The effect of social engagement on 24-month-olds’ imitation from live and televised models

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Abstract

To date, developmental research has rarely addressed the notion that imitation serves an interpersonal, socially based function. The present research thus examined the role of social engagement on 24-month-olds’ imitation by manipulating the social availability of the model. In Experiment 1, the children were more likely to imitate the exact actions of a live socially responsive model compared to a videotaped model who could not provide socially contingent feedback. In Experiment 2, the children were more likely to imitate the exact actions of a model with whom they could communicate via a closed-circuit TV system than a videotaped model who could not provide interactive feedback. This research provides clear evidence that children’s imitative behavior is affected by the social nature of the model. These findings are discussed in relation to theories on imitation and the video deficit.

Introduction

Imitation is a fundamental human behavior. We reproduce the actions of others with a frequency and fidelity that has yet to be identified in any other species (e.g. Tomasello & Call, 1997; Whiten, 2005). By directly copying others we are provided with a particularly powerful form of learning that permits us to rapidly acquire new skills while avoiding the potential pitfalls of individual trial-and-error learning. However, the drive to acquire new skills is not the only reason to imitate others; we also do so for socially oriented reasons. For example, we can imitate to communicate, to be like others, to be liked by others and to show others that we are alike (Baldwin, 1894; Dijksterhuis, 2005; Lakin, Jefferis, Cheng & Chartrand, 2003; Meltzoff, 2005, 2007; Nadel, Guérini, Pezé & Rivet, 1999; Uzgiris, 1991; Wallon, 1934). To date, however, research with young children has primarily focused on imitation as a means of acquiring new skills; how social motivations to imitate others affect copying behavior in development has received scant attention.

Children’s tendency to imitate as a means of generating and sustaining ongoing interaction through their second year of life is well established (Asendorpf & Baudonnière, 1993; Eckerman & Didow, 1989; Kuczynski, Zahn-Waxler & Radke-Yarrow, 1987; Nadel, 2002; Nadel & Baudonnière, 1982; Nielsen & Dissanayake, 2004). For example, Eckerman, Davis and Didow (1989) observed unfamiliar peer dyads engaging in free play longitudinally between 16 and 32 months of age. They found age-related increases in children’s attempts at integrating their behavior via imitative turn-taking games that developed and/or maintained coordinated action on a common theme. Similarly, Nadel and colleagues documented that the use of imitation for communicative purposes increases from 12 to 36 months and then declines commensurate with language mastery (Nadel, 2002, 2006).

Children’s use of imitation as a communicative tool through the second year highlights views that imitation serves two complementary functions: A cognitive function that promotes learning about the world and an interpersonal function that promotes sharing with others (for review see Nielsen, Suddendorf & Dissanayake, 2006). Yet research investigating how the interpersonal function may impact children’s copying behavior is rare. Several studies have investigated how the familiarity of a model affects rates of imitation (Barr & Hayne, 2003; Devouche, 1998, 2004; Hanna & Meltzoff, 1993; Hayne, Herbert & Simcock, 2003; Learmonth, Lambeth & Rovee-Collier, 2005; McCabe & Uzgiris, 1983; Slaughter, Nielsen & Enchelmaier, 2008). Others have compared children’s imitation of human and nonhuman agents (Meltzoff, 1995; Slaughter & Corbett, 2007) or children’s imitation of actions presented using an invisible mechanism rather than a model (i.e. by using a ‘ghost condition’; Huang & Charman, 2005; Thompson & Russell, 2004). To date, however, only two studies have directly investigated whether social engagement with the model per se affects children’s copying behavior (Gergely & Király, 2004; Nielsen, 2006, Experiment 3).

Nielsen (2006, Experiment 1), for example, found that 24-month-olds persisted in copying a model’s inefficient actions. The children were shown how to use an object to disengage switches on the front of three novel boxes.
to open them and reveal a toy inside. Rather than devising a more effective means to disengage the switches (i.e. using their hands) they persevered in copying the model's exact yet inefficient means (i.e. using the object) that resulted in frequent failure to open the boxes. Užgiris (1981) argued that as infants imitate primarily to learn about events in the world they focus on what was done (i.e. the outcome). In contrast, toddlers imitate primarily to engage socially and hence they focus on the way something was done (i.e. the means used) as a means of realizing the congruence that exists between themselves and others. Following this view, Nielsen suggested that the children in his study persisted in using the inefficient object like the model to satisfy social motivations. He reasoned that 24-month-olds should be more inclined to copy the specific actions of a model when she is socially engaging than when she is disinterested.

To test this, Nielsen (2006, Experiment 3) presented 24-month-olds with a model who was either engaging and ‘social’ or detached and ‘aloof’. Unexpectedly, irrespective of the model’s interaction style, the children copied her specific actions and used the object at equivalent rates. However, they opened fewer boxes with an aloof model than with a social model. Nielsen speculated that the children who saw the aloof model may have imitated her object use in an attempt to initiate interaction; but when this failed, their motivation to produce the outcome was diminished (so they opened fewer boxes).

However, aspects of Nielsen’s (2006, Experiment 3) methodology may be problematic: The model in the aloof condition neither looked nor smiled at the children, which is a very unusual and unnatural interaction. The children’s responses may thus reflect their reactions to the model’s strange behavior. A means of presenting children with a model who acts in a social and engaging manner yet does not afford opportunity for spontaneous, contingent interaction is required to more accurately test the social motivation explanation for infants’ copying behavior. Video provides one such means.

**Experiment 1**

Research has established that 24-month-olds can imitate the actions of a model presented via videotape; although they do so at reduced levels when compared with a live model (Barr & Hayne, 1999; Hayne et al., 2003; McCall, Parke & Kavanagh, 1977). This diminution in learning from videotape compared to live models exemplifies the video deficit (Anderson & Pempek, 2005). Notably, actions modeled via videotape are inherently less social than actions modeled by a live experimenter; a model on television cannot interact with the child as she can when face-to-face with the child.

Thus, if 24-month-olds copy the specific actions of a model to be social and to sustain an interaction then they should be less inclined to do so when the model appears on video. To test this hypothesis, 24-month-olds’ imitation of a videotaped model was compared to their imitation of a live model. In the Live and Familiar Video conditions the model was an adult with whom the children had previously interacted. As having the model appear live in the room and on television may inadvertently confuse the children, impacting imitative behavior, we also included an Unfamiliar Video condition in which the televised model was an adult whom the child had never seen before. This condition also permits past findings regarding the familiarity of the model to be replicated using a new task (e.g. Hayne et al., 2003).

**Method**

**Participants**

The final sample included 48 healthy full-term 24-month-olds ($M = 24$ months 16 days; $SD = 21$ days), 25 girls and 23 boys. All were English-speaking Caucasians of middle socioeconomic status who lived in suburbs surrounding a large urban university. The names of potential participants were obtained from a participant pool comprising birth announcements in the local newspaper and word-of-mouth referrals. Parents were sent a letter inviting their child to participate in the study. An equal number of children were randomly assigned to the Live, Video Familiar or Video Unfamiliar conditions.

**Apparatus**

The apparatus included three similar wooden boxes (19.5 cm $\times$ 12.5 cm $\times$ 6.5 cm) (see Table 1). A different switch was positioned centrally on the front of each box. A different action disengaged each switch to release the lid and reveal a small novel toy inside the box. Each box was accompanied with a different object with which to manipulate the switch. The presentation order of the boxes, the object accompanying the box, and the side of the box on which the object was placed were counterbalanced across conditions.

**Procedure**

**Live condition**: Following a free-play warm-up, the child and mother sat at a table opposite the experimenter. The experimenter said: ‘Look at this’ and removed a box

<table>
<thead>
<tr>
<th>Table 1</th>
<th>The differential characteristics of the three boxes used in Experiments 1 and 2</th>
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<tbody>
<tr>
<td>Box</td>
<td>Lid color</td>
</tr>
<tr>
<td>1</td>
<td>Green Eeyore (donkey)</td>
</tr>
<tr>
<td>2</td>
<td>Pink Tigger (tiger)</td>
</tr>
<tr>
<td>3</td>
<td>Blue Piglet (pig)</td>
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*Switch characters from the children's book *Winnie the Pooh* (A.A. Milne).
and its object from a concealed container and placed them on the table. She demonstrated how to open the box using the object to activate the switch. After showing the child the hidden toy, the model discretely closed the box beneath the table and repeated the demonstration twice more. After the third demonstration, the closed box and its object were simultaneously given to the child. The test ended when the child opened the box or 60 sec after the box was presented to the child. This procedure was repeated for the remaining two boxes.

**Video conditions**: A video recording of the model using the object to activate the switch and release the lid was made for each box based on the live demonstration. The view was of the model’s upper body seated at the table with the box and object on the table in front of her. In the Video Familiar condition, the experimenter who administered the task also appeared on the videotape. In the Video Unfamiliar condition a model that the child had not previously met appeared on the videotape.

The procedure for both video conditions closely replicated the Live condition. The child and mother were seated at the table opposite the television (51 cm color monitor with built-in VCR). The experimenter sat beside the television and turned it on saying: ‘Look at this’. The child watched the videotaped model perform the three demonstrations for the first box. Upon completion, the experimenter turned the television off and gave the child the box and its object for the test session, which was identical to that in the Live condition. This procedure was repeated for the remaining two boxes.

**No model control condition**: In this condition no actions were modeled on the boxes so the children did not see them opened. The experimenter placed the first box and its object on the table and simultaneously presented them to the child. This was repeated for the remaining two boxes. This control assessed whether the children would spontaneously open the boxes, and whether they would attempt to do so using their hand or the object.

**Coding and reliability**

All coding was conducted from videotape following the same criteria as Nielsen (2006). There were two dependent variables for each box: (1) successfully opening the box, regardless of the means used to do so; and (2) touching the object to the switch of the box. For the second variable, successfully opening the box by object was unnecessary as activating the switch with the object was designed to be difficult. This variable thus provides a measure of children’s tendency to focus on the model’s actions at the expense of the outcome.

For each box, the children were awarded 1 point for performing the actions and 0 for failing to do so. Summed across the three boxes, children could thus score between 0 and 3 for copying the model’s actions (i.e. by trying to activate the switches using an object) and between 0 and 3 for copying the outcome of the model’s actions (i.e. successfully opening the boxes).

**Figure 1** The mean number of boxes (and standard errors) that the children touched the object to the switch (left side) and the mean number of boxes that the children opened successfully (right side) are presented as a function of the conditions of Experiment 1.

Agreement with a blind observer who coded 25% of the sample was $r = 1.00$ for the number of boxes opened and $r = .96$ for touching the object to the switch (Intraclass correlation coefficients, Shrout & Fleiss, 1979).

**Results and discussion**

Preliminary analyses (for Experiments 1 and 2) revealed no significant effects for gender or box order so neither are considered further. Preliminary analyses (for Experiments 1 and 2) were also conducted using non-parametric analogues. As they did not alter any of the conclusions, only the results of the parametric analyses are reported here.

The primary finding was that the children’s tendency to copy the model’s specific actions was significantly affected by condition, $F(3, 44) = 52.47, p < .001, \eta^2 = .79$. As shown in Figure 1 (left side), Tukey LSD post-hoc tests indicated that children were more likely to use the object in the Live condition than in the Video Familiar ($p = .001$), Video Unfamiliar ($p = .008$) or the No Model Control conditions ($p < .001$). Thus, supporting our hypothesis, the children presented with a live model were more likely to copy her exact, but inefficient, actions than the children who saw a videotaped model. The children were also more likely to use the object in the Video Familiar and the Video Unfamiliar conditions than in the No Model Control conditions ($p < .001$ for both comparisons), thus indicating that they did learn from the videos how the object could be used.

Emphasizing the inefficiency of using an object, the children opened the box with the object on only 24 of the 87 individual trials in which they attempted to do so. Thus, in line with Nielsen (2006), even when children used the object in an attempt to activate a switch they were not particularly successful at doing so.

Our finding that children copy a model’s inefficient actions is consistent with past studies (Gergely, Bekkering & Kiraly, 2002; Horner & Whiten, 2005; Melzoff, 1988; Nagell, Olguin & Tomasello, 1993; Nielsen, 2006) showing that even when a more efficient means was
available, children persisted in copying a live model's exact actions. However, when the opportunity for spontaneous contingent interaction was removed, as with the videotaped models in this research, the children were less inclined to copy her precise actions. This finding is in line with views that young children's tendency to imitate a model's precise actions is influenced by their opportunity to engage socially and sustain interaction.

In contrast, however, there was no significant difference in the number of boxes the children successfully opened across condition, $F(3, 44) = 1.30, ns, \eta^2 = .08$. As shown in Figure 1 (right side), the children were equally likely to produce the target outcome (i.e. open the boxes) whether they had previously seen a model do so or not. This seemingly counterintuitive finding can be explained by the specific actions the children employed when attempting to open the boxes. Through exploration, some of the children in the No Model control condition were able to discover that the boxes could be opened, and they used their hands to do so. In contrast, children who saw a model were inclined to follow her use of the object to activate the switches, thereby diminishing their ability to open the boxes (as previously noted, the switches are intentionally more difficult to activate by object than by hand). This pattern is in line with Nielsen's (2006) findings and can explain why the results reported here may appear to contradict prior research showing higher rates of imitation from a live model than from a video model (Barr & Hayne, 1999; Hayne et al., 2003). That condition did not affect the number of boxes the children successfully opened also raises a pertinent point. Assessing solely whether or not the outcome of a modeled action is produced, without evaluating the degree to which the specific action is matched, can miss vital information regarding children's imitative tendencies. Indeed, in the current task, a focus only on box opening would lead to a false conclusion that the children were not imitating.

The post-hoc tests also showed that the children did not copy the videotaped model's specific actions more, given that she appeared on the TV monitor and was present in the room (and hence was socially available). That this expectation was not confirmed is nonetheless consistent with prior research (Hayne et al., 2003) showing that children imitate a televised model at comparable rates regardless of whether or not they have previously interacted with her. This differs from findings that children's imitation from a live model is influenced by familiarity (Learmonth et al., 2005; Slaughter et al., 2008). One possibility is that the children in the video conditions simply failed to connect the model on television with the experimenter.

Due to prior experiences with television, children may not expect information presented via this medium to be related to their current situation (Troseth, 2003a, 2003b; Troseth & DeLoache, 1998; Troseth, Saylor & Archer, 2006). Troseth et al. (2006) tested this using DeLoache's (1991) object-retrieval task. A live or televised experimenter told 24-month-olds where a toy hidden in an adjacent room could be found. When the experimenter directly told the children the toy's location they usually found it, but they failed to do so when the televised experimenter presented the information. Troseth et al. argued that the asocial nature of television contributes to children's expectations that it is not related to current situations.

Troseth et al. (2006) next explored whether children could be taught to use information from television if they first communicated with a person on video. Thus, 24-month-olds received experience with interactive video using a two-way closed-circuit TV system prior to the retrieval task. The experimenter on the video responded contingently to the children and provided information about the environment. The children successfully located the toy when given social experience with a person on television. Similarly, Meltzoff (1988) showed that infants can imitate a single-step action from television when it is presented using closed-circuit technology. We used this approach in Experiment 2 to further investigate 24-month-olds' imitation of television models.

**Experiment 2**

The children in Experiment 1 may have been less likely to copy a model's exact actions from a TV demonstration than from a live demonstration because they did not view television as providing social information relevant to their current circumstances (Troseth et al., 2006). If this is so, children should copy a televised model's specific actions if they understand that live video can provide them with information relevant to the here and now. We tested this hypothesis in Experiment 2 by presenting the children with a televised model who interacted with them via closed-circuit video prior to the task.

**Method**

**Participants**

There were 42 24-month-olds ($M = 24$ months 13 days; $SD = 20$ days), 21 girls and 21 boys. Four additional children were excluded because they were fussy. The sample demographics and recruitment procedures were as in Experiment 1. An equal number of children were assigned to the Interactive, Non-interactive, or Baseline Noninteractive conditions.

**Apparatus**

The boxes and objects from Experiment 1 were used. A small heart-shaped box concealed beneath a blue cloth.
on the test table was also included. A floor-to-ceiling curtain divided the testing room into two spaces connected by a closed-circuit television system. The smaller space was for the model and contained a table and chair facing a video camera and television. The TV and camera in the smaller space were linked to a second TV (51 cm monitor) and camera in the larger space positioned at one end of a table and chair set for the children. This closed-circuit TV system enabled a live-video stream to be relayed to each television so that experimenter and child could interact with each other in real-time.

Procedure

Interactive condition: Following a warm-up, the mother and child sat together at the table in the larger space facing the television and camera. The experimenter said, ‘See you soon!’ and withdrew behind the curtain. She sat at the table and turned on the televisions with remotes so that she and the child could see each other on their respective screens. The experimenter smiled, saying: ‘Hello [child]!’ and commenced a 2 min standardized interaction via the closed-circuit television system (cf. Troseth et al., 2006; see Appendix). The volume on the child’s television was turned up so that the model could not be directly heard speaking from behind the curtain. First she asked the child a series of questions; if the child did not respond the mother was requested to answer. Next she said: ‘Can you get that for me?’ while pointing to the lower left corner of the monitor towards the cloth concealing the box. If the child did not get the box, the mother was asked to pass it to her child. The experimenter engaged the child in a discussion about the box.

Finally, the experimenter said: ‘Look at this!’ and she placed a test box and its object on the table for the demonstration. After modeling the target action three times, the experimenter remotely turned off the child’s television monitor and emerged from behind the curtain with the box and object. She put them in front of the child for the 60 sec test session, which was identical to that used in previous conditions. The procedure was repeated for the remaining two boxes.

Baseline Noninteractive condition: It is possible that the performance of the children in the Non-interactive condition could be affected by the experimenter using another child’s name and discussing potentially irrelevant topics (e.g. siblings, pets). To circumvent this problem, we presented children with a pre-recorded video of the experimenter engaging in a similar communication; although she asked the same questions (e.g. ‘Have you got a brother or sister?’) she did not make any references to the child’s name or gender. She paused after asking each question before responding: ‘Really? That’s great!’ Thus, the children received the same exposure to the experimenter as in the other conditions, but the non-contingent communicative component did not contain any personal information that could be irrelevant to the participant. The procedure was the same as in the Noninteractive condition.

Results and discussion

As in Experiment 1, the primary finding was that the children’s tendency to copy the model’s specific actions (i.e. to touch a switch using an object) was significantly affected by condition, $F(2, 39) = 7.21, p = .002, \eta^2 = .27$. As shown in Figure 2 (left side) Tukey LSD post-hoc tests indicated that children were more likely to use the object in the Interactive condition than in the Non-interactive or the Baseline Noninteractive conditions ($p = .037$ and $p = .001$, respectively). There was no difference between the Noninteractive conditions.

Thus, supporting our hypothesis, the children who experienced contingent social engagement with the model on TV were more likely to copy the behavioral means she used to produce the outcome than children who did not have this social interaction. Furthermore, the children in the Interactive condition performed no
differently from the children in the Live condition from Experiment 1, \( t(24) = .11, ns \). This is consistent with Troseth et al.'s (2006) findings that after engaging with a televised model 24-month-olds used her information to guide their search behavior.

With regard to using the object, the children in the two noninteractive videotape conditions of Experiment 2 performed no differently from the children in the two videotape conditions from Experiment 1, \( F(3, 48) = .75, ns \). Therefore it was not merely extended time observing the model on television prior to the test that affected the way in which the children imitated; they required social engagement to be motivated to copy her exact actions. This finding further reinforces the claim that the yoked-design used for the Non-interactive condition did not adversely affect the children's imitation of a videotaped model. Having the experimenter address them on television by another child's name and discuss matters not relevant to them did not change their copying behavior relative to children who did not have this experience but still viewed a videotaped demonstration (as in the video conditions in Experiment 1 and the Baseline Noninteractive condition in Experiment 2).

As in Experiment 1, there was no significant difference in the number of boxes the children opened across conditions, \( F(2, 39) = 0.90, ns, \eta^2 = .04 \). Thus, as shown in Figure 2 (right side), the frequency with which children copied the modeled outcome (i.e. successfully opening the boxes) was not affected either by the social contingency of the televised model or by observing the videotaped experimenter direct questions to another child. Furthermore, a cross-experimental comparison showed that the children in Experiment 2 opened boxes at the same rate as the children in Experiment 1, \( F(6, 83) = 1.48, ns \).

**General discussion**

The research reported here substantiates the notion that children's imitative behavior is affected by the social nature of the model. It adds to literature exploring the cognitive and skill acquisition function of imitation, showing that it also serves an interpersonal function that promotes social engagement. To demonstrate this novel aspect of imitation, the present research manipulated the sociability of the model by presenting 24-month-olds with a live or video model (Experiment 1) and by manipulating the social availability of the video model (Experiment 2).

In Experiment 1 the children strived to copy the exact actions of a socially engaging model even though it was an inefficient way of achieving the outcome. In contrast, when the model could not provide contingent social feedback because she appeared on videotape, the children were less likely to copy her exact actions. This supports Uçgiris' (1981) argument that children imitate for interpersonal reasons and is consistent with proposals that children can engage in imitation to establish and sustain social interactions (for review see Nielsen et al., 2006). Further, this research adds a socially based explanation for prior findings that 24-month-olds tend to copy the specific behavioral means used by a model to achieve an outcome (Call, Carpenter & Tomasello, 2005; Huang, Heyes & Charman, 2006; Tennie, Call & Tomasello, 2006; Tomasello, Savage-Rumbaugh & Kruger, 1993), and will do so even if a simpler method is available (Horner & Whiten, 2005; Nagell et al., 1993; Nielsen, 2006). Socially based explanations can also account for recent findings that 3- and 5-year-olds are more inclined to copy irrelevant actions presented by a live model than by a video model (McGuigan, Whiten, Flynn & Horner, 2007) – findings that McGuigan et al. acknowledge cannot be explained by views of imitative behavior which emphasize age-related increases in cognitive sophistication and causal understanding.

It has been proposed that children do not view people on television as relevant to their present situation (e.g. Troseth et al., 2006). Putting this to the test, in Experiment 2 children were presented with a televised model with whom they could interact. Now they copied her precise actions just as they did from the live model in Experiment 1. This contrasted with the children who observed a videotaped model who did not afford contingent social engagement; these children were more likely to devise their own means of opening the boxes. The imitative behavior of the children in the Interactive TV condition supports suggestions that the social relevance of the model is important to understanding the difficulty children have in learning from this medium (Troseth et al., 2006).

A number of studies have documented children's poor performance when cognitive tasks they would otherwise pass are presented on television. In what has been termed the video deficit (Anderson & Pempek, 2005), when compared to live equivalents, children show diminished performance on tests of object-retrieval (Deocampo & Hudson, 2005; Troseth, 2003b; Troseth & DeLoache, 1998), imitation (Barr & Hayne, 1999; Hayne et al., 2003; Klein, Hauf & Ascherleben, 2006; McCall et al., 1977), and self-recognition (Suddendorf, Simcock & Nielsen, 2007). Other than expectations based on experience, accounts for children's difficulty understanding television have included their failure to appreciate the representational nature of symbols such as television (DeLoache, 2004; Troseth & DeLoache, 1998) and the challenges of interpreting degraded perceptual attributes of small-scale 2-D televised images (Barr & Hayne, 1999; Schmitt & Anderson, 2002; Suddendorf et al., 2007). All these factors no doubt play a role in children's developing understanding of television. However, when the children here were given a socially responsive partner on television, who could hear and see what they were doing, the children learnt from her just as they did from a live model. The opportunity for social interaction can clearly circumvent the video deficit and can contribute to our understanding of why children have difficulty with this medium (cf. Troseth et al., 2006). Thus, the present
results cannot be attributed to the difficulty children have understanding degraded 2-D televised representations relative to their corresponding 3-D objects as they responded to a televised model as they did to a live model.

Interestingly, there is evidence to suggest that whereas the video deficit clearly impacts on infants' learning from TV from 18 months on, 12- and even 6-month-olds are not as heavily affected (Barr, Muentener & Garcia, 2007; Mumme & Fernald, 2003). Twelve-month-olds are also less inclined than 18-month-olds to engage in imitative exchanges in which the social and communicative aspects of copying are emphasized (Nielsen & Dissanayake, 2004), and they similarly focus less on the actions used by a model (Nielsen, 2006). Further exploration of the ways in which young infants' ability to learn from TV is affected by the level of infant–model contingency and the sociability of the model thus promises to yield deeper insights into the video deficit.

As others have shown, children are not blind imitators: Their copying behavior is guided by a range of dimensions including the model's apparent intentions (Carpenter, Akhtar & Tomasello, 1998; Carpenter, Call & Tomasello, 2002; Meltzoff, 1995), goals (Bekkering, Wohlschläger & Gattis, 2000; Carpenter, Call & Tomasello, 2005), as well as the rationality of the model's behavior given the constraints of the modeling situation (Gergely et al., 2002) and their capacity for identifying the affordances of the target objects (Huang, Heyes & Charman, 2002). Children will also copy what they think the model is trying to communicate to them (Gergely & Csibra, 2005, 2006; Gergely, Egyed & Király, 2007). They might therefore imitate strange or irrelevant actions because they interpret these actions as having been demonstrated for them and hence assume that such actions must accrue some benefit that is not immediately obvious. The present research adds to this list by underscoring the relevance of the often-overlooked interpersonal function of imitation: The way in which 24-month-olds copy others is influenced by opportunities for social interaction.

It is thus notable that the results reported here contrast with those from Nielsen (2006, Experiment 3). Recall that children presented with an aloof model copied her specific actions at equivalent rates to children presented with a social model, yet they were less likely to produce the outcome of these actions. Rather than seeming incompatible with this previous finding, the present results emphasize that it is not simply the availability of social interaction that impacts children's copying behavior but the nature of that interaction (see also Repacholi & Meltzoff, 2007).

These findings inform our understanding of children's social learning while having potentially important implications for the way in which children's television programs are designed. Whereas most learning takes place within an interactive milieu, learning from television does not. The present results suggest that, as it is not interactive in nature, incorporating social cues into television shows may not, to any meaningful extent, facilitate children's comprehension and ability to relate the content to their daily lives. Given the ongoing emphasis on television as an educational tool, continued exploration of these issues is warranted.

Our primary aim in the current research was to explore how children's imitative behavior can be mediated by socially oriented motivations, and to contrast this with more widespread views that emphasize imitation as a means by which children acquire new skills. Here we focused on situations in which the opportunity to use imitation as a means of initiating and/or maintaining personal interaction is removed. However, the social motivation we point to is likely to be multifaceted and can encompass multiple situations. Precisely what social motivations are at play and when they become activated remain topics for future research. It is also important to state that we do not maintain that all imitative behavior is solely socially driven or that cognitive accounts of imitation should be discarded. Rather, we wish to emphasize that socially based functions can be a critical component in directing the manner in which young children imitate and it is a component that warrants continued theoretical and empirical focus.

Appendix

Procedure instructions – Interactive condition

1. Social interaction:
   a. Allow 3 seconds for the child to answer each question.
   b. If the child's response is very quiet, repeat the question so you can hear it and respond.
   c. If the child does not respond to your questions, ask the parent to do so: e.g. 'Parents name> does <child's name> have a brother or sister?'

   Say: 'Hello <child's name>, hello <parent's name>. Can you see me? I can see you.'
   Ask the child general questions:
   1. Do you have a brother or sister? If yes:
      • What is his/her/their name(s)?
      • Hair color?
      • Bigger or smaller?

   Eventually move to:

   'I have a sister. Her name is Jenny. She's bigger than me. She has red hair.'

   If no, move directly to above.

   For each of the following, ask (as with the above) general, leading questions and relate them to yourself (either real or made up).

   2. Have you got a pet? What kind, name, color?
   3. What is your favorite color?
4. Do you have some toys at home?
5. What is your favorite toy?

2. Box interaction:

Point to the bottom left corner of the monitor and say: ‘I can see something there, can you get it for me?’

Allow the child to retrieve it, if not, ask the mother to do so.

Specific points and questions about the box:

• ‘Can you find the blue balloon for me?’
• ‘I like the red heart the best, can you see it?’
• ‘Can you open the box up?’ and ‘Look, it’s empty.’

3. Imitation session:

‘Now look, I’m going to show you how to do something.’

Model 3 times opening Box 1 with its associated object – each time make sure it is shut under the table (i.e. out of view).

After the third demonstration say: ‘Now <child’s name> it’s your turn. Just wait there.’

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