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## Social, cognitive, and physiological aspects of humour perception from 4 to 8 months: Two longitudinal studies

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### Abstract

Infants laugh by 4 months, but whether they understand humour based on social or cognitive factors is unclear. We conducted two longitudinal studies of 4-, 6-, and 8-month-olds ( $N = 60$ ), and 5-, 6-, and 7-month-olds ( $N = 53$ ) to pinpoint the onset of independent humour perception and determine when social and cognitive factors are most salient. Infants were shown six events in randomized repeated-measures designs: two ordinary events and two absurd iterations of those events, with parents' affect manipulated (laugh or neutral) during the latter. Four-month-olds did not smile/laugh more at absurd events, but exhibited a significant heart rate deceleration. Five-month-olds independently appraised absurd events as humorous, smiling/laughing despite their parents' neutrality. Parent laughter did not influence infants of any age to smile more, but captured 4-month-olds' attention. Results suggest that 4-month-olds laugh in response to social cues, while 5-month-olds' can laugh in response to cognitive features.

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Long before they speak or crawl or walk, infants laugh. Infant laughter appears between three and 4 months of age (Sroufe & Wunsch, 1972), but despite its early emergence and the strong immediate effect it has on the infant's social relationships, it has received relatively little empirical attention (Reddy & Mireault, 2015). Recently, researchers have begun to explore infant humour perception and creation to understand how and when such young infants extract humour from the environment and whether it corresponds with cognitive and/or social achievements (e.g., Loizou, 2005; Reddy, 2001). Humour and laughter are closely related; humour refers to the general experience of perceiving and creating amusement (Davies, 1998), while laughter serves as an expression and reasonable measure of humour, particularly in infants and young children (Mireault, Sparrow, Poutre, Perdue, & Macke, 2012) as they have not yet learned to mask their emotions. We have been investigating infant humour perception using smiling and laughter as a metric in a series of longitudinal experiments conducted in infants' homes as they age up through the first year to examine cognitive and social features in the early emergence of humour.

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Humour perception in adults and children has been explained with two competing theories: social and cognitive. Social theorists have argued that the best indices of humour perception – smiling and laughter – have more to do with the social context in which humour is embedded (Kraut & Johnston, 1979; Mireault *et al.*, 2015; Provine, 2004; Reddy, 2008). That is, smiling and laughing are rare in solitary situations even when an individual is amused, and are more common in social situations even when there is nothing particularly comedic happening (Provine & Fischer, 1989). The social theory of humour perception is further supported by evolutionary evidence that suggests smiling and laughing have mostly to do with communicating and forming social alliances. For example, precursors of smiling and laughing are present in some non-human primates (Preuschoft, 1992), and the neurological circuitry for joy is shared by all mammals (Panksepp, 2000). Further, Pien and Rothbart (1980) have argued that the presence of humour perception in infancy suggests it is primarily a social phenomenon and does not rely on advanced cognitive skills.

However, cognitive theorists have countered that the social context is not sufficient for humour to be perceived. After all, human beings – especially infants – spend most of their time with others, but little of that time laughing. These theorists propose that humour perception involves the cognitive element of incongruity, defined as a mismatch between what is expected and what actually happens (Hoicka, 2014). Incongruity initially results in surprise, and is only appraised as humorous if embedded within a ‘playful frame’ (Hoicka, 2014). Thus, according to the cognitive model of humour perception, the infant must be able to recognize incongruity as well as the playful context in which it exists.

It is clear that infants as young as 4 months can both play and recognize incongruity (Pien & Rothbart, 1980). A host of research, unrelated to humour specifically, has shown that infants can and do detect incongruity, and respond by looking longer at it. This work is based on the Violation of Expectation (VoE) paradigm (Baillargeon, 1991; Spelke & Van de Walle, 1993) during which infants show surprise and/or look longer at unexpected physical events. The VoE research has been used to infer that infants have an early understanding of simple physics (Baillargeon *et al.*, 2012; Dan, Omori, & Tomiyasu, 2001; Spelke & Van de Walle, 1993), object permanence (Baillargeon & DeVos, 1991), and quantity (Dillon, Huang, & Spelke, 2013; McCrink & Wynn, 2007; Wynn, 1998) based on their observations of the world (Tafreshi, Thompson, & Racine, 2014). Importantly, VoE studies show that looking (i.e., consistent with ‘wonder’) – not smiling or laughing (i.e., consistent with ‘joy’) – is the response brought on by incongruity, lending support to the theory that infants require incongruity to be embedded in a social context in order to find it humorous (Hoicka, 2014). This interpretation is somewhat consistent with Dunn and Bremner’s (2016) finding that social looking (i.e., looks towards the parent) may be a more useful metric of infants’ response to VoE and novelty than looking towards the event.

Some researchers have been melding the social and cognitive approaches to infant humour perception. For example, Mireault, Poutre, *et al.* (2012) presented infants with ordinary events and absurd versions of those same events and instructed parents to alternate between remaining affectively neutral towards and laughing at the events. Studies like those have investigated infants’ use of parental cues (consistent with social theory) versus infants’ independent appraisal of events as humorous (consistent with cognitive theory). In one

study, 6-month-olds (Mireault *et al.*, 2014) defied predictions that they would require parental affective cues (i.e., social referencing) to perceive an absurd event as humorous, suggesting that by the end of the first half of the first year, infants are sufficiently cognitively sophisticated to make an independent appraisal of humour. Thus, the developmental point at which infants rely on parental cues, if they do so at all, must occur at or before 6 months of age. The present two longitudinal within-subjects studies employed a close replication of Mireault *et al.*'s (2014) study, but tested infants at 5, 6, and 7 months ( $N = 37$ ) and subsequently at 4, 6, and 8 months ( $N = 46$ ), including a heart rate (HR) measure with the latter sample to corroborate the valence of infants' facial expressions. Prior research has shown infant HR deceleration is associated with visual fixation or interest (e.g., Elsner, Pauen, & Jeschonek, 2006; Langsdorf, Izard, Rayias, & Hembree, 1983), as well as smiling – including smiling while oriented to a social stimulus – in infants as young as 3 months (Brock, Rothbart, & Derryberry, 1986).

With Mireault *et al.* (2014) having found 6-month-olds' can independently appraise events as humorous, we set out to pinpoint the onset of independent humour perception and determine when social and cognitive factors are most salient. To do so, we employed two slightly younger samples with which to replicate Mireault *et al.*'s (2014) protocol. We predicted that 4- and 5-month-olds would not differentiate ordinary and absurd events unless parental affective cues were provided during the latter; thus, we replicated the absurd-neutral versus ordinary comparisons predicting that 4- and 5-month-olds would not be cognitively sophisticated enough to independently appraise an event as humorous, and would require social cues. We therefore predicted more smiling in the absurd-cued versus absurd-neutral and ordinary conditions at 4 and 5 months, and a corroborating heart rate deceleration in the absurd-cued condition to accompany the predicted smiling response. As researchers (e.g., Baillargeon *et al.*, 2012) have documented that infants younger than 4 months can detect violations of expectation based on looking, we predicted more looking in the absurd versus ordinary conditions across all ages, and again expected a corroborating heart rate deceleration based on the predicted looking response in the absurd versus ordinary conditions.

## Method

### Participants

**5-, 6-, 7-month-old sample**—Fifty-three infant–parent dyads were recruited for which longitudinal data were complete for 37 pairs (19 males, 18 females). Infants were full-term and half were firstborns. Infants were 5 months old at the first data collection point, and were within 7 days of their 5-, 6-, and 7-month birthdays upon first, second, and third testing sessions, respectively. Most (95%) participated with their mothers who were on average 31.74 years old ( $SD = 4.94$ ). Most participating parents were married (91.5%), college-educated (72.3%), and had a median combined annual income of \$75,000. No heart rate data were collected on the 5-, 6-, 7-month-old sample as they participated prior to our laboratory being outfitted with heart rate equipment.

**4-, 6-, 8-month-old sample**—Sixty infant–parent dyads were recruited for which longitudinal data were complete for 46 pairs (19 males, 27 females). Infants were full-term, and half were firstborns. Infants were 4 months old at the first data collection point, and were within 7 days of their 4-, 6-, and 8-month birthdays upon first, second, and third testing sessions, respectively. Most (96%) participated with their mothers who were on average 31.5 years old ( $SD = 4.46$ ). Most participating parents were married (82.6%), college-educated (72.5%), and had a median combined annual income of \$61,500.

## Measures

**Smiling/Laughing**—Due to their rate of co-occurrence, smiling and laughing were collapsed into one category. Raw duration (in seconds) of infants' smiling/laughing towards the event/parent was recorded and converted to percentages to adjust for slight differences in event length due to human error (e.g., stopping the event shy of or after 45 s). Working in pairs, research assistants coded smiling/laughing via facial expression based on the Baby Facial Action Coding System (Oster, Hegley, & Nagel, 1992).

**Looking at event**—The majority of the VoE literature has employed looking time as a dependent measure (Baillargeon, 2004), and to maintain investigative consistency, this study followed suit. Behaviour was coded as looking at the event, as long as infants were not smiling at the event (in which case it was coding as smiling/laughing). Duration (in seconds) of looking was coded and converted to percentages to adjust for slight differences in event length due to human error.

Overall Cohen's kappa for the coded variables (smiling/laughing, looking) was very good ( $\kappa = .83$ ).

**Heart rate**—Electrocardiogram (ECG) with an EZ-IBI interbeat interval monitor (UFI, Morro Bay, CA, USA) was used to measure heart rate. Self-adhesive ECG electrodes were placed in a three-lead configuration on the infant's chest. The ECG and heart period data from the monitoring devices were inspected and edited offline with CardioEdit software (Brain-Body Center, University of Illinois at Chicago). This technique did not tend to upset infants or modify their responses from baseline comparisons.

## Procedure

Ethical approval was obtained from the Institutional Review Board. Both samples were recruited from public birth records from the state health department. Parents of full-term infants living within a 50-mile radius of the study site, and of appropriate age for the study were mailed a flyer describing the study. Interested parents contacted the PI, who obtained informed consent. Both short-term longitudinal experiments were carried out in infants' homes. Infants watched while a research assistant showed parents two ordinary events (narration of playing with a ball or drinking from a cup, or read a book) and two absurd events (ball worn as a clown nose and continuously poked while saying 'beep', book or cup worn like hat and continuously raised and lowered while saying 'zoop'), in a within-subjects randomized design. Each absurd event was presented twice: once with parents exhibiting neutral affect and once with parents exhibiting positive affect towards the event (i.e., smiling

and laughing). Except for parental affect (neutral and positive), which was counter-balanced for the absurd events, the absurd events were identical. Parental affect was not manipulated during ordinary events in order to preserve their ordinary nature. Thus, there were six randomized conditions each lasting 45 s: two ordinary events, two absurd-neutral events, and two absurd-positive events. The absurd-neutral and absurd-positive events were identical with the exception of parental affect.

All events were performed for the parent by an experimenter who remained affectively neutral, and each event was separated by 10 s. The three members of the triad were seated in a triangular configuration around a dining or kitchen table, which had been cleared of all objects. Infants were seated in a high chair between the researcher and the parent, who were directly opposite each other with approximately three feet between each member of the triad. The effect of this configuration was to place the infant in the role of observing the event and the parent's reaction to it. This seating arrangement allowed the infant to see both the parent and the event presented by the researcher, and required infants to only slightly turn their heads so that identifying and coding the target of infants' looking behaviour was clear. Parents were instructed to look at and direct their affect towards the event, not at the infant, and not to touch or speak to the infant while the experimenter performed the event for the duration of the procedure. A SONY HD video camera on a tripod was set up opposite the infant so that the complete triad could be captured in the frame. All parents followed the instructions for the procedure, so none were excluded from the analysis.

## Analysis

For each sample,  $3 \times 3$  (age  $\times$  condition) factorial ANOVAs were employed to analyse whether infants exhibited differences in duration of smiling/laughing across ordinary and absurd conditions, including when they did and did not have access to parental humour cues. To reduce the number of analyses and risk of type I error, we only analysed looking when smiling/laughing differences did not occur, to see whether infants differentiated the conditions. Heart rate (HR) data were only collected on the 4-, 6-, 8-month-old sample, with complete longitudinal heart data available for approximately half the sample ( $n = 17$ ) and insufficient HR data at 8 months ( $n = 12$ ) due to electronic file corrosion. Thus, only HR data from the 4- and 6-month-old age conditions were included for analysis with, which involved two  $2 \times 3$  (age  $\times$  condition) factorial ANOVAs to examine HR differences appeared across conditions. As is the case with most longitudinal studies, there were not complete data on every infant at each time point due to scheduling difficulties or other issues (e.g., infant illness, equipment, or technological glitches). All tests were two-tailed.

## Results

### Smiling/Laughing

Contrary to the prediction, 4-month-olds did not find events more humorous when parents provided humour cues, and exhibited a low degree of smiling/laughing across conditions such that there was considerable positive skew in the distribution. However, the age  $\times$  condition interaction effect was significant,  $F(4, 26) = 6.48$ ,  $p < .001$ ,  $\eta_p^2 = .19$ , as were the

main effects for age,  $F(2, 28) = 8.53, p < .001, \eta_p^2 = .24$ , and condition,  $F(2, 28) = 14.35, p < .001, \eta_p^2 = .35$ . (See Figure 1). Follow-up paired  $t$ -tests found the main effect for condition at 6 months, whereby infants smiled/laughed more at the absurd-neutral ( $M = 8.7, SD = 13.9$ ) versus ordinary ( $M = 2.1, SD = 7.6$ ) events,  $t(47) = -3.67, p = .001$ . This effect held up longitudinally at 8-month-olds where infants continued to smiling/laughing more at the absurd-neutral ( $M = 16.3, SD = 22.8$ ) versus ordinary ( $M = 1.9, SD = 4.7$ ) events,  $t(45) = -4.47, p < .001$ . The main effect of age on smiling/laughing occurred between 4 ( $M = 5.9, SD = 10.5$ ) and 8 months ( $M = 16.3, SD = 22.8$ ),  $t(36) = -3.58, p = .001$ , specifically in the absurd-neutral condition.

In the other sample and also contrary to the prediction, 5-month-olds did not find events more humorous when parents provided humour cues. A main effect for condition emerged,  $F(2, 34) = 6.62, p = .002, \eta_p^2 = .17$  (see Figure 2), and follow-up paired  $t$ -tests found this effect began at 5 months, whereby infants smiled/laughed more at absurd-neutral events regardless of age  $t(43) = -2.11, p < .05$  (See Table 1).

### Looking

Since 4-month-olds did not exhibit smiling/laughing differences across conditions, we used a one-way, repeated-measures ANOVA to examine whether they differentiated the conditions based on looking. As predicted, a main effect for condition was found,  $F(2, 44) = 13.59, p < .001, \eta_p^2 = .24$ . Follow-up paired-sample  $t$ -tests showed that 4-month-olds looked more at absurd-neutral ( $M = 71.9, SD = 29.4$ ) than absurd-cued ( $M = 57.2, SD = 30.3$ ) events,  $t(43) = -3.22, p = .002$ , presumably because they were drawn to looking at their smiling parent during the latter events. *Post-hoc* paired  $t$ -tests showed this to be the case, whereby 4-month-olds engaged in more looks towards the parent (i.e., social looking) during absurd-cued ( $M = 19.2, SD = 17.4$ ) versus absurd-neutral ( $M = 7.3, SD = 14.3$ ) events,  $t(43) = -5.21, p = .001$ . Four-month-olds' looking at ordinary ( $M = 77.8, SD = 22.6$ ) versus absurd-neutral ( $M = 71.9, SD = 29.4$ ) events was not significantly different and trended towards the opposite direction,  $t(45) = -1.88, p = .067$  (See Table 2).

### Heart rate

As predicted mean heart rate (beats per minute) differed across conditions where a main effect for condition emerged,  $F(2, 15) = 8.94, p = .001, \eta_p^2 = .36$ . (See Figure 3.) Follow-up paired  $t$ -tests found this effect at 4 months between the absurd-neutral ( $M = 136.1, SD = 10.85$ ) and ordinary ( $M = 139.4, SD = 12.43$ ) conditions,  $t(33) = -2.92, p < .01$ , as well as between the absurd-cued ( $M = 138.9, SD = 11.62$ ) and absurd-neutral ( $M = 136.1, SD = 10.65$ ) conditions,  $t(33) = 2.77, p < .01$ , effects that held up longitudinally at 6 months. In addition, a significant main effect for age was found,  $F(1, 16) = 4.32, p = .05, \eta_p^2 = .21$ . Paired-sample  $t$ -tests found this effect to be due to differences in HR at 4 ( $M = 136.5, SD = 10.65$ ) and 6 months ( $M = 130.7, SD = 11.07$ ) in the absurd-neutral condition only,  $t(16) = 2.92, p < .05$ . Pearson correlations between infant heart rate with looking and smiling specific to the absurd-neutral condition at each age were not significant. This is likely

explained by positive skew in smiling/laughing at 4 months, but not at 6 months. To explore what variables might account for heart rate changes, we ran additional Pearson correlations between infant heart rate and looking at the parent (i.e., 'social looking') during absurd-neutral events. This association was significant at 4 months,  $r(32) = -.050$ ,  $p = .006$ , and 6 months,  $r(28) = .49$ ,  $p = .006$  although in opposite directions.

## Discussion

Infant laughter is a universal response that appears by 4 months of age. However, it is not known how infants extract humour from the environment. Competing theories of humour perception, primarily in adults and children, argue for the importance of social versus cognitive factors in interpreting events as amusing (Hoicka, 2014; Pien & Rothbart, 1980; Provine, 2004; Reddy, 2001). How these two sources of information contribute to humour perception in infancy is particularly unclear.

The present findings from two longitudinal studies shed some light on the process of humour perception early in infancy, especially with regard to infants' reliance on social and cognitive features of humorous stimuli. Mireault *et al.* (2014) unexpectedly found that 6-month-olds were able to independently appraise events as humorous, and would smile and laugh at absurd events even when others remained affectively neutral. The present studies replicated Mireault *et al.* (2014) but employed younger samples of infants to identify whether independent humour perception emerges prior to 6 months, and when social and cognitive features of an event are more salient to infant humour perception. The broad pattern of results replicated Mireault *et al.* (2014) but in 5-month-olds. Specifically, beginning at 5 months, infants independently appraised absurd events as humorous, meaning that they did not require parental affective cues to interpret those events as amusing. Thus, 5-month-olds are cognitively sophisticated enough to perceive an absurd event as humorous all by themselves.

Although infant laughter emerges by 4 months, 4-month-olds did not perceive absurd or ordinary events as humorous, even when the former were paired with parental cues of smiling and laughter. This finding primarily reflects that 4-month-olds exhibited a low frequency of smiling and laughing overall such that there was insufficient variability between conditions to know whether they were differentiating them. However, when looking was used as the dependent variable, 4-month-olds did differentiate between the event types, preferring to look at ordinary events most of all and at absurd-cued events least of all (during which their parents were smiling and laughing). This finding suggests that the neutral affect of the absurd-neutral condition made the event less look-worthy, and suggests that for 4-month-olds, *positive* affect (i.e., absurd-cued events) is better than *some* affect (i.e., ordinary events), which is better than *no* affect (absurd-neutral events). This suggests that social factors may be more important than cognitive factors in the perception of humour at 4 months, while cognitive factors become more salient in humour perception at 5 months. Furthermore, independent humour perception can be pinpointed at 5 months of age, replicating what Mireault *et al.* (2014) had initially reported in 6-month-olds, and extending them through 8 months of age.

Despite the fact that 4-month-olds were not smiling or looking more at absurd-neutral events, they did exhibit a significant heart rate deceleration in this condition, an effect that persisted at 6 months. At neither age was heart rate correlated with looking or smiling/laughing, contrary to some research showing an association between heart rate and positive affect and/or looking (Brock *et al.*, 1986). However, heart rate was consistently associated with looking at the parent (i.e., social looking) during the absurd-neutral events. At 4 months, looking at the affectively neutral parent was negatively associated with heart rate deceleration, a relationship that reversed itself at 6 months. This curious finding may lend support to Porges & Furman's (2011) proposal that instead of a reflection of infants' affective state, heart rate serves as a physiological resource that allows infants to maintain their orientation towards a novel stimulus and/or primes them for positive affect. For 4-month-olds, the social salience of the parent – even in a state of neutral affect – outweighed the event in capturing infants' attention and allowed them to maintain a state of lower arousal during these novel events. By the time they reached 6 months, absurd events were more salient than parents' affective neutrality, and infants' lowered heart rate allowed them to remain oriented to the event, which they perceived as humorous.

Taken together, these findings suggest that infant laughter at 4 months is primarily stimulated by the power of the social context and the salience of others' positive affect, rather than the infant's ability to recognize incongruous events as humorous. Still, infants' sensitivity to novelty, including incongruity, is maintained by physiological factors that allow their continued orientation towards novelty, potentially priming them for positive affect. By 5 months, one cognitive aspect of humour – incongruity – is recognizable as amusing. One question that arises is why infants look at physical incongruities (e.g., Baillargeon, 1991; Spelke & Van de Walle, 1993) but laugh at social incongruities, which can be thought of as violations of behavioral expectations (Walden, Kim, McCoy, & Karrass, 2007). One prospect is that the former are 'impossible' (i.e., magical) events that cannot be resolved, while the latter are possible events that violate social, rather than physical, expectations (Walden *et al.*, 2007). This would suggest that infants as young as 5 months are capable of arriving at some simple incongruity resolutions. For example, a social incongruity by default is embedded in a social context and exists between people, unlike physical incongruities or magic tricks which exist between 'things'. In fact, the presence of another person with whom the infant has a laughter history may be enough to provide a 'playful frame', one of the elements Hoicka (2014) suggests is required to convert novelty or surprise into humour. Additionally, social incongruities – including those used in the present studies – are often repeated (e.g., infants observed the experimenter place the cup on his/her head over and over again within a 45-s interval). It is possible that the use of repetition helps the infant recognize the behaviour of the actor as intentional instead of accidental, and therefore as *funny*.

Future research should address these and other questions to shed additional light on the variables involved in infant humour perception, which may be relevant to other social and cognitive milestones in the first year.



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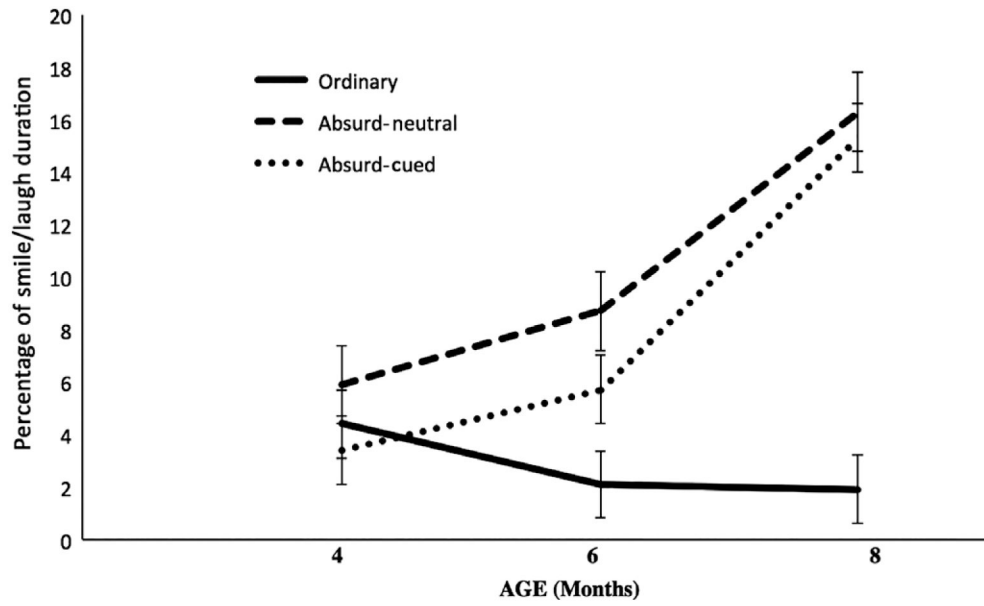
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**Statement of contribution****What is already known on this subject?**

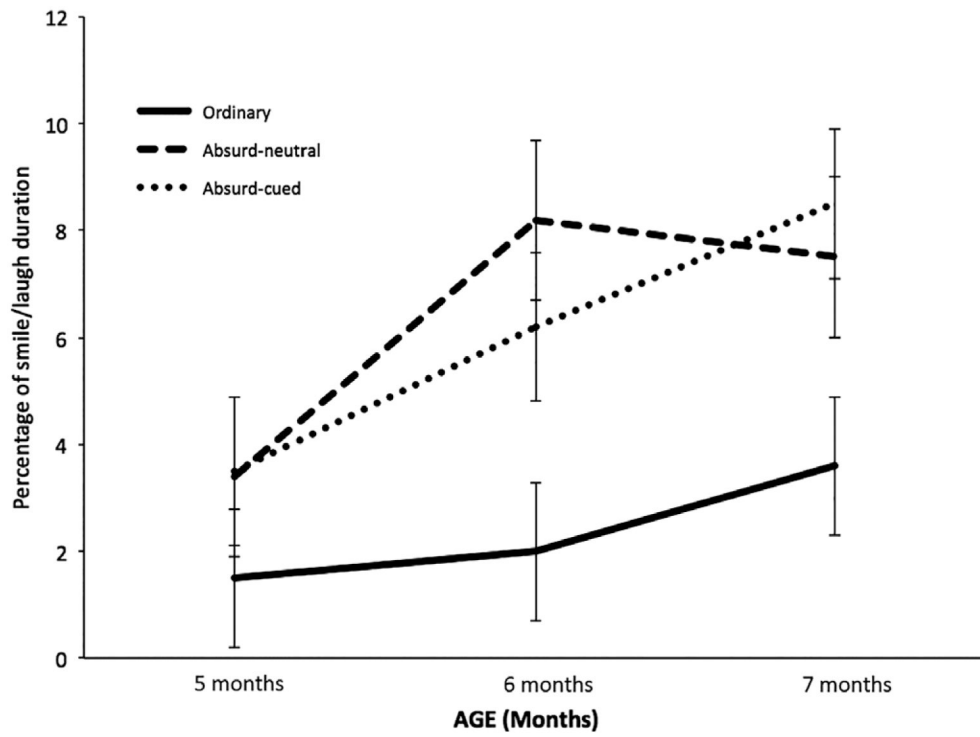
- By 6 months, infants can independently appraise absurd events as humorous, but it is not known whether younger infants can.

**What does this study add?**

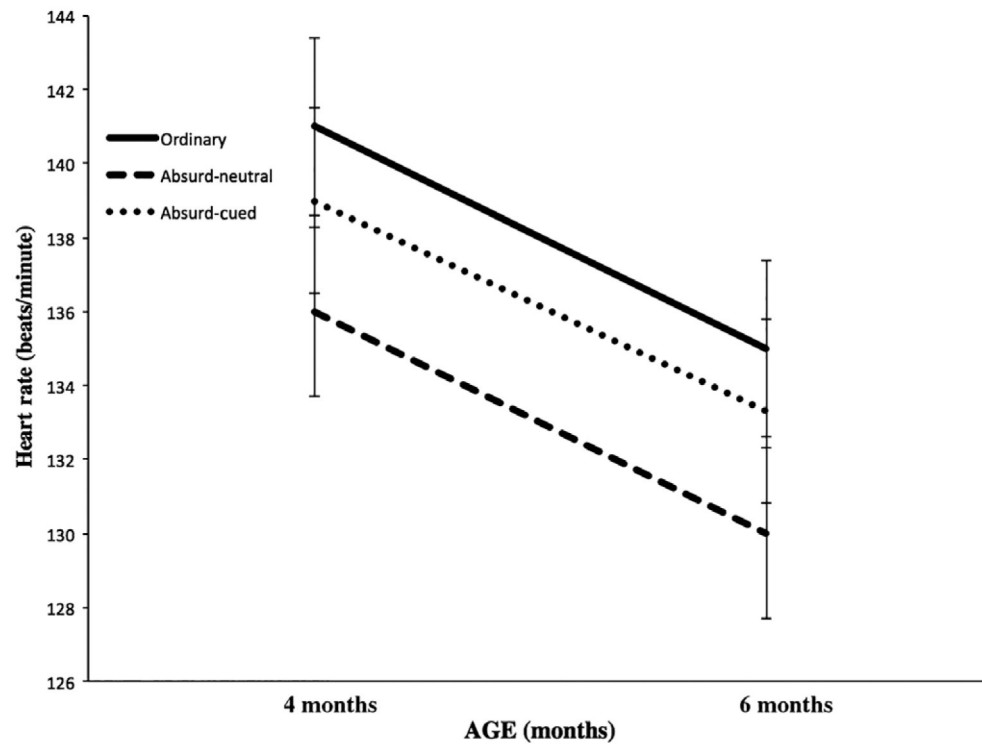
- This study replicated the finding on younger infants, showing that 5-month-olds are similarly capable of independent humour appraisal. These studies also found that although 4-month-olds do not respond to absurd events with positive affect, they do exhibit a heart rate decrease that is unrelated to looking. These studies help delineate when social and cognitive factors contribute to infant humour perception.



**Figure 1.** Percentage of smiling/laughing (seconds) by age<sup>1</sup> and condition<sup>2</sup>. The interaction<sup>3</sup> was significant. Smiling/laughing were collapsed into a single coded category as both represent positive affect. Proportions were used to correct for variation in event length (45 secs) due to human error. <sup>1</sup> $F(2, 28) = 8.53, p < .001$ . <sup>2</sup> $F(2, 28) = 14.35, p < .001$ . <sup>3</sup> $F(4, 26) = 6.48, p < .001$ .



**Figure 2.** The main effect for condition<sup>1</sup> shows that infants' smiled/laughed less at ordinary events regardless of age.  $^1F(2, 34) = 6.62, p = .002$ .



**Figure 3.** Main effects for heart rate deceleration by age\* and condition\*\*. There was no interaction effect. Note that 8-month-olds trended in the same direction, but were omitted from this analysis due to insufficient heart rate data. \* $F(1, 16) = 4.81, p < .05$ . \*\* $F(1, 16) = 22.85, p < .001$ .

**Table 1.**

Percentage of smiling/laughing at ordinary and absurd events at 5/6/7 months

Age (months)	Ordinary <i>M</i> ( <i>SD</i> )	Absurd-Neutral <i>M</i> ( <i>SD</i> )	95% CI	<i>t</i>	<i>df</i>
5	1.4 (3.1)	3.4 (7.9)	-.05, -.00	-2.11*	43
6	2.1 (4.6)	8.2 (15.6)	-.11, -.01	-2.61**	38
7	3.7 (9.4)	7.5 (12.3)	-.07, -.00	-2.12*	41

Notes. CI refers to the difference between conditions.

\*  $p < .05$ ;

\*\*  $p < .01$ .

**Table 2.**

Percentage of smiling/laughing at ordinary and absurd events at 4/6/8 months

Age (months)	Ordinary <i>M</i> ( <i>SD</i> )	Absurd-Neutral <i>M</i> ( <i>SD</i> )	95% CI	<i>t</i>	<i>df</i>
4	4.4 (8.6)	5.9 (10.5)	-.05, .02	-.89	45
6	2.1 (7.6)	8.7 (13.9)	-.10, .03	-3.67*	47
8	1.9 (4.7)	16.3 (22.8)	-.21, .08	-4.47*	45

*Notes.* CI refers to the difference between conditions.

\*  $p < .001$ .

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