

Young Children's Understanding of Photo Self-Representations¹

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ABSTRACT

This experiment examined delayed self-recognition in 24 2.5-year-old and 24 3-year-old children. Children were marked covertly with a sticker on their forehead while playing a game, after which their photograph was taken. When shown this photograph, the 3- but not the 2.5-year-olds reached to remove this sticker reliably. However, the older children reached reliably only when first shown how a recently taken photograph can be used to guide their search for an object in the testing room that was not directly visible to the unaided eye. Implications of the findings in terms of the development of a temporally extended sense of self are discussed.

INTRODUCTION

Numerous researchers have used the mirror self-recognition (MSR) task to explore the development of self-recognition and mark directed behaviour (Amsterdam, 1972; Bertenthal & Fisher, 1978; Bigelow, 1981; Johnson, 1983; Lewis & Brooks-Gunn, 1979; Nielsen, Dissanayake, & Kashima, 2003; Vyt, 2001). However, when looking into a mirror we are confronted with our current self-image; as such, responses to the MSR test do not reflect an understanding of one's self through time (Povinelli, 1995). In order to explore the development of a temporally extended sense of self, Povinelli, Landau, and Perilloux (1996) developed the delayed self-recognition (DSR) test, which is a delayed analogue of the mirror mark test. The test of DSR differs from the test of MSR in that children must recognize an image of their self that contains a temporal dimension; whereas a mirror reveals who we are in the here and now, a delayed image reveals what we were like some time in the past, be that recently in the past or at a time point much further away from the present.

Whilst both delayed videotapes and photographs of the self have been used in the test of DSR (see Povinelli et al., 1996; Skouteris, Spataro, & Lazaridis, in press; Suddendorf, 1999; Zelazo, Sommerville, & Nichols, 1999), researchers have predominantly used briefly delayed videotapes. In relation to photographs we know that infants are able to discriminate between

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their own image and another child's in photographs by 9 months of age (Lewis & Brooks-Gunn, 1979), and they can recognize their parents' and their own photographic image from a set of photographs by 18 and 24 months of age, respectively (Bigelow, 1981). Infants can also label their video and photographic image by about 2 years of age (Bigelow, 1981; Lewis & Brooks-Gunn, 1979; Povinelli et al., 1996). However, responses to the question "Who is that?" when shown a delayed representation of self, such as a photograph or video representation, may not be appropriate measures of self-awareness (Skouteris et al., in press), and the ability to label one's photographic image may not reflect an understanding of the self's continuity through time.

Povinelli et al. (1996) were the first to use photographs to test for DSR in 3- and 4-year-old children. In their test of DSR, an experimenter places a large sticker covertly on a child's head during a game and a photograph is taken to show the child (with a sticker on their forehead), the main experimenter, and a large stuffed toy. Having the experimenter and the large stuffed toy in this photograph serves to provide distinct temporal markers for the children to understand that the photograph represents a particular moment in the recent past. Povinelli et al. argued that if children have developed a temporally extended sense of self they should recognise their briefly delayed image in the photograph and reach up to remove the sticker when prompted to do so, if not immediately. Only 13% of the 3-year-olds in Povinelli et al.'s sample did so. In contrast, almost all of the 4-year-old children reached to remove the sticker when shown the photograph. Similar findings were revealed when delayed videotapes were used as opposed to photographs. Povinelli et al. concluded that 3-year-old children fail the test of DSR because they have a temporally restricted sense of self whereas 4-year-olds pass because they have a temporally extended sense of self.

Given that most 3-year-old children have had lots of experience with photographic images of themselves, it may seem surprising that they fail to pass the test of DSR when photographs are used. However, researchers have argued that the average 3-year-old appears to have difficulty understanding what is represented in this type of delayed representation. Flavell, Flavell, Green, and Korfmacher (1990) showed that 3-year-olds were relatively poor on photograph tasks that involved predicting whether objects depicted in a photograph would fall out if the photograph was inverted or whether people in a photograph could hear the experimenter banging on a drum. Surprisingly, 3-year-olds made errors on these tasks even when corrective feedback was provided to help them understand that things cannot fall out of photographs and people in photographs cannot perceive the "real world" so to speak. Flavell et al. argued that children at this age appear to be considering only the actual physical properties of the referent and do not take into account the fact that the photograph is a representational medium. It is possible that delayed images, such as photographs, present conflict for 3-year-olds because what they believe to be true is in fact not true; that is, when you tip a "real" (not photographed) uncovered box with things in it upside down, the contents are likely to fall out.

Zaitchik (1990) also argued that when photographic information conflicts with current reality, 3-year-old children may rely on what they believe to be true rather than what they see in the photograph. Zaitchik used a false belief task to examine children's beliefs about the content of photographs when the referent object was moved after being photographed. Three-year-old children failed this task consistently even when given probe questions to assist them in making early inferences about where the objects were located in relation to when the photograph was taken. It appears that 3-year-olds have difficulty retrieving information from a photograph to solve a problem that relates to the current state of affairs (such as the location of a hidden object) when that delayed representation conflicts with their reality.

Given that in the test of DSR children do not know that a sticker has been placed covertly on their forehead, a photograph revealing such a sticker is in congruence with their perception of the present state of affairs. Hence, in order to pass this test children must have two kinds of understanding: (1) an understanding that the delayed medium can reveal information about an event or object that cannot be seen by the unaided eye, and (2) an understating of the casual

connection between their self, as depicted in the recent past, and their present physical self. When children acquire the second understanding, Povinelli (1995) argued they have developed a "*proper self*" (p. 167). The proper self, otherwise known as the temporally extended self, is considered a higher order representation of the self that allows children to hold in mind multiple and contradictory representations of the self (past, present, and future states) that refer to the same entity. According to Povinelli (1995), this system of self-representation, that is capable of temporal differentiation, takes over at about 4 years of age and replaces the initial system of self-representation, referred to as the "*present self*", that is restricted largely to 'the here and now' (p.165). Povinelli et al.'s (1996) DSR findings accord with this theory as do the findings of Povinelli and Simon (1998). Povinelli and Simon also showed that 4- but not 3-year-old children passed the test of DSR reliably when shown a 3-minute delayed video recoding of their marked self image, as opposed to a video recording that was taken one week earlier and depicted the child on a completely different day and in a different context.

In a recent experiment, we provided pre-test video familiarisation to facilitate the first kind of understanding and this, we argued, would enable 3-year-old children to show they have the second (Skouteris et al., in press). We proposed that the poor performance of 3-year-old children in previous DSR experiments was due to a lack of appropriate pre-test training, rather than to a restricted sense of self as suggested by Povinelli et al. (1996). We explored Zelazo et al.'s (1999) assumption that 3-year-old children's difficulty in recognising themselves in delayed media representations may reflect a more general difficulty in using the video image as a spatial referent and, in so doing, questioned Suddendorf's (1999) conclusion that Povinelli et al.'s test of DSR may not be a valid measure of self-awareness. In our pre-test video familiarisation trials an object was hidden in a location of the test room that was not directly visible to the child, such as under the table at which the child sat. This "space" in the room was not visible to the child's unaided eye. However, when the videotape was played back, the child could see that an object was hidden under the table. By using the video image as a spatial referent, the child understood that objects that are not visible directly can still exist. Both 2.5- and 3-year-old children passed the pre-test training trials revealing they had no difficulty retrieving a hidden object from delayed video footage. Our findings, of both a cross-sectional sample and a prospective longitudinal one, also showed clearly that when no pre-test training was offered, 2.5- and 3-year-old children were not able to pass the test of DSR. The older children passed the test of DSR with little difficulty *only* when first trained to use the video to guide their search for an object that was otherwise not directly visible. In contrast, 2.5-year-old children did not reach to remove the sticker from their hair during the test of DSR despite receiving such pre-test video training. Whilst we concluded that children younger than 3 years of age appear to have a restricted sense of self, we also conceded that further research is needed to ascertain whether this is the case.

The aim of the experiment reported here was to determine whether the successful training procedure of Skouteris et al. (in press), with video as the delayed media representation, could be applied to photographs as an alternate type of delayed representation. Children aged 2.5 and 3 years were tested. Previous researchers agreed that it was not until 4 years of age that children reliably recognise themselves in delayed representations such as video and photographs (Povinelli et al., 1996; Suddendorf, 1999; Zelazo et al., 1999). Our previous findings have shown that not to be the case and support Zelazo et al.'s (1999) assumption that 3-year-old children's difficulty in recognising themselves in delayed media representations may reflect a more general difficulty in using the delayed image as a spatial referent. Our first hypothesis was based on Skouteris et al.'s conclusion that 3-year-old children appear to have a more mature proper self than argued by Povinelli (1995, 2001). Consequently, we predicted that if children at this age were first trained to understand that a photograph can show an object on one's self that is situated in a location that is otherwise not visible to them (i.e., on their hair) they would reach up to remove the sticker during the test of DSR significantly more often than children who were not given such pre-test training. Alternatively, in accordance with Povinelli et al.'s (1996) findings, if 3-year-old children do not have an

extended sense of self, DSR performance should be poor and should not differ statistically across the photograph training and no training conditions.

With respect to the 2.5-year-old children, if they have a restricted sense of self as suggested by Skouteris et al. (in press), pre-test training with photographs should not facilitate their DSR performance. In contrast, given that most 2.5-year-olds have had substantial experience with photographs, and understand that a photograph is a symbol that stands for something (DeLoache, 1991), it is possible that with the appropriate pre-test training children younger than 3 years will appreciate the causal link between recently delayed and present self images in a photograph. If the latter hypothesis is supported, the claim that 2.5-year-old children have a restricted sense of self will be challenged.

METHOD

Participants

The participants comprised 24 2.5-year-old children and 24 3-year-old children recruited from the Child Development Registry at La Trobe University. The children were predominantly Caucasian and from middle class families living in the Northern suburbs of Melbourne, whose parents gave informed written consent for their participation. The children in each age group were divided at random into two groups: no training condition: (6 girls, 6 boys; M age = 30.17 months, SD = 1.64 months) and (7 girls, 5 boys; M = 37.08 months, SD = 2.78 months), for the 2.5- and 3-year-olds, respectively; training condition: (5 girls, 7 boys; M age = 30.25 months, SD = 1.42 months) and (4 girls, 8 boys; M age = 37.58 months, SD = 2.68 months), for the 2.5- and 3-year-olds, respectively. An additional five children were tested; one 3-year-old and two 2.5-year-olds discovered the sticker prior to the test of DSR and two of the younger children did not complete the testing session due to fussiness. These children were not included in the final sample. A parent remained with their child during the entire testing session.

Materials

The room used for testing was 4.07m x 3.40m, with a beige floor-to-ceiling curtain covering the entire wall to the left of the experimental table and three colourful children's posters on the wall to the right. The experimental setting consisted of a small table for testing (113cm long x 50cm wide x 42cm high) and a small chair for seating the participants. This table was positioned in the middle of the room, with the child's chair facing away from the curtain covering the left wall. A chair for the child's mother was positioned behind and slightly to the right of the child's chair so that she was out of the child's sight but her image was visible in the photographs that were taken as part of the test of DSR. A mirror (59cm high x 37cm wide) was required to test participants who did not pass the test of DSR. In both the training and no training conditions six coloured plastic cups were required (each 10.5cm high with a base diameter of 9.5cm) under which the experimenter hid six toy animals. A colourful box was located on the floor just in front of the table at which the child sat. The children could not see this box when they were seated at the table. One square fluorescent yellow sticker (approximately 4.5cm square) was placed on each participant's head in the DSR marking procedure. A Polaroid Spectrum camera was used to take photographs during the test session.

Procedure

No training condition. The experimenter sat on one side of the table to be close to the child during this condition. The session was introduced as a game of 'hide and seek' in which

the experimenter would hide six toy animals under six different coloured cups. The animals and the cups were removed systematically from a colourful box that was next to the table at which the children sat and placed onto the table in front of the children. While the children were watching, each animal was hidden under one of the coloured cups, until all animals were hidden. The children were then asked to find one of the animals. If the children did not choose the correct cup they were encouraged to keep searching until the animal was found. When the animal was found the child was given praise in the context of having his hair ruffled; hence the proximity of the experimenter to the child. The hair was ruffled at this time to habituate the children to being touched on their foreheads, thus enabling, the experimenter to place a sticker there covertly during the marking procedure (see description below). This procedure was continued for another two animals that were hidden.

Training condition. In this experimental condition children were told that one of the toy animals (the toy was pointed out) was to be hidden somewhere in the room. The child was shown the Polaroid camera and was told that this camera took special pictures that would at first be invisible but would then show the child where a toy was hidden in the room. They were then asked to cover their eyes whilst the experimenter hid the animal in a cup or box that was hidden in a location that was not directly visible to the children in “real time” (i.e., in a cup under the table at which the children sat, in a colourful box in front of the table at which the children sat, and in a cup behind the curtain covering the left wall). The experimenter took a photograph of the toy next to the hiding place before actually hiding it (e.g., the toy was photographed next to the box before being placed into the colourful box). The photograph was taken from the front corner of the room to ensure that the child, the mother, the table at which the child sat, the colourful box and the curtain behind the child could all be seen in the photograph. The children were asked to watch while the photograph developed. This took approximately two minutes. The experimenter then pointed out the toy in the photograph and told the children that the photograph revealed where she had hidden the toy while their eyes were covered; at that point they were encouraged to locate the hidden toy. A correct response required the children to locate the hidden animal without prompting. If they could not locate the toy, the experimenter pointed the location out again in the photograph and gave the child another chance to find the toy. As with the no training condition, when the animal was found the child was given praise in the context of having his or her hair ruffled. In order to participate in the DSR testing, children were required to locate the hidden animal without prompting on at least two of three training trials. All of the children met this requirement.

Marking procedure. In the training condition, the marking procedure involved hiding the toy animals under cups that were placed on the table at which the children sat, whilst they shut their eyes. The children were once again encouraged to look for the hidden toys and after the fourth toy animal was found a sticker was covertly placed on their hair, just above the forehead. The experimenter then told the children that they were so good at finding all the toy animals that a photograph would be taken showing them with their toys. A photograph of each child, with the sticker clearly visible on their forehead, was taken; this photograph showed the mother sitting behind her child and depicted the cups and toy animals on the table at which the children sat. The mother and toy cups served as distinct temporal markers to facilitate the child's understanding that the photograph depicted what just happened 3 minutes prior.

The marking procedure for the no training condition was identical to that described for the training condition. However, given that the children were already playing the hide and seek game with toy animals being hidden under one of the cups on the table, the experimenter conducted a fourth trial and on this occasion when the child found the toy they were covertly marked with a sticker on their forehead as opposed to having their hair ruffled. The three children who discovered the sticker inadvertently prior to testing of DSR were excluded from the final sample.

Test of DSR. After the marking procedure the children watched while the photograph developed and were then asked four questions: “Who is that?” while the experimenter pointed

to the child in the photograph, "What is that?" while the experimenter pointed to the sticker, and "Where is the sticker really? Can you get it for me?" These questions were almost identical to the ones used by Povinelli et al. (1996). The index of DSR was whether the children reached up to locate the sticker on their head. The experimenter scored the response of each child during the test session.

Mirror self-recognition. If a child did not reach up to remove the sticker during DSR, that child was tested for MSR. The same four questions were asked in the test of MSR.

In order to ascertain whether children have had experience with photographs, each mother was asked to report on her child's exposure to this medium. Not surprisingly, all mothers reported that their child had previous experience with photographs and substantial exposure to his or her photographic image.

RESULTS

The dependent variable was whether or not children reached up to the sticker on their head during the test of DSR. A second experimenter observed the testing session of 16 children (four from each condition). Inter-rater reliability on reaching/not reaching for the sticker and on the type of verbal response given to the question "Who is that?" was 100%.

The number of 2.5- and 3-year-old children demonstrating DSR in both the training and no training conditions is shown in Table 1.

Table 1: Number of 2.5- and 3-year-old Children Exhibiting Delayed Self-recognition (DSR) in each of the Two Conditions: Pre-Test Photograph Training and No Training.

Condition	2.5-year-olds		3-year-olds	
	Yes	No	Yes	No
Training	4	8	10	2
No Training	3	9	4	8

A 2 (training or no training) X 2 (DSR or no DSR) chi-square analysis was carried out to examine the relationship between training on DSR for 2.5- and 3-year-old children. Training did not facilitate DSR in 2.5-year-olds, (Fisher exact test, $p = .50$). In contrast, a significant relationship between training and DSR was demonstrated for 3-year-old children (Fisher exact test, $p = .02$). More children in the training condition reached for the sticker than children in the no-training condition. All of the children (both 2.5- and 3-year-olds) who did not display DSR passed the test of MSR.

Children's verbal responses to the question "Who is that?" are shown in Table 2. All children used either their proper name or "me". A 2x2 chi square analysis revealed a non-significant relationship between age and verbal response used, $\chi^2_{(1)} = 0.87$; $p > .05$. The younger and older children did not differ in their use of self-reference phrases.

In relation to responses given to the question "Who is that?" as a function of task performance, 9 (42.9%) and 7 (37%) of the children who passed and failed the DSR test, respectively, responded with their first name, as opposed to "me". A chi square analysis revealed a non-significant relationship between DSR performance and verbal measures of self-recognition, $\chi^2_{(1)} = 0.67$; $p > .05$.

Table 2: Frequencies of Verbal Labelling of Delayed Self-Image Across the Two Age Groups.

AGE	Verbal Labels	
	"Me"	Proper Name
2.5 years	10	14
3 years	9	15

DISCUSSION

As expected, 3-year-old children reached up to remove the sticker from their forehead when first given the appropriate pre-test training with photographs. However, despite the exposure young children have with photographs, the causal connection between one's briefly delayed self-representation and current reality was not obvious to 3-year-old children when they were untrained prior to the test of DSR, even though there was no secrecy surrounding the fact that their photograph was taken and the sticker on their forehead was pointed out to them. This latter finding concurs with that reported by Povinelli et al. (1996). In contrast, 3-year-olds were able to use information from a photograph to retrieve a hidden toy, as was also the case in Skouteris et al. (in press) when video was used as the delayed medium.

Our findings suggest that by 3 years of age children understand that their self moves through time, in so far as they can respond to a briefly delayed image of themselves and remove a sticker that has been placed covertly on their forehead. This finding does not support the findings of Povinelli et al. (1996), who also used photographs in the test of DSR, nor does it support the findings of Suddendorf (1999) and Zelazo et al. (1999) who showed that 3-year-olds perform poorly in the test of DSR when video recordings are used. Whilst Povinelli et al. and Povinelli and Simon (1998) argued that 3-year-old children may develop a less sophisticated form of the proper self that enables them to hold in mind different states of self (past, present, and future) but does not enable them to bind these different states over time, our findings suggest that 3-year-olds may indeed have a more mature proper self. It appears that a lack of pre-test training may have masked this maturity in previous research examining DSR performance in children of this age; when pre-test training was provided to facilitate 3-year-old children's understanding that delayed representations can reveal information about an event or object that cannot be seen by the unaided eye, they passed the test of DSR.

Our findings showed clearly that 2.5-year-olds performed poorly on the test of DSR in both the pre-test training and no training conditions. We were not surprised by this finding given our previous research with children of this age (Skouteris et al., in press). We were also not surprised by the finding that 2.5-year-olds have the representational capacity to pass photograph object retrieval-tasks that are not specific to the self, as was required in the pre-test training. This finding is in line with two recent studies by Suddendorf (2003) and Troseth (2003) who showed that even 24-month-olds have this ability. Furthermore, this finding is in line with DeLoache's (1991) research that showed 2.5-year-olds were able to find a hidden toy in a large room when shown a photograph of a scale model of that room. In contrast, it appears that 2.5-year-old children do not have the representational capacity to solve a retrieval problem based on delayed *self*-information. Despite the fact that the younger children were trained successfully to use information from a photograph to retrieve a hidden toy, they could not use this source of information to guide their search of the sticker in their hair. This finding suggests that success on the DSR task may require a more advanced level of representational insight than object-retrieval tasks.

According to Suddendorf (1999), children who have not developed metarepresentational thinking might pass the task of DSR by matching features from the delayed image to current

reality. Whilst this might be the case, Povinelli (2001) argued that the most salient aspect of one's present self-representation is kinaesthetic information. Given that photographs do not provide such kinaesthetic information, Povinelli reasoned that children without a developed proper self will conclude, more often than not, that the image in the is not the same as themselves and hence not reach for the sticker. We have shown this to be the case with 2.5-year-olds in several experiments now (in two experiments in Skouteris et al. (in press), and in the experiment here). Interesting, the children who did not reach for the sticker were able to label their delayed image correctly by using either their proper name or saying "me". As our findings revealed though, responses to the question "Who is that?" may not be appropriate measures of self-awareness because there was no association between the type of label used by the children in response to their delayed image and performance on the DSR task. In accordance with Smiley and Huttenlocher (1995), it appears that the use of a proper name is as much an index of self-recognition as is the use of a first person pronoun.

Povinelli (2001) also argued that if children have developed a proper self, reaching for the sticker during the test of DSR should be reliable. As with the unreliable reaching of 2.5-year-olds, we have shown this reliable reaching in 3-year-olds in several experiments now (in two experiments in Skouteris et al. (in press), and in the experiment here); this reliable reaching occurs only when 3-year-olds are *first* provided with the appropriate pre-test training. If, overall, children were responding to the featural equivalence of the delayed image and their present self then a difference in reaching behaviour between 2.5- and 3-year-old children should not have been revealed, especially given that both the 2.5- and 3-year-olds here had no problem retrieving a hidden object from photographic information provided to them in the training trials.

Whilst the present findings and those of Skouteris et al.'s (in press) study revealed that children of both ages, 2.5 and 3 years, had no difficulty retrieving a hidden object from photographs or from delayed video footage, the pre-test training trials in either of these studies did not involve a "surprise". Children were told clearly by the experimenter that one of the toy animals was to be hidden somewhere in the room and that the photograph or video footage would help them to locate that hidden object. It is possible, therefore, that the pre-test training primed the children to look for a hidden object³. In contrast, the sticker placed on the child's hair during the DSR task was done so covertly; as such the child was not primed to expect to look for a hidden object on self when shown their delayed self-image. Whereas the older children were able to transfer from the pre-test training that involved priming to the test of DSR that did not involve priming, the 2.5-year-old children could not. It is possible that 2.5-year-olds needed additional pre-test training to perform the DSR task successfully, such as delayed self-image experience. Indeed, Troseth (2003) showed that giving 2-year-old children extensive experience with their live self image facilitated their performance on a live object-retrieval task, a task that had traditionally only been passed by 2.5-year-olds (Troseth & DeLoache, 1998). Future research should explore this possibility⁴.

In conclusion, our findings suggest that 2.5-year-old children can make inferences about objects in space (i.e., a toy hidden somewhere in the room) before they can make inferences about an object on their own bodies (i.e., a sticker on my hair) when using delayed representations and that their difficulty with the latter task may arise because of a restricted sense of self. We argue that changes in DSR performance from unsuccessful, at the age of 2.5 years, to successful, at 3 years of age, may be due to the transition from a present to a proper self. While Povinelli (1995, 2001) described this transition he may have underestimated the age at which a mature proper self emerges.

³ We thank an anonymous reviewer for this point.

⁴ Unpublished data in our laboratory has shown that delayed self-image experience in addition to pre-test training does *not* facilitate DSR performance in 2.5-year-old children.

REFERENCES

- Amsterdam, B. (1972). Mirror self-image reactions before age two. *Developmental Psychology*, 5, 297-305.
- Bertenthal, B.I., & Fischer, K.W. (1978). Development of self-recognition in the infant. *Developmental Psychology*, 14, 44-50.
- Bigelow, A.E. (1981). The correspondence between self and image movement as a cue to self-recognition for young children. *The Journal of Genetic Psychology*, 139, 11-26.
- DeLoache, J. S. (1991). Symbolic functioning in very young children: Understanding of pictures and models. *Child Development*, 62, 736-752.
- Flavell, J.H., Flavell, E.R., Green, F.L., & Korfmacher, J.E. (1990). Do young children think of television images as pictures or real objects? *Journal of Broadcasting and Electronic Media*, 34(4), 399-419.
- Johnson, D.B. (1983). Self-recognition in infants. *Infant Behaviour and Development*, 6, 211-22.
- Lewis, M., & Brooks-Gunn, J. (1979). *Social cognition and the acquisition of self*. New York: Plenum Press.
- Nielsen, M., Dissanayake, C., & Kashima, Y. (2003). Self-other discrimination and the emergence of mirror self-recognition: A longitudinal investigation through the second year. *Infant Behaviour and Development*, 26, 213-226.
- Povinelli, D. J. (1995). The unduplicated self. In P. Rochat (Ed.), *The self in infancy: Theory and research* (pp. 161-192). Amsterdam: North Holland/Elsevier Science Publishers.
- Povinelli, D. J. (2001). The self: Elevated in consciousness and extended in time. In C. Moore & K. Lemmon (Eds.), *The self in time: Developmental perspectives* (pp. 75-95). Mahwah, NJ: Erlbaum.
- Povinelli, D. J., Landau, K. R., & Perilloux, H. K. (1996). Self-recognition in young children using delayed versus live feedback: Evidence of a developmental asynchrony. *Child Development*, 67, 1540-1554.
- Povinelli, D. J., & Simon, B. B. (1998). Young children's reactions to briefly versus extremely delayed images of the self: Emergence of the autobiographical stance. *Developmental Psychology*, 34, 188-194.
- Schmitt, K. L., & Anderson, D. R. (2002). Television and reality: Toddlers' use of visual information from video to guide behaviour. *Media Psychology*, 4, 51-46.
- Skouteris, H., Spataro, J., & Lazaridis, M. (in press). Young children's use of a delayed video representation to solve a retrieval problem pertaining to self. *Developmental Science*.
- Smiley, P., & Huttenlocher, J. (1995). Conceptual development and the child's early words for events, objects, and persons. In M. Tomasello and W. Merriman (Eds.). *Beyond names for things: Young children's acquisition of verbs*. Lawrence Erlbaum and Associates: New Jersey.
- Suddendorf, T. (1999). Children's understanding of the relation between delayed video representation and current reality: A test for self-awareness? *Journal of Experimental Child Psychology*, 72, 157-176.
- Suddendorf, T. (2003). Early representational insight: Twenty-four-month-olds can use a photo to find an object in the world. *Child Development*, 74, p. 896-904.

- Troseth, G. L. (2003). TV guide: Two-year-old children learn to use video as a source of information. *Developmental Psychology, 39*, 140-150.
- Troseth, G. L., & DeLoache, J. S. (1998). The medium can obscure the message: Young children's understanding of video. *Child Development, 69*, 950-965.
- Vyt, A. (2001). Processes of visual self-recognition in infants: Experimental induction of 'mirror' experiences via video self-image presentation. *Infant and Child Development, 10*, 173-187.
- Zaitchik, D. (1990). When representations conflict with reality: The pre-schooler's problem with false beliefs and "false" photographs. *Cognition, 35*, 41-68.
- Zelazo, P. D., Sommerville, J. A., & Nichols, S. (1999). Age-related changes in children's use of external representations. *Developmental Psychology, 35*, 1059-1071.