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Visual self-recognition in mirrors and live videos: Evidence for a developmental asynchrony

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Abstract

Three experiments ($N = 123$) investigated the development of live-video self-recognition using the traditional mark test. In Experiment 1, 24-, 30- and 36-month-old children saw a live video image of equal size and orientation as a control group saw in a mirror. The video version of the test was more difficult than the mirror version with only the oldest children's performance approaching ceiling. In Experiment 2, most 24-month-olds showed self-recognition when presented with a TV-set that featured a mirror in place of a screen. This finding does not substantiate the possibility that expectations about what appears on TV are responsible for the asynchrony. In Experiment 3, children were given a mark-test involving only their legs. Again, a video version was more difficult than previously reported performance with mirrors, suggesting that the impossibility of eye-contact in video cannot explain this developmental asynchrony. The findings suggest that self-recognition can be added to the growing list of contexts in which 2-year-olds display what has been called a "video deficit" [Anderson, D. R., & Pempek, T. A. (2005). Television and very young children. *American Behavioral Scientist*, *48*, 505–532].

Keywords: Self-recognition; Video; Mirror; Video deficit

1. Introduction

To test self-recognition in children and animals, Amsterdam (1972) and Gallup (1970) developed a now widely used task in which the subject's head is surreptitiously marked (e.g., with rouge or a sticker) and the subject is then presented with a mirror. By 24 months most children investigate their own head upon seeing the surprising mark in the mirror (Amsterdam, 1972; Lewis & Brooks-Gunn, 1979; Nielsen & Dissanayake, 2004). The only other primates that have passed the task are great apes (e.g., Gallup, 1970; Patterson & Cohen, 1994; Suarez & Gallup,

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1981). Though widely used, the task has attracted considerable debate and it remains contentious what performance indicates (e.g., Anderson, 1984; Bard, Todd, Bernier, Love, & Leavens, 2006; Courage, Edison, & Howe, 2004; Gallup, 1998; Heyes, 1998; Mitchell, 1993, 1997; Povinelli, 1995; Rochat, 2003; Suddendorf & Whiten, 2001).

Recently, variants of the classic task have been used to empirically address some of the possibilities. Nielsen, Suddendorf, and Slaughter (2006) placed children in a highchair that prevented direct view of their legs and then surreptitiously placed a mark on a leg rather than on the face. When a mirror offered children the opportunity to inspect their legs they reached for the mark just as they did in the classic face version of the mark task. These results speak against proposals that claim the classic task measures developmental changes specifically related to cognitions about faces and other not-directly-visible parts of the body (Anderson, 1984; Hart & Fegley, 1994; Lewis & Brooks-Gunn, 1979; Neisser, 1993, 1995, 1997). In further studies, Nielsen et al. (2006) placed children into novel pants that were attached to the high chair. In one condition, they were first given 30 s to view these novel pants, in another they had no opportunity to observe the pants directly. Next, a sticker was surreptitiously put on these pants and children were given the opportunity to view their legs in a mirror. Children who had the brief prior exposure performed like those in the first study, whereas children in the no-exposure condition failed to reach for the mark. These findings suggest that passing the classic task does reflect that children have developed an idea of what they look like and that this expectation is rapidly updateable. They substantiate claims that the task does assess self-recognition (e.g., Anderson, 1984; Courage et al., 2004; Gallup, 1998; Gergely, 1994; Lewis & Ramsay, 1999; Nielsen, Dissanayake, & Kashima, 2003; Suddendorf & Whiten, 2001).

Other aspects of the debate may be resolved through further experimental modifications of the classic task. One particularly promising variant involves using video as stimulus material (Gallup, 1994). Clever manipulation of video feedback involving, for example, comparison of performance on live video with conditions in which the image is distorted or delayed, might be able to identify what the necessary and sufficient cues are for passing the test (e.g., contingency or feature cues). In a seminal paper, Povinelli, Landau, and Perilloux (1996) (see also Povinelli & Simon, 1998), for example, introduced a delay in the feedback. Children were shown a video-clip of an experimenter surreptitiously marking their head three minutes earlier. Only by around age 4, 2 years after they typically pass the mirror version of the task, did children consistently reach for the mark on their head upon seeing the video. With contingency information removed (or better delayed) younger children failed to recognize the relation between the image and their current situation. The authors attributed this asynchrony in the development of self-recognition to a conceptual change from a present self, as indicated by recognition in live feedback, to a proper or temporally extended sense of self (but see Suddendorf, 1999; Zelazo, Sommerville, & Nichols, 1999).

The rationale for this attribution, however, rests in part on the common assumption that, since both contingency and feature cues are similar, the live-video baseline is "in effect a mirror" (Lewis & Brooks-Gunn, 1979, p. 71). Indeed, it is often assumed that children can recognize themselves in both media by about age 24 months (Brooks-Gunn & Lewis, 1984; Miyazaki & Hiraki, 2006). A closer look at the data, however, suggests that this may not be so. Only 62% of 3-year-olds (range = 30–42 months) passed the test in the live-video control condition of Povinelli et al. (1996) (Experiment 3). There are two further reports in the literature that suggest self-recognition in live videos may be more difficult than in mirrors (Johnson, 1983; Vyt, 2001).

Video images differ from mirror images in numerous ways, including clarity, resolution, luminance and depth cues. However, two salient differences have been singled out as likely reasons for increased difficulties in video self-recognition tasks. One reason is that images on a TV monitor