ORIGINS OF DEHUMANIZATION: INFANTS' GOAL ATTRIBUTION TO LINGUISTIC IN-GROUP AND OUT-GROUP MEMBERS

by

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Abstract

Research in the past two decades has found evidence for dehumanization in both adults and children; however, its developmental origins – that is, whether young infants already possess the tendency to dehumanize others – has yet to be investigated. The present study examined whether 11-month-old infants already dehumanize out-group members by denying out-group others of certain mental states, a common measure of dehumanization in adults and children. To do so, the study examined infants' attribution of goals, a basic mental state infants readily attribute to human agents. Sixty-two primarily English-hearing infants watched videos in which a female experimenter, either speaking in English or Spanish, reached for one of two objects. At test, the two objects switched places, and infants' looking times were measured as the experimenter either reached for the same object or a different object. Infants who watched the English speaker were surprised, and thus looked longer, when she reached for a different object, suggesting that they attributed a goal of the original object to the English speaker. By contrast, infants watched both types of reaches equally if they saw the Spanish speaker. Exploratory analyses examined the impact of age and language exposure on infants' goal attribution to in-group and out-group members. These findings suggest that infants as young as 11 months of age may already show the tendency to deny out-group others of certain mental states. We discuss the implications of these findings as it relates to the nature of dehumanization and the emergence of intergroup bias.

Lay Summary

As humans, we find harming others extremely aversive. Given this, why does history continue to witness atrocious acts of violence? One answer to this is dehumanization: Perpetrators of violence rob their victims of human-ness to justify harmful acts. A large body of work has shown that adults and older children indeed dehumanize others by attributing to them fewer complex mental states, but where does this tendency come from? This research finds that infants as young as 11-months-old may already deny out-group members – in this case, someone who speaks a different language – basic mental states, such as goals. We discuss the implication of our findings as it relates to the nature of dehumanization as well as its relationship with intergroup bias.

Preface

This thesis is an original, unpublished intellectual product of the author, F. Yuen. The research was conducted by the author at the University of British Columbia under the supervision of J. K. Hamlin, who was involved in the research design, data analysis, and research design. All work, data collection procedures, and methods were approved by the University of British Columbia's Research Ethics Board (H10-01808, "Early Understanding of the Physical and Social Worlds").

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Introduction

Humans are a cooperative species that rely on one another to survive and flourish. Relatedly, humans have a strong aversion towards harming others; indeed, adults show signs of distress even when merely simulating acts of violence (Cushman et al., 2012). Despite this clear aversion towards harm, humans are nonetheless surprisingly capable of committing crimes against humanity. From the merciless genocide of Jewish people during World War II (Kershaw, 2001) and Tutsis in Rwanda during the spring of 1994 (Tirrell, 2012), to the mass incarceration and cultural genocide of Uyghurs in Xinjiang (Smith Finley, 2021), we have and continue to witness atrocious acts of violence against our fellow humans. How can we begin to reconcile this apparent paradox?

Research on dehumanization seeks to offer a resolution. More specifically, the *dehumanization hypothesis* builds on the observation that victims of historical tragedies were often compared to nonhuman entities, such as rats, lice, monkeys, and dogs (Bruneau & Kteily, 2017; Hagan & Rymond-Richmond, 2008; D. L. Smith, 2011, 2014). It posits that by perceiving their victims, often racial out-group members, as being "less than human" or even not human at all, perpetrators of violent acts can overcome harm aversion and mentally justify such acts (Andrighetto et al., 2014; Cuddy et al., 2007; Haslam, 2006; Leyens et al., 2007). Though inspired by historical tragedies, dehumanization is far from being a relic of the past: Asian Americans, for example, were found to be dehumanized during the recent coronavirus 2019 (COVID-19) pandemic (Markowitz et al., 2021). Given its relevance, this proposition has received considerable attention from its proponents in both the social sciences (Harris, 2017; Harris & Fiske, 2006, 2009, 2011; Haslam, 2006; Leyens et al., 2007) and philosophy (D. L. Smith, 2011, 2014, 2016), and there is a large literature demonstrating both subtle and more blatant forms of dehumanization in adults. However, far less research has examined *how and when* humans begin to dehumanize out-group members; that is, the developmental origins of dehumanization remain underexplored. The current research seeks to contribute to this ongoing investigation by examining whether preverbal infants possess the tendency to dehumanize.

Conceptualizing and Measuring Dehumanization

Dehumanization has been conceptualized and measured in different ways. In its most extreme form, *blatant dehumanization* describes cases in which out-group members are entirely removed from the human category, often with direct comparisons to non-human animals. Blatant dehumanization has been proposed to be a key causal factor driving extreme cases of violence against outgroup members such as torture and genocide (D. L. Smith, 2011, 2014, 2016; Viki et al., 2013). Evidence for blatant dehumanization has been found using both explicit and implicit measures. Explicit tasks include the "Ascent of (Hu)man" scale, in which adults rated how 'evolved' they considered different social groups using a visual scale depicting an ape on one end of the spectrum, and a modern human on the other (Kteily et al., 2015). Such work has revealed that racial and religious minorities are often rated as significantly less human by members of non-minority groups (Kteily & Bruneau, 2017b); this tendency is especially prevalent during times of crisis such as the COVID-19 pandemic (Markowitz et al., 2021). Other explicit measures find converging evidence for blatant dehumanization; for instance, adults are more likely to directly compare out-group members to animals in a negative way (e.g., saying a group is "lacking self-restraint, like animals"; Bastian et al., 2013; Landry et al., 2022).

Findings with explicit measures are corroborated by implicit measures, such as the reverse correlation task (Kunst et al., 2019; Petsko et al., 2020). In this task*,* one set of participants (the generators) are asked to determine which of two blurry faces more resembled a target group (e.g. which face looks more Arab/American; Petsko et al., 2020). These images are then digitally combined to make composite images that reflect the generators' mental representations of these groups. Next, a separate group of participants (the raters) rated the composite faces using explicit measures of dehumanization described above. Such findings reveal that adults' mental representations of out-groups (e.g. the composite Arab faces) were consistently dehumanized to a greater extent relative to the in-group (e.g., the composite American faces; Kunst et al., 2019; Petsko et al., 2020). Critically, this is considered an implicit measure as the generators were not aware of the nature of the task: they were told that the study examined how people evaluated pictures that differed in clarity. Other implicit measures, such as a modified implicit association task (IAT), find similar results: Participants who were primed with Black faces via rapid subliminal image flashes were faster to respond to images of apes compared to those primed with White faces (Goff et al., 2008).

Importantly, implicit measures such as reverse correlation reveal that blatant dehumanization may not be reserved for groups that are traditionally openly discriminatory towards minorities: Politically liberal participants, who explicitly reject the notion of dehumanization, nevertheless implicitly dehumanized racial outgroups (Petsko et al., 2020). Implicit measures also appear to have real-world consequences: For instance, in one study the tendency for police officers to associate Black male children's faces with apes in an IAT predicted their tendency to use force against Black children (Goff et al., 2014). Together, these findings suggest that blatant dehumanization is not only still prevalent in modern society, but may have serious down-stream consequences.

Adults also show more subtle forms of dehumanization. Unlike blatant dehumanization in which outgroup members are denied full humanity and/or directly associated with non-human animals, in subtle dehumanization out-group others are denied certain uniquely human *traits* and/or perceived as relatively “less human” than are in-group members (Haslam, 2006; Haslam & Loughnan, 2014; Vaes et al., 2012). For example, adults explicitly grant out-group members fewer complex mental states (e.g., second-order emotions like guilt and remorse; Cuddy et al., 2007; Leyens et al., 2000, 2001, 2007), agency (the capacity to plan and act; Gray et al., 2007), and experience (the capacity to sense and feel; Waytz et al., 2010). Adults also use less mental state words when describing the lives of out-group members (Harris & Fiske, 2011), and are less likely to perceive out-groups as “having a mind” (Krumhuber et al., 2015),

These findings are similarly supported by evidence from implicit measures. For example, content analysis and computational linguistic work analyzing descriptions of minoritized groups in historical documents (e.g. colonial settlers describing indigenous peoples) has found that out-group others were described using fewer mental state terms and with less agentic language (Choi et al., 2020; Mendelsohn et al., 2020). This difference in mind attribution has also been found in experimental settings, such as IATs (Paladino et al., 2002) and face morph tasks (Hackel et al., 2014). In the latter, participants were shown face morphs that sometimes looked more human and sometimes looked less human (e.g., like a mannequin). Participants were then asked to judge how likely it is that a given face morph possessed a mind. Critically, between trials, individual morphs were randomly assigned to be labeled as either belonging to the participant’s minimal in-group or out-group. Results showed that adults held a lower threshold for mind attribution for faces labeled as in-groups compared to faces labeled as out-groups; that is, they were more willing to judge a less-human face as possessing a mind when the face is described to be an in-group member’s face, but less willing to do so if the face was described to be an out-group member. Finally, subtle dehumanization has been shown to be associated with real-world harm, at least through acts of omission: Adults who attributed less secondary emotions to out-group victims of natural disasters, and those who described out-groups in an animalistic (e.g. rating a group as being "backwards in culture") or mechanistic way (e.g., rating a group as being cold) reported less willingness to provide help to the victims in hypothetical scenarios (Andrighetto et al., 2014; Cuddy et al., 2007).

Developmental Trajectory of Dehumanization

Given the potential harm that can result from both blatant and subtle dehumanization, there has been growing effort to reduce dehumanization tendencies (Bruneau et al., 2021; Capozza, 2014; Capozza et al., 2013, 2017; Prati et al., 2015; Schroeder & Risen, 2016; J. M. Smith et al., 2022). However, these approaches often target adults, who typically already hold deeply entrenched views about out-groups that are difficult to sway. Early interventions with young children, on the other hand, may prove more fruitful in achieving the ultimate goal of reducing intergroup conflict and biases. Indeed, a wealth of research has collectively shown that young children already hold intergroup biases (Aboud, 1988; Dunham et al., 2011; Kinzler et al., 2009; Patterson & Bigler, 2006). Children as young as 5 years old show both explicit and implicit preferences for their own gender (Dunham et al., 2016) and race (Doyle & Aboud, 1995; Kinzler & Spelke, 2011). By 6 years of age, children already show levels of implicit own-race preference comparable to that of adults in a child-friendly IAT (Baron & Banaji, 2006).

Emerging work suggests that children may also show tendencies to dehumanize, both blatantly and subtly. For example, Zhou and Hare (2020) first introduced 5- to 12-year-olds to a hypothetical out-group against which they will compete in a memory competition. Then, children rated the out-group members on a children-friendly version of the Ascent of (Hu)man scale (Kteily et al., 2015); results showed that children rated the hypothetical out-group as less human than their in-group. Similar evidence has been found with subtle dehumanization: One study found that ethnically White 6- to 10-year-olds attributed fewer human traits (e.g., creativity) and second-order emotions (e.g., guilt) to Black targets compared to White targets (Costello & Hodson, 2014). This tendency to subtly dehumanize seems to generalized beyond racial groups: 7- to 12-year-olds judged those who are not their friends as possessing less human traits such as humility and trustworthiness (van Noorden et al., 2014), and 6- to 11-year-old Scottish children estimated that members of an opposing sports team (i.e., the English national football team) experience second-order emotions less intensely (Martin et al., 2008). Dehumanization in children has also been examined implicitly: Adapting the face morph task (Hackel et al., 2014), McLoughlin and colleagues (2018) found that 6-year-olds perceived face morphs as less human if they belonged to either a different gender or to a geographically distant out-group (i.e., someone who lives far away). Taken together, these findings suggest that young children already show tendencies to both blatantly and subtly dehumanize.

Dehumanization and Out-group Dislike

Despite the growing interest and mounting evidence in the past two decades, the exact nature of dehumanization (i.e. what dehumanization *is*) and its developmental trajectory are far from conclusive. For example, while some theorists believe dehumanization to play a causal role in the development of intergroup preference, others have expressed concern that blatant dehumanization may simply reflect general antipathy towards out-groups. Under this conceptualization, observed instances of dehumanization may be strong manifestations of intergroup preference – more specifically out-group dislike – rather than the cause. That is, people compare out-groups to animals and non-human entities *because* they already dislike them (Haslam & Loughnan, 2014; Over, 2021). Indeed, explicit measures of dehumanization are consistently correlated with measures of out-group dislike (Kteily et al., 2015, 2016; Kteily & Bruneau, 2017), suggesting that the two processes may share an underlying construct. In addition, the majority of human traits utilized in past work have been positive and socially desirable (e.g. warmth); denial of such traits may therefore reflect a tendency to deny out-group members of *any* positive traits rather than dehumanization (Over, 2021).

Further support for this account comes from empirical evidence suggesting that adults do not indiscriminately deny *all* human-ness from out-groups. In a series of studies, Enock and colleagues (2021) asked adults to attribute human traits that varied in desirability to in-group targets and three different out-group targets for which evidence of dehumanization has been obtained: political adversaries (Pacilli et al., 2016), immigrants (Kteily et al., 2015; Kteily & Bruneau, 2017a; Markowitz & Slovic, 2020), and criminals (Bastian et al., 2013; Viki et al., 2012). Rather than attributing more human traits to in-groups overall, adults only denied positive uniquely human traits (e.g., moral, civilized) to out-groups, and were actually *more* likely to attribute to them traits that are undesirable, but nonetheless uniquely human (e.g., cynical, corrupt). These findings suggest that the observed dehumanization via human-trait denial in some past work may have reflected a general attribution of negative traits to out-groups, regardless of whether these traits are unique to humans, as opposed to actual dehumanization (Enock et al., 2021).

On the other hand, other studies suggest that, although related, the process of dehumanizing is different from simply expressing strong dislike towards out-groups. For example, blatant dehumanization uniquely predicts hostile attitudes towards low-status out-groups even when controlling for dislike (Kteily et al., 2015, 2016). These findings are further corroborated by neuroimaging work. For instance, fMRI studies demonstrate that adults show consistently greater activity in the inferior frontal cortex (IFC) when passively viewing images of animals compared to images of humans (Jack et al., 2013). Critically, when adults undergo fMRI scans while making judgments about out-group members, activity in the same region is more strongly correlated with explicit dehumanizing judgments than judgments of dislike (Bruneau et al., 2018).

Similarly mixed evidence is observed in studies with children. For example, dehumanization in children is associated with stronger out-group dislike: Children who were more likely to dehumanize out-groups also more strongly endorsed in-group superiority, were more willing punish out-group members in hypothetical scenarios, and were marginally less willing to share stickers with out-group others (Zhou & Hare, 2020). Further, while as noted above, McLoughlin and colleagues (2018) found that 6-year-olds showed stronger tendencies to dehumanize out-groups (e.g. other gender) by giving lower humanness ratings, the same sample already showed an explicit in-group preference (e.g. own gender) by 5 years of age. Together, these findings suggest that not only does dehumanization seem to be strongly associated with dislike during childhood, but that tendencies to dehumanize may emerge later in development than out-group dislike does. This developmental trajectory suggests that dehumanization may be a product of early emerging intergroup preferences in childhood rather than the cause, at best emerging in tandem.

On the other hand, one study also found that White children's racial prejudice against Black people was fully mediated by their tendency to attribute less uniquely human qualities to Black individuals (Costello & Hodson, 2014), as though dehumanization explains dislike versus the other way around. These contradictory findings may be due to differences in the target group's status; perhaps *some* forms of dehumanization (e.g., against racial out-groups) may emerge earlier than others (e.g., against other gender). Evidently, more work is needed to elucidate the relationship between dehumanization and out-group dislike.

Studying Dehumanization in Infants

One way to further our understanding of the dehumanization process as it relates to intergroup preference is to examine its developmental origins of dehumanization in preverbal infants. Specifically, if the tendency to dehumanize emerges in early infancy *prior* to the emergence of out-group dislike, it would suggest dehumanization to be a process distinct from and preceding out-group dislike. Young infants provide a unique opportunity for this investigation as they already demonstrate robust intergroup preferences: They visually prefer faces of their own race (Bar-Haim et al., 2006; Kelly et al., 2005, 2007; Liu et al., 2015) and socially prefer for speakers of their native language (Kinzler et al., 2007). They also selectively use information provided by speakers of their native language to guide their own behavior (Shutts et al., 2009; Soley & Sebastián-Gallés, 2015).

Critical for the understanding of both the developmental origins as well as the true nature of dehumanization, this observed intergroup preference in infants does not appear to reflect or stem from out-group dislike. Unlike most studies in which infants' responses merely reflected a *relative* preference for in-groups over out-groups, in a series of experiments, Pun and colleagues (2018) found while that 1-year-old infants expected speakers of their native language to perform prosocial acts, and readily associated them with positively valenced items (e.g. smiley faces), they neither expected speakers of a foreign language to perform antisocial acts, nor associated them with negative items (e.g. spiders). These findings suggest that the tendency to prefer ingroups to outgroups, and to view in-group members as "good," is already present around 1 year of age, but that the tendency to negatively evaluate out-group members emerges later. These patterns of results are also consistent with past work with older children demonstrating that explicit out-group prejudice emerges later than in-group favoritism (Aboud, 2003; Brewer, 1999; Buttelmann & Böhm, 2014). Thus, if the tendency to dehumanize already exists at an age when out-group dislike has yet to be observed, it may shed light on how the tendency to dehumanize develops in childhood and adulthood, as well as whether dehumanization is a distinct process separate from out-group dislike.

Investigating dehumanization in preverbal infants proves difficult, as they are incapable of performing existing tasks used for adults and older children. Thus, the present study focuses on one form of dehumanization that can be measured in this younger population: Mental state attribution. As discussed prior, one way in which adults subtly dehumanize out-groups is through the denial of complex mental states such as agency and experience (Gray et al., 2007; Waytz et al., 2010). Thus, if infants similarly show subtle dehumanization of out-groups, they may differ in how they attribute mental states to in-group and out-group individuals. One suitable candidate for investigation is infants' attribution of goals. Firstly, evidence from neurological work suggests that infants may differentially process the goal-oriented actions of racial in-groups versus out-groups (Hwang et al., 2021), lending support to the proposition that infants may reason differently about out-group members' goal-related mental states. Secondly, infants' goal attribution to animate agents has been studied extensively (e.g., Cannon & Woodward, 2012; Luo & Baillargeon, 2005; Woodward, 1998; see Robson & Kuhlmeier, 2016 for a review). In a seminal study, Woodward (1998) first watched as a hand repeatedly reached for and grasped one of two objects. After habituation, the objects switched locations, and infants watched the hand reach for either the same object or the other object on alternating trials. Infants in this study looked longer at the display when the hand grasped the new object, suggesting that they a) attributed a goal to the hand (presumably attached to a human), and b) expected the hand to act in a goal-driven manner. Critically, when the hand was replaced with a mechanical claw (i.e., not an animate agent), infants looked equally regardless of what object the claw reached for. Together, this series of studies suggest that by 5 months of age, infants attribute goals to animate agents, but not to objects (see also Kanakogi & Itakura, 2011).

Relatedly, and perhaps most relevant for the current study, research investigating *to whom* infants attribute goals have revealed two critical findings. Firstly, not *all* human actions are automatically perceived as goal-oriented: Infants do not attribute goals to a hand that touched an object with the back of the hand (Kanakogi & Itakura, 2011; Woodward, 1999). Secondly, some evidence suggests that goal attribution may not be reserved for humans, but animate agents in general. Although there is lively debate as to what properties constitute an animate agent (for a review, see Rutherford & Kuhlmeier, 2013), a host of studies have demonstrated that demonstration of certain cues to agency – things like engaging in self-propelled motion, responding contingently to the environment, etc. – is sufficient to elicit goal attribution to non-human entities in preverbal infants (Biro & Leslie, 2007; Csibra, 2008; Luo & Baillargeon, 2005; Schlottmann & Ray, 2010; Shimizu & Johnson, 2004). Nevertheless, it is generally agreed upon that infants do not attribute goals to inanimate objects that have not displayed such agency cues.

The Present Study

Building on the aforementioned work on goal attribution, the present study asked whether infants are less likely to attribute goals to an in-group human versus an out-group human. If infants are relatively less likely to attribute goals to an out-group member, this may suggest that infants view out-group members as possessing less agency than in-groups, much like adults do (e.g., Choi et al., 2020; Mendelsohn et al., 2020). Critically, this tendency would be in place at an age where infants *do not* yet appear to demonstrate clear out-group dislike (Pun et al., 2018).

To investigate this question, we adapted the Woodward paradigm with several modifications. First, prior to any reaching trials, infants first watched an introductory video in which two female experimenters established their group status by speaking either in the infant's native language (i.e. English) or a language unknown to the infant (i.e. Spanish). We chose to manipulate group status via language rather than race because past work suggests language to be a stronger cue to group membership than race for young infants (Cohen, 2012; Kinzler et al., 2009; Kurzban et al., 2001). Second, the experimenter makes short utterances in either English or Spanish (depending on the condition to which the infant was assigned) as they reach for the objects rather than reaching in silence. This is to ensure that infants are constantly reminded of the speaker's group status. Third, we opted to use a pre-recorded video rather than a live performance by an actor in order to minimize stimuli variation between trials as well as across participants. Finally, we used six familiarization trials leading up to the test trials rather than employing a habituation design, reasoning that 11-month-olds would require relatively few trials to encode and attribute the goal of the experimenter and might become overly bored by a habituation design. We chose to investigate this question in 11-month-olds because they already reliably show both a preference for their linguistic in-group but not out-group dislike (Kinzler et al., 2007, 2009; Pun et al., 2018), as well as the capacity to attribute goals to animate agents (Woodward, 1998). This would also be, to our knowledge, the youngest age at which dehumanization has been tested.

As there has been no work, to our knowledge, that examines dehumanization in infants, we do not have strong predictions for what might occur. That is, while we predicted that infants would look longer when an English-speaking (e.g., ingroup) experimenter reaches for a different object versus the same object during test trials – replicating decades of similar work in which group status was not manipulated (Ambrosini et al., 2013; Kanakogi & Itakura, 2011; Woodward, 1998) – we were agnostic as to whether they would do so with a Spanish-speaking (e.g., out-group) experimenter. That is, while we hypothesized that infants would differ in their tendencies to attribute goals to the Spanish speaker, two potential patterns might emerge. The first possibility is that infants would look longer at outcomes where the Spanish speaker reaches for the *same object* versus a different object. This would suggest that infants did not attribute any agency or goals to the Spanish speaker, and in fact expected her to *not* act in an agentic manner and were surprised when she did. Alternatively, infants might look equally at both outcomes much like the claw condition in Woodward (1998), suggesting that they either attribute little to no agency to the Spanish speaker and expected her to act in the same manner as inanimate objects, or simply failed to reason about her mental states altogether. Either of the two looking patterns would provide evidence that infants may have failed to attribute goals to – and therefore may have dehumanized – the Spanish speaker. That said, this is indeed a stringent test of our hypothesis, given that even before this age, infants already show robust goal attribution to non-human entities that have otherwise provided evidence of being agents (Biro & Leslie, 2007; Csibra, 2008; Luo & Baillargeon, 2005; Schlottmann & Ray, 2010; Shimizu & Johnson, 2004). Therefore, infants may show the same looking pattern for both English and Spanish speakers, suggesting that they do not dehumanize linguistic out-groups, or that our measures were not sensitive enough to detect it.

Methods

Participants

Participants were recruited from a database of families who expressed interest in participating in psychological research. A legal guardian, typically the infant's primary caregiver, provided written informed consent prior to their participation. Participants were 62 full-term (min. 36 weeks gestation), healthy, and typically developing infants (30 females; mean age = 10.6 months, range = 10.4 – 12.4 months) living in a North American city. The majority of participants were from Caucasian or Asian backgrounds, representative of the population from which the participants were sampled. According to parental reports, all infants were exposed to English during at least 80% of their waking hours, and did not regularly hear Spanish. This ensured that English was their primary language, and Spanish was entirely foreign. The average percentage of exposure to English was 95.9%, with 28 infants hearing exclusively English, while 34 hearing a mixture of majority English and minimal amounts of other languages.

An additional 16 infants participated in the study, but were excluded due to fussiness ($N = 4$), procedure errors ($N = 6$), equipment failures (e.g., recording malfunction; $N = 2$), or other errors ($N = 4$). The sample size was based on past work examining goal attribution and action understanding, which have typically tested 16 to 24 infants per condition (for example, $N = 24$ per condition in Gerson et al., 2015; $N = 20$ per condition in Gerson & Woodward, 2014). Given that the current study is a stringent test of our hypothesis, we aimed for a minimum of 30 infants per condition in order to have sufficient power to detect the effect of interest. All study protocols were approved by the Behaviour Research Ethics Board at the University of British Columbia, and all procedures, sample sizes[1], and analysis plans were preregistered[2].

Apparatus and Setup

All infants were tested in a dimly lit, soundproof room. The study stimuli were presented on a 41" by 23" monitor. Infants sat in their caregiver's lap approximately 100cm away from the screen. A camera mounted under the monitor recorded the infants' looking behavior at 25 frames per second. Throughout the study, parents wore noise canceling headphones and listened to classical music in order to remain ignorant of the condition, and were instructed to keep their eyes closed for the entire duration.

Procedure and Stimuli

Introduction Trial

The present study adapted the methodology used to investigate infants' goal understanding in past work (e.g., Woodward, 1998), with two modifications. First, infants saw an introduction trial at the start of the study that manipulated condition assignment. Second, infants were familiarized rather than habituated prior to the test trials, given that the present study tested an older age range, and pilot findings suggested that infants were more likely to become fussy and disengage from the stimuli when a habituation design was used. See *Figure 1* for a schematic depiction of the study flow.

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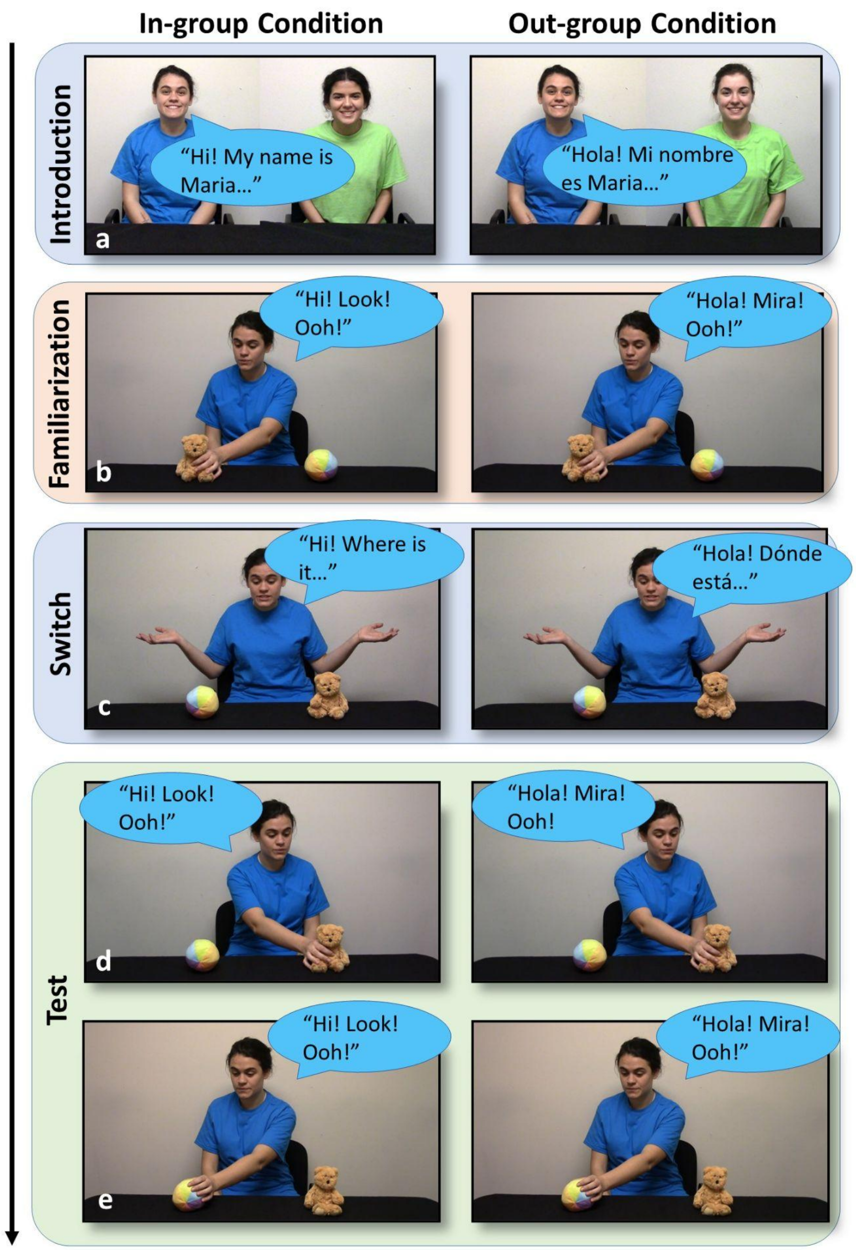
[1] A sample size of 40 was originally preregistered. However, prior to performing any data analysis related to the hypothesis, the target sample size was increased to 64 to ensure there were 32 infants per cell, which is the recommended sample size for infant looking time studies (Oakes, 2017)
[2] Access to OSF repository will be made available upon official publication of this work, and is not made public in this thesis

Figure 1

Schematic Depiction of Study Flow



Note. Schematics depiction of the study flow. Infants watched an introduction trial (panel a), six familiarization trials (panel b), a switch trial (panel c), and six test trials that alternated between the new path event (panel d) and new goal event (panel e).

Infants first watched an introduction trial in which two female experimenters wearing plain blue and green t-shirts each read out a short dialogue in English and Spanish. The dialogues described different playing activities (in English, “Hi! My name is Maria/Stacy. Everybody plays! You can play with toys, you can go to the park, and you can play games. Everybody plays!”), and the order in which the two languages were spoken was counterbalanced across infants. The same experimenter (the one in blue) is always the one that performed the reaching action during the familiarization and test phase, regardless what language she spoke. The introduction trial consisted of the following: a still frame displaying the two speakers (10 seconds), an attention getter (5 seconds), both dialogues (12 seconds each x 2 = 24 seconds), attention getter (5 seconds), and another still frame of the two speakers (10 seconds).

Familiarization Trials

Following the introduction trial, infants watched a total of six identical familiarization trials, each separated by an attention getter (approximately 1 second). Each trial started by showing the experimenter in blue seated in front of a gray table, with two objects (a bear and a ball) in front of her approximately 60cm apart. In the In-group condition, the experimenter said, “Hi!” while looking at the infant, then looked down at one of the objects and said, “Look!”. Then, she reached for and grasped the target object while saying “Ooh!”, and a still frame depicting the final result (i.e. the experimenter grasping the target object) remained on the screen. In the Out-group condition, the experimenter vocalized in Spanish instead of English (“Hola! Mira! Ooh!”). The entire sequence lasted 6 seconds. An observer unaware of the target of the reach monitored the infant’s looking behavior during the still frame, and began coding as soon as the final vocalization ended (i.e. after the experimenter stopped saying “Ooh!”). Trials were infant contingent, and advanced when infants looked away from the screen for 2 consecutive seconds or after 60 seconds had elapsed, whichever occurred first. The sides of the objects and the target object being grasped are counterbalanced.

Following familiarization, infants watched a switch trial, which began by revealing that the two objects had switched positions. Then, the experimenter spoke to draw infants' attention to the change ("Hi! Where is it? Did they switch? Where did they go?"). In the Out-group condition, the experimenter said the dialogue in Spanish instead. A still frame of the objects in their new locations remained on the screen for up to 60 seconds, or until infants looked away for 2 consecutive seconds.

Test Trials

Following the switch trials, infants watched two test trials – the *new goal* or the *new path* event – three times each in alternating fashion, for a total of six test trials. In the new goal event, the experimenter performed the same reaching action as in the familiarization trials, but since the objects have switched locations, she now grasped the other object. By contrast, in the new path event the experimenter reached for and grasped the object she had previously grasped during the familiarization trials. As the object was now in a new location, she performed a previously unseen action. All test trials, regardless of event type, were accompanied by the same vocalization as in the familiarization trials. Identical to the familiarization trials, a still frame remained on the screen for a maximum of 60 seconds, or until infants looked away for 2 consecutive seconds. The order in which the new goal and new path trials were presented was counterbalanced.

Coding

Although infants' looking behavior was coded by an on-line observer during the study, looking time during the test trials was coded offline frame-by-frame by a second coder. This is to both maximize coding accuracy as well as minimizing experimenter bias. While the on-line coders were always unaware of the trial order, and thus did not know whether a given trial featured the new goal or new path event type, on-line coders were not consistently unaware of the study condition (i.e. what language the experimenter spoke during familiarization and test trials). That said, the two objects were not sufficiently apart on the stimuli display such that coders could feasibly guess whether a test trial reach was consistent with those in the familiarization phase. Nonetheless, infants' looking time during the test trials was coded offline frame-by-frame by a second coder to both minimize experimenter bias as well as maximizing coding accuracy. If the offline coder determined a trial did not advance with the correct timing, either prematurely (i.e. trial advanced despite infant not looking away for 2 consecutive seconds) or with delay (i.e. trial did not advance despite infant looking away for 2 consecutive seconds), data from that infant was discarded. No infants were excluded based on this criterion, and all statistical analyses were conducted using the offline observer's coding.

Results

Data Transformation

Looking time data for infant research is often heavily right skewed, which necessitates data transformation prior to analyses. Shapiro-Wilk normality test revealed that infants' looking time data significantly deviated from the normal distribution (W = 0.84, $p < .0001$), so all looking time data was log-transformed prior to all statistical analyses (Csibra et al., 2016). Following log-transformation, outliers that deviate 2.5 standard deviations from the mean, calculated separately for the three different trial types (familiarization, switch, test) were removed from subsequent analyses. A total of five familiarization trials, one switch trial, and nine test trials were excluded. After transformation and exclusions, the looking time data no longer violated normality assumptions (W = 0.99, $p = .12$).

Preregistered Analyses

Counterbalanced Variables

To examine whether counterbalanced variables had a significant effect on infants' looking time during the test trials, we conducted a mixed ANOVA[3] with initial reach side (left or right), event order (new goal or new path first), and original target toy (ball or bear) as between-subjects factors, and log-transformed looking time during the first test trial pair (the primary measure of interest; discussed in the *New Goal Versus New Path* section below) as the dependent measure. The analysis revealed no significant main effects or interactions, and thus all counterbalanced variables were collapsed in all subsequent analyses.

[3] Analyses of counterbalanced variables were initially preregistered as chi-squared tests. As chi-squared tests are not appropriate for the dependent variable in the current study, a mixed ANOVA was conducted instead. This decision was made prior to data exploration, and was made solely on the basis of appropriateness of statistical models.

Overall Attention During Familiarization

To ensure that any conditional differences could not be attributed to attentional differences driven by novelty effects, infants' mean looking time during the first three and last three familiarization trials were compared across the two conditions via paired-sample t-tests. Results indicate that infants were equally attentive in both conditions during both the first half ($t(30) = 0.69$, $p = .0.49$) as well as the second half ($t(30) = 0.95$, $p = .35$) of the familiarization trials. However, a two-sample t-test revealed that during the switch trial, infants looked longer in the In-group condition ($M_{loglooking} = 2.77$) than the Out-group condition ($M_{loglooking} = 2.24$; $t(51) = 2.48$, $p = .02$). This attentional difference was explored in the *Exploratory analyses* section to follow.

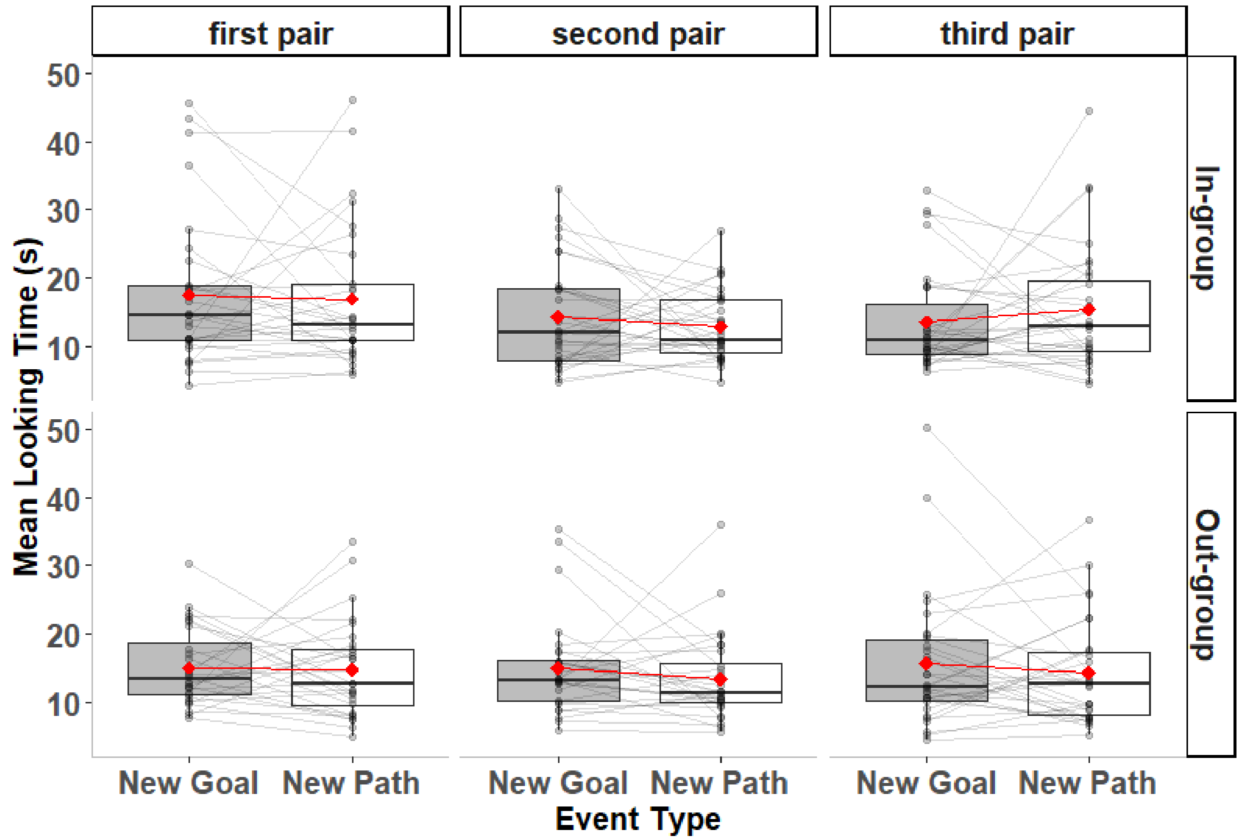
New Goal Versus New Path

The main prediction for the present study was that infants who watched an English-speaking experimenter (In-group condition) reach for objects will be surprised, and thus look longer, when the experimenter reaches for a new object (new goal event) at test. On the contrary, infants who watched a Spanish-speaking experimenter (Out-group condition) will either look longer when the experimenter reached for the same object (new path event), or look equally to both the new goal and new path scenarios. While all infants completed a total of six test trials, our focal analysis tested infants' looking pattern during the first pair of test trials. This decision was informed by two reasons. First, infants may become less interested in the stimuli, thus showing decreased looking time, as the study progressed. Therefore, any difference in looking time between event types would likely be strongest during the first pair of test trials. Second, infants may learn from the test trials and "recalibrate" their expectations or attribution of goals as they watch more test trial events. That is, after watching the first pair of test trials, which always featured two contrasting events, infants may no longer hold a strong expectation for what the experimenter might do. Therefore, any surprise (and thus increased looking) that results from a violation of their expectations should be strongest during the first test trial pair. If one of the two trials were excluded as an outlier, data from that infant was excluded from this analysis, yielding a sample size of 57 infants. Paired-sample t-tests revealed that infants in the In-group condition looked equally to both event types, $t(28) = 0.18$, $p = .86$, 95% CI [-0.21, 0.25]. Similarly, infants in the Out-group condition also showed no differences in looking, $t(27) = 0.70$, $p = .49$, 95% CI [-0.14, 0.28]. Thus, infants looked equally at both outcomes regardless of what language the experimenter spoke.

To examine whether infants looked differentially at the new goal and new path events during the other test trials, paired-sample t-tests were conducted for the second and third test trial pairs. Following the same trial-level exclusion criteria outlined above, the two analyses were conducted on $N = 59$ and $N = 61$ infants for the second and third test pairs, respectively. Results revealed that, during the second test trial pair, infants looked equally at the *new goal* and *new path* events in both the In-group condition ($t(30) = 0.37$, $p = .72$, 95% C [-0.19, 0.28]) and the Out-group condition ($t(27) = 1.21$, $p = .24$, 95% CI [-0.08, 0.30]). Infants similarly showed no difference in looking in the third test trial pair in either the In-group ($t(30) = -0.76$, $p = .46$, 95% CI [-0.34, 0.16]) or the Out-group condition ($t(29) = 0.62$, $p = .54$, 95% CI [-0.14, 0.27]; see Figure 2.).

Figure 2

Looking Time Across Test Trial Pairs



Note. Boxplot of infants' mean looking time across all three test trial pairs. Solid center line indicates the median, red diamond indicates the mean. Across all conditions and test trial pairs, infants did not look longer at either the new goal or new path event.

Exploratory Analyses

First Test Trial Only

While one of the predicted outcomes was that infants in the Out-group condition would not look longer at either event types, that infants in the In-group condition did not look longer at the new goal trials was inconsistent with past findings using similar paradigms. One possibility is that even after just one test trial, infants already adjusted their expectations about what the experimenter might reach for. If so, infants should show spontaneous recovery in their looking time during both test trials if the surprising outcome was presented during the first test trial, but show longer looking only during the second test trial if the first test trial was unsurprising. To examine this, an ANOVA with condition (In-group or Out-group) and event order (new goal or new path first) as between-subjects factors, trial number (first or second trial) as the within-subjects factor, and log-transformed looking time was conducted. The analysis revealed a significant two-way interaction between condition and event order, $F(1, 53) = 2.89$, $p = .003$. Post-hoc tests showed that infants in the In-group condition looked significantly longer when the new goal trial was presented first ($M_{loglooking} = 2.88$) compared to when the new path trial was first ($M_{\text{loglooking}} = 2.44$; $t(54) = 3.21$, $p = .002$). By contrast, infants in the Out-group condition showed the opposite pattern, looking marginally longer when the new path trial was presented first ($M_{loglooking} = 2.72$) compared to when the new goal trial was first, $M_{loglooking} = 2.52$; $t(56) = -1.77$, $p = .08$. These results suggest that infants' looking time during the second test trial was affected by the outcome of the first, and thus a comparison between the first two test trials may not accurately reflect infants' goal attribution.

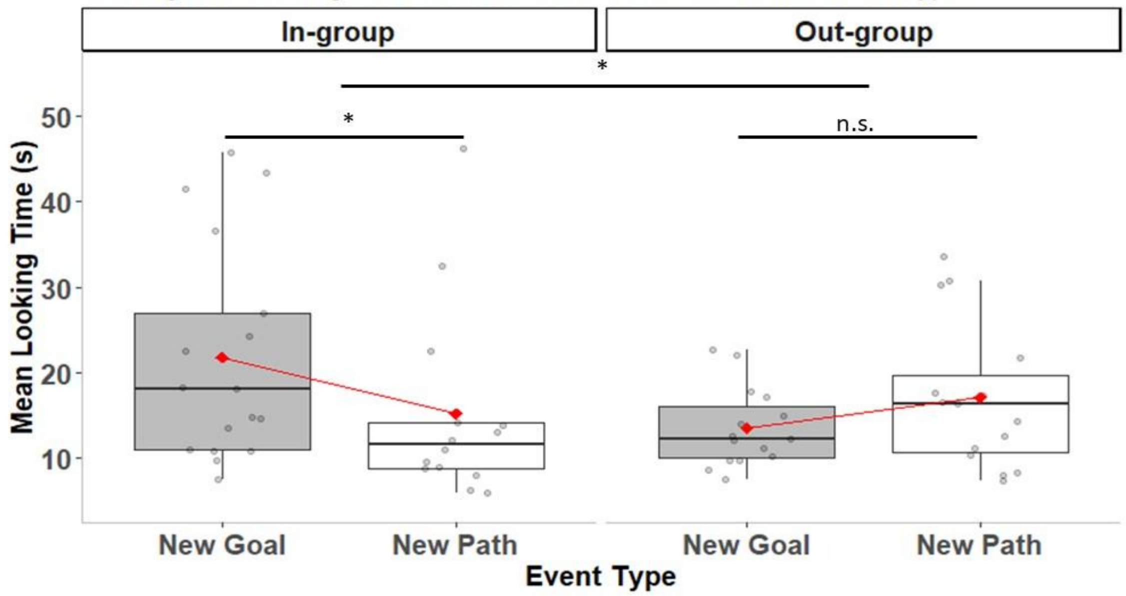
To explore these suggestive patterns, we conducted exploratory analyses by examining infants' looking during the first test trial only, reasoning that their looking time during this trial would be less 'noisy' than subsequent test trials (for similar between-subjects analyses, see Burnside et al., 2020 and Perez & Feigenson, 2022). As looking times during the first trial is overall higher than the remaining test trials, we recalculated the means and standard deviations for the first test trial only, and used this new criteria to detect outliers that were 2.5 standard deviations from the mean. A total of one participant was removed as an outlier[4].

[4] The same results were obtained when outlier removal was conducted following the original criteria outlined in the *Data Transformation* section. That is, the same participant was removed from analysis regardless of whether outlier detection was based on all six test trials or only the first test trial

A 2 (condition: In-group vs Out-group) x 2 (event type: new goal vs new path) between-subjects ANOVA found no significant main effects of condition, $F(1, 57) = 0.74$, $p = .39$, indicating that infants looked equally to reaches performed by In-group and Out-group members. There was also no main effect of event type, $F(1, 57) = 0.74$, $p = .39$, indicating that infants generally looked equally at both event types. However, there was a significant interaction between condition and event type, $F(1, 57) = 4.74$, $p = .03$. Planned contrasts revealed that in the In-group condition, infants looked significantly longer at the new goal trial ($M_{\text{loglooking}} = 2.93$) than at the new path trial, $M_{\text{loglooking}} = 2.54$, $t(57) = 2.14$, $p = .04$, whereas in the Out-group condition, infants looked equally at both the new path trial ($M_{\text{loglooking}} = 2.73$) versus the new goal trial, $M_{\text{loglooking}} = 2.55$, $t(57) = -0.94$, $p = .35$. See Figure 3.

Figure 3

Looking Time During First Test Trial Across Condition and Event Type



Note. Infants' looking time during the first test trial across condition and event type, analyzed between subjects. Infants did not look significantly longer at the new goal trials compared to the new path trial in the In-group condition, but looked significantly longer at the new path trial relative to the new goal trial in the Out-group condition. The effect of event type was significantly different for infants in the Out-group condition than it was for those in the In-group condition. $^*p < .05$

Attention During Switch Trials

Next, we examined the impact of infants' attention during switch trials on their subsequent test trial performance. As discussed prior, infants looked significantly longer at the switch trial if the experimenter spoke English than if the experimenter spoke Spanish, $t(51) = 2.48$, $p = .02$. Thus, the pattern of looking observed in the first test trial may be driven by these attentional differences if infants in the In-group condition showed longer looking at the new goal trial because they were more attentive during the switch trial, and were more likely to detect the switch in the objects' locations. If this is the case, then attention during the switch trial alone, regardless of condition, should predict infants' differential attention during the test trial. To investigate this possibility, a multiple linear regression was calculated to predict test trial looking based on switch trial looking, event type (new goal versus new path), and the interaction between the two factors.. The regression equation was not significant, $F(3, 56) = 0.24$, $p = .87$, $R^2 = -0.04$. By contrast, the regression model that used event type (new goal versus new path), condition (In-group versus Out-group), and the interaction between the two factors provided a better fit, $F(3, 56) = 2.19$, $p = .10$, $R^2 = 0.06$. This suggests that while there was overall higher looking during the switch trial in the In-group condition, this difference in looking did not reliably predict infants' looking during the first test trial.

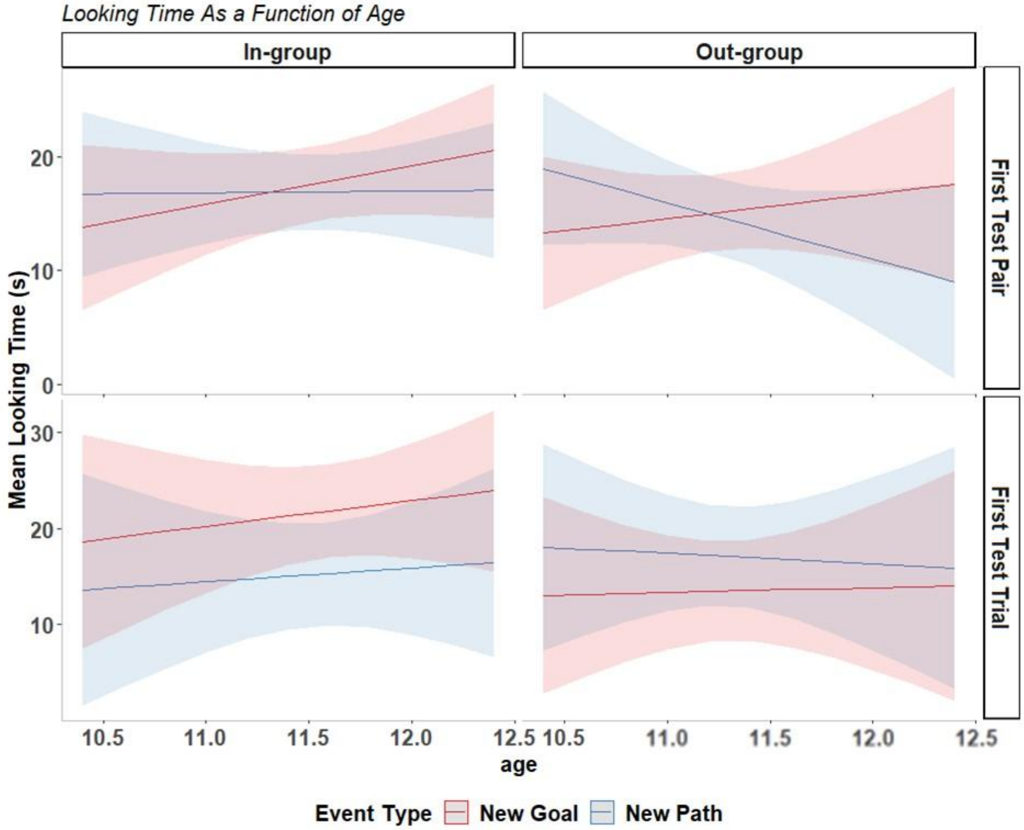
Age Effects

As the current study spanned a two-month age range, we examined whether older infants performed differently than younger infants. A mixed ANOVA was conducted with age (continuous) and condition (In-group or Out-group) as between-subjects variables, event type (new goal or new path) as the within-subjects variable, and log-transformed looking times during the first test trial pair as the dependent variable revealed no significant main effect of age, $F(1, 53) = 0.005$, $p = .95$. There was, however, a significant two-way interaction between age and event type, $F(1, 53) = 5.37$, $p = .02$. The pattern indicates that on average, older infants looked longer during new goal trials than new path trials, regardless of what language the experimenter spoke. No other interactions were statistically significant, including the three-way interaction between age, condition, and event type. Together, this suggests that older infants were more likely to have attributed goals to the experimenter, regardless of the language she spoke.

When examining infants' looking time only during the first test trial, however, this interaction was no longer significant ($F(1, 53) = 0.01$, $p = .91$). Instead, the analysis revealed the predicted two-way interaction between condition and event type, $F(1, 53) = 4.40$, $p = .04$, with infants on average looking longer during new goal trials if they had seen an English speaker, but looking longer during new path trials if they had seen a Spanish speaker (see Figure 4).

Figure 4

Looking Time As a Function of Age



Note. Infants' looking time during the first test trial pair (top panel) and first test trial only (bottom panel) as a function of age, across condition and event type. Older infants on average looked longer at new goal events compared to younger infants during the first test trial pair, regardless of condition. By contrast, when examining only the first test trial, infants looked longer at the new goal event if the experimenter spoke English, and looked longer at the new path event if the experimenter spoke Spanish; this pattern was unaffected by age.

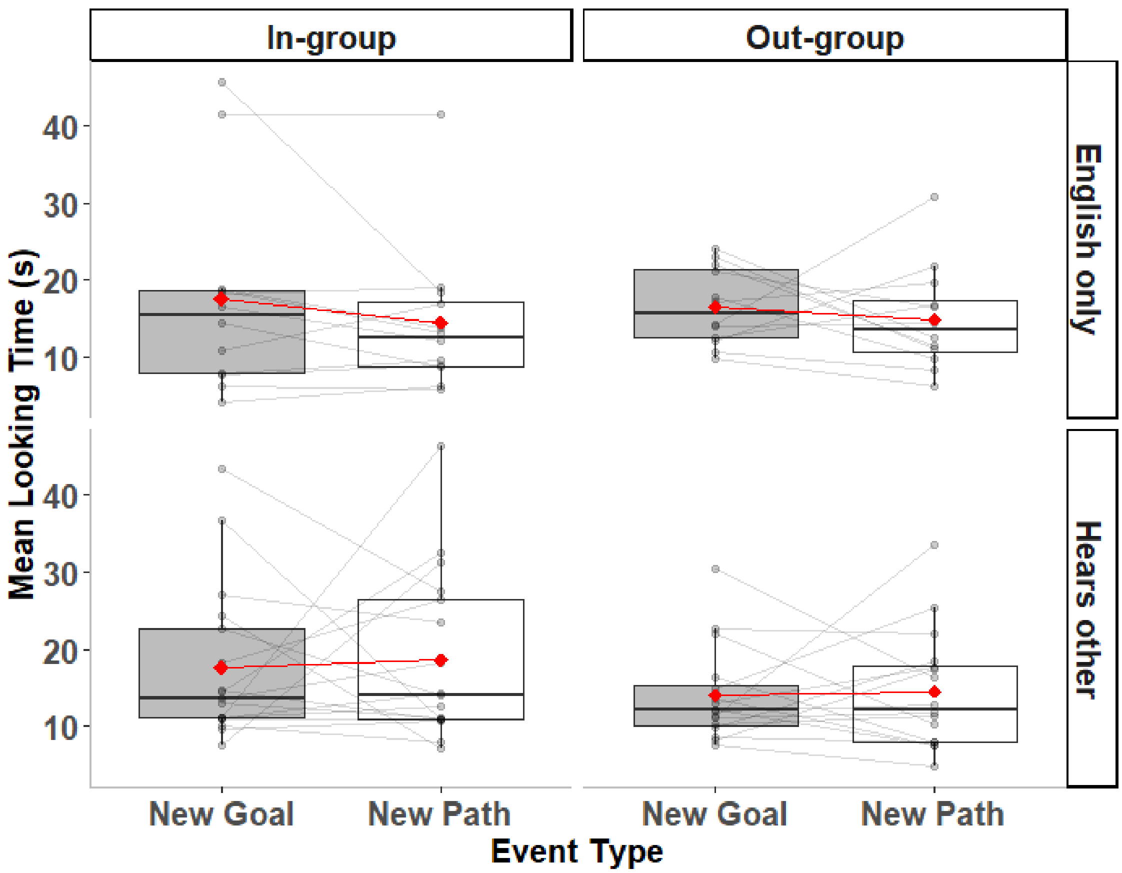
Language Effect

Although the current study tested only infants who were monolingual as reported by their caregivers, that the minimum requirement for English exposure was 80%, resulting in some variation in infants' secondary language exposure. Given that the manipulation of group status was based on language, we reasoned that infants' tendency to view a Spanish speaker as an Out-group member may be sensitive to secondary language experience. For instance, while monolingual children preferred to socially affiliate with a monolingual adult over a bilingual one, bilingual children befriended both speakers equally (Byers-Heinlein et al., 2017). In addition, infants raised in multilingual environments, regardless of the degree of exposure, showed enhanced perspective taking abilities compared to infants raised in monolingual households (Liberman et al., 2017).

Thus, to follow-up on this possibility, we contrasted the tendency to attribute goals between truly monolingual infants (i.e. 100% English exposure) versus those who were regularly exposed to any percentage of non-English languages. A mixed ANOVA with condition (In-group or Out-group) and age group ("English only" or "Hears other languages") as between-subjects variables, event type (new goal or new path) as the within-subjects variable, and log-transformed looking time during the first test trial pair as the dependent variable revealed no significant main effects or interactions (see Figure 5). Similarly a 2 (condition) x 2 (language group) x 2 (event type) between-subjects ANOVA with log-transformed looking time during the first test trial as the dependent measure revealed only the predicted interaction between condition and event type, $F(1, 53) = 5.06$, $p = .03$. A visualization of the data revealed that infants who heard only English show a higher contrast between new goal and new path looking compared to those who heard other languages (see Figure 6.), but none of the interactions involving language groups as a factor reached statistical significance (all *p*'s > 0.10). An independent sample t-test did reveal that English-only infants in the In-group condition who saw a new goal trial looked longer than those who saw a new path trial, although this difference was only marginally significant (p = .053, see Figure 6).

Figure 5

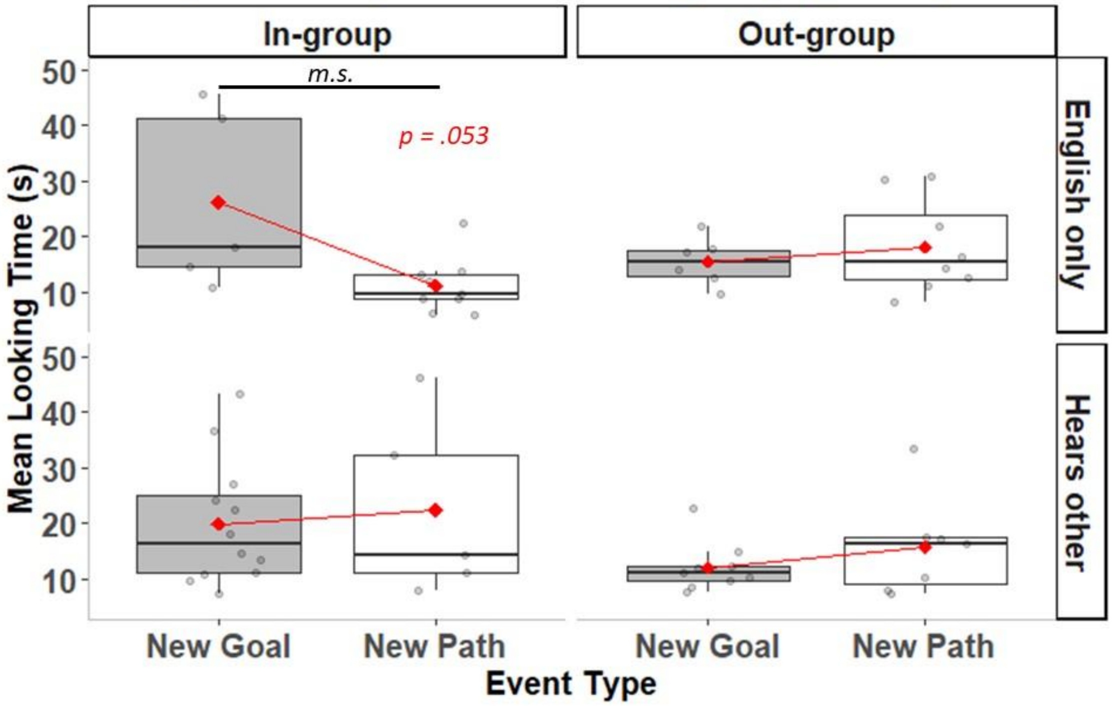
Looking Time Across Test Trial Pairs by Language Group



Note. Infants' looking time during the first two test trials across condition, event type, and language group. There were no differences between infants who heard 100% English versus those who were exposed to a secondary language regularly.

Figure 6

Looking Time During the First Test Trial by Language Group



Note. Infants' looking time during the first test trials across condition, event type, and language group. There were no differences between infants who heard 100% English versus those who were exposed to a secondary language regularly. *m.s.* = marginally significant.

Discussion

The present study examined whether 11-months-old infants possessed the tendency to dehumanize out-group others by asking whether they differentially attributed goals to linguistic in-group versus out-group members. Building on past work demonstrating that infants attribute goals to animate agents but not inanimate objects (Cannon & Woodward, 2012; Luo & Baillargeon, 2005; Woodward, 1998, 1999), we hypothesized that English-hearing infants should expect an English speaker (an in-group member) to act in a goal-driven manner (i.e., consistently reach for the same toy), whereas they may either hold no expectations for a Spanish speaker (an out-group member), or expect them to not act in a goal-driven way (i.e. consistently reach for the same location, regardless of what toy is there).

Results from this study provided partial support for this prediction. When the experimenter spoke English, infants who saw her pursue a different goal looked longer on average than infants who saw her pursue the same goal; when the experimenter spoke Spanish, infants looked equally at both outcomes. However, this pattern was only found when comparing the first test trial between infants; within-subjects (i.e. comparing infants' looking time to the first test pair), infants looked equally at both outcomes regardless of language condition. Exploratory analyses reveal that these opposing findings may be due to a learning effect, where infants' expectations for subsequent test trials after the first were affected by the first trial that violated their expectations. In addition, it should be noted that by virtue of analyzing only the first test trial between-subjects, we effectively halved our sample size. Future work should expand on these suggestive findings either with a larger sample, or with dependent variables that can be more reliably measured within the same participant.

The present work adds to our understanding of infants' goal attribution by demonstrating that even before their first birthday, infants may already selectively attribute goals to human agents depending on their group status. To date, studies examining infants' understanding of goal-directed action have primarily focused on the boundary between animate and inanimate entities (Robson & Kuhlmeier, 2016; Woodward, 1999), as well as investigating which factors contribute to infants' attribution of agency to seemingly inanimate objects, and thus their attribution of goals (Luo & Baillargeon, 2005; Luo & Johnson, 2009; Shimizu & Johnson, 2004; Yoon & Johnson, 2009). Other studies have investigated the range of human motion that facilitates goal attribution, showing that infants do not attribute goals to *all* human actions (Hamlin et al., 2008; Kanakogi & Itakura, 2011; Woodward, 1999), and do not show motor activation in response to human actions that do not appear goal-oriented (Southgate et al., 2010). The current findings show that, despite witnessing clear cues of animacy and identical goal-directed actions, infants may nonetheless fail to attribute goals to out-group members. Given that goals are a relatively basic mental state afforded to even minimally animate entities, this finding is surprising and warrants further investigation.

But what drives this failure to attribute goals? One possibility is that infants simply pay less attention to out-group members and thus are less likely to keep track of what they want. Indeed, past work suggests that infants may be more attentive to a native language speaker over a foreign language speaker, and this attentional difference may be driven by an expectation of information as opposed to dislike (Begus et al., 2016). Further corroborating this possibility is Hwang and colleagues (2021)'s study on 7- to 12-month-olds, which found that White infants from racially homogenous neighborhoods, as compared to those from racially diverse ones, exhibited lower frontal theta oscillation (index of top-down attention) as well as less mu desynchronization (argued to be index of motor system activation and neural mirroring) when observing racial out-group members perform goal-directed actions. The influence of neighborhood diversity parallels the emerging, albeit not statistically significant, effect of language exposure in our study. Specifically, infants who only heard English were marginally more likely to attribute goals to an in-group, but not to an out-group member (see Figure 6). On the contrary, infants who were regularly exposed to non-English languages did not show this effect. That said, this pattern is purely speculative as infants were not evenly distributed across conditions as a function of their language exposure, and so there were far too few infants in each group for any effect to be reliably detected. Nevertheless, together with Hwang and colleagues (2021)'s findings, these results point to the possibility that exposure to other languages and races affect infants' processing of out-group members' goals.

However, analysis of infants' attention speaks against this possibility. Indeed, infants in our current sample did not watch the English speaker more than the Spanish speaker across both familiarization and test trials. In addition, while infants in our sample did in fact look longer during the switch trial if they had watched the English speaker compared to the Spanish speaker, this differential attention did not reliably predict subsequent looking behavior during test trials. One additional possibility is that the two different languages resulted in varying degrees of the spotlighting effect, an alternative explanation that is typically ruled out in studies utilizing similar designs (e.g., Woodward, 1998). That is, since infants have a general attentional bias towards human hands, they may have spent more time observing, and therefore encoding, target objects touched by the human hand, whereas in inanimate object conditions they might pay less attention to the objects being touched. By extension, infants in the current study may have been less attentive to the hand of the Spanish speaker because they were distracted by the foreign language, and therefore may have been attentive to the speaker's face instead of her hand. While this alternative explanation has been ruled out in past work by examining infants' gaze towards the target versus the distractor object, in our stimuli the two objects were insufficiently far apart on the display for observers to tell which object the infant was looking at. However, since vertical changes in gaze direction (i.e. looking at the top versus bottom of the screen) was feasible, we randomly coded 50% of the sample to examine whether infants were selectively attentive to the speakers' hands across the two conditions. Results showed that infants spent a large portion (>75%) of their time looking towards the objects and/or the speaker's hand regardless what language she spoke, therefore a differential spotlighting effect was unlikely. Nonetheless, it remains inconclusive whether attentional differences are the driving force behind differential goal attribution, and we look forward to future work that can elucidate this ambiguity by combining neurological methods (e.g., EEG) with behavior measures (e.g. looking time).

A second possibility, and one most consistent with the dehumanization hypothesis, is that infants attributed less agency (and with that, the capacity to have goals) to the out-group member. If so, the present study has clear implications for our understanding of dehumanization as it relates to the development of intergroup biases; specifically, it contributes to the growing debate regarding the nature of dehumanization. While some evidence suggests dehumanization to be a process distinct from, and even predictive of out-group negativity and harm (Bruneau et al., 2018; Jack et al., 2013; Kteily et al., 2015, 2016), others findings suggest dehumanization simply be a product of out-group hate, or at the very least share underlying constructs (Enock et al., 2021; Haslam & Loughnan, 2014; Over, 2021). Our findings provide the first evidence that the tendency to dehumanize out-group members may emerge at an age prior to the development of out-group dislike (Pun et al., 2018). These results suggest that dehumanization, or a lack of ability or willingness to reason about out-group members' mental states, may emerge early and subsequently develop into the full-fledged out-group dislike observed in older children.

However, there is insufficient data from the current study to ascertain this interpretation. To corroborate current findings, future work should examine whether this differential goal attribution extends to other cues of membership such as race (Bar-Haim et al., 2006; Kinzler & Spelke, 2011). Importantly, new work should carefully control for attentional differences, such as the differential attention found during the switch trial in the present study. One way to do so is to manipulate group status via less attentional salient methods, such as minimal group assignment, which has been utilized in both children (Dunham et al., 2011) and infant work (Hamlin et al., 2013). If infants are less likely to attribute goals to those who are perceived as part of an out-group even under conditions that do not elicit attentional biases, it would provide evidence that differential goal attribution is indeed a product of the perception of group membership.

Interestingly, some evidence from the current study seems incompatible with this proposition. Specifically, the overall tendency to attribute goals to the experimenter increased with age, regardless of what language she spoke. Most critically, while infants showed no evidence for goal attribution to the Spanish speaker, looking time during new goal trials (index of goal attribution with the current task) increased steadily with age. While this trend was not statistically significant, it nonetheless suggests that the tendency to dehumanize via the denial of basic mental states may *decrease* with age, and thus is unlikely to explain the emergence of intergroup biases observed in older ages. However, this pattern was only found when comparing infants' looking during the first test pair; infants' looking pattern during the first test trial was unaffected by age. It is therefore possible that the age effect observed reflects differences in how younger versus older infants process test trial events. The current data cannot disambiguate these two possibilities, but provides groundwork for future work to follow-up on whether the observed pattern reflects a genuine developmental change in dehumanization tendencies, flaws in methodology, or changes in how infants reason about others' mental states in general.

Although the present work took the first steps towards investigating the developmental origins of dehumanization, several limitations should be noted. First, infants in the current sample did not show robust goal attribution to the English speaker, an in-group member to whom goals should be readily attributed. That is, they only showed the predicted effect when we analyzed only their first test trial. This contradicts a long line of past work on infants' goal attribution and understanding, and therefore the null effects in the Out-group condition must be interpreted with caution. In addition, the analyses that found statistically significant results were all fully between-subjects, which resulted in lower-than-planned statistical power. As such, these findings remain inconclusive until it can be replicated in a larger sample. As of the writing of this thesis, a conceptual replication is underway to provide converging evidence for the current work. Future work should also improve upon the current design by either studying younger infants for whom the present paradigm is more suited, or utilize other age-appropriate paradigms such as anticipatory looking to corroborate the current findings obtained with the violation-of-expectation paradigm.

Second, while the selection of "goals" as a mental state was intentional in order to maximize the chances of infants succeeding in the in-group condition, goal attribution is nonetheless a basic mental state that is difficult to be compared directly to dehumanization work with adults and children. Indeed, such works have traditionally examined the denial of complex mental states as well as uniquely-human traits to assess dehumanization (Choi et al., 2020; Costello & Hodson, 2014; Cuddy et al., 2007; Haslam, 2006; Haslam & Loughnan, 2014;

Leyens et al., 2000, 2001, 2007; Martin et al., 2008; Mendelsohn et al., 2020; Vaes et al., 2012; van Noorden et al., 2014). Thus, more evidence is needed to link the failure to attribute basic mental states to the denial of complex mental states. For example, future work should seek to assess infants' reasoning about relatively more complex mental states, such as false-belief, and examine whether a tendency to deny basic mental states (e.g., goals) is associated with denying more complex ones.

Finally, even if the present work is to be taken as evidence for infantile dehumanization, the developmental trajectory of dehumanization remains unclear. To date, the youngest age in which dehumanization has been observed is at 5 years of age (Zhou & Hare, 2020). It would be fruitful to investigate whether children who are capable of explicit and verbal responses (e.g. 3-year-olds), but not yet socialized in formal schooling, already show the tendency to dehumanize out-groups. Future work can feasibly adapt existing tasks, such as an even more simplified version of the Ascent of (Hu)man scale (Kteily et al., 2015; Zhou & Hare, 2020) or the face morph task (Hackel et al., 2014; McLoughlin et al., 2018), to directly investigate the developmental trajectory of both blatant and subtle dehumanization. In addition, rather than explicitly asking children to attribute the abstract concept of "mind" to out-group faces, researchers can instead use age-appropriate Theory-of-Mind battery tasks (e.g., Hadwin et al., 1996) to examine whether performance on these tasks vary as a function of group membership. Together, work with both infants and young children will bring us closer to a deeper and more complete understanding of the origins, nature, and development of dehumanization.

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