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Object processing during a joint gaze following task

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To investigate object processing in a gaze following task, 12-month-old infants were presented with 4 movies in which a female model turned and looked at one of two objects. This was followed by 2 test trials showing the two objects alone without the model. Eye movements were recorded with a Tobii-1750 eye tracker. Infants reliably followed gaze and displayed longer looking times towards the attended object when the model was present. During the first test trial infants displayed a brief novelty preference for the unattended object. These findings suggest that enhanced object processing is a temporarily restricted phenomenon that has little effect on 12-month-old infants' long-term interaction with the environment.

Gaze following is an essential element of joint visual attention and an important ingredient of the development of early social cognition (Moore & Corkum, 1994; Tomasello, 1999). It enables an individual to obtain useful information about his/her surrounding by observing others' behaviour. This ability is not restricted to humans but occurs in numerous other species, e.g., great apes or domestic dogs (e.g., Bräuer, Call, & Tomasello, 2005; Hare, Call, & Tomasello, 1999). Typically, gaze following has been studied in "live" social situations, where an adult initially establishes eye contact with the infant and thereafter turns to and fixates one of several objects. Infants'

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tendency to follow others gaze is typically measured by relating the infants first eye turn to the direction of the adults attention (D'Entremont, Hains, & Muir, 1997; Hood, Willen, & Driver, 1998; Johnson, Slaughter, & Carey, 1998; Moore & Corkum, 1998; Scaife & Bruner, 1975) or by comparing looking durations towards attended and unattended locations (Reid & Striano, 2005; von Hofsten, Dahlström, & Fredriksson, 2005).

Some authors argue that infants can follow others' gaze direction from 6 months of age (e.g., Butterworth, & Cochran, 1980; D'Entremont et al., 1997; Morales, Mundy, & Rojas, 1998). Others have not found evidence of gaze following until infants are between 9 and 12 months of age (Corkum & Moore, 1998; Flom, Deák, Phill, & Pick, 2004; Moore & Corkum, 1998; Morissette, Ricard, & Gouin Décarie, 1995). The exact onset of this ability might still be debated. However, it appears safe to say that infants at 12 months of age follow others' gaze; responding to the behavioural manifestations of others' psychological orientations (Moore & Corkum, 1994; see also Johnson et al., 1998; Woodward, 2003).

Despite this, little is known about how infants at this age process the object of others' attention. It is tempting to assume that an infant, by following the gaze of another person to an object, naturally also understands the psychological relationship between the person and the attended object, as if saying: "this specific thing was interesting for this person", but, de facto, little is known about the development of the actual function of gaze following beyond target localization. This study aimed to increase our understanding of how infants' object processing is influenced by the direction of others' gaze.

In a study by Reid, Striano, Kaufman, and Johnson (2004), 4-month-old infants were presented with a frontal face and one object either to the left or to the right side; these events were presented on a video screen. After one second the eyes rotated either towards (cued) or away (non-cued) from the object and fixated that location for one additional second. Following this period the face disappeared and the previously presented object appeared in its place. Throughout the experiment EEG was recorded. The results demonstrated lower peak amplitudes for slow wave ERPs in response to previously cued as opposed to non-cued objects. This effect was interpreted as a novelty preference to non-cued objects, resulting from enhanced object processing to the attended (cued) compared to the unattended (non-cued) object.

In a different experiment by Reid and Striano (2005) 4-month-olds were similarly presented with an adult face, but this time with two objects present, one to either side of the face. The adult's eyes were initially directed forward, shifting to one side and fixating one of the objects after one second. After a brief intermission the two objects were presented without the face. During this later phase infants' looking durations to each of the two objects were recorded. Infants looked reliably longer at the non-cued compared to the cued object; this novelty preference indicates that infants were influenced by the model's gaze shift and that the non-cued object was more interesting than the object previously attended by the adult face. This result again demonstrates an enhanced object processing as a function of others' gaze direction.

These studies clearly demonstrate that infants at 4 months of age are sensitive to others' gaze direction. They are, however, unable to inform us about what impact this enhanced object processing has on infants' future interaction with the attended object for two reasons. First of all, both studies were performed on an age group that is not frequently reported to follow others' gaze direction. Reid et al. (2004) clearly state that: "no infants overtly followed the gaze to the object location", suggesting that the reported effects are not the result of shifts in overt attention but rather result from subtle shifts in covert attention without behavioural correlates. A lack of eye movements is obviously a prerequisite of high quality ERP data (reducing the noise level by minimizing eye movements); however, this gives us no indication that the studied infants could follow gaze direction. In another study, Reid and Striano (2005) did not report whether infants follow the model's gaze direction or not.

In addition, it is still unclear what is meant by "enhanced object processing". One interpretation is that infants simply follow the model's gaze direction without attributing any meaning to the model's behaviour. In this case infants' preference for non-attended objects should appear as a temporarily restricted novelty preference with little bearing on infants' long-term interaction with the attended object. Another interpretation is that infants' attribute some kind of meaning to the attended object, perhaps infants understand the relationship between the model's attention and the object and, as a consequence thereof, differentiate this object from the other object over time.

If one wishes to gain a better understanding of how others' gaze direction influences infants' object processing it is important to focus on an age group that has a well-documented ability to follow others' gaze direction and to use a paradigm with a high spatial-temporal resolution that allows us to evaluate the temporal restraints of infants' object processing and whether infants follow the model's gaze. The current study attempts to answer these questions by measuring gaze following and object processing in 12-month-old infants using high-resolution eye-tracking technology.

METHOD

Participants

Sixteen 12-month-old healthy, full-term infants (mean age 11 months and 28 days, $SD = 2$ days) participated in this study. Four infants were eliminated because of refusal to remain seated or because of technical problems. Participants were contacted by mail based on birth records. As compensation for their participation each family received either two movie tickets or a CD voucher with a total value of 15 €.

Stimuli and apparatus

Gaze was measured using a Tobii 1750 near infrared eye tracker with an infant add-on (Tobii Technology; www.Tobii.se). The system records the reflection of near infrared light in the pupil and cornea of both eyes at 50 Hz (accuracy = 0.5 degrees, spatial resolution = 0.25 degrees) as participants watch an integrated 17-inch monitor. During calibration infants were presented with a looming and sounding blue and white sphere (extended diameter = 3.3 degrees; Gredebäck & von Hofsten, 2004). The calibration stimulus could be briefly exchanged for an attention-grabbing movie (horizontal and vertical extension = 5.7 degrees) if infants temporarily looked away from the calibration stimulus.

The stimuli set consisted of 30 movies. Twenty included a female model that shifted her gaze (head and eyes) to one of two toys placed on either side of the model (Figure 1A). Each movie included two toys randomly selected from a set of 5 unique toy pairs. The toy pairs were counterbalanced with regards to which toy the model attended and their respective locations, which equal $5 \times 2 \times 2$ variations. Ten additional movies without the model were also included (Figure 1B). Again the five toy pairs were counterbalanced for location, which equal 5×2 variations.

Movies that included the model lasted on average for 13 seconds. Each movie started with a 5-second period during which the model looked down at the table in front of her with the two toys visible on either side (see Figure 1A1). After 5 seconds the model moved her face upwards and fixated straight ahead (see Figure 1A2 for endpoint of upwards motion), this movement lasted for 1.5 seconds. During these 6.5 seconds the model had not yet attended to either toy. This part is referred to as the Baseline block. The following 1.5 seconds involved a sideways downwards movement of the model's head and eyes towards one of the toys, accompanied by a smile. The movie ended with a 5-second interval in which the model kept fixating the toy. These last 6.5 seconds of the sequence are referred to as the Gaze Direction block (see Figure 1A3). The purpose of the current study was to investigate the depth of infants' object processing during a joint gaze following task. The stimulus material was therefore designed to simulate the natural interaction between an infant and an adult. As such, the model shifted her gaze and directed positive regard to a near object. For the same purpose the action was presented over the extended period of 13 seconds altogether. The infants should have been given time to encode and react to

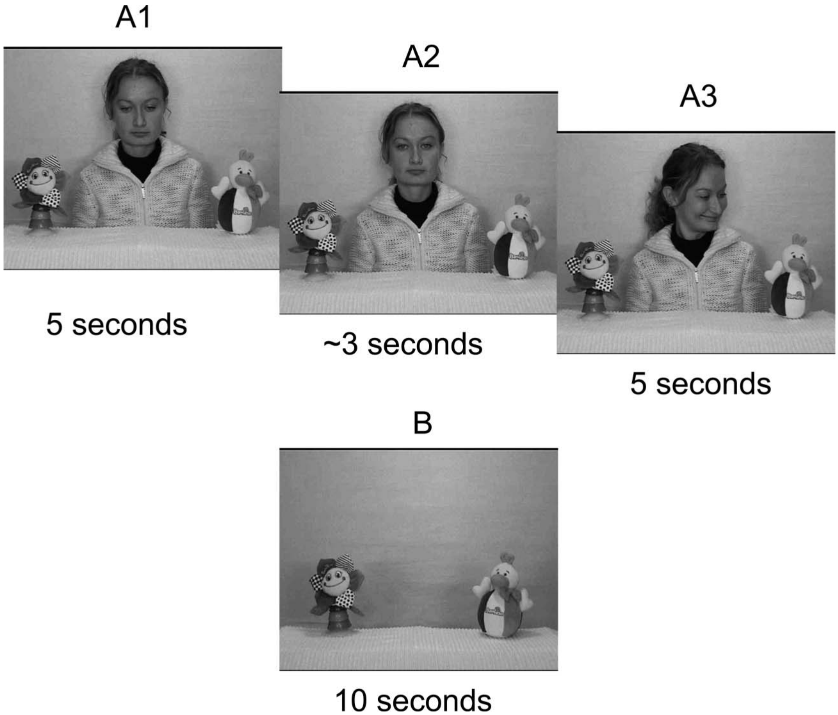

Figure 1. Timeline and sample stimuli with the model present (A) and during the Test block (B). The Baseline includes the first 5 seconds (A1) and the duration when the model looks up (up to the frame depicted in A2). The Gaze Direction block starts when the model indicates the direction of gaze (following the frame depicted in A2) and ends with the termination of the movie (A3).

the full situation, as if in any playful situation with an adult. Movies that did not include a model lasted for 10 seconds. In these movies the two objects were displayed on their own (Figure 1B).

Procedure

Infants were seated in a safety car seat and placed on their parent's lap with their eyes about 60 cm from the eye tracker. During calibration the looming stimulus described above was presented at nine different locations in a random order. If the infant's attention was drawn to other parts of the visual field during this procedure the experimenter exchanged the calibration stimulus for an alternative attention-grabbing movie at the current location. If any points were unsuccessfully calibrated these points were recalibrated.

Infants were always presented with four trials that included the model. During these presentations the model always attended to the same toy, but its location changed between presentations according to an ABBA design. For example, the attended toy might first appear to the left, followed by two movies in which the toy appeared to the right, and a final movie in which the attended toy appeared to the left. These presentations were followed by two test trials in which the toys appeared on their own, again at switched locations. Each infant was presented with one of two presentation orders ABBA – BA or BAAB – AB.

This presentation order was necessary to ensure the infants would interpret the model's behaviour as object directed and not as directed to a particular side of their visual field. In addition, reversing the location of the objects between the last trial with the model and the first test trials (and between the first and second test trial) ensured that infants' paid attention to the objects and not just the disappearance of the model.

After the experiment parents were given the opportunity to look at a replay of the stimuli that included the infants' gaze. In general each family spent 15 to 20 minutes in the lab.

Data reduction

Infants had to fixate the model's face and then shift their gaze to one of the toys after the model started moving her head on at least three trials to be included in the analysis. These infants further fixated each object location at least once during the Gaze Direction block. Gaze data were transformed to fixation data with a spatial-temporal filter covering 200 ms and 50 pixels (approximately 1 visual degree) in ClearView (Tobii). All analyses were performed using a custom-made analysis program in Matlab (Mathworks).

Data from each trial that included the model were separated into a Baseline block, including the beginning of each trial until the model had raised her head, and a Gaze Direction block, including the entire head movement and the model's subsequent fixation on an object. Data from the Test block were analysed as a whole. Each trial of these blocks was analysed separately. The blocks were used in an area-of-interest (AOI) analysis including only fixations within any one of three equally sized areas, covering face, left toy, and right toy. These analyses calculated effects in two ways: according to the location of each fixation, and with respect to the AOIs covering the attended or unattended toy (see Figure 2 for approximate size and location of AOIs). Note that the AOI analysis included more detailed information by separating the face from the toys and excluding fixations at other parts of the screen than typically used preferential looking paradigms for which the screen would have been divided into left and right sections

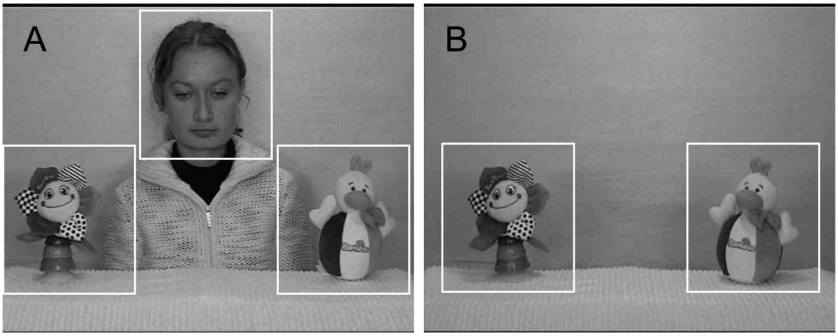

Figure 2. White squares represent AOIs covering the face and any of the two toys during trials with the model present (A) and during test trials (B). AOI squares do not represent the exact size used for analysis.

only. Observe that during test trials AOI analysis was based on the AOIs covering the attended or unattended toy (see Figure 2B).

As infants differ in overall fixation duration, proportional fixation duration was calculated (attended = fixation duration attended/fixation duration attended + fixation duration unattended; unattended = fixation duration unattended/fixation duration attended + fixation duration unattended). Only this proportional fixation duration is reported in the result section below.

Focus was also directed at the first fixations and individual gaze shifts. Infants' first fixation of the model's face and the two toys during the Baseline block and the Gaze Direction block was registered (after infants had fixated the model's face for at least 200 ms during this block) together with the duration of this fixation. During Baseline and Gaze Direction blocks the fixated target was registered and whether or not the attended target was the one being fixated. Additionally, infants' first gaze shift from the model's face to a toy (as defined by the AOIs) during the Gaze Direction block was registered. During the Test block infants' proportional fixation duration was analysed with respect to the AOIs covering the two toys (see Figure 2B) as well as the first fixation of a toy. Also the first fixated toy was included.

In addition, a difference score (DS; cf. Corkum & Moore, 1998; Moore & Corkum, 1998) was calculated for each infant in order to reliably investigate gaze following during the Gaze Direction block. This DS was determined by the number of trials where the infants' first gaze shifted from the face to the attended toy, minus the number of trials where infants went to the unattended toy first. DS could thus vary from + 4 (shifting in all trials to the attended toy) to − 4 (shifting in all trials to the unattended toy).

RESULTS

Baseline block

The mean fixation duration during the four Baseline trials within all three AOIs equalled 4405 ms ($SE = 202$ ms). More time was spent looking at the face ($M = 49.48\%$, $SE = 2.64\%$) than at either toy ($M_{\text{left}} = 20.52\%$, $SE = 2.17\%$ and $M_{\text{right}} = 30.00\%$, $SE = 2.92\%$), $F(2, 45) = 27.613$, $p = .000$, $\eta^2 = .551$. Separated t-tests differentiated the face from both the left toy, $t(46) = 7.505$, $p = .0000$, as well as from the right toy, $t(46) = 3.794$, $p = .0004$, which additionally differed from each other, $t(46) = 2.146$, $p = .037$. Note that even though infants spent more time looking at the right AOI than at the left AOI there were no significant differences between the AOI that later would be the attended (45.8%, $SE = 4.7\%$) and the unattended (54.2%, $SE = 4.7\%$) AOI, $t(47) = 0.887$, $p = .380$ (see Figure 3).

Gaze Direction block

During the Gaze Direction block 4625 ms ($SE = 259$ ms) was spent fixating the three AOIs on average. More time was spent fixating the face ($M = 59.11\%$, $SE = 3.04\%$) than either the left ($M = 19.7\%$, $SE = 2.8\%$) or the right ($M = 21.2\%$, $SE = 2.5\%$) toy, $F(2, 45) = 34.806$, $p = .000$, $\eta^2 = .607$. Post hoc tests differentiated the face from both the left, $t(46) = 7.609$, $p = .000$, as well as from the right toy, $t(46) = 7.628$, $p = .000$, which did not differ ($p = .570$; see Figure 3). In contrast to the Baseline block, now the attended toy was fixated to a higher degree ($M = 67.5\%$, $SE = 4.5\%$) than the unattended toy ($M = 32.5\%$, $SE = 4.5\%$), $t(43) = 3.797$, $p = .0005$.

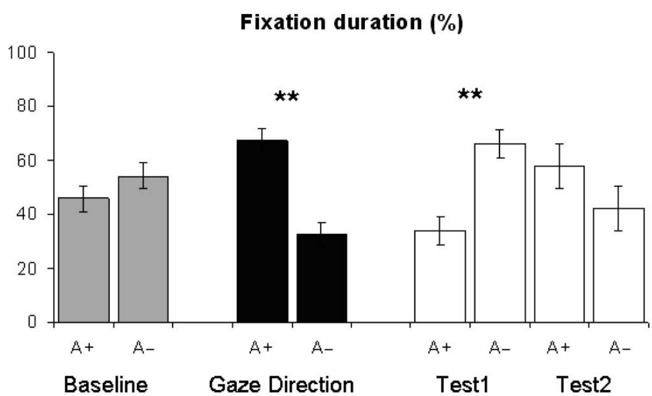

Figure 3. Average proportional fixation durations to the attended (A+) and unattended (A−) toy, based on AOI, in Baseline (B) and Gaze Direction (GD) blocks and the two test trials. Error bars indicate standard error and ** depict significant differences.

Test block

In total infants spent 6588 ms ($SE = 487$ ms) fixating the two AOIs during the Test block. Thereby infants looked equally long at the right ($M = 50.88\%$, $SE = 5.47\%$) and the left ($M = 49.12\%$, $SE = 5.47\%$) toy, $t(23) = 0.164$, $p = .871$. The proportional fixation of the toys during the Test block was analysed by a 2×2 analysis of variance (ANOVA) with the within-subject factors Test (trial 1 and trial 2) and Toy (attended or unattended). The analysis yielded a marginally significant test trial $\times$ toy interaction, $F(1, 11) = 3.981$, $p = .071$, $\eta^2 = .266$, but no significant main effects (ps $> .189$). Even though infants' overall fixation times did not differ between the attended toy ($M = 45.8\%$, $SE = 5.4$) and the unattended ($M = 54.2\%$, $SE = 5.4$) toy during the entire Test block, $t(23) = 0.795$, $p = .435$, post hoc tests differentiated the fixation duration of the first test trial from the fixation duration of the second test trial (see Figure 3). The previously unattended toy was fixated to a higher degree ($M = 66.2\%$, $SE = 5.4\%$) than the previously attended toy ($M = 33.8\%$, $SE = 5.4\%$) during the first of two test trials, $t(11) = 3.166$, $p = .009$. However, during the second test trial infants fixated both toys equally long—previously unattended toy: $M = 42.2\%$, $SE = 8.4\%$; previously attended toy: $M = 57.8\%$, $SE = 8.4\%$; $t(11) = 0.971$, $p = .352$. In addition, the fixation duration during the first test trial did not correlate with the fixation duration during the Gaze Direction block, $r_{xy} = .103$, $p = .750$.

The analysis of the fixation duration demonstrated that infants spent a different amount of time looking at the two toys during both the Gaze Direction block and the Test block. Interestingly, infants showed no preference at all during the Baseline block. An especially detailed analysis was conducted covering the first fixation and the order of presentation.

Analysis of first gaze shift and first fixation

The first gaze shift from the model's face to a toy during the Gaze Direction block was analysed separately. Infants' first gaze shifts were directed to the attended toy in 38 of 46 trials, $\chi^2\,(1) = 19.565$, $p = .000$, with an averaged DS of 2.17 ($SE = 0.48$), indicating that infants were reliably following the model's gaze. This first gaze shift did not correlate with the fixation duration during the first test trial, $r = .089$, $p = .783$. The first fixation of a toy was analysed by a 3×2 ANOVA with the within-subject factors Block (baseline, gaze direction, and test) and Toy (attended or unattended). The analysis yielded a significant block $\times$ toy interaction, $F(2, 10) = 6.297$, $p = .017$, $\eta^2 = .557$, but no significant main effects (ps $> .312$), indicating that the infants' first fixations to the attended toy differed among the blocks; see Figure 4 for the percentage of first fixation on the toys. Accordingly,

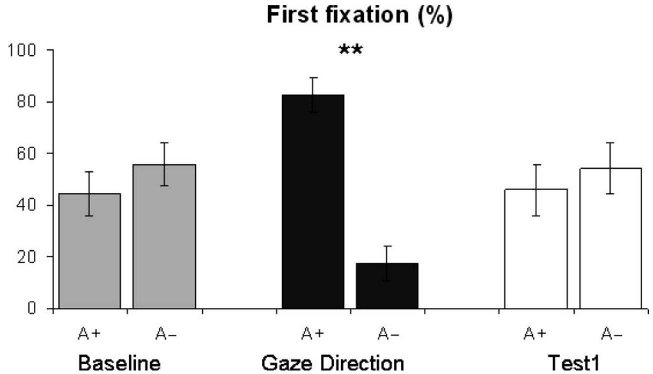

Figure 4. Average percentage scores of the first saccade directed to the attended (A+) and unattended (A−) target based on AOI, in Baseline (B), Gaze Direction (GD) and Test blocks. Error bars indicate standard error and ** depict significant differences.

separated *t*-tests revealed that the first fixation was significantly directed to the attended toy during the Gaze Direction block ($M = 82.7\%$, $SE = 6.8\%$), $t(11) = 5.011$, $p = .0004$, whereas no differences occurred in the first fixation between the attended toy ($M = 44.4\%$, $SE = 8.5\%$) and the unattended toy ($M = 55.6\%$, $SE = 8.5\%$) during the Baseline block, $t(11) = 0.689$, $p = .505$, and the Test block, attended toy: $M = 45.8\%$, $SE = 10.1\%$; unattended toy: $M = 54.2\%$, $SE = 10.1\%$, $t(11) = 0.432$, $p = .674$. In addition, the percentage of first fixation directed to the left toy was not significantly different from the percentage of first fixation directed to the right toy during all blocks (all ps $> .522$).

Analysis of the presentation order

Each infant was presented with four trials where the model always attended to the same toy, but its location was changed between trials according to an ABBA design (cf. procedure). The subsequent test trial without the model presented the toys again in changed location (B). In order to investigate the responsibility of the presentation order for the fixation times of both Baseline trials and Gaze Direction trials, differences scores were calculated for the fixation duration in each trial separately. Positive scores indicate longer fixations of the attended toy, whereas negative scores demonstrate longer fixations of the unattended toy (see Figure 5). The differences of these scores were analysed by a one-way ANOVA of the changed locations (GD1 to B2, GD2 to B3, GD3 to B4). This analysis revealed no significant main effect, $F(2, 10) = 1.907$, $p = .199$, ruling out an overall influence of the presentation order. Of special interest was the alteration between GD1 and

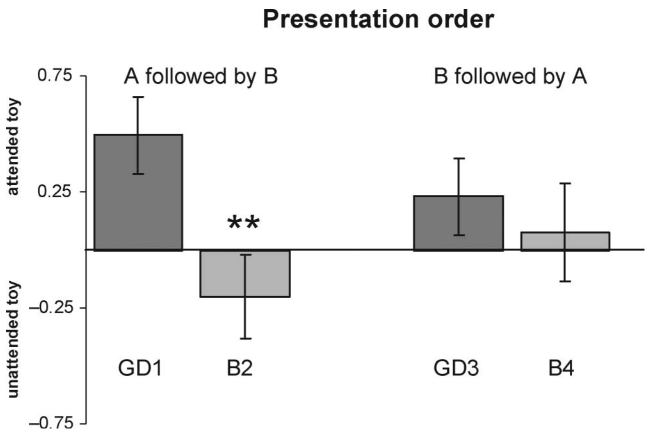

Figure 5. Average difference scores of the fixation duration to the attended and unattended toy, based on AOI, in Baseline trials and Gaze Direction trials in reference to the presentation order. Positive scores indicate longer fixation to the attended toy, negative scores to the unattended toy, respectively. Error bars indicate standard error and ** depict significant differences.

B2 (A followed by B), as well as between GD3 and B4 (B followed by A). Planned contrasts yielded a significant difference of the scores between GD1 ($M = 0.49$, $SE = 0.17$) and B2 ($M = -0.20$, $SE = 0.18$), $t(11) = 3.728$, $p = .003$, indicating a location cueing at the beginning (see Figure 5). Nevertheless, this difference disappeared over trials. Accordingly, the difference scores did not vary anymore during the last changed location between GD3 ($M = 0.23$, $SE = 0.16$) and B4 ($M = 0.08$, $SE = 0.21$), $t(11) = 0.678$, $p = .512$.

DISCUSSION

In order to investigate object processing in a gaze following task, we presented 12-month-old infants with different movies on an eye tracker. The first four movies showed a female model turning and looking to one of two objects; this was followed by two test trials showing only the two objects without the model. Infants did not differentiate between the two objects during the Baseline block. In the Gaze Direction block infants consistently followed the model's gaze to the attended object and fixated the attended longer than the unattended object. No overall difference was found during the Test block; there was, however, a significant difference in the first test trial, here infants fixated the unattended object for a longer duration than the attended object.

First of all, it is important to emphasize that these results complement previous findings that infants by the end of the first year of life follow gaze (Carpenter, Nagell, & Tomasello, 1998; Corkum & Moore, 1995; Johnson et al., 1998; Scaife & Bruner, 1975; von Hofsten et al., 2005), which is an important precondition for the question at hand. In fact, even though the model was presented on a monitor (as opposed to "live"), infants reliably followed the model's gaze to the attended object. This suggests that movies can substitute "live" interactions in order to take advantage of the high resolution provided by current eye-tracking technology.

In addition to demonstrating the basic finding of gaze following, the high spatial-temporal resolution of the eye-tracking system allowed us to obtain additional details about the infants' gaze following behaviour. We were able to differentiate the trials temporally into Baseline, Gaze Direction, and Test blocks, as well as spatially into the three specific areas of interest: face, attended, and unattended objects. This made it possible to show that infants' first fixation of the attended toy differed among the blocks; it was only significantly directed towards the attended toy during the Gaze Direction block. The analysis of the AOIs revealed that the main location of attention was the model's face, where infants spent altogether up to 60% of their looking duration. The first gaze shift from the model's face to a toy during the Gaze Direction block was directed towards the attended toy in 83% of the trials.

Despite the fact that infants readily followed the model's gaze to an object, we cannot find evidence that following another person's gaze direction had a long-term effect on infants' object processing at 12 months of age. The only detectable difference in behaviour towards the attended and the unattended object in the Test block was a brief novelty preference for the previously unattended object. This effect was only evident in the first test trial. We suggest that this result represents a temporarily restricted novelty effect caused by prolonged looking durations to the attended object during the Gaze Direction block.

These results harmonize well with the enhanced object processing documented by Reid and colleagues (2004, 2005). Both studies demonstrate a novelty preference for the previously unattended object. These similarities exist despite differences in the design. In the current study infants were being presented with far more ecologically relevant stimuli that simulated the natural interaction between an infant and an adult.

At the same time the current design allowed us to look at the depth of this enhanced object processing by presenting infants with multiple test trials. We have demonstrated that this novelty effect is brief and only influences infants' behaviour for a single test trial. The current finding suggests that infants do not attribute any strong meaning to the relationship between the model's gaze and the attended object, at least not to such a degree that it has a profound impact on the infant's long-term interaction with the attended object. This suggests that a careful interpretation of the phrase "enhanced object processing" should be applied to future studies of perception of gaze direction. According to our findings, 12-month-old infants follow others' gaze but are unable to represent the relationship between the model's gaze and the attended object, or alternatively are unable to attribute any specificity to the regarded object.

The notion that infants are unable to transfer the perceived relationship between the model and the object across trials receives further support from the infants' performance during the Baseline block. With the exception of the first baseline, infants have previous experience with the model and have perceived her attend to one of the two objects. As such, later parts of the Baseline block could be considered an additional test of infants' object processing. However, as mentioned, no difference in fixation duration was found in this part of each trial. In addition, there was no significant correlation between fixation durations in Gaze Direction and Baseline blocks or between the first gaze shift in the Gaze Direction block and fixation durations during the first test trial. The missing correlation between the looking behaviour during the Gaze direction block and the looking behaviour during the Test block further supports the argument that gaze following does not automatically go hand in hand with object processing.

It is of course possible that by the end of the first test trial infants have fixated the previously unattended object enough to cancel out the novelty effect from the first test trial. Such an alternative interpretation of the current results would produce a similar null-effect in the second test trial. The current design is, however, unable to differentiate between the two.

Interestingly, a study of Itakura (2001) showed that 12-month-old infants looked significantly longer to one of two objects on a screen, if their mother has been previously drawing their attention to it through pointing and vocalizing. In this experiment the infants were sitting on the mother's lap and followed her pointing gesture, not her gaze. The mother's pointing here had a clear impact on the infant's interest towards the attended object.

Consequently, future studies should aim at describing how infants come to attribute a more profound meaning to objects that have been attended by others and to investigate at what age infants attribute sufficient meaning to others' gaze direction to display a stable behavioural change that enhance the acquisition of knowledge about the environment. Related studies (e.g., Itakura, 2001) suggest that additional gestures such as pointing might enhance the processing of the object of interest.

CONCLUSION

The results indicate that infants at the age of 12 months reliably follow others' gaze direction. Nevertheless, there is no implication that retrieving specific information about the objects during a gaze following task is a fundamental property of gaze following at this age. Following a model's gaze does not influence infants' looking behaviour beyond a temporarily restricted response. The study further demonstrates that eye-tracking technology represents a promising paradigm for obtaining detailed information of infants' gaze following. Further investigations are required to observe at what age gaze following results in object processing, which is stable enough to guide long-term interactions with attended objects.

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