

Environmental differences in self-recognition: The early development of individualist and interdependent selves?

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Running head: Environmental differences in self-awareness

Word count main text: 3998

Keywords: cross-cultural, self-recognition, social development, cognitive development, individualist, interdependent

Research Highlights

1. This study describes different patterns in Zambian, Scottish and Turkish 15 to 18-month-olds performance in two established self-awareness tasks.
2. This can be interpreted as a cultural difference, such that one of the tasks is better suited to an individualistic perspective of self (the mirror mark test of self-recognition), and the other appears better suited to a collectivist perspective (body-as-obstacle test).
3. In support of this idea, associations between distal/individualistic and proximal/interdependent parenting practices and performance in the tasks are reported.
4. This novel data addresses the neglected question of how individualistic versus collectivist perspectives of self are socialized, and how different developmental environments may contribute to performance in self-awareness tasks. More generally, the report highlights the importance of designing culturally sensitive tests of ‘universal’ cognitive developments.

Abstract

15 to 18 month-old infants from three nationalities were observed interacting with their mothers and during two self-recognition tasks. Scottish interactions were characterized by distal contact, Zambian interactions by proximal contact, and Turkish interactions by a mixture of contact strategies. These culturally distinct experiences may scaffold individualist versus interdependent perspectives of self. In support, Scottish infants performed best in a task requiring recognition of the self as a distinct physical entity (mirror self-recognition), whereas Zambian infants performed best in a task requiring recognition of the causal impact of self on the environment (body-as-obstacle task). Turkish infants performed similarly to Zambian infants on the body-as-obstacle task, but outperformed Zambians on the mirror self-recognition task. Verbal contact (a distal strategy) was positively related to mirror self-recognition and negatively related to passing the body-as-obstacle task. This novel data substantiates the idea that environmental factors may play a role in the early expression of self-awareness. More broadly, the results highlight the importance of moving beyond the mark test, and designing culturally sensitive tests of self-awareness.

Self-awareness can be defined as the capacity to reflect on the self as an object in the environment. The development of self-awareness is typically measured using the mirror mark test of self-recognition (Amsterdam, 1972; Gallup, 1970). In this test, infants are surreptitiously marked on the forehead and a mirror is introduced. To pass, the infant must take self-directed action, reaching for, or trying to remove the mark. This behavior indicates that the infant has inferred a relationship between the mirror-image and themselves, and is conscious of the self as a physical object. Confirming that mirror self-recognition (MSR) is indicative of a wider sense of self-awareness, passing in the mark test has been correlated with self-other differentiation in language (Courage, Edison & Howe, 2004; Lewis & Ramsay, 2004), emotion (Kochanska, Gross, Lin & Nichols, 2002; Lewis, Sullivan, Stanger & Weiss, 1989) and social interaction (Bischof-Kohler, 1991; Johnson, 1982; Nielsen & Dissanayake, 2004; Zahn-Waxler, Radke-Yarrow, Wagner & Chapman, 1992).

It has been established that the majority of infants achieve MSR by the age of two years (Courage et al., 2004; Lewis & Brooks-Gunn, 1979). This timeline is largely based on western populations. An early paper by Priel and de_Schonen (1986) showed that despite infants from a Bedouin tribe having no prior experience with mirrors, they passed the mark test at the same age as Israeli infants with mirror experience. This influential paper established the universality of MSR. The implication was that environmental factors had little impact on the development of self-awareness. However, more recent data suggests that performance on the mirror mark test does vary between countries. Specifically, Keller and colleagues found that Greek, German and Costa Rican infants were more likely to self-recognize early (at 18 to 20 months) than infants from the Nso tribe of Cameroon (Keller, Kartner, Borke, Yovsi, & Kleis, 2005; Keller et al., 2004). Further, Broesch, Callaghan, Henrich, Murphy and Rochat (2010) report that in a sample spanning 18 to 72 months, rates of spontaneous self-directed behavior significantly lower in several non-western locations;

sometimes at floor. Rather than indicating a lack of MSR, Broesch et al. (2010) speculate that these ‘failures’ may be indicative of the cultural variations in autonomy. Although children in western cultures are encouraged to be independent, and so are disposed to explore the mark, non-western cultures often encourage compliance. This may dispose them to ignore the mark. This explanation highlights the practical disadvantage of relying on one dependent variable to qualify the onset of self-awareness cross-culturally.

Moreover, there is a broader theoretical reason to question the acceptance of self-directed behavior as the best universal indicator of self-awareness. As reflected in Broesch et al.’s (2010) explanation, it is well established that mature conceptions of self can be differentiated according to the emphasis placed on independence versus interdependence, corresponding to the cultural dimensions of individualism and collectivism (Markus & Kitayama, 1991). Individualist (often geographically western) cultures conceive of self as a distinct and autonomous individual, whilst collectivist (often geographically non-western) cultures conceive of self in relation to others. This fundamental difference in orientation may well underlie the western bias in mirror self-recognition performance, for which recognition of the self as distinct from others is necessary. Indeed, whereas Broesch et al. (2010) treat cross-cultural variations in mirror mark test performance as an artificial effect stemming from cultural conventions in social situations, Keller et al. (2005; 2004) suggest that cultural variations on the mark test may be indicative of true variations in the quality of early self-awareness. Specifically, Keller et al. (2005; 2004) describe how early parenting practices aimed at emphasizing autonomy (e.g. face to face contact) as opposed to relatedness (e.g. direct physical contact) may scaffold infants’ conception of self as a distinct individual. Keller et al. (2005; 2004) suggest that this encourages the process of self-awareness to onset earlier in individualist cultures, as highlighted by German infant’s precocious passing of the mark test. However, if we define and measure self-awareness as a process of

‘individualization’ then it is unsurprising that individualist cultures have an advantage. What if the process of self-awareness was measured in a way that did not emphasize the boundaries between self and environment?

The current study sought to identify an established measure of self-awareness in which infants from collectivist cultures, who see the self as an integrated object, might have the advantage. Using an established test was important as the measurement of self-awareness is notoriously controversial (e.g. Mitchell, 1997). The methodology chosen has a longer, though far less active, history than the mirror mark test. Piaget (1953/1977) reported observing his 18-month-old daughter trying unsuccessfully to pick up a rag that she was standing on, apparently not understanding that her body weight was the cause of the resistance. However, within a month she was able to solve this self-related problem, stepping off of the rag in order to retrieve it. This developmental progression was later replicated under experimental conditions (Bullock, & Lutkenhaus, 1990; Geppert & Kuster, 1983). More recently, Moore, Mealiea, Garon and Povinelli (2007) developed a novel apparatus for the ‘body-as-obstacle’ test, designed to rule out the possibility that infants learn to pass through trial and error. Infants were placed on a mat which was attached to the axle of a toy shopping trolley and encouraged to push the trolley towards their mother. Moore et al. (2007) found that significantly more 21-month-olds appreciated the need to step off of the mat than 15-month-olds. Moreover, this developmental lag was specific to self; there was no age difference in solving the task when a heavy object was placed on the mat rather than the infant, and only the self version of the task correlated with MSR performance. Brownell, Zerwas and Ramani (2007) confirm that self and non-self versions of the obstacle task do not correlate. These results establish the body-as-obstacle test as a measurement of ‘embodied’ self-awareness, indicating that the infant is aware of their own causal impact on the environment.

As the key variable in passing the body-as-obstacle task is the ability to reflect on the self as immersed in environmental context, we hypothesize that infants from collectivist cultures may pass the task precociously in comparison to infants from individualist cultures. In keeping with Keller et al. (2005; 2004) we expect to see the opposite pattern in the onset of MSR. It is clear that self-other differentiation and self-perceptions of facial appearance are an important component of individualist self-concepts. However, passing the MSR task may be considered a less important developmental milestone in other cultural settings, where self-representation is built on other's perceptions (see Cooley's (1902) idea of the "looking glass self", p. 183) and individualistic aspects of self are less emphasized. Thus, even if the body-as-obstacle task does not provide the perfect analogue to the interdependent perspective on self, it is at least an established measure of cognitive self-recognition which avoids an emphasis on individualistic facial appearance (though see Rochat, Broesch, & Jayne 2012 for an interesting adaption of the MSR which emphasizes appearance in social context).

In addition to highlighting the interaction between culture and different measures of self-awareness, we aimed to explore the mechanism by which culture might shape the experience of self. This topic has arguably been given short shrift by western developmental psychology. Although there has been considerable interest in parenting practices and their cultural variation, with the exception of the studies reviewed above (Broesch et al., 2010; Keller et al., 2005; 2004; Priel & deSchonen, 1986), few authors have explicitly linked early socio-environmental factors to developing self-awareness. One reason for this omission may be the dominant view of self-awareness as a universal cognitive process, leading some to argue that although the content of self-awareness may vary cross-culturally, its onset is impervious to environmental influence. However, the universality of self-awareness does not preclude its developing through different developmental pathways or to different schedules. See work concerning the development of theory of mind as a case in point (Shahaeian,

Peterson, Slaughter & Wellman, 2011). Thus, although it is generally accepted that the content of self-awareness varies cross-culturally in adulthood, little research addresses how this comes to pass.

To address this research gap, we use a cross-sectional design to assess the concurrent relationship between individualist and collectivist parenting practices and early self-awareness, as measured by the mirror mark test and the body-as-obstacle test. To achieve this we collected data from three continents; Africa, Eurasia, and Europe. It is well established that the dominant perspective on self in rural Africa is collectivistic, whereas the dominant perspective on self in Europe is individualistic (Hofstede, 2001). By contrast, although perspectives on self in Eurasian countries are traditionally collectivistic, the westernization of urban Eurasia has led to an increasing emphasis on individualistic values (Hofstede, 2001). Importantly, ‘mixed’ cultural settings may allow a finer test of the hypothesis that parenting practices are key factors in the socialization of individualist and collectivist perspectives on self. Keller et al. (2004) demonstrate that South American infants experience aspects of both distal and proximal parenting, and profile between European and African infants on tests of MSR. Taking a similar approach, we expected European participants to show precocious MSR, in line with distal socialization strategies. In contrast, we expected the dominant parenting style for African mothers to be proximal, and for these infants to show precocious performance in the body-as-obstacle task. Finally, we expected urban Eurasian infants to profile between these nationalities, experiencing mixed parenting practices and showing intermediate performance in the self-awareness tasks.

Methods

Participants

86 mother-infant dyads participated, 33 from Ikelenge, Zambia (16 male), 31 from Dundee, Scotland (17 male) and 22 from Istanbul, Turkey (12 male). Infants were aged between 15 and 18 months (Zambian $M = 16.7$ months, Scottish $M = 16.5$ months, Turkish $M = 16.2$ months) and able to walk unsupported. This stage was chosen as it encompasses the earliest period at which MSR and body-as-obstacle tasks may be passed, allowing us to measure precocious performance (Courage et al., 2004; Moore et al., 2007). As is common in rural cultures, mothers reported that Zambian infants started to walk earlier (49% walked prior to 12 months) than Scottish (32%) and Turkish (36%) infants. This is potentially important as previous research has identified the earlier onset of walking as a potential factor in passing the body-as-obstacle task (Brownell et al., 2007). However, a univariate ANOVA indicated no main effect of walking prior to 12 months on performance ($F(1, 74) = 2.3$, $MSE = 1.4$, $p = .16$, $\eta_p^2 = .03$).

Scottish and Turkish infants were living in an urban, densely populated environment with mothers from a variety of employment settings/educational backgrounds. In contrast Zambian infants lived in a rural village setting, and the majority of mothers had limited educational backgrounds and worked in farming. Scottish and Turkish data were collected by researchers native to the country (authors two and five) travelling alone, whereas Zambian data were collected by a Scottish researcher (author four) with the aid of a translator/local guide. Participants were identified through word of mouth. In Scotland, testing took place in dyads' homes. In Zambia, testing occurred outside in a private area of the grounds of a school. In Turkey, testing took place either at home (twelve infants) or in a private area of the infant's nursery, according to the mother's choice.

Over 90% of Scottish and Turkish infants had regular experiences of interacting with the mirror, compared to 15% of Zambian infants. Moreover, none of the Zambian infants had experience of the toy shopping trolley used in the body-as-obstacle task, whilst

approximately half of Turkish and Scottish infants had played with similar toys in the past. Perhaps as a result, nine Zambian infants would not engage with the body-as-obstacle task, compared to one Scottish and one Turkish infant (one Scottish infant also declined to participate in the MSR test). All mothers and children reported being comfortable and familiar with the concept of stacking cups introduced to facilitate social interaction. However, interactions from one Zambian, four Scottish and five Turkish dyads were excluded from analysis due to their brevity.

Materials

Testing was filmed using a digital video recorder. Verbatim transcriptions/translations of mother's speech during cup play were also produced. On site task materials included multi-colored stacking cups, a toy supermarket trolley (59.5cm in height) with an attached mat (74cm x 36cm), and a large mirror (59cm x 90cm).

Procedure and coding

After providing consent and relevant background information, mothers were asked to play with their infant with stacking cups. This toy was introduced to provide parity of focus for the interactions. The quality of social interaction during the first 1.5 minutes of cup play was coded for key markers of distal and proximal parenting strategies. A time limit on the amount of interaction coded (dictated by the mode length) was used to ensure comparability. Although the period was brief, it was sufficient to identify large differences in mother-infant interaction between nationalities which were indicative of the expected differences in parenting style (see *Results*).

Following Keller et al.'s (2004) time-sampling method, body contact and mutual eye gaze were coded in 5 second intervals, giving a count of up to 18 intervals in which these behaviors might be present. Directive action (where the mother physically controlled the infant's manipulation of a cup) was scored according to the same system. When direction is

physical, infants' actions literally become an extension of their mothers' goals. Thus high levels of physical direction, together with supportive bodily contact, may be a factor in shaping interdependent perspectives on self. Verbal contact was coded by counting the number of discrete phrases (e.g. well done baby!) uttered by the mother during the 1.5 minute period. Although verbal contact and eye contact also establish a connection between self and other, and may be directive, the distal nature of these strategies means that a separation between own and other's goals is maintained. For this reason, high levels of verbal contact and mutual eye gaze may support an individualist perspective on self. Although these developmental pathways to culturally distinct selves may appear simplistic, attachment research makes evident that basic differences in the way parents interact with their infants have significant implications for developing conceptions of self (Dykas & Cassidy, 2011).

Following cup play, the mothers were invited to play in front of the mirror with their infant. This period of familiarization was important given several infants had limited prior experience of the mirror. The mirror was then removed and the infant was given a toy supermarket trolley to play with. This was necessary to ensure the infant could push the trolley to their caregiver under normal circumstances, and to familiarize the infants with the stimulus, since several had no prior experience with shopping trolleys (see *Participants*).

During the testing phase of the body-as-obstacle task, a mat attached to the base of the trolley was unrolled behind it, and the infant placed on it. The researcher then encouraged the infant to push the trolley to their mother, who was approximately two meters away. However, the infant's bodyweight prevented the trolley from being pushed whilst they were standing on the mat. To successfully push the trolley to their mother infants had to step off of and walk to the side of the mat (or pull the trolley from the front). Infants who spontaneously stepped off of the mat and moved the trolley were considered to pass. After infants stepped off of the mat

and successfully pushed the trolley, became distressed, or showed five failed attempts at pushing the trolley, the mat was rolled away and a further period of free play ensued.

During this second period of free play a sticker was discreetly applied on the infant's forehead, in preparation for the testing phase of the mirror task (following Moore et al., 2007; Neilsen & Dissanyake, 2004). No infant reached for the sticker prior to introduction of the mirror, indicating that the marking event was not felt. During the test phase, dyads were invited to play again in front of the mirror. Infants who spontaneously reached up to touch within 2cm of the sticker were considered to pass.

Inter-rater reliability

Performance was coded by authors two, four and five for their own geographical setting. To ensure reliability the first 20% of tapes from each nationality were also coded by the first author. For this subsample, over 80% of social interaction variables were within two points of agreement. 90% of MSR scores and 85% of body-as-obstacle scores were initially in agreement. Agreement rose to 100% after discussion.

Results

Mother-infant interaction

As hypothesized, Zambian interactions were characterized by high levels of body contact ($M=14.6$, $SD= 1.2$) and directive action ($M=9.9$, $SD= .9$), and low levels of verbal contact ($M=7.8$, $SD= .8$), indicating a preference for proximal parenting. Scottish interactions showed the opposite pattern (body contact: $M=6.7$, $SD= 1.5$; directive action: $M=3.6$, $SD= .4$; verbal contact: $M=31.9$, $SD= 2.7$), indicating a preference for distal parenting. Turkish dyads showed a mixed pattern, favoring verbal contact ($M=19.5$, $SD= 2.3$) to body contact ($M=6$, $SD= .4$) but showing relatively high levels of directive action ($M=8$, $SD= 1.5$). Perhaps due to a focus on the cups, rates of mutual eye gaze were very low for all nationalities, though they

were highest for 'individualistic' Scots (Zambian: $M=.6$, $SD=.2$; Turkish: $M=.57$, $SD=.3$; Scottish: $M=1.1$, $SD=.2$). Multivariate ANOVA confirmed a significant effect of nationality on the quality of social interaction for all variables aside from mutual eye gaze (body contact: $F(2,75)=27.4$, $MSE=42.4$, $p<.001$, $\eta_p^2=.43$; directive action: $F(2,75)=12.4$, $MSE=23.7$, $p<.001$, $\eta_p^2=.26$; verbal contact $F(2,75)=40.5$, $MSE=108.3$, $p<.001$, $\eta_p^2=.6$; $F(2,75)=2.2$, $MSE=1.8$, $p=.120$, $\eta_p^2=.6$).

Self-awareness tasks

Figure 1 shows the pass rate of each nationality on the self-awareness tasks. A Fisher's exact test confirmed that performance in the MSR ($\chi^2(2, N = 85) = 7.1$, $p = .03$, $\Phi = .28$) and body-as-obstacle tasks ($\chi^2(2, N = 75) = 7.1$, $p = .03$, $\Phi = .30$) differed depending on nationality. A Univariate ANOVA was used to confirm this result (MSR: $F(2, 82) = 3.62$, $MSE = .20$, $p = .031$, $\eta_p^2 = .08$; body-as-obstacle: $F(2, 72) = 3.65$, $MSE = .22$, $p = .031$, $\eta_p^2 = .09$), and run planned LSD comparisons. As shown in Figure 1, Scottish and Turkish infants' MSR performance was similar ($p = .85$), in comparison to Zambian infants who achieved MSR less often (Scottish: $p = .046$; Turkish: $p = .043$). In contrast, Turkish and Zambian infants' performance in the body-as-obstacle task was equivalent ($p = .62$), and Scottish performance was the outlier (Turkish: $p = .015$; Zambian: $p = .046$).

INSERT FIGURE 1 ABOUT HERE

Association between the quality of mother-infant interaction and self-awareness performance

Table 1 shows the results of Spearman's correlation analyses testing the relationships

between distal and proximal parenting strategies and self-awareness performance.

Performance in the MSR task was positively related to verbal contact ($p=.031$) and negatively related to directive body contact ($p=.02$). In contrast, performance in the body-as-obstacle task was negatively related to verbal contact ($p=.03$).

INSERT TABLE 1 ABOUT HERE

Discussion

In support of the idea that the self-awareness tests employed may reflect different perspectives on self, MSR scores were highest in cultures including autonomous parenting practices (Scotland, Turkey), and lowest in the culture focused on interdependence (Zambia). By contrast, body-as-obstacle scores were highest in cultures which included interdependent parenting practices (Zambia, Turkey), and lowest in the culture focused on autonomy (Scotland). Providing support for the role of cultural environment in passing the tasks, infants whose mothers' displayed a tendency for high levels of verbal communication were more likely to pass the MSR task, and less likely to pass the body-as-obstacle test. In contrast, infants whose mothers tended to physically direct their actions were less likely to achieve self-other differentiation, as measured by the mark test. These observations are important as they confirm that performance in self-awareness tasks is subject to environmental influence. We hypothesize that these environmental differences may be a reflection of the early social construction of individualist and interdependent selves.

However, alternative explanations for the result should be considered. In the current sample, Scottish and Turkish infants were more familiar with mirrors than the Zambian infants, and it is possible that this led to their advantage in MSR. Although intuitively plausible, there is currently no evidence to suggest that increased familiarity with mirrors plays an important role in passing the mark test. In addition to Priel and DeSchonen's (1986) observation that MSR requires only a brief period of exposure to mirrors, longitudinal research implies that repeated exposure to the mirror and the mark test does not result in earlier self-recognition (see Courage, et al., 2004; Hart & Fegley, 1994; Lewis & Brooks-Gunn, 1979). Moreover, Vyt (2001) and Courage et al. (2004) have shown that the ability to

use reflective surfaces to infer the location of objects (e.g. turning to fetch a toy) is variable in onset, sometimes preceding and sometimes following MSR. These results are in line with the established idea that MSR is based on cognitive self-awareness, as opposed to general cognitive reasoning or learnt familiarity with the self-image. In addition to cultural variation in mirror familiarity, mothers reported an earlier onset of walking for Zambian infants, in keeping with the propensity to loco-mote earlier in rural environments. It is possible that this may have resulted in more previous encounters with physical obstacles, leading to the Zambian advantage on the body-as-obstacle task. However, our data did not support this explanation, as we did not find a statistical link between the onset of walking and performance on the body-as-obstacle task. Further, Turkish infants walked at a similar age to Scottish infants, yet outperformed them in the body-as-obstacle task.

Whatever the explanation for the difference, this study highlights the necessity of recognizing that the measurement of self-awareness is inextricably bound with our environment. More care needs to be taken in measuring self-awareness if valid cross-cultural comparisons are to be made. There are both theoretical and empirical reasons to believe that the mirror mark test may not provide a full profile of self-awareness, and could be challenging for those whose dominant perspective on self is interdependent. The reverse may be true of the body-as-obstacle task. This is the first research to identify an established experimental measure of self-awareness which may be well suited to collectivist cultures. However, it is clear that the body-as-obstacle test does not offer the perfect representation of the collectivist self. Rather than requiring recognition of the self as socially interdependent, the body-as-obstacle task tests recognition of self as environmentally interdependent. It is questionable whether this simple form of integration can be used as a proxy for more complex social relations. A social version of the test may ultimately be more appropriate. Moreover, this project focuses on discrete aspects of parenting identified as potentially

important by previous research (Keller, et al. 2005; 2004). Numerous social and environmental factors which may contribute to the early development of self-awareness are left unmeasured, and it is possibly that the factors identified here are confounded with other measures. Nevertheless, the current project takes a first step, moving beyond the mark test to demonstrate that self-recognition performance is influenced by methodology, nationality and parenting practice.

Despite an interesting body of research correlating MSR with other social and cognitive developments in infancy, there has been little experimental exploration of the idea that the early self is set in a broader context than the individual. In other words, different perspectives on self may be more or less adaptive in different developmental environments. Although it pays to be individualistic in western society, a preoccupation with the self as a distinct object is unlikely to be of benefit in collectivist societies. Thus, different socialization strategies, and possibly different developmental schedules, are likely to evolve. Yet despite established cross-cultural variations in adult's experience of self-awareness (Hofstede, 2001), we currently have very little data concerning the development of this difference. Given this striking omission, the principal aim of the current report is to stimulate debate and further experimental research concerning the early social construction of self.

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