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Delayed self-recognition in autism: A unique difficulty?

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ABSTRACT

Achieving a sense of self is a crucial task of ordinary development. With which aspects of self do children with autism have particular difficulty? Two prior studies concluded that children with autism are unimpaired in delayed self-recognition; we confirm and clarify this conclusion by examining it in conjunction with another key aspect of self understanding, including several needed controls and contrasts. Three groups of children were tested in a delayed self-recognition paradigm as well as a self-other action memory card game in which they took turns placing pictures with an adult: 3-year-olds ($n = 25$), 5-year-olds ($n = 27$), and children with autism spectrum disorder ($n = 20$). Children with autism spectrum disorder (ASD) demonstrated impaired performance on self-other recall compared to both typical 5-year-olds and typical 3-year-olds, but were not significantly different on delayed self-recognition. Results are discussed with regard to the unique profile of self-related performance in autism.

1. Introduction

By the middle of the second year of life, typically developing children are engaging in a suite of activities that reveal their abilities to consciously represent the self. Reaching to one's own forehead in response to a marked mirror image has traditionally been conceptualized as an important, initial measure of self-awareness (the mirror self-recognition test, or MSR, e.g., Gallup, 1970) and it typically emerges between the ages of 18 and 24 months (Bertenthal & Fischer, 1978). MSR is a developmental accomplishment that emerges in synchrony with other indications of emerging self-representation such as personal pronoun use (Courage, Edison, & Howe, 2004; Hay, 2006). At the same time children begin to pass level-1 perspective taking tasks (e.g., Moll & Tomasello, 2006), in which they realize that a single object can be simultaneously visible to one person but not visible to another. Relatedly, children engage in other-directed pretend play (e.g., Lewis & Ramsay, 2004), and demonstrate increasingly sophisticated attention to gaze (Dunphy-Lelii & Wellman, 2004; Moll & Tomasello, 2004), all of which indicate conscious differentiation between themselves and others.

While impressive, these self-representational accomplishments are limited. In particular, young children find it challenging to conceptualize and speak of themselves at time points other than the present (e.g., Busby & Suddendorf, 2005). Thus, even once a typically developing 2-year-old is able to pass the MSR test, her self-concept is tethered to the here-and-now. It does not reflect the older child's more mature concept of the 'self-through-time', that is, a linking of past, present, and future experiences into a single self with consistent and causal properties (Povinelli, 1995). One task in particular has been used to investigate the temporal properties of self-recognition: the delayed self-recognition test (DSR). When given a DSR task that amounts to the MSR task but with the difference that the video image they see of themselves is slightly delayed, young children do not consistently demonstrate full self-recognition until the fifth year (Povinelli, Landau, & Perilloux, 1996;

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Suddendorf, 1999). In this scenario, all the visual cues that a child could normally use to identify herself are the same as in the standard MSR test *with the exception of* the perfect here-and-now temporal contingency produced by a mirror image. 3-year-olds, while frequently able to verbally identify themselves in slightly delayed video footage by answering the question "Who is that?" correctly, are much less likely to reach to their own heads to remove a mark than older children. Those 3-year-olds that do reach to their own heads often do so regardless of the length of time that has passed – be it 5 min or a full week. Older children reach for the mark when several minutes (but not a week) have passed, demonstrating understanding of the rigors of the passage of time on their person as well as the causal relationship between the past and present physical self (Povinelli & Simon, 1998).

Self-recognition, however, is just one way to investigate the development of the temporal self. The ability to successfully pass the DSR task likely emerges coincidentally with children's ability to situate the self in the past. Memory of the self, in particular, must play a vital role in accumulation and integration of self states into a temporally coherent self-representation. Indeed, beyond improved performance on DSR tasks, the years between three and five are crucial to developments of autobiographical, episodic memory as it is traditionally tested in children, through verbalized recall of past episodes in their own lives. Children are frequently characterized as developing this kind of memory only well into their fourth year, when a combination of sociocognitive, linguistic, and brain maturational factors come together to provide support for this achievement (Bauer, 2002). It is not until about age 4, for example, that children demonstrate the emerging ability to accurately recount novel, episodic memories from more than several months ago (e.g., Fivush & Hamond, 1990). Children younger than 3 years may be quite capable of both semantic and episodic memories (Bauer, 1996; Howe, Courage, & Edison, 2003) yet not be capable of "autonoetic memory" in the sense of attaching these memories to a continuous self. Moreover, 3-year-olds are less able than older children and adults to consistently distinguish memories that are derived from personal experience from those they have simply been told about (Gopnik & Graf, 1988; O'Neill & Gopnik, 1991). Four-year-olds can similarly find it quite difficult to remember which of two speakers was the source of an utterance (Lindsay, Johnson, & Kwon, 1991), abilities that develop by 5 and 6 years of age (e.g., Foley & Johnson, 1985). These developments do not just co-occur; for typically developing children, success on the DSR test is correlated with children's verbal elaborations and recall of past events in their lives (Welch-Ross, 2001) as well as future-oriented prudence (Lemmon & Moore, 2001), in which children make decisions based on their own future benefit.

1.1. Atypical developmental trajectories

Children with autism provide a special avenue for better understanding the self and in particular the self-through-time; likewise, examining the self through time provides an informative avenue for understanding social cognition in children with autism. While early research demonstrated that most children with autism achieve MSR (e.g., Neuman & Hill, 1978; Spiker & Ricks, 1984), self-recognition performance may have been confounded by mental age (MA), which was not carefully controlled or reported. In the above studies, children's ages ranged from 3 years to 12 years, and in Neuman and Hill (1978) only 7 children were tested. In Dawson and McKissick (1984), 15 children between 4 and 7 years of age were tested, all of whom scored below average on IQ measures; nonetheless, 11 of these children showed MSR. In both this study and Neuman and Hill (1978), the authors noted that those children who succeed typically fail to show the self-conscious and shy behaviors that mark typical children's reaction to their marked image. Despite the record of relative MSR achievement, the lack of self-conscious behaviors during the MSR task itself, together with a general lack of self-consciousness in front of others, language abnormalities relevant to perspective (such as pronoun reversal; Lee, Hobson, & Chiat, 1994), difficulty with protodeclarative pointing, and poor performance on standard theory-of-mind tasks, suggests that children with autism may be specially impaired in self-awareness.

We may distinguish between *psychological* and *physical* self-awareness, as did Lind (2010); self-recognition reflects the latter, and irregularities in pronoun use, perspective-taking, and protodeclarative gestures reflect the former. Relatively unimpaired visual self-recognition supports the idea that individuals with ASD have intact *physical* self-awareness, as do findings demonstrating no impairment in detecting contingency between their own actions and movement on a screen (Hill & Russell, 2002; Williams & Happe, 2009). In contrast, there is evidence of impairment in *psychological* self-awareness in autism. For example, individuals with autism fare worse than matched controls when asked to provide rich narrative descriptions of past autobiographical events, despite unimpaired narrative skill (Losh & Capps, 2006). Indeed, individuals with autism demonstrate irregularities in episodic autobiographical memory despite displaying very good rote memory (Jordan & Powell, 1995). That is, these individuals often have relatively unimpaired working memory (Ozonoff & Strayer, 2001) and semantic memory (Mottron, Morasse, & Belleville, 2001). Klein, Chan, and Loftus (1999) report, in a very interesting case study, that a high-functioning 21-year old man with autism performed accurately when attributing personality traits to himself while simultaneously demonstrating serious impairment in accessing the *episodic* autobiographical memories on which this trait knowledge ordinarily relies (see also Crane & Goddard, 2008; Goddard, Howlin, Dritschel, & Patel, 2007). Since this man's difficulties are developmental in origin (as opposed to traumatic amnesia, for example), it suggests that the acquisition of trait self-knowledge may proceed independently of episodic memory. In addition, individuals with ASD struggle to accurately identify their own emotions and cognition on-line (Silani et al., 2008; Williams & Happe, 2010).

With an uneven pattern of self-development, constructing a rich temporally extended self may be particularly problematic even for those individuals with autism who achieve self-recognition. Such difficulty might reveal itself when