesting that the manipulation had activated a goal to perform well.

In future research, it would be interesting to incorporate a similar manipulation into this infant priming paradigm. That is, infants would once again be presented with affiliation primes and then participate in a helping task. Critically, however, half of infants would participate in the helping task immediately after the presentation of the primes, and half would participate in the helping task after a very brief (for example, 30 second) delay. If the affiliation primes induce a goal to affiliate in infants, then the influence of the prime should be stronger after the brief delay.

4.3.2 Would affiliation primes increase social imitation in infancy?

In the previous chapter, I described an experiment in which I tested whether inducing a goal to affiliate increases affiliative imitation in 5-year-olds. In that chapter, I suggested that it would be interesting to try a similar experiment with younger children, but also pointed out that the primes used in that experiment would not be suitable for use with infants.

The priming stimuli described in this chapter could, however, be used to test whether imitation performs an affiliative function in infancy. If infants' tendency to copy the style with which a model performs an action is influenced by a drive to affiliate, then they should be more likely to copy a model's action style after having been exposed to photographs depicting two dolls facing towards each other than after having been exposed to photographs depicting two dolls facing away from each other.

Chapter 5

General Discussion

5.1 Introduction

In this chapter, I draw together the theoretical perspective adopted in my General Introduction with the results from my three experimental chapters. Following this, I use the theoretical ideas and results from this thesis as a basis from which to make suggestions for future research. As the specifics of each result have already been outlined within the individual chapters, this discussion concentrates on the more general themes of the research and broader suggestions for further work.

5.2 Summary of the main findings

In this thesis, I examined three different forms of behaviour matching in development. In my General Introduction, I argued that, in adults, social influence in general, and behaviour matching in particular, is often motivated by goals to learn from and affiliate with others (or by some combination of these two factors). In addition to these explicit forms of behaviour matching, however, I pointed out that adults also subconsciously assimilate (or match) their behaviour to those around them. Based on an analogy to social influence research, I argued that behaviour matching in young children may be similarly motivated by goals to learn from and affiliate with others. In other words, that imitation serves both an instrumental and a social function in development (Užgiris, 1981, 1984). Further developing the connections with the adult social psychology literature, I argued that, in addition to explicit forms of behaviour matching, young children and infants may also subconsciously assimilate their behaviour to social

primes. In the experimental chapters of this thesis, I investigated questions raised by this review. In Chapter 2, I investigated aspects of instrumental imitation. In that chapter, I tested whether verbal imitation is based on intention understanding. In Chapter 3, I investigated the more social aspects of imitation. In particular, I tested whether having an affiliation goal increases children's tendency to imitate the specific actions of a model. In Chapter 4, I moved on to discuss unintentional behaviour matching. More specifically, I investigated whether even infants assimilate their behaviour to subtle social primes. Below I discuss the findings of each chapter and the implications of these results for our understanding of behaviour matching in development.

5.2.1 Instrumental behaviour matching

In chapter 2, I investigated instrumental aspects of behaviour matching. In my General Introduction, I argued that, although it is broadly accepted that imitation performs an instrumental function in development, the specific nature of this skill has proved controversial. Whereas some researchers have argued that imitation is based on understanding and reproducing the intentions of a model, others have argued that it is based predominantly on direct matching or associative learning.

In Chapter 2, I attempted to shed fresh light on this issue by investigating the relatively neglected domain of verbal imitation. In that chapter, I tested whether 3-year-old children imitate the perceived intentions behind speech rather than the specific utterances they hear. In Experiment 1, I replicated previous research showing that children correct sentences which include ungrammatical repetitions. In Experiment 2, I replicated and extended this result, showing that children correct sentences with

ungrammatical repetitions, but repeat sentences with grammatical repetitions exactly. Experiment 3 provided the critical test of the intention-based account. In this experiment, I compared imitation of the same ungrammatical sentences spoken by an intentional agent and a non-intentional agent. Children in this experiment corrected the ungrammatical sentences of the intentional agent, but repeated the same sentences exactly when they were spoken by the non-intentional agent.

Taken together, these three experiments provide strong evidence that verbal imitation is based on intention-understanding. When combined with previous results from the action domain (e.g. Carpenter et al., 1998; Meltzoff, 1995), they also provide evidence that imitation more generally is based on intention understanding. Intention-based imitation is thus a powerful mechanism for learning how to achieve instrumental goals. In the physical domain, intention-based imitation allows children to learn the efficient use of tools and cultural artifacts, filtering out mistakes and accidents from the demonstrations they observe. Similarly within language, intention-based imitation allows children to learn the pragmatics of communication; filtering out mistakes and accidents from linguistic demonstrations in order to learn how to efficiently achieve their communicative goals.

5.2.2 Social behaviour matching

Whereas Chapter 2 focused on the more instrumental aspects of imitation (how children use imitation in order to learn new skills), Chapter 3 concentrated on the more social aspects of imitation. In that chapter, I investigated whether children use imitation as a means by which to affiliate with those around them.

Both Carpenter (2006, in press) and Nielsen (2006, in press) have suggested that children's tendency to copy the specific actions of a model is motivated by affiliation goals. Under this conceptualisation, social motivation is taken as a sort of default explanation: if children choose not to copy selectively, then their motivation for copying must be social rather than instrumental. However, we know from previous research that children sometimes copy the specific actions of a model for other reasons. For example, in Chapter 2, I reported an experiment in which children copied the specific behaviour of a model because they did not believe that model to be an intentional agent. Furthermore, some researchers have questioned the theoretical position of Carpenter (2006) and Nielsen (2006). Lyons et al. (2007), for example, have argued that children rarely, if ever, copy the specific actions of a model for social reasons. According to their conceptualisation, children's tendency to copy the specific actions of a model is produced by limitations in their causal understanding (see also Whiten, in press).

In order to test whether children sometimes imitate the specific actions of a model in order to fulfil affiliation goals, I presented 5-year-old children with videos in which one shape (for example, a blue pentagon) appeared to be excluded from a group of other shapes and measured the impact of this prime on their tendency to reproduce the specific actions of a model. Results showed that children primed with ostracism reproduced significantly more components of the model's action than children given a neutral prime. Presumably they did so because the ostracism prime produced a goal to affiliate. Consequently, these data provide strong evidence that imitation serves affiliation goals in development.

5.2.3 Unintentional behaviour matching

In my General Introduction, I argued that, in addition to explicit forms of behaviour matching, adults also show a tendency to subconsciously match their behaviour to social primes. The theme of social priming was reintroduced in Chapter 3 and further investigated in Chapter 4. The experiment I reported in Chapter 4 had two main goals. First, I sought to investigate whether even infants match their behaviour to the information presented in social primes. Second, I sought to explore whether affiliation information influences infants' tendency to be helpful.

In order to answer these questions, I presented 18-month-old infants with photographs that either primed affiliation (two small dolls standing next to each other in the background of other photographs) or individuality (for example, two dolls standing back-to-back in the background of otherwise identical photographs) and measured the impact on infants' tendency to be helpful. Results showed that infants primed with affiliation were three times as likely to spontaneously help an experimenter as infants primed with photographs depicting individuality. These data are the first to demonstrate that even infants assimilate their behaviour to social primes. Furthermore, they demonstrate that the connections between affiliation and prosocial behaviour are so fundamental that they are seen even in infancy.

5.2.4 Conclusion

Taken together, the experiments conducted for this thesis indicate that behaviour matching is a diverse and important phenomenon in development. Supporting previous research, Chapter 2 shows that imitation is powerful mechanism for learning new skills;

children do not blindly copy all aspects of behaviour they observe, rather they copy the perceived goals and intentions behind demonstrations. Chapter 3 provides strong evidence that imitation performs a social as well as an instrumental function in development: children use imitation in order to affiliate with those around them. Chapter 4 shows just how pervasive behaviour matching is in development: even infants assimilate their behaviour to subtle social primes.

5.3 Suggestions for future research

In this section, I discuss the broader implications of my experimental work and, on that basis, make suggestions for future research. As specific follow-ups to each experiment have already been proposed within the individual chapters, this section will focus on more general suggestions for further work.

5.3.1 Other forms of behaviour matching

In this thesis, I have adopted a broad perspective on behaviour matching, suggesting that it can be thought of in terms of social influence. I have discussed three main forms of social influence and behaviour matching in development: instrumental imitation, social imitation and social priming. Within adult social psychology, however, the field of social influence includes a wide range of other processes, including persuasion, compliance, conformity, obedience, group polarisation and minority influence (see Turner, 1991). Conformity, compliance and persuasion are particularly interesting within the current context, because they each contain an imitative component. In conformity, the individual matches the opinions of their group members. In

compliance, the individual matches the behaviour of their group members, but does not internalise the opinions which underlie them. In persuasion, the individual (sometimes) adopts the perceived attitudes of another.

Developmental research suggests that young children also engage in some of these forms of behaviour matching. Corriveau and Harris (2009), for example, investigated the extent of conformity in 3- and 4-year-olds by testing them within a modified version of the Asch paradigm. Corriveau and Harris presented children with a video in which three individuals offered a unanimously incorrect judgement on the relative length of three lines. When asked to judge the relative length of similar lines themselves, children conformed to the majority's opinion on approximately one third of trials (see also Walker & Andrade, 1996).

Despite increasing interest in group processes such as conformity and compliance in development, there have thus far been no attempts to empirically combine research on imitation with research on these other forms of behaviour matching. In future research, it would be interesting to investigate the developmental connections between instrumental imitation, social imitation, conformity, compliance and persuasion. Longitudinal research could investigate when each of these different forms of behaviour matching first emerge in development and whether there are systematic individual differences in the tendency to engage in some forms of behaviour matching over others.

5.3.2 The effects of being imitated

In this thesis, I have thus far discussed (and conducted) research on children's tendency to match the behaviour of those around them. Within real-world settings,

however, imitation takes place within ongoing social interaction, with many opportunities for a social partner to imitate the child as well as the other way round. In future research, it would be interesting to investigate the impact of being imitated on young children's behaviour.

Previous research in adults has shown that being imitated increases rapport between individuals. Chartrand and Bargh (1999), for example, demonstrated that participants who have had their mannerisms mimicked by a confederate subsequently report liking the confederate more than participants who have not been mimicked by the confederate. Subsequent research has demonstrated that being imitated also influences adults' behaviour. Participants who have had their mannerisms mimicked by a social partner are subsequently more helpful (van Baaren et al., 2004) and more generous (van Baaren, 2005) than participants who have not had their mannerisms mimicked. Thus, imitation has been conceptualised as a form of 'social glue' which facilitates bonds between individuals (Lakin et al., 2003).

Developmental work has suggested that infants are also able to discriminate between an individual who imitates and an individual who does not imitate them. Meltzoff (1990) found that 14-month-old infants prefer to look at an imitator over a nonimitator. Very recent work has suggested that being imitated may also influence behaviour in infancy. Carpenter, Uebel and Tomasello (2009) engaged 18-month-old infants in a brief interaction during which an experimenter either imitated their actions or not. Subsequent to this, the experimenter briefly left the room and returned with a small bundle of sticks which she 'accidentally' dropped on the floor. Although there were no differences between conditions in the number of infants who helped the experimenter (by

picking up the sticks and offering them to her), infants who had previously been imitated were significantly faster to offer their help than infants who had not been imitated.

In future research, it would be interesting to further investigate the influence of being imitated on young children's behaviour. One important question is whether imitation has universally positive consequences for social interaction, as suggested by the 'social glue' hypothesis. One possibility is that, although imitation increases liking and rapport, it decreases perceived competence and expertise. From a theoretical perspective this seems plausible because, under many circumstances, an imitator cannot be considered an independent source of information; their opinions and behaviour reflect the decisions of those around them rather than their own experience. Consequently, when presented with a choice to learn from an imitator or from an individual who makes independent decisions, children may choose to learn from the independent source. I have recently conducted an experiment which supports this novel hypothesis. In this experiment, 4-year-old children were more likely to believe an implausible fact (that a particular type of fish lived in trees) if it was told to them by an individual who had previously made independent choices than if it was told to them by an individual who had previously imitated them. In an ongoing follow-up to this experiment, I am investigating whether children choose to adopt the preferences of an imitator, but the novel object labels of an independent source.

5.3.3 Intergroup cognition and behaviour in early development

Thus far, the vast majority of the research I have discussed has investigated how young children and infants identify with others dyadically; in imitative interactions with a

single model. As adults, however, we do not merely identify with others as particular individuals, we identify with them as members of particular groups (Turner, 1991). Although intergroup cognition and behaviour is a huge field in social psychology, we know very little about young children's identification with the group. Research using verbal methods has suggested that ingroup bias and outgroup prejudice, for example, are not present until around 5 years of age (Aboud, 1988, 2003). However, more recent research has suggested that the origins of group identification can be seen even in infancy. Kinzler et al. (2007), for example, found that infants prefer to look at and accept toys from native language speakers over foreign language speakers. In future research, it would be interesting to further investigate the origins of intergroup cognition and behaviour in development. Below I outline a number of suggestions for empirical research which could shed light on this topic.

Do young children identify with ingroup members more than outgroup members?

Previous research has shown that young children are sensitive to some correlates of group membership, for example, the languages different individuals speak (Kinzler et al., 2007). However, we do not yet know whether young children merely prefer what is familiar to them (see Zajonc, 1968) or whether they truly identify with their group members. In future research, it will be important to investigate group identification in young children more directly.

One means by which to do this would be to adapt the Sticker Test, a task originally designed to test self-other identification in children with autism (Hobson & Meyer, 2005), for use within an intergroup context. In this task, an experimenter engages

children in a game with stickers. After giving the child a sticker for themselves, the experimenter holds up a second sticker and says to the child 'This sticker is for me to wear, where should I put it?' The task is based on the assumption that, if children identify with the experimenter, then they will indicate a location on their own body in response to this question. If children have problems identifying with the experimenter (or choose not to identify with them), on the other hand, then they will point directly to a location on the experimenter's body.

In future research, it would be possible to manipulate whether the experimenter in this task is an ingroup or an outgroup member. If children identify with ingroup members more strongly than outgroup members, then they should point to locations on their own body when playing the game with an ingroup member, but to locations on the experimenter's body when playing the game with an outgroup member.

Do young children imitate ingroup members and outgroup members differently?

Another important question for future research is whether young children's identification with the group influences their imitation. For example, it would be interesting to know whether young children choose to closely imitate the actions of an ingroup member, but distance their behaviour from that of an outgroup member. Following on from this basic question, it would be interesting to investigate whether group membership influences what children learn from a demonstration (as well as what they choose to imitate). For example, to test whether young children retain information taught to them by ingroup members for longer intervals than information taught to them by outgroup members. Experiments such as these would have important implications for

our understanding of how children's identification with the group impacts upon the formation and maintenance of culturally specific traditions (see Tomasello, 1999; Tomasello et al., 2005).

Does priming group membership influence young children's tendency to imitate an outgroup member?

Another important priority for future research will be to investigate the conditions under which young children are prepared to imitate an outgroup member. As adults, our understanding of group membership is flexible: a particular individual may be viewed as an ingroup member in one context and an outgroup member in another context. Furthermore, whereas under some circumstances we are accepting of, and even friendly towards outgroup members, under other circumstances we are indifferent and even hostile towards them. Previous research has demonstrated that infants are sensitive to some correlates of group membership (Kinzler et al., 2007), however, we do not yet know whether infants show any flexibility in their behaviour towards outgroup members. In future research, it would be interesting to use social priming in order to investigate whether the group context influences young children's tendency to imitate an outgroup member. If children are flexible in their behaviour towards outgroup members, then they should be less likely to imitate an outgroup member when primed with an intergroup comparison than when primed with group integration (see Haslam, Turner, Oakes, McGarty, & Hayes, 1992, for a related study with adults). Such an experiment would have important theoretical implications, suggesting that infants' behaviour towards outgroup members is not purely determined by the nature of the external stimulus.

Furthermore, it would have important practical implications, suggesting that subtle cues to group integration may increase children's tolerance for those perceived to be different from themselves.

5.4 Conclusion

This thesis investigated the nature of behaviour matching in development. My experimental work has demonstrated that children use imitation both as a means by which to learn from and affiliate with those around them. Furthermore, it has demonstrated that behaviour matching in development occurs both intentionally, as when children choose to imitate the instrumental actions of a model, and unintentionally, as when children assimilate their behaviour to subtle social primes. Thus, behaviour matching is a diverse and important phenomenon in development. In this General Discussion, I have argued that these results have important implications for future research. I have suggested that it will be important for future research to adopt an even broader perspective on behaviour matching, and investigate the developmental connections between imitation and other forms of behaviour matching such as conformity, compliance and persuasion. Furthermore, I have argued that future research should move beyond investigation of children's identification and affiliation with other individuals and explore children's identification with the group. Based on the methods developed in this thesis, I have suggested a series of experiments which could help to address these important issues in future work.

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