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RESEARCH ARTICLE

The impact of sufferers' wealth status on pain perceptions: Its development and relation to allocation of healthcare resources

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Abstract

Wealth-based disparities in health care wherein the poor receive undertreatment in painful conditions are a prominent issue that requires immediate attention. Research with adults suggests that these disparities are partly rooted in stereotypes associating poor individuals with pain insensitivity. However, whether and how children consider a sufferer's wealth status in their pain perceptions remains unknown. The present work addressed this question by testing 4- to 9-year-olds from the US and China. In Study 1 ($N = 108$, 56 girls, 79% White), US participants saw rich and poor White children experiencing identical injuries and indicated who they thought felt more pain. Although 4- to 6-year-olds responded at chance, children aged seven and above attributed more pain to the poor than to the rich. Study 2 with a new sample of US children ($N = 111$, 56 girls, 69% White) extended this effect to judgments of White adults' pain. Pain judgments also informed children's prosocial behaviors, leading them to provide medical resources to the poor. Studies 3 ($N = 118$, 59 girls, 100% Asian) and 4 ($N = 80$, 40 girls, 100% Asian) found that, when evaluating White and Asian people's suffering, Chinese children began to attribute more pain to the poor than to the rich earlier than US children. Thus, unlike US adults, US children and Chinese children recognize the poor's pain from early on. These findings add to our knowledge of group-based beliefs about pain sensitivity and have broad implications on ways to promote equitable health care.

KEYWORDS
pain perception, wealth status, prosociality, development, cross-cultural

Research Highlights

- Four studies examined whether 4- to 9-year-old children's pain perceptions were influenced by sufferers' wealth status.
- US children attributed more pain to White individuals of low wealth status than those of high wealth status by age seven.
- Chinese children demonstrated an earlier tendency to attribute more pain to the poor (versus the rich) compared to US children.

- Children's wealth-based pain judgments underlied their tendency to provide health-care resources to people of low wealth status.

1 | INTRODUCTION

The wealth gap continues to widen in the United States and across the globe (Pew Research Center, 2020). According to the World Inequality Report (Chancel et al., 2022), the world's richest 0.01% shared 7% of the wealth in 1995, whereas this number increased to 11% in 2021. This ballooning wealth inequality is associated with a host of adverse social problems, such as disparities in health systems. Across the world, groups of high socioeconomic status (SES) enjoy greater access to health care than groups of low SES (e.g., Bristow et al., 2013; Mackenbach et al., 2008). The United States, for example, exhibits one of the largest wealth-based disparities in patient care worldwide (Van Doorslaer et al., 2006). In particular, though people of low SES are more susceptible to pain (Chou et al., 2016; Dorner et al., 2011), they receive undertreatment for a variety of painful medical conditions (Nampiaparampil et al., 2009; Joynt et al., 2013; Ji et al., 2013; Lipton et al., 2013; Gebauer et al., 2017). The present paper explores children's pain perceptions of the poor and the rich. Such inquiries provide insights into the developmental mechanisms that underlie the disparities in health care.

One potential contributor to the wealth-based disparities in pain treatment is the stereotype viewing low-SES individuals as hardened and inured to physical pain (Johnson et al., 2023; Summers et al., 2021, 2023). For example, adults perceived low-SES individuals, whether adults or children, as feeling less pain and thus requiring less intensive pain treatment than their high-SES counterparts (Summers et al., 2021, 2023). This belief may stem from the thick skin bias, that is, the misconception that life hardships lead to toughness (i.e., what doesn't kill you makes you stronger; Deska et al., 2020; Hoffman & Trawalter, 2016). However, this body of research focuses exclusively on adults and thus it remains an open question *whether* and *how* a sufferer's wealth status influences children's pain judgments.

Developmental work on this topic is of both theoretical and practical importance. Research examining early group-based beliefs about pain sensitivity is only emerging such that developmental studies to date have solely focused on racial bias in pain judgments (Dore et al., 2014, 2018). The present research adds to this nascent literature by exploring how other social dimensions, such as sufferers' wealth status, shape pain perceptions. In addition, pinpointing the onset of wealth-based pain judgments could shed light on the developmental mechanisms underlying the disparities in health care and informs strategies to promote equitable pain treatment. If young children hold a similar stereotype as adults, interventions should focus on addressing this belief early in life, especially before the stereotype is entrenched. On the other hand, if children recognize the poor's suffering, this early empathy should be strengthened across development to counteract the bias against the poor's pain.

The present research addressed this question by including a wide age range of children, 4- to 9-year-olds. Children in this age range are capable of perspective-taking (Dadds et al., 2008; Wellman et al., 2001) and show robust sensitivity to wealth cues to make inferences (Chafel & Neitzel, 2005; Dunham et al., 2014; Enright et al., 2020; Shutts et al., 2016; Sigelman, 2012; Zhang et al., 2021). For example, children as young as age three expect the rich to possess high-value belongings (e.g., a fancy house; Olson et al., 2012). Preschool-aged children tend to befriend the rich (Shutts et al., 2016), like the rich more (Horwitz et al., 2014), and predict the rich as possessing positive traits (Ahl et al., 2019; Li et al., 2014). The overall tendency to favor the wealthy may originate from a halo effect, such that young children form broader positive expectations about people who possess some desirable qualities such as being competent or lucky (Brosseau-Laird & Birch, 2010; Olson et al., 2006). However, children's general pro-rich bias declines across this age range (Elenbaas & Killen, 2019; Mistry et al., 2015; Yang & Dunham, 2022). For example, while four- to five-year-olds expected the rich to be more helpful than the poor, nine- to twelve-year-olds demonstrated the opposite: they expected the poor to be more prosocial (Yang & Dunham, 2022). The increasing sophisticated understanding of wealth and poverty allows us to observe potential developmental changes in children's wealth-based pain judgments, for which we proposed two possibilities.

On the one hand, one might expect children to increasingly endorse the negative stereotype associating the poor with less pain (vs. the rich). As children grow older, they might gradually internalize the cultural messages suggesting economic hardships confer toughness (e.g., Hoffman & Trawalter, 2016), which may hinder them from recognizing the poor's suffering. In line with this possibility, studies examining early racial bias in pain perceptions found that children by age seven believed that Black individuals feel less physical pain than White individuals, and this bias became even more pronounced in 10-year-olds (Dore et al., 2014; Dore et al., 2018). Since race and income are closely intertwined in the United States (Black people, on average, face greater economic disadvantages than White people; US Census Bureau, 2020), and children associate Black people with economic hardships (Olson et al., 2012), it is possible that children also hold a bias against the poor's pain.

On the other hand, there are reasons to expect children to gradually attribute more pain to the poor (vs. the rich) when they experience identical physical harms. As noted earlier, children change from an overall pro-wealth bias to holding a more multi-faceted understanding of wealth status (Elenbaas & Killen, 2019; Mistry et al., 2015; Yang & Dunham, 2022). The increasing inclination to view the poor in a more positive light could lead children to empathize more deeply with them. Indeed, past studies suggest that children's empathy towards poor individuals improves over time (Chafel & Neitzel, 2005; Dys et al., 2019; Elenbaas & Killen, 2016). For example, while three- to four-year-old

children prefer to distribute resources equally between a rich and a poor recipient, children by age seven favor strategies to rectify wealth-based inequalities by allocating more resources to the poor (Rizzo et al., 2016). Importantly, children's tendency to provide more resources to poor individuals (vs. rich individuals) was related to their empathetic feelings (Essler & Paulus, 2021; Paulus & Leitherer, 2017).

In addition, children gradually establish links between wealth and power, such that they expect the poor to possess a decreased capacity to influence social and life outcomes (Yang & Dunham, 2022). The adult literature underscores the significance of an individual's sense of control in influencing their health outcomes, with higher perceived mastery correlating with better physical health (e.g., Lachman & Weaver, 1998). Based on this reasoning, associating the poor with limited control in life may lead children to recognize their suffering. In line with this possibility, emerging research finds that children believe the poor are constrained in their capacity to resolve life's problems and are also more likely to notice their distress (Lazaro et al., 2023). These considerations provide distant support for the possibility that children with age would associate individuals of lower wealth status with stronger physical pain.

The present research provides a direct investigation of the developmental trajectory of early wealth-based perceptions of physical pain. In addition, we examine how children's wealth-based pain perceptions shape their subsequent prosocial behaviors towards the poor, that is, their allocation of healthcare resources. As noted earlier, symbols of wealth status influence how much help and resources a child decides to concede to or share with others (Elenbaas & Killen, 2016; Rizzo et al., 2016), but few studies have examined the factors leading to children's emerging prosociality toward the poor in healthcare contexts. Since recognizing others' pain is arguably an essential first step of offering care and support (Dunfield & Kuhlmeier, 2013; Eisenberg & Miller, 1987), we predicted that children's wealth-based pain perceptions would shape their prosociality toward the poor.

Finally, we set out to explore how culture may modulate children's attendance to sufferers' wealth status in their pain predictions by testing children from the US and China—two cultural contexts that share both similarities and differences with respect to wealth disparity. The wealth gap in both countries has steadily increased over the decades. According to the World Inequality Report (2022), the richest 10% of the population in China owns around 68% of the total wealth, a pattern similar to that of the US (71%). Yet the two cultures may hold slightly different views about various social classes (e.g., Grigoryan et al., 2020; Wu et al., 2018). In the US, there is a general admiration for the upper class or the wealthy (Nickerson et al., 2003; Horwitz & Dovidio, 2017). These positive attitudes are especially salient in US preschoolers (e.g., Shutts et al., 2016). In contrast, Chinese culture has a long history of upholding a suspicion of the wealthy (Gerth, 2011; Shen, 2010) while treating the working class with respect (Grigoryan et al., 2020). These cultural values may encourage Chinese population to empathize with the poor in early childhood.

Overview of Studies. The present studies examined three interrelated questions: (1) What is the developmental trajectory of children's wealth-based pain perceptions? (2) How do children's wealth-based pain perceptions affect their prosociality towards the poor? (3) How does culture moderate children's wealth-based pain perceptions? To disentangle the effect of a sufferer's wealth status from their race, children saw two race-matched characters who varied in their wealth status but experienced identical harmful events, and indicated which one felt more pain. We adopted relative measures because wealth categories are relational in nature, and these measures are more sensitive to young children's reasoning (e.g., Ahl et al., 2019; Bian et al., 2017). To explore the downstream influence of children's pain perception on their helping behaviors, Studies 2 and 4 also assessed children's allocations of scarce healthcare resources.

2 | STUDY 1

2.1 | Method

2.1.1 | Power analysis

We conducted a priori power analyses (G*Power 3.1; Faul et al., 2007) specifying a logistic regression. Based on past work on children's understanding of wealth status (Shutts et al., 2016; Yang & Dunham, 2022), we assumed a medium effect size ($OR = 3.47$; Chen et al., 2010) with an alpha level of .05. The power analysis indicated that a sample size of 101 would be sufficient to achieve 80% power. However, we increased the sample size to 108 to fully counterbalance all aspects of the study.

2.1.2 | Participants

We recruited 108 US children between the ages of four and nine years ($M_{age} = 6.79, SD = 1.67$, 56 girls, 52 boys) from a college town in upstate New York. Informed by past research suggesting that children's reasoning about wealth status becomes more sophisticated around age seven (e.g., Rizzo et al., 2016), we included a similar number of participants in two age groups: 57 four- to six-year-olds (47% girls) and 51 seven- to nine-year-olds (57% girls). Two additional participants were excluded because of parental interference ($N = 1$) or developmental delay ($N = 1$).

The demographic information was available for 53% of the sample, with 79% of the subset identified as White, 4% as Asian, 2% as Hispanic, 2% as Black, and 14% as mixed and others. In our sample, 41% of families reported income. The median household income was $98,000. According to the economic class categories based on annual household income (World Economic Forum, 2022), the majority of children came from middle-class families (67%), with 20% from lower class and 13% from upper class. Ninety-five percent of the participants had at least one parent with a bachelor's degree or higher. The research was approved by the University of Chicago Institutional Review Board. Each participant's parent provided written informed consent.

2.1.3 | Materials and procedure

Participants were tested in a research lab or at a local science museum. Before the testing session, parents were instructed not to intervene with their child during the study. For this and the following studies, materials and questions were presented on an iPad or a laptop using Qualtrics. The testing sessions were recorded.

Children received four trials. In each trial, children saw pictures of two gender-matched White children (a pair of girls or a pair of boys). Past work assessing adults' wealth-based pain perceptions has successfully used child stimuli (Summers et al., 2023). We focused on White characters to isolate the effect of wealth on children's pain perception from race. Prior studies with adults suggest that race may interact with SES to influence stereotypes (Brown-Iannuzzi et al., 2017; Fiske et al., 2002), thus it is possible that children's wealth-based pain perceptions vary depending on the race of the targets. We return to this limitation in the general discussion.

One child was paired with a high-value belonging (e.g., a fancy house), and the other was paired with a corresponding low-value belonging (e.g., an old house), indicating a difference in their wealth status (Olson et al., 2012; Horwitz et al., 2014; Shutts et al., 2016). The pairing between the pictures of the child and the high- versus low-value objects was counterbalanced across participants.

Next, participants heard that both children had experienced an identical painful event (e.g., "They both got soap in their eyes"). These harmful events have been used in previous studies with children of a similar age range (Dore et al., 2018). Participants then indicated which child felt more pain by choosing between the two characters. The order of the four trials was randomized among participants. In each trial, children received 1 if they selected the poor child and 0 if they selected the rich child. This coding method was applied to all four studies.

At the end of the testing session, the experimenter debriefed the study and thanked the children for their participation.

2.2 | Results

Preliminary analyses revealed no effect of participant gender on pain perceptions, thus the data were collapsed across participant gender. We performed a mixed-effects logistic regression model on children's responses in each trial in R (Version 4.1.2, R Core Team, 2021), including participant age (continuous), with random intercepts for participants and trials. This model revealed a significant effect of age, $X^2 = 7.70$, $p = 0.006$, suggesting that children, with age, become increasingly likely to perceive the poor White individuals as suffering more pain (Figure 1, left).

Next, we employed the Johnson-Neyman "regions of significance" approach (Johnson & Neyman, 1936) to pinpoint the exact age at which US children began perceiving greater pain in poor White individuals compared to rich individuals. To achieve this, we calculated the difference between participants' exact age and a specific age of interest, substituting this difference for their exact age in the previously described model. This approach allowed us to systematically assess how minor adjustments in the specific age of interest, made in 0.1-year increments within the age range, influenced the model's intercept. Our goal was to identify the age point at which the intercept reached statistical significance, indicating children's pain perceptions began to deviate from chance (0.5). This method has been used in recent developmental studies (Zhao & Yang, 2023). The analysis showed that, starting at the age of 7.2, the probability of choosing the poor White individuals as feeling more pain became significantly higher than chance. Therefore, around age seven, US children believe that White children of lower wealth status feel more pain than their counterparts of higher wealth status when they experience the same incident.

In addition, informed by past work suggesting a potential change in children's reasoning about wealth status at around age seven (Rizzo et al., 2016; Yang & Dunham, 2022), we categorized children into two age groups (4- to 6-year-olds vs. 7- to 9-year-olds) and performed one-sample *t*-tests to compare their selections of poor individuals to chance (0.5). These analyses revealed that, whereas 4- to 6-year-olds' tendency to choose the poor characters did not deviate from chance ($M_{4\text{-}6y} = 0.48$, $SD = 0.31$, $t(56) = -0.43$, $p = 0.667$, Cohen's $d = -0.06$, 95% CI for Cohen's $d = [-0.33, 0.20]$), 7- to 9-year-olds were more likely to perceive the poor individuals as experiencing more pain, ($M_{7\text{-}9y} = 0.61$, $SD = 0.30$, $t(50) = 2.67$, $p = 0.010$, Cohen's $d = 0.36$, 95% CI for Cohen's $d = [0.08, 0.65]$).

2.3 | Discussion

Children in the US became increasingly likely to perceive the poor as suffering more physical pain than the rich. Specifically, children around age 7 began to attribute more pain to White individuals of low wealth status than to White individuals of high wealth status. Using relative measures with the current stimuli, we found that the stereotype associating poor people with toughness does not emerge until after the age of 9.

3 | STUDY 2

Study 2 has two primary goals. First, to explore the downstream impact of children's wealth-based pain perceptions on their prosociality, we assessed their distributions of scarce medical resources between a rich and a poor recipient. Second, we investigated whether the effect of a sufferer's wealth status on pain perception varied across child and adult targets. Children's wealth-based pain perceptions may extend to their judgments of adults' pain, as some research has shown that group-based beliefs expressed towards children are similarly applied to adults (Alto & Mandalaywala, 2023; Bian et al., 2017). Conversely, other studies suggest that children integrate multiple social dimensions in constructing social stereotypes (Jaxon et al., 2019; Shu et al., 2022), thus their wealth-based beliefs may manifest differently when judging adult versus child targets. Specifically, it is possible that children only expect adults of low wealth to have lived a harder life and

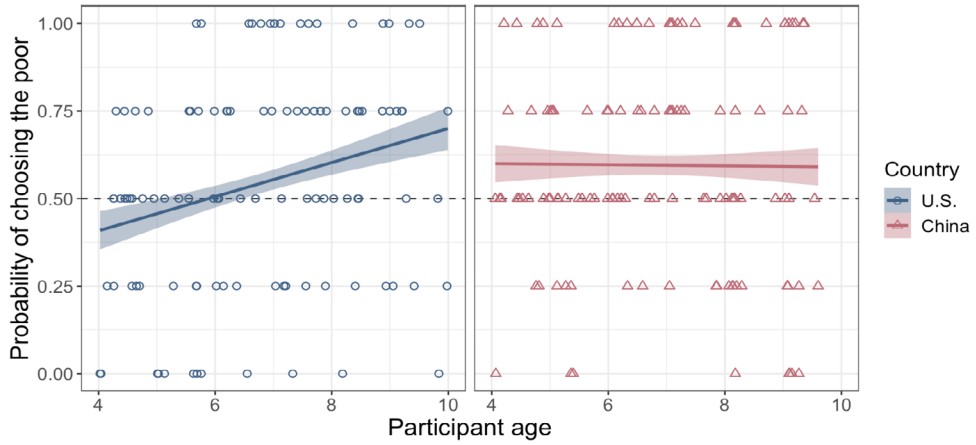

FIGURE 1 US (Study 1; left) and Chinese children's (Study 3; right) predicted probability of choosing poor individuals as feeling more pain across age. Circles and triangles represent the data of individual participants. Shaded areas represent 95% confidence intervals.

thus would feel less pain, but they do not hold this expectation for low-wealth children (as shown in Study 1).

3.1 | Method

3.1.1 | Participants

We recruited 111 four- to nine-year-old children ($M = 6.76$, $SD = 1.69$, 56 girls, 55 boys; 61 four- to six-year-olds, 50 seven- to nine-year-olds) from diverse locations in the US. The geographic information was available for 93% of the sample; this subset came from 26 different states: 56% were from the Northeast (e.g., NY, MA), 12% from the Western (e.g., CA, CO), 11% from the Midwest (e.g., IL), and 21% from the Southeast or Southwest area (e.g., AR, TX).

The demographic information was available for 98% of the sample, with 69% of the subset identified as White, 17% as Asian/Pacific Islander, 6% as Latino/Hispanic, 3% as Black, and 5% as mixed and others. In our sample, 74% of families reported income. The median household income was $120,000. The majority of children came from middle-class families (63%), with 6% from lower class and 30% from upper class. Ninety-eight percent of the participants had at least one parent with a bachelor's degree or higher. Two additional participants were excluded because they did not complete the study.

3.1.2 | Materials and procedure

The method of this experiment was identical to that of Study 1, with several exceptions.

First, due to the COVID-19 pandemic, participants were tested online using Zoom. Children first participated in a warm-up session adapted from Sheskin and Keil (2018), which served to make the children feel comfortable answering questions over video and to ensure that they could differentiate the colors used to mark characters in the main tasks. Specifically, an experimenter asked children to identify two different colors, blue and orange. In the main tasks, in which children saw two characters, one was presented in an orange frame and the other in a blue frame. This way, the child and the experimenter could refer to each character by its associated color.

Second, to explore whether children's wealth-based reasoning about pain applied to targets of different age groups, participants evaluated child and adult characters. Specifically, they received two trials presenting two gender-matched White children (a pair of girls and a pair of boys), and two trials presenting two gender-matched White adults (a pair of women and a pair of men). The order of the two blocks was counterbalanced.

Third, to confirm that the belief associating low wealth status with pain was not tied to specific stimuli, we used a new set of properties to signal wealth status (i.e., houses and cars for adults, and toys and bikes for children), and a new set of painful events (e.g., "fell and scratched their knees").

Fourth, for a more precise estimate of pain perception, we added one question to the pain perception measure. Upon viewing each set of photos, children were asked to guess (1) which individual hurt more and (2) which individual they felt more sorry for. The two questions were presented in randomized order.

Fifth, in each trial, children were introduced to a resource allocation scenario in which only one healthcare resource (i.e., a band-aid or an ice pack) was available to distribute between the two characters. Children were asked to choose one character to receive the resource. The order of the two measures, resource allocation and pain perception, was randomized.

3.2 | Results

3.2.1 | Pain perception

We first performed a mixed-effects logistic regression model on children's pain inferences as a function of participant age (continuous),

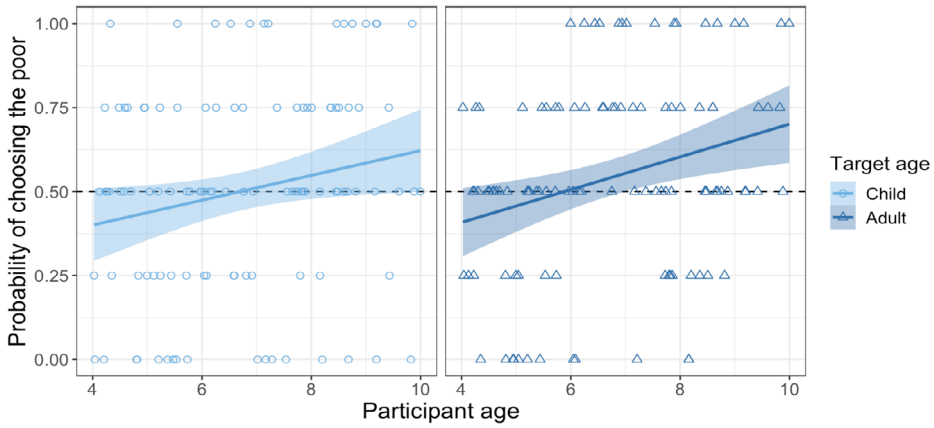

FIGURE 2 US children's predicted probability of choosing poor individuals as feeling more pain in Study 2, by participant age and target age. Circles and triangles represent the data of individual participants. Shaded areas represent 95% confidence intervals.

target age (child vs. adult), and their interaction, with random intercepts for participants and trials. The analysis revealed a significant effect of participant age, $X^2 = 12.11$, $p < 0.001$. Replicating Study 1, children with age became more likely to associate pain with the poor than with the rich individuals (Figure 2). This effect was not moderated by target age, $X^2 = 0.43$, $p = 0.513$. The Johnson-Neyman "regions of significance" approach (Johnson & Neyman, 1936) suggested that starting at 7.6 years of age, children began to attribute more pain to the poor individuals.

In line with these results, 4- to- 6-year-old children's responses did not deviate from chance ($M_{4\text{-}6y} = 0.48$, $SD = 0.24$, $t(60) = -0.53$, $p = 0.596$, Cohen's $d = -0.08$, 95% CI for Cohen's $d = [-0.33, 0.17]$), while 7- to 9-year-old children were more likely to perceive the poor White individuals as suffering more pain ($M_{7\text{-}9y} = 0.57$, $SD = 0.21$, $t(49) = 2.34$, $p = 0.023$, Cohen's $d = 0.33$, 95% CI for Cohen's $d = [0.04, 0.62]$).

3.2.2 | Healthcare resource allocation

We conducted similar analyses on children's resource allocation decisions. The mixed-effects binomial regression model showed a significant effect of age, $X^2 = 18.21$, $p < 0.001$, indicating that, with age, children were more likely to provide healthcare resources to the poor individuals than to the rich individuals. This main effect was qualified by an interaction between child age and target age, $X^2 = 5.74$, $p = 0.017$. Simple slope tests suggested that, the tendency to allocate healthcare resources to the poor increased with age when the recipients were adults, but this age effect was only marginal when the recipients were children (Adult targets: $B = 0.47$, $SE = 0.10$, $z = 4.71$, $p < 0.001$; Child targets: $B = 0.17$, $SE = 0.09$, $z = 1.88$, $p = 0.060$). Since the age effect trended in the same direction, we averaged their responses across the four trials and compared them to chance. The results suggested that younger children's responses were at chance ($M = 0.45$, $SD = 0.26$, $t(60) = -1.61$, $p = 0.113$, Cohen's $d = -0.19$, 95% CI for Cohen's $d = [-0.45, 0.06]$), whereas older children were more likely to provide healthcare resources to the poor individuals ($M = 0.68$, $SD = 0.28$, $t(49) = 4.60$, $p < 0.001$, Cohen's $d = 0.64$, 95% CI for Cohen's $d = [0.33, 0.95]$).

3.2.3 | Pain perception → healthcare resource allocation

To examine whether children's pain perceptions underlie their resource allocating behaviors, we first conducted a Pearson correlation analysis between the two variables. Averaging across the four trials, every child received a pain perception score and a resource allocation score. As expected, children's tendency to attribute stronger pain to the poor (vs. the rich) predicted their tendency to provide healthcare resources to the poor, $r(109) = 0.48$, 95% CI = [0.33, 0.61], $p < 0.001$.

Next, to test whether the age effect on participant's resource allocations was mediated by their wealth-based pain perceptions, we adopted Model 4 of the PROCESS macro in R (Hayes, 2022) and bootstrapped 10,000 samples. In the mediation model, participant age was entered as the independent variable, with their tendency to choose the poor as feeling more painful (i.e., pain perception scores) as the mediator and their tendency to provide the healthcare item to the poor (i.e., resource allocation scores) as the dependent variable. As predicted, the mediation effect was significant, indirect effect = 0.02, 95% CI = [0.01, 0.04] (Figure 3). The direct effect of age on resource allocations remained significant, direct effect = 0.05, 95% CI = [0.02, 0.08]. Thus, children's increasing tendency to attribute more pain to the poor than to the rich partially explained older children's increasing tendency to distribute the medical item to the poor.

Supplementary analyses

We conducted two sets of additional analyses to explore (1) how local environments shaped children's wealth-related beliefs about physical pain, and (2) whether participant race influenced their wealth-based pain perceptions.

To increase the power to detect differences by children's own socioeconomic status, we pooled the data with available demographic information from Studies 1 and 2 ($N = 165$). We first created a

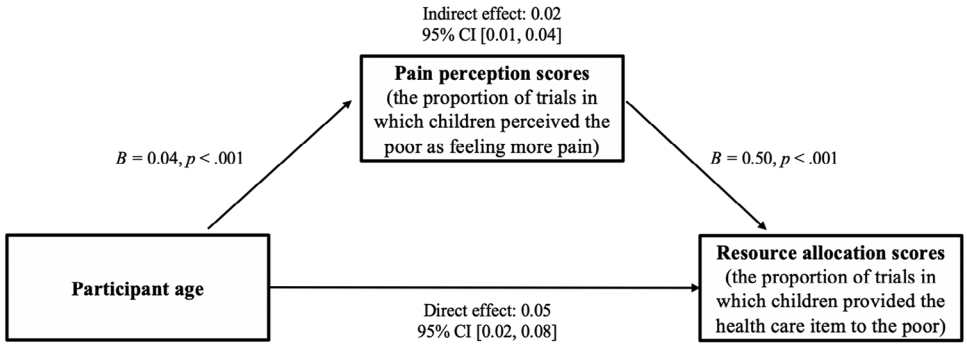

FIGURE 3 Results of mediation analysis in Study 2. The age effect on children's tendency to provide the health care item to the poor was mediated by their tendency to attribute pain to the poor.

composite SES measure by (1) standardizing the average education level of the parent(s) (which had been converted to years of education prior to standardizing) and the total income of the household, and then (2) averaging these two scores (education and income) into a composite SES variable. We then conducted a linear regression model on children's composite pain perception scores with SES, age and their interaction as fixed effects. SES did not moderate the effect of age, $B = -0.004$, $SE = 0.02$, $p = 0.790$. The main effect of SES was not significant, $B = 0.01$, $SE = 0.11$, $p = 0.902$. Next, we replaced SES with children's household income and performed similar analyses. Neither the main effect of income, $B = 0.05$, $SE = 0.14$, $p = 0.743$, nor the interaction between income and age, $B = -0.004$, $SE = 0.02$, $p = 0.830$, reached significance. These results suggested that children of different SES backgrounds develop similar attitudes towards the poor's pain. However, since our sample was not socioeconomically diverse, this finding should be interpreted with caution.

Next, we explored how children's own racial identity influenced their pain perceptions of White sufferers from different economic backgrounds. Given that our samples were primarily White and the targets were White as well, perhaps children merely displayed empathy toward disadvantaged *ingroup* members, rather than to the low-wealth group in general. To test this alternative explanation with a more powered sample, we combined participants who reported their race in Studies 1 and 2 ($N = 162$; 118 White children, 44 children of color). As before, we conducted a linear regression model on children's composite pain perception scores with their race, age and their interaction as fixed effects. With age, children became more likely to attribute pain to poor White characters, $F(1,158) = 9.85$, $p = 0.002$. This effect was not moderated by participant race, $F(1,158) = 0.18$, $p = 0.672$. These results suggest that children's tendency to associate the poor with more pain reflects their wealth-related beliefs, rather than their empathy towards vulnerable ingroup members.

3.3 | Discussion

Study 2 provided converging evidence suggesting that with age, US children become more likely to predict White individuals of low wealth status to suffer more pain than White individuals of high wealth status. This effect persisted across child and adult sufferers. Importantly, this association underlied children's tendency to allocate healthcare resources to the poor, speaking to a link between children's pain judgments and their prosociality.

4 | STUDY 3

Study 3 included Chinese children to provide the first test exploring how culture may moderate the development of wealth-based pain perceptions. Although China face similar economic inequality as the US, the two cultures hold relatively different views about social classes (Wu et al., 2018). Specifically, Chinese culture tends to hold a suspicion of the wealthy (Gerth, 2011; Shen, 2010) and treat the working class with more respect (Grigoryan et al., 2020). These cultural values may encourage Chinese children to empathize with the poor from early on.

4.1 | Method

4.1.1 | Participants

We recruited 118 four- to nine-year-old Chinese children ($M = 6.83$, $SD = 1.64$, 59 girls, 59 boys; 60 four- to six-year-olds, 58 seven- to nine-year-olds) from multiple regions in China, including Hebei Province, Jiangxi Province, and Chongqing, to ensure a geographically diverse sample. These participants were from middle-class families in general, though the specific demographic information of this sample was not available due to local restrictions. According to the National Bureau of Statistics of China (2021), the average annual income was 82,526 RMB (approximately $12,000) in Hebei Province, 83,766 RMB (approximately $12,200) in Jiangxi Province, and 101,670 RMB (approximately $14,800) in Chongqing.

4.1.2 | Materials and procedure

Children were tested individually in a quiet classroom or school office. The procedure and materials were identical to those of Study 1, except

that the script was translated from English into Chinese by the first author and then back-translated into English by an independent bilingual translator to ensure accuracy. Any discrepancies between the back-translated script and the original version were resolved through discussion. In each trial, Chinese children were introduced to two White characters to ensure a close match to Study 1. Given that China is a racially homogeneous country with 99% of its population identified as Asian (National Bureau of Statistics of China, 2021), measuring Chinese children's pain perceptions about White targets also provides insights on whether children develop wealth-based pain perceptions when judging racially outgroup members.

4.2 | Results

We modeled children's selections in each trial as a function of their age (continuous), with random intercepts for participants and trials. Unlike Study 1, this analysis revealed no significant effect of participant age ($X^2 = 0.002$, $p = 0.961$; Figure 1 right). In fact, both younger ($M_{4\text{-}6y} = 0.59$, $SD = 0.27$, $t(59) = 2.65$, $p = 0.010$, Cohen's $d = 0.33$, 95% CI for Cohen's $d = [0.07, 0.59]$) and older Chinese children ($M_{7\text{-}9y} = 0.60$, $SD = 0.33$, $t(57) = 2.26$, $p = 0.028$, Cohen's $d = 0.30$, 95% CI for Cohen's $d = [0.04, 0.57]$) perceived the poor characters as suffering more pain.

4.2.1 | Cross-cultural comparison

To systematically test for the influence of culture on children's wealth-based pain perception, we combined the data from Studies 1 and 3. Children's responses were submitted to a mixed-effects logistic regression model that included participant age (continuous), country (US vs. China), and their interaction, with random intercepts for participants and trials. The analysis revealed a marginally significant effect of age, $X^2 = 3.40$, $p = 0.065$, which was qualified by an interaction between age and country, $X^2 = 5.45$, $p = 0.020$. To discompose the interaction, tests of simple slope revealed that US children become more likely with age to choose the poor individuals as suffering more pain, $B = 0.19$, $SE = 0.06$, $z = 2.96$, $p = 0.003$, whereas Chinese children's tendency to choose the poor individuals as experiencing more pain did not vary by age, $B = -0.02$, $SE = 0.06$, $z = -0.25$, $p = 0.806$. According to the Johnson-Neyman "regions of significance" approach, up until 6.4 years of age, Chinese children were more likely than US children to attribute more pain to poor individuals.

4.3 | Discussion

Study 3, coupled with Study 1, supplied the first evidence depicting cross-cultural similarities and variations in children's attendance to sufferers' wealth in their pain judgments. Both Chinese and (older) US children associated more pain with low-wealth White individuals than with high-wealth White individuals. However, Chinese children exhibited this association earlier than their US counterparts.

5 | STUDY 4

Study 4 examined whether Chinese children's tendency to perceive the poor as suffering more pain extended to their judgments of Asian people, who constitute the racial majority group in China. Since Chinese children have the most frequent interactions with Asians in their daily life, exploring how Chinese children incorporate the wealth status of Asian sufferers into their pain perceptions could yield more practical implications in real-world contexts. Informed by Study 3 that Chinese preschoolers started to attribute greater pain to the poor and this effect remained stable across age, the current study focused on 4- to 7-year-olds. In addition to measuring children's wealth-based pain perceptions, we also assessed their decisions to allocate healthcare resources between a poor and a rich Asian individual.

5.1 | Method

5.1.1 | Participants

We recruited 80 four- to seven-year-old children ($M = 5.99$, $SD = 1.03$, 40 girls, 40 boys; 20 participants in each age group) from multiple regions in China, including Hebei Province, Guangdong Province, and Chongqing. The specific family income information of this sample was not available due to local restrictions, but participants were generally from middle- or working-class families. According to the National Bureau of Statistics of China (2021), the average annual income was 82,526 RMB (approximately $12,000) in Hebei Province, 118,133 RMB (approximately $17,170) in Guangdong Province, and 101,670 RMB (approximately $14,800) in Chongqing. Seven additional participants were excluded because they did not pass the manipulation check questions (see below).

5.1.2 | Materials and procedure

Children participated in the study either in person ($N = 47$) or online ($N = 33$). In-person participants were tested in a quiet classroom or at a public park. Online participants interacted with an experimenter on Tencent Meeting (a Chinese version of Zoom). Visual stimuli were presented using the "screen sharing" function.

The procedure and materials were identical to those of Study 2, with four exceptions. First, the script was translated from English into Chinese by the first author and then back-translated into English by an independent bilingual translator to ensure accuracy. Second, children were presented with Asian characters rather than White characters. Specifically, they received two trials presenting two gender-matched Asian children (a pair of girls and a pair of boys), and two trials

presenting two gender-matched Asian adults (a pair of women and a pair of men). Third, a new set of properties that were commonly seen in Chinese culture were selected to indicate wealth status, though these properties belonged to the same categories as those in Study 2 (i.e., houses and cars for adults, and toys and bikes for children). Fourth, we included a manipulation check question after introducing each pair of characters. Children were asked to indicate which character is rich (for adult trials) or from a rich family (for child trials). Participants ($N = 7$) who answered incorrectly to two or more check questions were excluded from data analyses.

5.2 | Results

5.2.1 | Pain perception

We performed a mixed-effect logistic regression model on children's selections in each trial as a function of their age (continuous), target age (child vs. adult), and their interaction, with random intercepts for participants and trials. This analysis revealed no significant effect of participant age ($X^2 = 1.96, p = 0.162$), target age ($X^2 = 0.24, p = 0.627$), or their interaction ($X^2 = 0.26, p = 0.610$). Thus, we collapsed the data across the age range and found that Chinese children perceived the poor Asian characters as suffering more pain than the rich Asian characters ($M = 0.59$, $SD = 0.30$, $t(79) = 2.63$, $p = 0.010$, Cohen's $d = 0.30$, 95% CI for Cohen's $d = [0.08, 0.52]$). Chinese children's early tendency to associate physical pain with the poor individuals was generalized to Asian individuals.

5.2.2 | Healthcare resource allocation

Similar analyses were conducted on children's resource allocation decisions. The mixed-effects binomial regression model revealed a significant effect of age, $X^2 = 4.79, p = 0.027$. With age, Chinese children became more likely to provide healthcare resources to the poor Asian individuals than to the rich Asian individuals. Beginning at the age of 5.8 years, Chinese children chose to provide the healthcare resources to the poor Asian individuals. Neither the main effect of target age, $X^2 = 0.02, p = 0.888$, nor its interaction with participant age, $X^2 = 1.11$, $p = 0.293$, reached significance.

5.2.3 | Pain perception → healthcare resource allocation

Next, we performed a Pearson correlation to examine the relationship between children's perceptions of physical pain and their resource allocation decisions. As predicted, children who perceived the poor characters as suffering more pain were more likely to provide the healthcare resource to the poor, $r(78) = 0.68$, 95% CI = [0.54, 0.78], $p < 0.010$.

5.3 | Discussion

Chinese children perceived poor individuals as suffering more pain than rich individuals when making judgments of Asian people. This inclination developed at an early age and guided children's decisions to allocate medical resources, leading them to prioritize offering healthcare resources to people with lower wealth status.

6 | GENERAL DISCUSSION

The wealth gap in healthcare is a pressing issue that requires immediate attention. Though people of low SES are more susceptible to pain (Chou et al., 2016; Dorner et al., 2011), they receive less intensive pain treatment than high-SES groups (e.g., Bristow et al., 2013; Institute of Medicine, 2011). However, it remains unclear how children judge the physical pain of the poor and the rich. The present research addressed this gap and provided converging evidence suggesting that children consider sufferers' wealth status when making predictions about their painful feelings. Specifically, US children around age seven and above attributed more pain to White individuals of low wealth status than those of high wealth status when both groups experienced identical harmful events. Chinese children also viewed the poor as suffering more pain than the rich, and this tendency developed earlier than their US counterparts. The tendency to associate greater pain with the poor persisted across various painful events, target demographics including gender (i.e., female and male), age (i.e., children and adults) and race (i.e., Chinese children's pain judgments about White and Asian sufferers), and participants' own SES backgrounds and race (i.e., White and non-White). Importantly, children who attributed more pain to poor White individuals were also more likely to provide them with the healthcare resources available. Overall, our research suggests that from early on, children perceive and treat the poor with empathy.

These findings paint a different picture from adults' evaluations of the poor's suffering. Specifically, adults assume that people of low SES are inured to physical pain (Summers et al., 2021; Summers et al., 2023). This stereotype is rooted in the thick skin bias positing that economic hardships breed toughness (Deska et al., 2020; Hoffman & Trawalter, 2016). Unlike adults, however, children in our studies seemed to be immune to this stereotype. It is possible that 4- to 9-year-old children's conceptualizations of economic hardships are fundamentally different from adults', whereby they do not automatically link hardships with resilience. Therefore, children do not expect the poor to have thicker skin to resist pain. Future research tracking the emergence of the thick skin bias across a wider age range is needed to depict the developmental shifts in people's recognition of the poor's pain.

Then, why do children with age attribute more pain to the poor than to the rich? One possibility concerns children's increasing perspective-taking skills. For example, some research found that children's theory-of-mind development predicted their ability to show empathy (Caputi et al., 2012; Paulus & Moore, 2015). However, we deemed this possibility less likely for a few reasons. Some studies did not detect a relation

between perspective-taking capacity and children's empathy (Knafo et al., 2008; Paulus & Leitherer, 2017). In addition, since children's understanding of theory of mind seems to follow the same sequence in the US and China (Liu et al., 2008; Wellman et al., 2006), one would expect children in the two cultures to recognize the poor's pain at similar ages. Yet, the fact that Chinese children recognized the poor's pain at a younger age than their US counterparts provided some evidence against this explanation. In light of these considerations, we proposed three other possible explanations.

Children's increasing tendency to perceive the poor as feeling more pain may relate to the growing complexity in their conceptualizations of the poor and the rich. In contrast to preschoolers who often exhibit a halo effect about rich people (e.g., Ahl et al., 2019; Horwitz et al., 2014; Li et al., 2014), recent work has identified developmental shifts in children's reasoning about wealth status and awareness of inequality occurring around age 7 (Chafel & Neitzel, 2005; Dys et al., 2019; Elenbaas & Killen, 2016; Rizzo et al., 2016; Yang & Dunham, 2022). For example, though US preschoolers evaluated the rich highly positively, children perceived the rich and the poor as equally hardworking and helpful at age 7, and attributed more positive attributes to the poor after age 9 (Yang & Dunham, 2022). This developmental trend aligns with the findings of the present studies. The growing tendency to form a more positive view about the poor might encourage children to feel greater empathy towards them. A second possibility pertains to children's developing understanding of wealth-power associations, which may lead them to attribute stronger pain to the poor. It is well established that one's own sense of control plays an important role in influencing their health outcomes (Bandura, 1997; Rodin, 1986). For example, although low-wealth people's physical health is often compromised, those with a stronger sense of control report health outcomes comparable to high-wealth people (Lachman & Weaver, 1998). One recent study suggests that 4- to 9-year-old children gradually endorse the idea that the wealthy are more capable than the poor to determine their life outcomes (Yang & Dunham, 2022). This belief may lead them to perceive the poor as suffering more physical harm than their rich counterparts. Indeed, an emerging study assessing children's inferences of emotional harm found that children who judged the poor as having limited control over life also attributed stronger distress to them (Lazaro et al., 2023). Lastly, it is also possible that children's changing subjective social status (SSS) plays a critical role in shaping their wealth-based pain perceptions. Recent work found that, US children's SSS declines with age (Amir et al., 2019; Peretz-Lang et al., 2022). Children with age may perceive themselves as less similar to the rich and instead identify more strongly with people of lower social status. This increased identification with the poor could encourage children to acknowledge the pain experienced by them. Future work assessing children's evaluations and stereotypes about the affluent and the poor, their tendency to link wealth with power, and the development of SSS would help elucidate the precise mechanism.

Our findings make several notable contributions. Research examining early group-based biases in pain sensitivity is an emerging area such that developmental research to date has solely focused on race-based pain judgments (Dore et al., 2014; 2018). The present research extended this literature beyond racial bias by demonstrating that other social dimensions, such as wealth status, shape early pain judgments. This research also presents useful insights on the development of the stereotype portraying the poor as hardened and insensitive to physical harm. In fact, we found that children in two different cultural contexts share the consensus that the poor suffer more pain than the rich. Thus, the pernicious stereotype against the poor's pain does not emerge until later childhood or adulthood. Importantly, children's perceptions of the poor's pain underlied their tendency to allocate medical resources to the poor, which has practical implications for interventions to remedy the wealth-based disparities in health care.

Our work also provides important knowledge on children's wealth-related inferences in non-Western cultures. Past work on early reasoning about wealth status has focused primarily on Western contexts (e.g., Shutts et al., 2016). A few exceptions investigated children's sensitivity to wealth-related cues (Olson et al., 2012; Zhang et al., 2021) or their preference for rich people (Ahl et al., 2019; Amemiya et al., 2023). Our findings revealed cross-cultural similarities and variations in children's wealth-based pain perceptions: both US and Chinese children tended to attribute more pain to the poor (vs. the rich), though Chinese children showed this tendency earlier than US children. This variation may be related to the different cultural beliefs about social classes (Gerth, 2011; Shen, 2010). Although the US culture supports a general admiration for the upper class or the wealthy (Nickerson et al., 2003), Chinese culture tends to praise the working class (Grigoryan et al., 2020) and sometimes allows for "hatred against the rich" (Wu et al., 2018). These cultural messages may be available in early childhood and shape children's attendance to a sufferer's wealth status in their pain judgments. Additionally, the development of SSS may vary across cultures and give rise to cross-cultural differences in how children perceive the poor's pain. Conducting a comparative analysis of Chinese children's SSS across age with their US counterparts and exploring its connection to wealth-based pain perceptions would be a valuable research endeavor.

Our studies provide the first investigation of early wealth-based pain perceptions, yet there are some limitations that should be taken into account. First, we adopted forced-choice measures because wealth categories are inherently relational and these measures have been widely used in developmental studies to capture young children's understanding of wealth status (Horwitz et al., 2014; Olson et al., 2012). In addition, a recent study on children's social preferences showed that children's responses to forced-choice measures correlate well with their responses to continuous rating scales (deMayo & Olson, 2023). However, several characteristics of forced choice measures could potentially amplify children's wealth-based pain perceptions. For example, choosing between a rich and a poor individual may highlight the wealth dimension and prompt children to connect painful feelings with wealth levels (though this would not explain children's increasing tendency to attribute pain to the poor). Moreover, when using forced-choice measures, children were not given the option to express no biases in a single trial, whereas a rating scale would provide that possibility. Future work should employ a range of measurements

to provide a more precise depiction of children's wealth-based pain perceptions.

Second, we held target race constant to isolate the effect of a sufferer's wealth background on pain judgments. While Chinese children perceived the poor as suffering more pain than the rich when evaluating both White and Asian people, it remains unclear whether US children's wealth-based pain perceptions extend to racial minority groups. Since target race is a prominent social factor influencing children's pain perceptions (Dore et al., 2014, 2018), and it is closely intertwined with SES at least in Western contexts, future work should employ stimuli featuring individuals from various racial backgrounds to investigate the interplay between wealth and race. Similarly, it is important to note that the majority of children in our samples were from middle-class families. This limits the generalizability of our findings to children from lower socioeconomic backgrounds. Although our studies did not find that children's own SES standing shaped their wealth-based pain perceptions, future studies should recruit high-powered diverse samples to further test this question.

In sum, (older) US and Chinese children perceive the poor as feeling more physical pain than the rich. This perception guides children's helping behaviors, leading them to provide medical resources to the poor. Parents and educators may consider ways to foster the early empathy towards the poor across development, serving as the foundation for reducing wealth-based disparities in health care.

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CONFLICT OF INTEREST STATEMENT

The authors do not have any interests that might be interpreted as influencing the research.

DATA AVAILABILITY STATEMENT

The materials, data and analytic code taht support the findings of this research are openly available in Open Science Framework at https://osf.io/yq4nx.

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