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Maternal Postpartum Depression Impacts Infants' Joint Attention Differentially Across Cultures

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We assessed whether the negative association between maternal postpartum depression (PPD) and infants' development of joint attention (gaze following) generalizes from WEIRD (Western, Educated, Industrialized, Rich, and Democratic) to Majority World contexts. The study was conducted in Bhutan ($N = 105$, $M = 278$ days, 52% males) but also draws from publicly available Swedish data ($N = 113$, $M = 302$ days, 49% males). We demonstrate that Bhutanese and Swedish infants' development follows the same trajectory. However, Bhutanese infants' gaze following were not related to maternal PPD, which the Swedish infants' were. The results support the notion that there are protecting factors built into the interdependent family model. Despite all the benefits of being raised in a modern welfare state, it seems like Swedish infants, to an extent, are more vulnerable to maternal mental health than Bhutanese infants.

Keywords: Bhutan, joint attention, postpartum depression, culture, gaze following

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Postpartum depression (PPD) is a mental health disorder that shares phenomenology with major depression, but is distinguished by its association with childbearing (APA, 2013; Wisner et al., 2002). Primary symptoms include fatigue, anxiety, self-blame, and sadness (APA, 2013; Cox et al., 1987). Though the prevalence varies among countries and criteria, it affects 6% to 19% of mothers (Gavin et al., 2005; O'Hara & McCabe, 2013; Silverman et al., 2017; Warner et al., 1996). This makes PPD one of the most frequent complications following childbirth. Similar to general major depression, PPD is an impairing condition that causes great personal suffering. It is also associated with adverse life outcomes, such as

divorce, reduced quality of relations, terminated education, and unemployment (Ildstad, 2015; Lee et al., 2009; Robinson & Stewart, 2001; Slomian et al., 2019), and sensitization, making recurrent depressive episodes more likely (Jacobsen, 1999; O'Hara & McCabe, 2013; Post, 2015). However, the greatest challenge facing mothers with PPD is perhaps they have a newborn child to care for.

When depression occurs during the postpartum period, it directly impacts the mother–infant relation as well as many aspects of parenting, including the mother's ability to care for, the way she interacts with, and to which environments she exposes her infant. For example, depressed mothers engage in less face-to-face interaction (Forbes et al., 2004), and their emotional expressions are more negatively tuned (Field, 1995). Correspondingly, infants of depressed mothers engage in less gaze activity during interaction (Væver et al., 2015) and are less likely to recognize positive responses (Bornstein et al., 2011). However, it is not only the dyadic mother–infant interaction pattern that is affected; having a depressed mother may also have negative consequences for infants' development.

Recently, Astor et al. (2020) demonstrated that infants whose mothers had elevated symptoms of PPD were less likely to coordinate their gaze with others to external objects. This ability, referred to as gaze following (or triadic joint visual attention), typically starts to emerge within the first 6 months after birth (Astor & Gredebäck, 2019; D'Entremont, 2000) and improves rapidly across infancy (Gredebäck, Fikke, et al., 2010). Gaze following has been demonstrated in a wide range of countries such as the United States (Brooks & Meltzoff, 2015), Sweden (Astor et al., 2020), Japan (Ishikawa & Itakura, 2019), and Vanuatu (Hernik & Broesch, 2019), but never before compared

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The study design, hypothesis, and analyses reported in this article were not formally preregistered. The data that support the findings of this study are available on request from Kim Astor. Tobii had no influence on any part of the research.

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directly between countries. It is a fundamental social skill known for its significance to language development (Brooks & Meltzoff, 2015; Tenenbaum et al., 2015) and later emotion regulation (Morales et al., 2005). Moreover, it allows individuals to benefit from others' situational awareness and make quick social references without relying on verbal communication. As such, gaze following is a hallmark of social development (for reviews, see Flom et al., 2013; Del Bianco et al., 2019). Consequently, it is of great concern that the development of gaze following seems to be at risk when infants' primary interaction partners suffer from depressive symptoms (Astor et al., 2020).

However, the generalization of the study by Astor et al. is limited as it was conducted in the Northern European country of Sweden, a Western welfare state with distinctive societal characteristics. For example, looking at the family structure, Sweden has the lowest average household size globally (1.9 individuals, cf. a world average of four individuals; Population Reference Bureau, 2020). In addition, Swedish attitudes and beliefs similarly reflect an exceptionally individualistic country that prioritizes independence and secular values over tradition (Inglehart et al., 2014), a position typically related to loneliness (Barreto et al., 2021). Consequently, even though the Swedish model may produce citizens that are less dependent on social networks and extended family structures (especially from an economic standpoint), it may ultimately affect the amount of social support a new parent can rely on, especially during an infant's first year (before daycare is common).

Along the lines of the more extensive discussion on cross-cultural differences (e.g., Berch et al., 2018; Gauvain & Munroe, 2009; Keller, 2007; Ungar et al., 2013), it is unclear whether infants' vulnerability to PPD, as described by Astor et al. (2020), generalizes to other cultures. There are two possibilities: The negative effect of maternal PPD on infants' development might be fundamental and culture-independent (the universality hypothesis). This hypothesis is based on the presence of gaze following in several cultures (outlined above) and the assumption that this ability has strong innate components that develop independently from culture-specific experiences. From this perspective, Astor et al.'s finding should replicate across a wide range of cultural settings. Alternatively, the adverse effects of maternal PPD may be culturally mitigated (the cultural mitigation hypothesis). According to this hypothesis, maternal PPD does not have the same impact on development across cultures, for example, where family structures are larger and where infants consequentially are less dependent on a single parent (Kağitçibaşı, 2007; Rennels et al., 2017)—cultures that are often described as more interdependent and collective than the highly independent and individualistic Swedish society.

One such place is Bhutan, a Himalayan country bordered by Tibet and India. Bhutan is an agrarian society guided by tradition and the Buddhist religion (Gross National Happiness Commission, 2019). Extended family structures are common (average household size in Bhutan is 4.2, close to the world average of 4; Population Reference Bureau, 2020) and closely knitted. In Bhutan, the family is central to the collective sense of happiness. Importantly, the concept of family extends beyond household members and blood relatives to include neighbors, community members, and countrymen and women, providing a social buffer beyond the household (Leaming, 2004; Thinley, 2004). While the Bhutanese culture is less individualistic than the Swedish, as most cultures are, it is not entirely community/family-oriented but rather proximate to a world average in this regard (Hofstede Insights, 2018).

Today, most of the world's scientific literature is published in a few WEIRD (Western, Educated, Industrialized, Rich, and Democratic;

Henrich et al., 2010) countries. Very few articles in developmental psychology or infant research come from other countries or contexts. Not a single article in this area is affiliated with Bhutan.¹ Thus, a better understanding of child development and infancy in Bhutan would be valuable, allowing new perspectives and the opportunity to assess whether studies from WEIRD can generalize to novel contexts or not.

Scope

This proof-of-concept study assesses the two hypotheses outlined above (the cultural mitigation and the universality hypothesis). Do the results from Astor et al. (2020) generalize across cultural contexts? The overarching aim was to advance our understanding of how maternal PPD may impact infants' development by transitioning from WEIRD to Majority World contexts (also known as developing countries, see Kağitçibaşı, 2007). To do this, we assessed gaze following and maternal PPD in 105 mother-infant dyads in Bhutan and related this to a publicly available data set from Astor et al. (2020), consisting of a similarly sized sample (113 dyads) from Sweden. Thus, we could compare different cultural contexts within a combined sample of 218 dyads by complementing our primary data with publicly available data.

Method

The study was conducted following the Helsinki 1964 declaration and approved by the local ethics committee in Bhutan (Research Ethical Board of Health [REBH]), protocol 2018/056 and the ethics review committee in Uppsala Sweden (EPN), protocol 2018/181. Before any data collection, we informed parents about the study and obtained their written consent.

Participants

In Bhutan, parents bring their infants to visit the local Mother and Child Health Clinic for a routine immunization program covering more than 90% of children nationwide. Before the vaccination, 105 parents (ethnic distribution: 29% Ngalop, 45% Scharchop, 16% Lhotshampa, and 10% other²) agreed to participate in the study with their infants ($M = 278$ days, $SD = 6$ days, 52% males). An additional 18 infants were excluded from the analysis due to premature birth ($n = 8$), and/or growth abnormality ($n = 8$), and/or health complications ($n = 6$). This collaborative study was conducted in February

¹ As an example, a search for "Child Development" AND "Psychology" at WebOfScience (2021, August 21) produced 34,315 results, 88.7% of these articles were affiliated with the United States, England, Canada, Netherlands, Germany, or Australia (the 6 top countries for this category). The top non-WEIRD countries, according to our interpretation of the term, accounted for less than 7% of articles, including China, South Africa, Portugal, Brazil, Turkey, and South Korea (even some of these countries can arguably be considered Western and does not represent the large population of countries outside the Western world). Zero articles were affiliated with Bhutan. Similar numbers for the search terms "Infant" AND "Psychology" resulted in 11,352 articles, with 82% from the same top Western countries and less than 5% from the same non-Western countries, with no articles from Bhutan.

² As a reference, the ethnic distribution in Bhutan is 50% Ngalop, 35% Nepali (including Lhotshampa), and 15% Indigenous or migrant tribes (including Scharchop), as reported by the Central Intelligence Agency (2021). Though consider that this number is geographically dependent, for example, Sharchops are most common in Bhutan's eastern regions.

and March 2019 at the Jigme Dorji Wangchuck National Referral Hospital in Thimphu as part of a larger project. We almost reached the goal to match the Swedish sample size.

We used publicly available data from the Swedish study by Astor et al. (2020) as a comparison sample. This sample consisted of 113 families with healthy full-term infants ($M = 302$ days, $SD = 9$ days), of which 49% were males. When mothers were assessed for PPD, their infant was 368 days old on average ($SD = 18$ days); see Table 1. An additional five infants did not provide data for any of the measures of interest and were therefore not included in the current study. Families visited the Uppsala Child and Baby Lab between September 2014 and January 2017. No ethnic information was collected for the Swedish sample as such questions were not culturally acceptable in a Swedish context at the time (Sweden is one of the only countries in Europe that does not collect census data that includes race or ethnicity, only place of birth).

Measures and Procedure

Only the procedures and measures of concern for the current study will be presented here. For a more comprehensive project description, see the online supplementary material.

Maternal Depression

We assessed maternal postpartum depression using the Edinburgh Postnatal Depression Scale (EPDS; Cox et al., 1987), a 10-item inventory for depression screening. Each item is rated from 1 (*not at all*) to 4 (*yes, most of the time*). An average score is calculated from the 10 items where higher scores reflect higher levels of depressive symptoms. Because of the rich language variation in Bhutan (23 living languages; Eberhard et al., 2020) and high levels of illiteracy (33% of the total population; UNESCO Institute of Statistics, n.d.), it was decided beforehand that these questions were to be administered as an interview conducted by trained Bhutanese clinicians under the guidance of authors SCN and TW. People in Bhutan know English well (it is used in both education and official documents). Therefore, for consistency, we used the English translation of EPDS as a base for the interview, and the clinicians translated it when needed. We kept no record of mothers' primary language. While it cannot be ruled out that variations in translations impacted the internal consistency of the EPDS, the clinicians reported no language-related issues to indicate this. The Swedish sample self-administered the questionnaire. Coefficient alpha for the EPDS scale reached .64 in the Bhutanese sample and .89 in the Swedish sample (see the online supplementary material for further elaboration on coefficient alpha levels).

Gaze Following

Gaze following was assessed with six test trials presented on a computer screen. Before each trial, a fixation grabber was presented

to attract infants' attention to the center of the screen. Each trial started with a female actor sitting behind a table with two objects placed to her left and right. First, the actor looked straight into the camera to simulate eye contact with the infant (2-s greeting phase). Then she turned her head approximately 45°, directed her gaze toward one of the targets, and kept her gaze fixated at the toy (5-s gaze phase). The direction of the actors' gaze, left (L) and right (R), was presented in a fixed order across trials (LRLRR). Aside from the objects at the table and the ethnicity of the actors (three Bhutanese and three Swedish female actors), there were a few minor differences between the stimulus materials (no average difference in the amount of gaze following between cultures were found, see Figure 1 A). In the Swedish version, there was an additional prephase (2 s) with a "beep" sound, after which the actor called for the infant's attention by looking up (from the table) at the infant/toward the camera (greeting phase). In the Bhutanese version, the actor instead called for attention by saying "Hi" to the infant in the greeting phase while continuously looking forward. A Tobii Pro Nano (60 Hz) eye-tracker together with a 14-in. screen (for stimuli presentation) was used to measure infants' gaze in Bhutan, while a Tobii TX300 (60 Hz) together with a 24-in. screen was used in Sweden. Before the stimuli started, a 5-point calibration (Gredebäck, Johnson, et al., 2010b) was performed. Infants were seated on their parent's lap during the procedure.

Data Reduction

Raw eye-tracking data was exported from Tobii Lab Pro and processed in TimeStudio (Version 3.18 timestudioproject.com; Nyström et al., 2016) under MATLAB version R2017b (9.3.0.713579). Three areas of interest (AOI) were used to define gaze behavior; one around the actor and one around each of the two targets with slight variations between stimuli versions (see Figure 1 B). The AOIs were activated at the initiation of the actors' head turn, and from that point, the first head-to-target gaze shift was scored as either congruent (1) or incongruent (−1). The sum of scored trials provided a difference-score (ranging from −6 to 6), with gaze following being defined as a positive score. All infants with sufficient data (at least one gaze shift from the model to either toy when the actors cued one of the locations with her gaze) were included in the analysis. See Table 1 for measure descriptives and the final participant count for each variable.

The data that support the findings of this study are available on request from the corresponding author. The study design, hypothesis, and analyses reported in this article were not formally preregistered.

Results

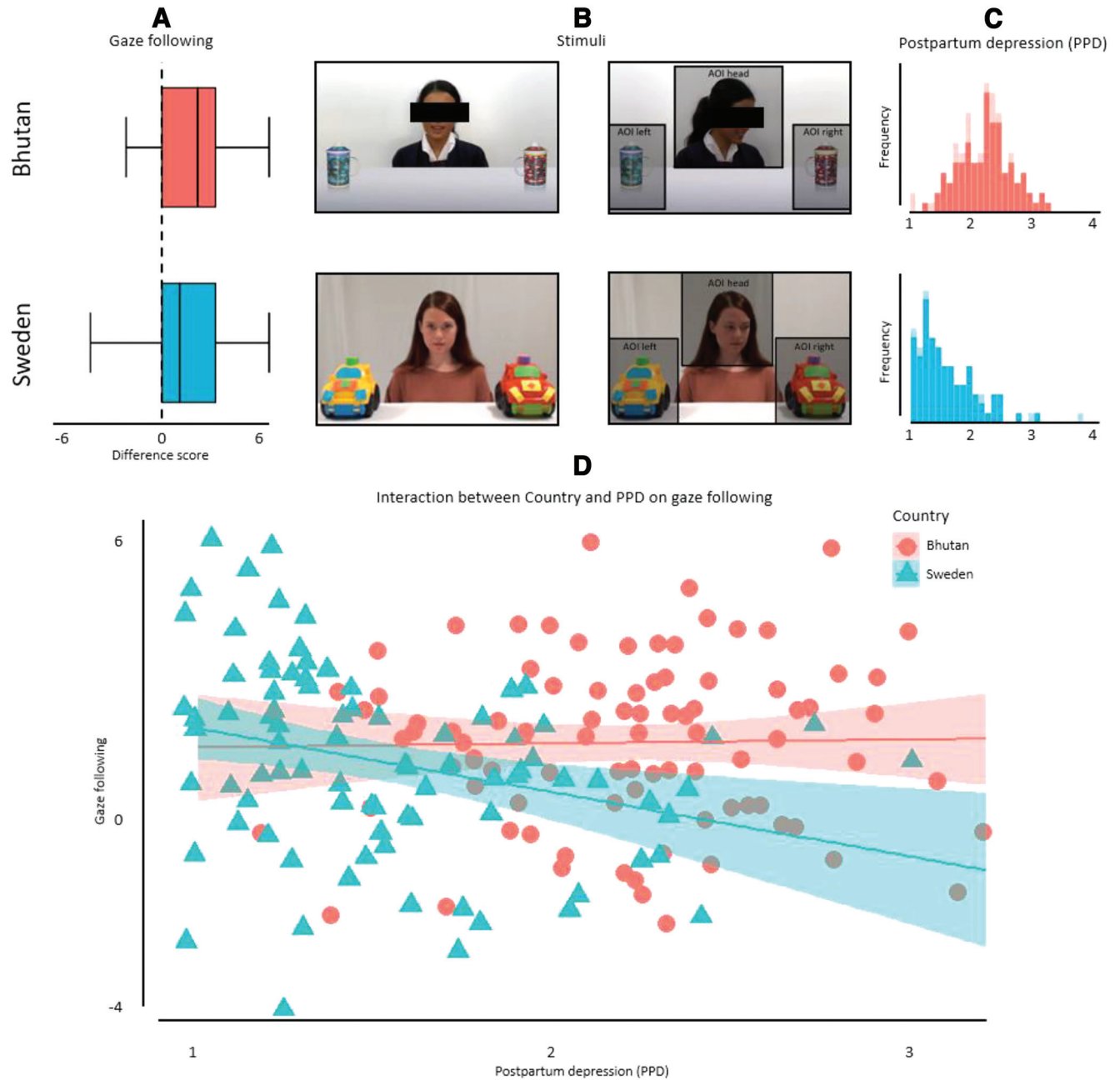
General linear model (GLM) analysis revealed an interaction between country and PPD on gaze following $F(1.171) = 4.89, p =$

Table 1
Descriptive Statistics, Including Variable Means (M), Confidence Intervals (CI), and Ranges

Measure	Culture	Age of infants	n	M	95% CI	Range
Gaze following	Bhutan	278 days	89	1.61	[1.22, 1.99]	−2–6
	Sweden	302 days	107	1.28	[0.89, 1.67]	−4–6
Maternal depression	Bhutan	278 days	105	2.15	[2.06, 2.24]	1–3.2
	Sweden	368 days	93	1.57	[1.46, 1.68]	1–3.7

Figure 1

A: The Boxplots Show Gaze Following Difference Score by Country. Boxes (Data Within the 1st to 3rd Quartile), the Horizontal Line Within the Box (Median), and Whiskers (1.5 Times the Interquartile Range From the 1st and 3rd Quartile Respectively) Illustrate the Distributions. B: Two Different, Ethnically Appropriate, Versions of the Stimuli Were Used, Bhutanese (Top) and Swedish (Bottom). C: The histograms show distributions of mothers' PPD scores in Bhutan (red [black]) and Sweden (blue [dark gray]), respectively. D: There is an interaction between PPD and country on gaze following. Gaze following on the x-axis and postpartum depression on the y-axis. Dots represent individual cases (Bhutanese cases = red [black] circles, Sweden cases = blue [dark gray] triangles). The width of the error bands corresponds to confidence intervals (95%) for linear model predictions. See the online article for the color version of this figure.



Note. The black bar covering the Bhutanese actor's face did not appear in the presented stimuli. The images of the Swedish stimuli are adaptations of material published under Creative Common license in Astor et al. (2020). The individuals whose face appears here gave consent for their likeness to be published in this article. To the left is the "greeting phase" and to the right is the "gaze phase." The rectangular areas of interest in the gaze phase captions illustrative purposes only and were not part of the stimuli shown to the infants. Though there were minor differences in stimuli material, created to ensure that each stimuli was appropriate for its cultural context, there was no difference in group-level gaze following performance. C: The histograms show distributions of mothers' PPD scores in Bhutan (red [black]) and Sweden (blue [dark gray]), respectively. Lighter color indicates participants who did not provide data on the gaze following task and, therefore, were not included in the GLM. D: There is an interaction between PPD and country on gaze following. Gaze following on the x-axis and postpartum depression on the y-axis. Dots represent individual cases (Bhutanese cases = red [black] circles, Sweden cases = blue [dark gray] triangles). The width of the error bands corresponds to confidence intervals (95%) for linear model predictions. See the online article for the color version of this figure.

.028, $\eta_p^2 = .028$ (see Figure 1 D). The main effect of PPD did not reach significance $F(1.171) = 3.81, p = .052, \eta_p^2 = .022$. Finally, there was no main effect of country $F(1.171) = 2.13, p = .146, \eta_p^2 = .012$. One multivariate outlier was excluded from the analysis (see online supplementary materials).

As demonstrated in Table 1, infants in Bhutan (72%) and Sweden (67%) followed gaze at a similar rate. In line with previous research from different cultures, single sample *t*-tests against chance level performance (difference score = 0) revealed that gaze following group performance was significant in both samples: Bhutanese sample, $t(88) = 8.25, p < .001, d = .88$, Swedish sample, $t(106) = 6.52, p < .001, d = .63$. An independent *t* test revealed no significant difference in levels of gaze following between the samples $t(194) = 1.17, p = .24, d = .17$ and Levene's test revealed no difference in variance between the two samples ($F = .43, p = .513$). Mothers in the Bhutanese sample had significantly higher levels of postpartum depression (independent *t* test: $t(196) = 8.42, p < .001, d = 1.19$), an expected result since PPD rates are typically higher in low- and middle-income countries (Parsons et al., 2012), but there was no difference in the variances between the two samples (Levene's test: $F = 1.42, p = .235$). While there was a negative significant association between postpartum depression and gaze following in the Swedish sample, $r_s(85) = -.31, p = .003$, this association was not found in the Bhutanese sample, $r_s(87) = .01, p = .916$. Importantly, the lack of correlation in the Bhutanese sample is not due to restricted range (see Table 1, Figure 1 A and C, and Levene's test above). Furthermore, the difference between the two correlations was significant, $z = 2.17, p = .015$. These correlations, demonstrating a negative association between PPD and gaze following in Sweden but not Bhutan, show that the marginally significant main effect of PPD in the GLM was driven by the Swedish sample.

Discussion

We aimed to assess whether the negative effect of maternal PPD on infants' development of joint attention (gaze following) generalizes to a broader cultural context or if these effects were mitigated in less individualistic cultures. We found support for the *cultural mitigation* hypothesis. Infants in Sweden appear to be more negatively affected by maternal PPD than Bhutanese infants.

When trying to disentangle child development, it is essential to consider the context of the child, both the immediate/microscopic environment, such as family, and the macroscopic environment; the culture and society in which families exist (Bronfenbrenner, 1999; Green et al., 2016; Kağitçibaşı, 2007). The current study assessed infants in two different countries with entirely different cultures, Sweden and Bhutan. Sweden is an individualistic, industrialized, and secular welfare country that promotes equality and long periods of parental leave (Försäkringskassan, n.d.). However, these characteristics also place a high demand on the mother–infant relation during the first year (see Introduction). By contrast, the Bhutanese culture is shaped by tradition rooted in the Buddhist religion, and an agrarian society where extended family structures are common (the average household size in Bhutan is 4.2 compared to 1.9 in Sweden; Population Reference Bureau, 2020). However, the notion of family in Bhutan is not limited to the household or blood relatives, though differences in average household size help illustrate structural differences between countries.

There is a cultural, historical, and spiritual notion of relatedness, providing a social structural foundation where everyone expects to care for and help each other, including care for children; a family view that is integral to the notion of happiness in Bhutan (Leaming, 2004; Thinley, 2004). In cultures with more interdependent family structures, such as the Bhutanese, poorer maternal mental health (in this case, elevated PPD levels) seem to have a diminished impact on infant development, perhaps as a result of adults sharing the load and scaffolding infant development. An alternative, and complementary, hypothesis is that having more people around (e.g., larger household size), regardless of their engagement level, is enough to advance the development of gaze following. However, being born to a large household does not guarantee more infant interaction; indeed, it might have the opposite effect early in life (e.g., Bornstein et al., 2019). For related work demonstrating a link between infants' experience and gaze following development, see Brooks et al. (2020) and Senju et al. (2015).

The Bhutanese society is undergoing rapid change with a substantial rural-urban migration (World Bank, 2015), modernization, and economic growth (Gross National Happiness Commission, 2019; Walcott, 2009). This study was conducted in the capital of Thimphu, the main foci-point of urbanization (National Statistics Bureau, n.d.). Here it should be noted that urbanization/modernization does not necessarily result in assimilation to individualistic value structures and a Western family model. Instead, some aspects of the agrarian interdependent family tradition might flourish throughout modernization. Specifically, while economic interdependencies and hierarchical family structures diminish (allowing for increased individual autonomy), culturally conditioned psychological/emotional interdependencies are still functional and essential parts of family values. Kağitçibaşı (2007) provide compelling empirical evidence that urbanization in interdependent cultures across the globe transition into a new, non-Western, family value system, governed by relatedness and autonomy. In essence, the Bhutanese culture, whether rural or urban, clearly provides a different mold than Sweden for the mother–infant relation where other family and community members can relieve mothers to a greater extent.

What support do we have for interpreting that the differences mentioned above are the active ingredients that buffer against maternal PPD in Bhutan? Previous studies from the United States have demonstrated that the involvement of the larger family (beyond the mother) is associated with infants' improved cognitive milestone attainment (Singletary, 2021). Moreover, paternal leave-taking decreases divorce risk (Petts, Carlson, et al., 2020) and strengthens long-term father–child relations (Petts, Knoester, et al., 2020). Other studies conducted in Sweden show that the distribution of parental leave between parents influences infants' processing of emotions and perceptual narrowing in a way that also suggests positive effects of paternal leave (Gredebäck et al., 2012; Rennels et al., 2017). Together, these studies indicate that an active family context beyond the mother provides an environment that is beneficial for the child. Here we extend this literature by suggesting that, when comparing across cultures, active and extended family involvement can buffer against the impact of poor maternal mental health on infant development. It looks like Swedish infants, despite all the benefits that come with being raised in a modern welfare state (Försäkringskassan, n.d.), in some cases are more vulnerable than infants in other cultures, especially when

mothers suffer from depression. Needless to say, changing this is not best handled by dismantling the Swedish welfare state, but perhaps by facilitating community activities and extra efforts from the state, community, and family members to mothers who suffer from PPD. It should also be mentioned that, though some negative aspects of having a depressed mother might be culturally mitigated, infants in cultures where interdependent family models are the standard, such as Subsaharan Africa and India, are not immune to the negative consequences of maternal PPD (Hadley et al., 2008; Patel et al., 2003).

It needs to be acknowledged that culture should not only be seen as a distal context that indirectly affects the child, but that it also affects the way parents interact with the child (Keller, 2007; Super & Harkness, 1999). Besides extended family structures and richer social networks, child rearing practices in interdependent communities are typically characterized by more body contact and less face-to-face interaction with the infant. For example, it is common practice in Bhutan to carry infants on the back (Leaming, 2004). Compared to using a stroller, which is common in Sweden, this results in less face-to-face interaction but more physical contact. Thus, Bhutanese infants might receive relatively high levels of contingent social engagement with their mother through physical—rather than eye contact (Akhtar & Gernsbacher, 2008). While this likely promotes joint attention in general, it remains to be tested whether it could generalize across sensory modalities to aid the development of gaze following specifically. This alternative explanation focuses on cultural-dependent aspects of mother–infant interactions instead of the interdependent family model. However, distinguishing how children and parents interact from the type of culture families live in is challenging at best, and we must be humble toward the fact that multiple factors together help define the context in which a child is raised.

Furthermore, the vulnerability that we here associate with PPD in Sweden is potentially not solely tied to culture but also related to other circumstances that lead mothers into isolation and lack of support. For example, migration, experiences of war, and refugee status, as well as national lockdowns (such as those imposed in response to the Covid-19 pandemic during 2020 and 2021), may all risk reproducing the same vulnerability. Especially since these events can be connected to the increased prevalence of depression in the population (McCracken et al., 2020; Twenge & Joiner, 2020)—something that is bound to impact both mothers and their children. Please note that the current study was conducted before the SARS-CoV-2 outbreak in Wuhan in December 2019.

There are a few limitations that we would like to draw the readers' attention to. First, as noted in the Method section, minor discrepancies exist in the stimuli and how they were presented (e.g., actor timing and screen size). In addition, there are minor differences in actor performance: In the Swedish version, the actor raised her head to look at the infant subsequent to a “beep” sound. In the Bhutanese version, the actor instead looked at the infant from the start and said “hi.” Also, note contextual differences in stimuli presentation: Both the current study and Astor et al. (2020) are part of larger projects that include eye-tracking assessments other than gaze following. The gaze following trials in the current study were presented together in succession following other tasks. In Astor et al., the gaze following trials were mixed with other tasks (not the same tasks as the current study). See the online supplementary material and Astor et al. (2020) for more details. Discrepancies are

common when comparing data sets between countries, and we believe that these factors have not affected the results as no difference in levels, or variance, of gaze following between countries can be found. Concerning actor performance specifically, prior work has shown that differences in low-level social cues preceding the gaze shift to an object (the action that infants follow during gaze following) do not impact gaze following performance (Gredbäck et al., 2018; Szufnarowska et al., 2014). Second, the Bhutanese infants were 24 days younger than the Swedish on average. The reason for this was a pragmatic one as recruitment took place at the local Mother and Child Health Clinic in coordination with the nine-month routine visit for the Bhutanese immunization program. Again, gaze following scores indicates that performance on the crucial dependent measure was indistinguishable between the groups. In the context of this age difference, it should be mentioned that Astor et al. (2020) did not find an association between PPD and gaze following in younger infants, at the age of 6 months. A sudden increase in infants' sensitivity to PPD, within a narrow (24-day) developmental window between 9 and 10 months, would not be detected in the current study. However, given typical levels of individual variability, such an abrupt age threshold seems unlikely. Third, the Edinburgh Postnatal Depression Scale (EPDS) has not been validated in Bhutan. Instead, the Bhutanese authors evaluated it for the Bhutanese context. Moreover, the Bhutanese version was distributed as an interview, which made it possible to ensure that participants understood the question as intended. Interviewers reported nothing to indicate that the scale was inappropriate. Despite this effort, the EPDS coefficient alpha in the Bhutanese sample did not reach beyond .64. Looking at PPD from a global perspective, higher rates of PPD are usually observed in low- and middle-income countries (Parsons et al., 2012). Consistent with the literature, we found higher levels of PPD in Bhutan than in Sweden. While higher levels of PPD in the Bhutanese sample also allowed the distribution to spread out more, the variance is still comparable between the samples, indicating that the statistical properties allowed detection of an effect of PPD on gaze following if there were any in the Bhutanese sample (as Astor et al., 2020, reported in the Swedish sample). For further elaboration on the Bhutanese EPDS measure, see the online supplementary material. Fourth, the current study is limited in focusing on gaze following as a measure of infant development. It cannot be ruled out that Bhutanese infants may show impairments in other areas than Swedish infants. Finally, as this study does not assess clinical depression, we also draw attention to the fact that elevated symptoms below the threshold for clinical depression disrupt infant development similarly to mothers' clinical depression (e.g., Meaney, 2018).

Despite these caveats, we believe that the current results open a window for further, much needed, cross-cultural exploration in developmental psychology, using study designs that directly compare across cultural contexts using stimuli and questionnaires that are similar in all essence and at the same time culturally appropriate in all contexts. This initial study opens up for more work in this area where we can learn how infant development is impacted by culture, family context, and how these interact during development. Though research in this area is scarce, we recognize that significant work has been done by, for example, Greenfield (2009) and Keller (2007). Another important lesson from these results is that they demonstrate why we need to be careful in generalizing results to

formulate theories of ontogeny, in this case of gaze following, as critical findings might not always generalize across cultures.

In summary, we demonstrate that Bhutan and Sweden differ in how mothers' depressive symptoms are associated with infant development. Specifically, infants in Bhutan followed gaze at the same rate as Swedish infants on a group level (despite having mothers with more PPD symptoms), but in contrast to Swedish infants, they were not affected by maternal PPD on an individual level. This interaction between contexts on a micro- and macroscopic level (mother and culture) suggests that protecting factors are built into the Bhutanese culture. It seems possible that an active (interdependent) family context and sufficient maternal support positively impact infants' environment, which can help mitigate adverse downstream effects of maternal PPD. It seems equally possible that general mother–infant interaction patterns differ between countries to make Bhutanese infants less vulnerable to maternal PPD. This proof of concept study outlines a future direction where we look beyond baseline comparisons in cross-cultural psychological research to focus more on how cultural contexts might interact with other contexts and processes to shape human development.

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