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The Bias Blind Spot Across Childhood

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Abstract

The bias blind spot (BBS) is the tendency for people to perceive themselves as less biased than others. This tendency resembles a self-enhancement effect, but research has mainly focused on other mechanisms that purportedly underlie the BBS. In this paper we present developmental evidence that the BBS and a self-enhancing tendency, namely the better-than-average effect, develop independently (Studies 1 and 2). Children aged 5 to 12-years-old do not believe they are biased (despite evidence that they are). However, while younger children tend to believe others are unbiased, older children believe others are biased (Studies 2 and 3). Importantly, younger children understand that unbiased behavior is better than biased behavior (Study 4). Together, these results converge with the notion that the BBS is not a mere instance of a self-enhancing tendency and suggest that the BBS is the residual part of a bigger illusion that everyone is unbiased.

Keywords: bias blind spot; better than average; person perception; bias; social cognitive development

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"Every man can see things far off but is blind to what is near." (quote attributed to Sophocles)

Nothing is nearer to oneself than the self, and proving Sophocles right, people are usually blind to the biases that affect their own judgment and behavior, but can see biases in other peoples' judgments and behaviors. For example, sports fans often find the objectivity of the referees and opponents questionable, but rarely appreciate how much their own perceptions are tainted by their team affiliation (e.g., Wann et al., 2006). This selective form of blindness has been dubbed the bias blind spot (BBS; Pronin, Lin, & Ross, 2002).

The BBS is prevalent among adults and quite difficult to overcome (e.g., Pronin et al., 2002; Pronin & Kugler, 2007; Zappala, Reed, Beltrani, Zapf, & Otto, 2018). Less is known about the developmental origins and trajectory of the BBS (for an exception see Elashi & Mills, 2015). We propose that studying the development of a bias is indispensable for a clearer, more complete understanding of the bias, including whether, how, and when one should intervene, should one wish to lessen that bias. Moreover, many of the social psychological implications of how people perceive bias in others and themselves (e.g., regarding intergroup relations, conflict resolution, decision making) are important for both adults and children, which is another reason why studying the BBS across childhood is essential. However, for the present research, our interest rests on how developmental data may contribute to the understanding of the mechanisms underlying the BBS and its relationship with another tendency in social perception, namely people's tendency to self-enhance.

At the surface the BBS looks just like any other example of people's tendency to self-enhance—people see themselves as less biased than others because bias has a negative connotation. The better-than-average effect (i.e., people's tendency to believe they have more positive characteristics than others; e.g., Alicke, 1985; J. Brown, 2012) and self-serving attributions (i.e., people's tendency to attribute their successes to their abilities but their failures to external circumstances; e.g., Hastorf, Schneider, & Polefka, 1970), for example, are other instances of what might be called an overarching self-enhancing tendency. However, in the literature, many have argued that the BBS is not a mere instance of a tendency for people to judge themselves in a more positive light than others, nor plainly a motivational bias, but a distinct effect with unique cognitive underpinnings (e.g., Pronin, 2007; Scopelliti et al., 2015). In the present paper, we explore the development of the BBS, specifically focusing on how that development could inform the discussion on (a) the extent to which the BBS is distinguishable from other self-enhancing tendencies and (b) the extent to which the cognitive mechanisms thought to produce the BBS in adults are implicated in the emergence of the BBS.

To date and to our knowledge, there are only two other studies that focus on the BBS during childhood (Elashi & Mills, 2015). These studies indicate that 7- and 10-year-olds already show the BBS and tentatively suggest that the BBS increases with age, either because older children considered themselves less similar to biased characters (Study 1) or considered others more likely to engage in biased behaviors (Study 2) than younger children. Overall, the authors argued that as soon as children are able to recognize bias in others, the BBS is in place. The present work advances beyond past work by including children under the age of 7. Including younger children in studies of the BBS can inform an understanding of the origins and, importantly of the cognitive underpinnings, of the BBS. Moreover, unlike the previous work, we sought to examine a possible developmental overlap (or the lack thereof) between the BBS and a tendency to self-enhance. We chose the better-than-average effect as a representative of people's tendency to self-enhance because rating oneself as better than the average other is arguably the most direct way of self-enhancing (but see, Heck & Krueger, 2015).

To illustrate how we envision the developmental evidence as potentially informative of the underlying mechanisms of the BBS, we briefly discuss three distinct developmental hypotheses that could inform this discussion.

Blind to Bias Hypothesis

One hypothesis is that young children are equally blind to their own and others' vulnerability to bias early on, but throughout development come to see others as biased, retaining a blind spot regarding their own susceptibility to bias (as we find in adults). This developmental trajectory would suggest that young children apply their naïve realism—or the tendency to believe that their own perceptions are true reflections of reality (e.g., Ross & Ward, 1996)—to the self and others alike. In adults, researchers have argued that naïve realism causes people to see themselves as objective. In contrast, adults think other people are biased, reasoning that if those other people were unbiased, the other people would have the same perceptions and preferences as they do (e.g., Pronin, Gilovich, & Ross, 2004). Children are known to have even more difficulty than adults understanding the constructive nature of their own perceptions (i.e., children are stronger naïve realists than adults; e.g., Gopnik, & Astington, 1988), which would predictably lead them to think they are unbiased. Moreover, children have difficulty in taking others' perspectives and instead impute their views on others (e.g., Birch & Bloom, 2003), which could lead them to think others are unbiased, too. For all of these reasons, young children may be especially likely to see themselves and others as unbiased. Importantly, if young children show the better-than-average effect, but do not show the BBS (because they rate others as unbiased as themselves), this would be evidence that the two effects have different underlying mechanisms.

Seeing Bias Hypothesis

The reverse hypothesis is that from an early age young children are open to seeing themselves and other people as vulnerable to bias. For example, if one was to point out to children that their behavior is biased (e.g., that their preference for same gender peers is a form of bias), maybe young children would accept this view. Under this hypothesis, as children grow older, they might continue to see others as biased, but develop a blind spot regarding their own susceptibility to bias. This developmental trajectory would suggest that the introspective illusion—or people's tendency to over-rely on their introspections to gain insight into the process by which they made a judgment (e.g., Pronin, 2009)—is involved in the developmental emergence of the BBS. In adults, researchers have argued that the introspective illusion causes people to see themselves as bias-free, because biases operate largely at an unconscious level, leaving no traces detectable by introspection. On the other hand, people see others as biased because, when judging others, they do not rely on introspections, instead applying lay theories of how people are generally affected by biases (Pronin & Kugler, 2007). Since young children (those 6-years-old or younger) seem to rarely, at best, engage in spontaneous introspection (Flavell, Green, & Flavell, 2000), it is possible that they would accept that biases influence their behavior, as much as they influence other people's behavior. Only as their introspective abilities become more developed, would children fall prey to the illusion that they have full access to the causes of their behavior (Nisbett & Wilson, 1977), which apparently do not include bias. Alternatively, children could simply feel less embarrassed than adults about their biases, and thus acknowledge them more readily. Together, these possibilities would likely lead very young children to see bias both in their own and others' judgments. As in the previous hypothesis, if young children self-enhance in other domains early in development, but perceive both themselves and others as equally biased, this would support the thesis that the BBS is not a mere instance of a more general self-enhancing tendency.

The Continuity Hypothesis

A third hypothesis is that young children already see other people as vulnerable to bias, but have a blind spot regarding their own susceptibility to bias, as adults do. In this scenario, little would change throughout development in the perception of their own or others' biases. Moreover, if biased behavior is regarded from early on as something negative, and if young children already perceive themselves as better than others in other attributes, this developmental trajectory would suggest a high degree of overlap between the BBS and other self-enhancing tendencies, implicating a more parsimonious common mechanism for all of these tendencies.

Current Studies

The current studies aim to address two main questions: (1) Using a developmental approach, is the BBS distinguishable from other self-enhancing tendencies, such as the better-than-average effect? (2) What can developmental data tell us about the mechanisms involved in the production of the BBS?

To address these questions, we conducted four studies across a broad range of development (from 5 to 12-years-old). In Study 1 we examined the better-than-average effect in three age groups, to later establish whether and how this self-enhancing effect overlaps with the BBS during childhood. In Study 2 we replicated Study 1 (with new items) and assessed the BBS in the same three age groups. In Study 3 we replicated the BBS part of Study 2 (with new items) and different measures. Finally, in Study 4 we confirmed a presupposition of the previous work—that even our youngest participants understood that unbiased behavior is usually regarded as more desirable than biased behavior.

Study 1

The aim of Study 1 was to establish whether children across development show the better-than-average effect, as adults do, using a set of personality traits. To date, the developmental literatures on self-perceptions and peer perceptions have been studied separately, usually with a focus on how these variables affect children's social adjustment (see e.g., Salmivalli, Ojanen, Haanpää, & Peets, 2005). As a result no work to date has investigated the question of whether self-perceptions are more positive than peer perceptions in early childhood.

Some studies suggest that children (at least White, middle class, American children) tend to think highly of themselves. For example, on various scales of self-perception, children rate themselves well above the midpoint, and often near the maximum of the scales of intellectual competence (Harter, 1985/2012; Stipek & Iver, 1989). Children have also been found to overestimate their memorization capacities (Flavell, Friedrichs, & Hoyt, 1970), their psychomotor abilities (Schneider, 1998), and the extent to which they understand the functioning of mechanisms (Mills & Keil, 2004). However, these studies do not establish whether children think more highly of themselves than of others. In separate lines of work, researchers have found that children tend to think highly of others. For instance, children usually see their peers as friendly, supportive, and trustworthy (Ladd & Troop-Gordon, 2003; Rudolph & Clark, 2001). Children also show a broad positivity bias in their personality judgments of unknown people (Boseovski, 2010; Schuster, Ruble, & Weinert, 1998).

Together, this work could suggest that children perceive themselves as better than their peers (i.e., show the better-than-average effect) or as equally good as their peers (i.e., do not show the effect). In one study that compared predictions about the future performance of the self and others, the results were inconsistent across domains (memory vs. physical tasks; Schneider, 1998). However, predictions of future performance may not rely on the same processes as ratings of perceived abilities or traits, which are the tasks usually employed to assess the better-than-average effect with adults (e.g., Alicke, 1985).

Methods

Participants. Twenty-one 5-year-old (57% boys, *M* = 5 years and 4 months, *SD* = 3 months), 21 8-year-old (67% boys, *M* = 8 years and 6 months, *SD* = 3 months), and 20 11-year-old (33% boys, *M* = 11 years and 5 months, *SD* = 3 months) American children participated in this study.[1]

Procedure. Participants were interviewed individually and rated themselves and others, or themselves in comparison to others, on four different traits. The four traits were intended to reflect the two fundamental dimensions of social judgment, namely warmth and competence (Judd, James-Hawkins, Yzerbyt, & Kashima, 2005), varying in valence, and to be easily understood even by 5-year-olds. The selected traits were: *nice* and *annoying* (warmth dimension), and *smart* and *lazy* (competence dimension).

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[1] We aimed to recruit 20 valid participants per age group in all studies, which was a common and even recommended sample size at the time the studies were run (Simmons, Nelson, & Simonsohn, 2011), however an extra child was accidentally run in two age groups in this study. In Study 3 the sample sizes are bigger because we wanted to ensure that at least 20 participants per age group would pass the manipulation check and the analyses were conducted only after all data collection at school was completed. All exclusions of participants are reported. All manipulations and measures in the studies are reported.

All participants answered two direct comparison questions (e.g., "Do you think you are smarter, as smart as, or less smart than kids your age?"), two separate questions regarding themselves (e.g., "Do you think you are annoying, not annoying, or something in between?), and two separate questions regarding others (e.g., "What about other kids your age? Do you think they are annoying, not annoying, or something in between?"). Each of the four traits was either covered in the direct comparison question or the separate questions about themselves and others. Whenever participants did not use the central option (e.g., "as smart as" or "something in between"), they were asked a follow-up question adding two more options (e.g., "much smarter or a little smarter?" or "really annoying or a little annoying?"), providing in total five possible answers to each question.

The answers were coded from -2 to +2, with positive values indicating a more favorable rating (i.e., ratings provided for negative traits were reverse coded). Moreover, for the items where participants provided separate ratings for self and others, we subtracted the rating for others from the rating for self, obtaining a difference score that could vary from +4 (e.g., when participants rated themselves as really smart and others as really not smart) to -4 (e.g., when participants rated themselves as really not nice and others as really nice). Thus, two direct comparison values and two indirect comparison values (i.e., difference scores) were available for each participant, and for all four, positive values indicated that participants rated themselves more positively than others.

The four traits were presented in counterbalanced order. Each participant answered one direct comparison question for a positive trait of a given dimension (e.g., nice) and for a negative trait of the other dimension (e.g., lazy). The remaining two traits (e.g., smart and annoying) were assessed by the separate questions for the self and others. Thus, we had two versions of the material – a version in which the direct comparison questions featured the traits *nice* and *lazy*, and another version in which these questions featured the traits *smart* and *annoying* (see supplemental material—Part I for all the stimuli used in Studies 1-4).

Results

Since the direct and indirect comparison scores had different ranges (i.e., from -2 to +2 for the direct and from -4 to +4 for the indirect comparison scores), we rescaled the indirect comparison scores to the range of the direct comparison scores, by diving responses by 2 (e.g., a score of +4 was now a +2 and a score of -1 was now a -0.5). This procedure allowed us to enter the four scores for each participant in the same analysis. We calculated a 3 (age-group: 5-year-olds vs. 8-year-olds vs. 11-year-olds) X 2 (version: nice and lazy vs. smart and annoying in direct comparison) X 4 (trait: nice vs. lazy vs. smart vs. annoying) mixed-design ANOVA on the comparison scores, in which the two first factors were between-subjects and the third factor was within-subjects.

Overall, the better-than-average effect occurred (see Figure 1 – left pane) with participants rating themselves more positively than others, as attested by the statistically significant intercept, $F(1, 56) = 87.15$, $MSE = 0.70$, $p < .001$, $\eta_p^2 = .609$. The better-than-average effect was significant in each age group (5yr-olds: $M = 0.70$, 95% CI [0.52, 0.88], $F(1, 56) = 57.89$, $p < .001$, $\eta_p^2 = .508$; 8yr-olds: $M = 0.51$, 95% CI [0.33, 0.70], $F(1, 56) = 31.92$, $p < .001$, $\eta_p^2 = .363$; 11yr-olds: $M = 0.28$, 95% CI [0.09, 0.46], $F(1, 56) = 8.70$, $p = .005$, $\eta_p^2 = .134$).

However, the extent to which participants showed the better-than-average effect depended on their age group, $F(2, 56) = 5.28$, $p = .008$, $\eta_p^2 = .159$. A statistically significant linear contrast, $F(1, 56) = 10.51$, $p = .002$, $\eta_p^2 = .158$, suggests that the better-than-average effect decreased linearly with age.

Overall, the scores for the four traits did not differ from each other, $F(3, 168) = 1.60$, $MSE = 0.50$, $p = .191$, $\eta_p^2 = .028$. Yet, a statistically significant interaction between traits and age group indicates that children self-enhanced differently in the various traits depending on their age, $F(6, 168) = 2.20$, $p = .046$, $\eta_p^2 = .073$. The inspection of the means suggests that while 8- and 11-year-olds' scores were fairly similar across traits, 5-year-olds self-enhanced particularly for the traits *smart* ($M = 1.00$, 95% CI [0.69, 1.31]) and *annoying* ($M = 0.91$, 95% CI [0.58, 1.24], and to a lesser degree for the trait *lazy* ($M = 0.25$, 95% CI [-0.09, 0.59]). No other age-related significant effects were found.

Participants showed a larger better-than-average effect in version 2 ($M = 0.62$, 95% CI [0.46, 0.77]) compared to version 1 ($M = 0.37$, 95% CI [0.23, 0.52]), $F(1, 56) = 5.27$, $MSE = 0.70$, $p = .026$, $\eta_p^2 = .086$. The significant interaction of version with trait, $F(3, 168) = 12.28$, $MSE = 0.50$, $p < .001$, $\eta_p^2 = .180$, makes it clear that the better-than-average effect was stronger in the direct comparisons (i.e., regarding *nice* and *lazy* in version 1 and *smart* and *annoying* in version 2) than in the indirect comparisons (i.e., regarding *smart* and *annoying* in version 1 and *nice* and *lazy* in version 2). This finding replicates results obtained with adults, with whom better-than-average effects are stronger in direct comparison measures (Moore, 2007).

Because social projection, at least in adults, plays an important role in the better-than-average effect (e.g., Klar & Giladi, 1999; Krueger, 1998; Moore & Small, 2007), we conducted an exploratory analysis, in which we calculated the correlations between the ratings provided for the self and for the others in the indirect comparison items within each age group. Contrary to our prediction that younger (more egocentric) children would project more than older children, the magnitude of the correlations seem to, if anything, increase with age (5yr-olds: $r(19) = .27$, $p = .228$; 8yr-olds: $r(19) = .42$, $p = .055$; 11yr-olds: $r(18) = .39$, $p = .091$). Although one should be careful not to read too much into these results (e.g., sample sizes are extremely small for a correlational analysis), they seem to suggest that children are (a) not merely extending their self assessments to others, in which case the correlations should be positive and strong (e.g., “I’m really nice; other kids are really nice, too”), nor (b) are they using their self assessments as a term of comparison that would reflect on their assessments of others, in which case the correlations should be negative (e.g., “I’m really nice; meaning, I’m nicer than other kids; meaning, other kids are not that nice”).

Discussion

Children, 5 to 11-years-old, showed the better-than-average effect, rating themselves more positively than their peers. This self-enhancing tendency decreased with age. We cannot be certain whether this decrease is caused by a true decrease in the extent to which children think of themselves as exceptional, by an increasing awareness of modesty norms, by the traits we used, or by something different altogether (e.g., a change in how children cognitively process self-other comparisons; e.g., Keil, McClintock, Kramer, & Platow, 1990; Ruble, Boggiano, Feldman, & Loebl, 1980). In educational domains, 7^{th}-graders (around 12-years-old) and older students have shown better-than-average effects, regarding different abilities and traits, of an even smaller magnitude than the ones we obtained for 11-year-olds (Kuyper & Dijkstra, 2009; Kuyper, Dijkstra, Buunk, & van der Werf, 2011). Moreover, other self-enhancement tendencies, which do not rely on self-other comparisons, such as self-enhancement established by objective standards or self-serving attributions, decrease with age during childhood (e.g., Trzesniewksi, Kinal, & Donnellan, 2011). The decrease in the better-than-average effect we obtained is thus consistent with other data in the literature. However, we do not think that, had we collected data with samples of adolescents, this decrease would continue until extinction as adults have robustly shown the effect (e.g., Alicke, 1985). Also, taking all the items together, the better-than-average effect for 11-year-olds in this study was still quite large (Cohen's d = 0.79).

Independent of whether children's tendency to perceive themselves as better than their peers *really* decreases or only *apparently* decreases with age, for our current goals, the most relevant finding is that children as young as 5-years-old clearly show the effect. Therefore if the BBS is a reflection of the same underlying belief, then children should rate themselves as less biased than their peers early in development, too.

Study 2

In this study we were interested in comparing the better-than-average effect and the BBS across childhood, using a cross-sectional design as in Study 1. The developmental literature contains mixed evidence regarding the extent to which children recognize biased behavior in others. In general, studies show that young children have a hard time detecting and predicting biased behavior in others. For example, children 6 years and younger believe, to a higher degree than older children, that others' self-presentations are true reflections of reality (Gee & Heyman, 2007; Heyman, Fu, & Lee, 2007; Mills & Keil, 2005). Children also fail to predict that a judge with a special connection to a contestant may make a biased decision, particularly when the special connection is a positive one (e.g., the judge is one of the contestants' mother; Mills & Keil, 2008). However, there is also evidence that young children do understand that others can be biased and that bias is undesirable (e.g., C. Brown & Bigler, 2004; Shaw & Olson, 2014). For example, 6-year-olds recognize that a decision that harms a contestant might have been biased when made by a judge with a negative connection to that contestant (Mills & Grant, 2009), and many 6-year-olds considered that asking a contestant's best friend or worst enemy to be a judge in the contest was not a good strategy (Mills & Elashi, 2014).

While some evidence exists about children's understanding of bias in others, little is known about children's perceptions of their own and others' vulnerability to bias, after having learned about a particular bias. In Study 2, we first ask children to rate themselves across a range of abilities and traits. Then we describe the better-than-average effect and ask them to rate themselves again, as objectively as possible. Finally we ask them to predict how a peer would respond. These ratings provide us with some clues about children's perceptions of their *own* and *others'* vulnerability to bias.

Methods

Participants. Twenty 5-year-old (50% girls, *M* = 5 years and 7 months, *SD* = 3 months), 20 8-year-old (55% girls, *M* = 8 years and 5 months, *SD* = 3 months), and 20 11-year-old (55% girls, *M* = 11 years and 6 months, *SD* = 4 months) American children participated in this study.

Procedure. Participants were interviewed in individual sessions. They completed four measures corresponding to four different biases. Two of these measures were the focal ones for the current study, namely the better-than-average measure (consisting of three items) and the BBS measure (consisting of two trials). These measures were crucial to compare the better-than-average effect and the BBS across childhood, which was the main goal of this study. The two other measures assessed the false consensus effect (i.e., belief that one's own responses are relatively common, Ross, Greene, & House, 1977) and the curse of knowledge effect (i.e., inability to ignore one's private knowledge when predicting the judgments of others, Camerer, Loewenstein, & Weber, 1989). These measures were included in the study for two reasons: (1) The better-than-average effect and the BBS are both self-other asymmetries, meaning that in these two biases adults tend to see others as different (particularly as worse) than themselves. However, there are other biases in which adults (erroneously) assume that others are similar to themselves (e.g., false consensus, curse of knowledge). We thought that children might be especially prone to show these “egocentric” biases, because of their yet developing perspective taking abilities (e.g., Epley, Morewedge, & Keysar, 2004). We were particularly interested in exploring whether children would show both kinds of biases (i.e., “self ≠ others” and “self = others”) in the same experimental situation. Thus, we added a false consensus measure (consisting of two items) and a curse of knowledge measure (consisting of three trials); (2) Adding these other measures in the procedure reduced the likelihood that participants, particularly the older children, would perceive the study as solely concerned with their self-assessments.

The measures were administered in a counterbalanced order with the constraint that the better-than-average and false consensus measures would precede the BBS measure. The items or trials within measures were counterbalanced, too. We detail the two focal measures below and the two other measures, including their results, in the supplemental material (Part II).

Better-than-average measure. Each better-than-average item was introduced with a gender-matched sentence (e.g., “Some girls your age run really fast and some girls run more slowly.”), followed by a comparative question (e.g., “What about you? Do you think you run faster, the same speed, or slower than girls your age?”). If participants did not reply with the middle alternative (e.g., “same speed”), they would be probed further with two more alternatives. For instance, participants who replied “faster” would then have to indicate if it was “much faster or a little faster”. These responses were coded along a -2 (much slower) to +2 (much faster) scale. Analogs were created for items related to drawing ability and being bossy (reverse coded so that higher scores indicated being less bossy than others). A better-than-average score was computed as the average of the three items.

Bias blind spot measure. The BBS measure was introduced by a simplified description of the bias (e.g., for the better-than-average effect: "Most of the girls your age told me that they run faster than other girls, simply because kids (and adults, too) usually think they are better than other people."). Then, participants were asked to guess how another child, supposedly a previous participant with the same age and gender, answered the original questions (e.g., the better-than-average item regarding running speed). This part of the BBS measure assessed participants' perceptions of *others'* bias and was again coded along a 5-point rating scale ranging from -2 to +2. If children recognize others' susceptibility to bias, they should tend to predict that the peer would have answered in a way that is consistent with the just described bias (e.g., that she or he runs a little faster or much faster than others). On the other hand, if participants do not recognize others' susceptibility to bias, they should tend to predict that the peer would give an unbiased answer (e.g., that he or she runs the same speed or slower than others). Next, participants were reminded of their own original answers and were asked to provide a new answer in face of an imagined objective criterion (e.g., for the better-than-average effect: "Now, if you were in a running race with a bunch of girls your age, and I got to watch it, what do you think I would find out? That you ran faster, at same speed, or slower than the girls in the race?"). This part of the measure was again coded from -2 to +2. This measure is useful in assessing children's perceptions of their *own* bias in two different ways. First, if participants show the bias, after having learned about the bias and after being encouraged to think of an objective criterion, then participants are likely not recognizing their own susceptibility to bias. Second, if participants who behaved in a bias-consistent way (e.g., said they run faster than others) do not downgrade their original responses, this answer would also suggest that participants did not perceive themselves as biased (see Pronin et al., 2002 – Study 2).

There were two BBS trials – one building upon the better-than-average effect (operationalized through the *running* item, as exemplified above) and another building upon the false consensus effect. Out of concern for the limits of children's attention, we only assessed the BBS for one (of three) better-than-average effect items and one (of two) false consensus items (detailed in the supplemental material).

Results

In this section, we describe the results of the focal measures, namely the better-than-average and the BBS measures.

Better-Than-Average Measure. Data from the three better-than-average items were analyzed with a 3 (age-group: 5-year-olds vs. 8-year-olds vs. 11-year-olds) X 3 (item: running vs. drawing vs. bossy) mixed-design ANOVA. Overall, participants rated themselves more positively than their peers, showing the better-than-average effect (see Figure 1 – right pane), as attested by the statistically significant intercept, $F(1, 57) = 80.17$, $MSE = 1.08$, $p < .001$, $\eta_p^2 = .584$. Moreover, replicating Study 1, the better-than-average effect was visible for all three age groups individually, as evidenced by the contrast analysis per age group against the midpoint of the scale (5yr-olds: $M = 0.98$, 95% CI [0.71, 1.25], $F(1, 57) = 53.58$, $p < .001$, $\eta_p^2 = .485$; 8yr-olds: $M = 0.67$, 95% CI [0.40, 0.94], $F(1, 57) = 24.63$, $p < .001$, $\eta_p^2 = .302$; 11yr-olds: $M = 0.43$, 95% CI [0.16, 0.70], $F(1, 57) = 10.41$, $p = .002$, $\eta_p^2 = .154$).

In addition, as in Study 1, there was a statistically significant main effect of age group, $F(2, 57) = 4.22$, $p = .019$, $\eta_p^2 = .129$, and a significant linear contrast corroborated a linear decrease of the better-than-average effect with age, $F(1, 57) = 8.38$, $p = .005$, $\eta_p^2 = .128$. Overall, participants showed the better-than-average effect equally across items, $F < 1$. However, a statistically significant interaction of age group with the items indicated that the extent to which a given item produced the better-than-average effect was age dependent, $F(4, 114) = 6.41$, $MSE = 1.12$, $p < .001$, $\eta_p^2 = .184$. The inspection of the means suggests that 5-year-olds self-enhanced on running ($M = 1.15$, 95% CI [0.68, 1.62]) and drawing items ($M = 1.45$, 95% CI [0.97, 1.93]), but did not self-enhance for the bossy item ($M = 0.35$, 95% CI [-0.11, 0.81]). The 8-year-olds self-enhanced on bossy ($M = 1.30$, 95% CI [0.84, 1.76]) and running items ($M = 0.60$, 95% CI [0.13, 1.07]), but not on the drawing item ($M = 0.10$, 95% CI [-0.38, 0.58]). The 11-year-olds self-enhanced on the bossy item ($M = 0.70$, 95% CI [0.25, 1.16]), but not on running ($M = 0.35$, 95% CI [-0.12, 0.82]) or drawing items ($M = 0.25$, 95% CI [-0.23, 0.73]). Focusing on the *running* item, which was used in the formulation of the BBS measure, 5 and 8-year-olds clearly showed the better-than-average effect, but 11-year-olds did not show a significant effect for that item.

Bias Blind Spot Measure. We opted for analyzing and reporting the BBS results for the better-than-average and false consensus separately, since participants did not consistently show the false consensus effect (see supplemental material—Part II for the latter). As a reminder, for the BBS measure regarding the better-than-average effect, participants started by listening to a simplified definition of the bias. They then guessed what a hypothetical peer had answered when asked about how fast she or he runs in comparison to others. If participants recognize others' susceptibility to bias, they should guess that the peer would show the better-than-average effect, claiming to run a little faster (point +1 of the scale) or much faster (point +2) than other children. Thus, positive values on this item suggest that children perceived the peer as biased. Next, participants were asked to assess how fast they themselves run in comparison to others. Participants were encouraged to give a realistic answer, thinking of a scenario where an objective criterion would be available (i.e., a running race). If participants recognize their own susceptibility to bias, their answers should tend towards the midpoint of the scale (i.e., point 0). Children may not provide midpoint answers for all items, since some children in our sample might have been exceptional runners and some others might have been particularly poor runners, but at the group level one would predict a mean around 0. Thus, positive values on this item suggest that children are showing the bias on average and, importantly, this would indicate that they did not recognize their own susceptibility to bias.

We entered these values in a 3 (age group: 5-year-olds vs. 8-year-olds vs. 11-year-olds) X 2 (target: self vs. other) mixed-design ANOVA. The only significant effect was an age group by target interaction, $F(2, 57) = 8.51$, $MSE = 1.25$, $p = .001$, $\eta_p^2 = .230$. The pattern of results is consistent with a late emergence of the BBS. More specifically, 5-year-olds did not perceive their peer as biased ($M = 0.00$, 95% CI [-0.52, 0.52]). They did, however, show the better-than-average effect ($M = 1.25$, 95% CI [0.80, 1.70]), even while imagining an objective criterion, suggesting that they did not perceive themselves as susceptible to the bias either. Eight-year-olds' assessments of their running abilities were a bit biased ($M = 0.50$, 95% CI [0.05, 0.95]), though to a lesser extent than 5-year-olds'. Again, this suggests that children tended to consider their inflated views of themselves as objective. However, in contrast with the younger children, 8-year-olds tended to see their peer as biased ($M = 0.50$, 95% CI [-0.02, 1.02]). Finally, the older children did not show the better-than-average effect ($M = 0.25$, 95% CI [-0.20, 0.70]), suggesting that they either recognized their own susceptibility to bias and avoided it, or they were unbiased regarding their running ability to start with. The results for the running item on the better-than-average measure give some support to the latter interpretation. Interestingly, although 11-year-olds did not show the bias, they predicted that their peer would show it ($M = 1.05$, 95% CI [0.53, 1.57]), thus overestimating the peer's susceptibility to bias.

We also looked at the percentage of children who changed their initial assessment of how fast they run in comparison to their peers, after listening to the description of the bias and being asked to imagine a situation with an objective criterion (i.e., a race). Arguably, downgrading their answers under these conditions would be a sign that participants recognized their susceptibility to bias once they know about such bias. However, most children, across age groups, kept their initial assessments of how fast they run (85% of the 5-year-olds and 75% of the 8- and 11-year-olds). In contrast, only the majority of the 5-year-olds (65%) predicted that the peer would not self-enhance regarding the running ability. Half of the 8-year-olds and 70% of the 11-year-olds guessed the peer would be biased.

Next, we divided participants into those who showed the BBS (i.e., who guessed the peer's ratings would be more biased than their own) and those who did not show the BBS (i.e., who guessed the peer's ratings would be as (un)biased or less biased than their own). We assessed whether there was an association between showing the BBS and age group (see Figure 2 – left pane). The overall chi-square was statistically significant, χ^2 (2, N = 60) = 12.17, p = .002, *Cramer's V* = .450, indicating that the extent to which children showed the BBS was dependent on their age. Then, we looked at each age group separately and calculated the probability of obtaining the observed proportion of children showing the BBS by chance alone. Since participants used a 5-point scale to provide their answers regarding the self and the peer, 25 pairings of answers were possible. Ten of those pairings were consistent with the BBS (e.g., choosing +2 for the peer and +1 for the self). Thus, a BBS response had a .4 probability of occurring by sheer chance. Considering that probability, the proportion of 5-year-olds who showed the BBS was lower than chance, given the binomial probability b(x = 2; 20, 0.4) = .003, and the proportion of 8-year-olds did not differ from chance, b(x = 5; 20, 0.4) = .075. In contrast, 11-year-olds showed the BBS above chance level, b(x = 12; 20, 0.4) = .035.

Once again we conducted an exploratory social projection analysis by calculating the correlation between children's initial assessments of how fast they run (i.e., in the better-than-average measure) and their predictions of the peer's answer to the same question (i.e., in the BBS measure). There is some tentative evidence that younger children may have projected, and that the tendency to project decreased with age (5yr-olds: $r(18) = .38$, $p = .096$; 8yr-olds: $r(18) = .32$, $p = .165$; 11yr-olds: $r(18) = .16$, $p = .494$). Interestingly, children's second self-assessment (i.e., after listening to the bias description and imagining an objective criterion) seems unrelated to the predicted peer's answer (5yr-olds: $r(18) = -.04$, $p = .875$; 8yr-olds: $r(18) = .08$, $p = .727$; 11yr-olds: $r(18) = -.28$, $p = .231$), although it correlates with the initial self-assessment (5yr-olds: $r(18) = .54$, $p = .014$; 8yr-olds: $r(18) = .67$, $p = .001$; 11yr-olds: $r(18) = .64$, $p = .002$).

Discussion

In this study, children again rated themselves as better than their peers. However, they did not recognize that their ratings were likely biased, even after having learned about the better-than-average effect. When asked to predict whether a peer would show the bias, only 11-year-olds clearly recognized that bias in the peer was likely. These results suggest the absence of the BBS amongst younger children (5- and 8-year-olds in this study) and the presence of the BBS amongst older children (11-year-olds). Looking back at the three hypotheses laid out in the introduction, the observed pattern of results supports the first hypothesis—a tale of a blind eye that came to see bias in others (though retaining a blind spot regarding the self)—rather than the other hypotheses.

Three other results are particularly interesting. First, while the youngest children in our sample (5-year-olds) showed a self-enhancing tendency to rate themselves as better than average, they did not self-enhance when it came to ratings of bias susceptibility. This pattern converges with the proposition that the BBS is not merely another instance of a self-enhancing tendency.

Second, we gave participants a description of the better-than-average effect that stated that *most* children overestimated their abilities, and the most direct inference from that information would be that a peer overestimated his or her abilities. Yet, the younger children did not make this inference. This is particularly interesting considering that children are sensitive to communicative actions (e.g., Csibra & Gergely, 2009), and generally wish to cooperate with the experimenter's communicative intentions (Helming, Strickland, & Jacob, 2014). In the present case, this means that 5- to 8-year-olds probably counteracted a push towards *concurring* with the experimenter that another child would overestimate his or her abilities. In a similar vein, one might be concerned that children were confused by asking them to answer the same question again, when assessing perceptions of one's own bias (i.e., when asking "if you were in a running race…"). Being sensitive to communicative actions, children may infer that if the experimenter is asking again, their original answer was not correct and that they should change it (e.g., Siegal, Waters, & Dinwiddy, 1988). However, in our study, children (of all age groups) persevered in their original answers, reducing concerns that repeated questioning caused response inconsistency.

Third, because children in all age groups showed the better-than-average effect in this study, only the 11-year-olds were accurate in predicting their peer's susceptibility to the bias. Still, like the younger children, even the 11-year-olds wrongly denied their personal susceptibility to bias. One should note, however, that in this study the BBS was measured regarding a single domain and that this domain is quite objective to judge compared to other abilities (e.g., drawing skills) or personality traits (e.g., bossy). On the one hand, this enabled us to create a scenario with an objective criterion (i.e., a race) for the BBS measure that helps children discriminate between perceptions (i.e., of how fast one runs) from reality (i.e., how fast one actually runs), which more easily exposes bias. In more subjective domains, the distinction often relies on one's own perceptions rather than other people's perceptions (e.g., a jury evaluation, the impression others have of you). On the other hand, being a more objective domain, children might have had a better sense of their relative standing. The objectivity of the item might explain why 11-year-olds did not reliably self-enhance, rendering their results in the BBS measure less conclusive than intended.

Another concern about Study 2 might be that both the better-than-average and the BBS measure we used rely heavily in social comparison, and young children are not yet very proficient at these comparisons (e.g., Keil et al., 1990; Ruble et al., 1980). Researchers have suggested that young children, rather than comparing their abilities and performances with others, tend to compare themselves to their younger self, to take into account positive, but not negative, feedback they receive from others, and to equate the effort they exerted or the desire they had to do well with actual ability (see e.g., Stipek & Iver, 1989). However, young children are able to evaluate themselves and others, separately (e.g., Ruble et al., 1980). In Study 1, half of the better-than-average items asked for those kinds of evaluations, instead of social comparisons, and the results were similar. In the next study (Study 3), we use some BBS items that do not ask for social comparisons, which should decrease this concern. Moreover, there is plenty of evidence that even the way adults make social comparisons is not always transparent or normative (e.g., Chambers & Windschitl, 2004; Kruger & Dunning, 1999; Moore & Small, 2007), leading to curious results, such as the finding that comparing the self to others produces different assessments than comparing others to the self (Hoorens, 1995). This fact, together with the challenge of assuring that a given measure (or stimulus) will be understood and processed the same way across different age groups, make us believe that, independently of how people are producing social comparisons, that it is still interesting to know what children think and say when asked for such a comparison.

Before speculating further on the interpretation of Study 2 results, especially given that the BBS measure in this study hinged upon a single domain (i.e., *running*), we first conducted a conceptual replication.

Study 3

The main aim of our third study was to replicate the findings of Study 2 using other biases and measures of children's perceived susceptibility to bias. For this reason, we chose two new biases, in addition to the better-than-average effect, drawing on the previous literature: the gender-based ingroup bias (e.g., Hayden-Thomson, Rubin, & Hymel, 1987) and the preference for the lucky effect (Olson, Banaji, Dweck, & Spelke, 2006). We narrowed the susceptibility to bias measure to include, not only the prediction of biased behavior, but also the endorsement of a biased explanation of that behavior. Moreover, we chose another population of participants, namely Portuguese children living in Portugal, thus probing the robustness of these effects.

A secondary aim of this study was to probe whether providing evidence of a hypothetical peer's biased behavior would increase the likelihood of participants recognizing the biased nature of that behavior (through its explanation), especially younger children who failed to see this bias in Study 2. Moreover, if perception of bias increases with disagreement between the self and others (Pronin et al., 2004), and if participants tend to predict that they themselves would choose unbiased answers, telling them that the peer chose the biased option introduces disagreement, which should also increase bias perception.

Methods

Participants. Data for this study were collected in schools in Portugal. Due to the school setting, grouping participants by grade levels, instead of age groups, was more convenient. However, for consistency's sake and in order to ease comparisons between studies, participants will be referred to by age groups (labeled by mean age) instead of grade levels. Twenty-eight kindergarteners (henceforth *5-year-olds*, 50% girls, *M* = 5 years and 10 months, *SD* = 6 months), 26 third-graders (henceforth *9-year-olds*, 62% girls, *M* = 9 years and 2 months, *SD* = 5 months), and 26 sixth-graders (henceforth *12-year-olds*, 54% girls, *M* = 12 years and 5 months, *SD* = 12 months) participated in this study (see footnote 1 for the reason why this sample is a different size). One sixth-grader was not included in the analyses due to experimenter error during data collection.

Procedure. Participants were interviewed individually and at the beginning of the procedure they were encouraged to listen to the experimenter carefully so that they could answer the memory questions at the end of the session. In the first part of the study, the experimenter described one of three biases (counterbalanced between participants) – the better-than-average effect (Alicke, 1985), the preference for the lucky (Olson et al., 2006), or the gender-based ingroup bias (Hayden-Thomson et al., 1987). For instance, for the ingroup bias, the experimenter would place a photo of a boy and a photo of a girl on the table and say: “This boy and this girl are really nice. Do you know something? They are both really nice, but a lot of boys like this boy better than this girl, just because he's a boy like them”. After listening to the description of the bias, participants reported what they thought they would answer to a bias-related question (e.g., "What about you? Do you think you would like this boy better, this girl better, or both the same?" for the ingroup bias). If participants responded in the direction of the bias (e.g., a male participant stating preference for the boy), they then answered whether they thought their response was *unbiased* or *biased* (e.g., "Why do you think you would like this boy better – because he's really nicer than the girl or just because he's a boy like you?"). Responses were coded as bias recognition when participants initially selected the option in the direction of the described bias and then selected the biased explanation. When participants initially selected the option that countered the description of the bias (e.g., a male participant stating preference for the girl), the answer was coded as a claim of being *counterbiased*. All other cases (i.e., when participants selected the non-directional option, e.g., "both the same", or selected the bias-consistent option, but then chose the objectivity-based explanation, e.g., "the boy, because he's really nicer") were coded as a claim of being unbiased. Participants, then, replied to identical questions regarding how a gender-matched peer would answer. The same coding system was used.

In the second part of this study, we probed whether participants recognized the bias in others if we told them that, in fact, the peer had answered in a bias-consistent way (e.g., that a male peer had said he preferred the boy in the picture). This was done by telling the participants, after they had made their predictions about the peer regarding the first bias: "Let's see what [Peter] answered. He said [he liked the boy better]. Do you think he said that because [biased alternative] or because [unbiased alternative]?".

We repeated this procedure with the other two biases (in counterbalanced order). Finally, participants answered the memory-check questions regarding the three biases (e.g., "Do you still remember what I said before? Not what you answered, but what I told you. Many boys like this boy better, this girl better, or both the same?).

Results

The focal results of the first part of the study were whether participants predicted more biased behavior for the peer than for themselves. Because we told participants that the peer had selected the biased option after the end of the first trial, only the data collected in the first trial are adequate to answer this prediction question. The participants' answers to the other trials (second part of this study) answer the question of whether participants are more likely to use bias to explain other people's behaviors, when these behaviors are consistent with a bias that has been just described, than to predict biased behavior in the absence of additional information.

First, we looked at how many participants encoded the information we gave them about the first bias: 79% of the 5-year-olds, 88% of the 9-year-olds, and 84% of the 12-year-olds passed the memory check. The groups did not differ and all age groups were above chance level (P = .33; all binomial ps < .001), ensuring that the majority of the children in all age groups encoded the description of the bias that we provided them with.

We divided participants into those who did not show the BBS (i.e., who predicted themselves to be as (un)biased as or more biased than the peer) and those who showed the BBS (i.e., who predicted themselves to be less biased than the peer). Then, we assessed whether there was an association between showing the BBS and age group (see Figure 2 – right pane). The overall chi-square was statistically significant, χ^2 (2, N = 79) = 9.02, p = .011, *Cramer's V* = .338, indicating that the extent to which children showed the BBS was dependent on their age. Next, we looked at each age group separately and calculated the probability of obtaining the observed proportion of children showing the BBS by chance alone. Due to our coding procedures, for both the answers (as biased vs. unbiased vs. counterbiased) and the participants (as showing the BBS vs. not showing the BBS), the probability that an individual child would show the BBS by chance was $P = .31$. By that standard, the proportion of 5-year-olds who showed the BBS was not different from chance, b(x = 8; 28, 0.31) = .159. In contrast, both 9- and 12-year-olds showed the BBS at above chance levels, b(x = 18; 26, 0.31) < .001, and b(x = 13; 25, 0.31) = .015, respectively. This pattern of results suggests that by 9 years of age children are already prone to show the BBS.[2]

We also looked at the percentages of children who denied bias in themselves and in the other. Most children, across age groups, did not consider themselves susceptible to bias (79% of the 5-year-olds, 100% of the 9-year-olds, and 96% of the 12-year-olds). However, only the majority of the 5-year-olds (64%) did not perceive the peer as susceptible to bias either – most 9-

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[2] The just described analyses were run including all participants. Running the same analyses with the participants who passed the memory check only, leads to identical results.

As expected, since we told participants that the peer behaved in a bias-consistent way after the first trial, including all trials in the analysis leads to an increased number of children who showed the BBS at least once, at every age group. The differences between age groups are still significant, χ^2 (2, N = 79) = 10.43, p = .005, *Cramer's V* = .363, but the proportion of 5-year-olds showing the BBS at least once (57%) is only marginally lower than that expected from chance alone, b(x = 16; 28, 0.67) = .084, suggesting a tendency for young children not to show the BBS even after being told about the peer's bias-consistent behavior. The proportion of 3rd- and 6th-graders showing the BBS at least once (92% and 84%, respectively) remained higher than chance, b(x = 24; 26, 0.67) = .002, and b(x = 21; 25, 0.67) = .033, respectively.

year-olds (62%) thought the peer would be biased and the 12-year-olds were split about whether peers were biased (48% predicted bias for the peer). An exploratory correlational analysis, using Spearman rank-order coefficient, did not show that younger children projected their predicted behavior onto others or that they did so to a greater extent than older children (5yr-olds: $r_s(26) = .30$, $p = .119$; 8yr-olds: $r_s(24) = .17$, $p = .409$; 11yr-olds: $r_s(23) = .32$, $p = .121$).

In the second part of the study, we were interested in whether children in the different age groups would adopt the biased explanation for the peer's bias-consistent behavior. The majority of the children (89% of the 5-year-olds, 100% of the 9-year-olds, and 96% of the 12-year-olds) got at least two out of three memory checks right, suggesting that generally participants encoded the descriptions of the biases correctly.

In the older age groups, participants rarely chose the unbiased explanation for the peer's biased behavior (see Figure 3), making it impossible for us to calculate a chi-square test of independence between all response levels and all age groups. Thus, we divided participants into those who always chose the biased explanation (i.e., 3 times out of 3) and those who chose such an explanation less frequently (i.e., twice or less). The overall chi-square was statistically significant, χ^2 (2, $N = 79$) = 11.70, $p = .003$, *Cramer's V* = .385, reflecting differences per age group. While most 9- and 12-year-olds always chose the biased explanation (69% and 68%, respectively), only a minority of the 5-year-olds did so (29%). However, even in the case of the 5-year-olds, this proportion exceeds the one expected by chance alone (i.e., $P = .13$), b(x = 8; 28, 0.13) = .016. Thus, even 5-year-olds are willing to assign bias to others, if confronted repeatedly with biased behavior.[3]

Discussion

Replicating Study 2, 5 to 12-year-olds thought they would not fall prey to biases identified in the literature (Alicke, 1985; Hayden-Thomson et al., 1987; Olson et al, 2006). Moreover, the younger children again thought that a peer would not show the biases, while 9 and 12-year-olds predicted a peer would be biased. Both studies' results support the *blind to bias* hypothesis, which states that initially people do not perceive themselves or others as susceptible to biases and that the development of the BBS is mainly driven by an increasing perception of others as biased. Importantly, these results were obtained despite children at all ages encoding the descriptions of the biases provided to them. Across Studies 2 and 3, the only difference in results concerned the middle age group, who did not reliably show the BBS in Study 2 but did in Study 3. Even here though, the difference is consistent with an age-related increase in the perception of bias in others (i.e., 8-year-olds in Study 2 tended to predict the peer to be biased and 9-year-olds in Study 3 reliably predicted the peer to be biased).

Although 5-year-olds did not predict the peer to behave in a biased way, they were more likely to recognize that bias might have affected the peer's behavior when they learned that the peer consistently chose the biased option. This result is consistent with other findings in the literature suggesting that 6-year-olds usually do not predict biased decisions, but can detect bias

[3] Conducting the analyses with those participants who passed all three memory checks only does not change the results.

in decisions that have already happened (Mills & Grant, 2009), and suggests that perceptions of vulnerability to bias in young ages may be particularly malleable.

Having obtained evidence in two studies that older, but not younger, children show the BBS, in two slightly different cultural contexts (i.e., in the U.S.A. and Portugal), we feel confident in claiming that the developmental trajectories of the BBS and of the better-than-average effect are likely divergent. While the better-than-average effect is present from early on, and if anything decreases with age, the BBS likely emerges much later, and if anything increases with age. Even if the better-than-average effect does not *really* decrease with age, but only its expression (e.g., due to a modesty norm), we think that the discrepancy between the clear signs of the better-than-average effect at age 5 and of the BBS only much later (around age 9) is revealing of a probable dissociation.

This developmental evidence strongly suggests that the BBS and the better-than-average effect are distinguishable phenomena. However, one nagging concern, and the focus of the final study is that perhaps young children do not ascribe a negative connotation to biased behavior and thus do not use that attribute to self-enhance in comparison to others.

Study 4

In Studies 2 and 3 we did not find a self-other asymmetry in young children's perceptions of bias (i.e., they did not rate themselves as less biased than others), but we found an asymmetry favoring the self in their perceptions of abilities and traits in Studies 1 and 2 (e.g., they rated themselves as less annoying, smarter, and better at drawing). If the BBS is a self-enhancing effect, this difference in results could be explained by the fact that young children do not perceive biased behavior as less desirable than unbiased behavior (as they clearly do for e.g., annoying behavior). To test this hypothesis, we asked 5-year-olds to guess which of two children would be rewarded – a child who behaved in a biased way or a child who behaved in an unbiased way.

Methods

Participants. Twenty 5-year-old (50% boys, *M* = 5 years and 4 months, *SD* = 3 months) American children participated in this study.

Procedure. Participants were interviewed individually. They first learned about a teacher whom they were told had star stickers to give to kids who "were being good" and that their job would be to guess which child the teacher would give the sticker to. All characters were stick figures presented on a laptop. The first two trials were practice trials. In those trials it was very clear which kid had been "good" (e.g., the kid who shares). Participants were given feedback on their performance. Only one participant failed one of the practice trials and was corrected. The next three trials were the critical trials and for these, the characters' gender was matched to the participant's gender and their order was counterbalanced. In each critical trial, participants learned about two targets – one whose behavior was likely biased and one whose behavior was unbiased. The three biases were the same we used in Study 3 (i.e., better-than-average effect, ingroup bias, and preference for the lucky). For instance, for the ingroup bias, the "biased target" was described as preferring girls over boys (or the reverse to match the participant's gender) and only playing with girls. The "unbiased target" was described as not having a preference and playing with both genders. Participants indicated for each trial which target they thought the teacher would give the sticker to.

Results

The majority of the participants chose the unbiased target as deserving of the sticker more often than the biased target (i.e., 85% of the children chose the unbiased target two (n = 11) or three (n = 6) times out of three. Only 15% of the children (n = 3) chose the unbiased target once and no children never chose the unbiased target). The probability of obtaining this result by chance alone is very low, b(x ≥ 17; 20, 0.5) = .001, suggesting that 5-year-olds consistently recognized unbiased behavior as more desirable than biased behavior. Looking at the choices participants made in each trial, there was a difference between biases. Children consistently chose the unbiased target in two of the biases (ingroup bias: 90% of children chose the unbiased target, b(x ≥ 18; 20, 0.5) < .001; preference for the lucky: 80% of children chose the unbiased target, b (x ≥ 16; 20, 0.5) = .001), but were at chance level in the other bias (better-than-average effect: 45% of children chose the unbiased target, b(x ≤ 9; 20, 0.5) = .412).

Discussion

Children as young as 5-years-old consider unbiased behavior to be more praiseworthy than biased behavior. The results of Study 4 show that children are, at least, aware that adults prefer unbiased to biased behavior. Being aware of this norm, 5-year-olds could have produced a self-other asymmetry in Studies 2 and 3, by assigning themselves the positive attribute (i.e., the unbiased behavior) while assigning the negative attribute (i.e., the biased behavior) to the peer. However, this did not happen, strengthening the interpretation that 5-year-olds in the previous studies did not perceive their peers as being biased, even after listening to a description of several biases. This finding further supports the *blind to bias* hypothesis. Moreover, these findings converge with the notion that the BBS does not simply boil down to a self-enhancement tendency.

There may be, however, a concern related to the fact that young children, in this study, did not perceive the better-than-average effect as an undesirable bias, particularly because this effect was the focal bias in Study 2. We believe that Study 4 results, concerning the better-than-average effect, are tied to young children's difficulty in grasping that others, or themselves, might engage in self-presentational strategies – an effect already documented in the literature (Gee & Heyman, 2007; Heyman, Fu, & Lee, 2007; Mills & Keil, 2005). Children, in Study 4, probably thought that if another child is claiming to be smarter than their peers, then he or she probably is smarter, and thus deserves the teacher's reward over the child who is as smart as their peers. The fact that children do not seem to perceive these self-enhancement statements as negative makes it even more interesting that young children in Studies 2 and 3 did not predict that the peer would self-enhance, which would be the more direct inference to draw from the self-enhancement description they had just heard. Importantly, however, regarding the two other biases, 5-year-olds reliably recognized the unbiased behaviors as more positive, but did not see themselves as more likely than a peer to engage in those behaviors (Study 3).

General Discussion

Our studies reveal that the bias blind spot is not present early in development (ages 5-8 years), rather it likely emerges during middle childhood. This developmental trajectory is in notable contrast to the better-than-average effect, which is present from early on and, if anything, may reduce across the same age range. Young children thought that they and their peers were unbiased—consistent with the *blind to bias* hypothesis—even after being told that many children are biased (Studies 2 and 3). Importantly, this effect was not driven by a tendency to always perceive themselves and others as being equal. Even (and especially) younger children believed that they could run faster, draw better, be smarter, and be less annoying, for example, than their peers (Studies 1 and 2). Study 4 reduced concerns that young children's response was driven by their failure to see biased behavior as bad, as even the 5-year-olds understood that biased behavior was less likely to be rewarded by a teacher than unbiased behavior. This work suggests that if 5-year-olds had wished to portray themselves in a more positive light than their peers on our BBS measures, they could have rated themselves as less biased than them.

The likely developmental trajectory implied by our results suggests that the BBS is a residual part of a bigger illusion that people share while they are young children, namely that everyone is objective. Naïve realism, which is usually conceptualized as the conviction that "I see entities and events as they are in objective reality" (Ross & Ward, 1996, p. 110), during childhood seems to be applied to others, too – *we all* see things as they are in objective reality. As people grow older they seem to escape this illusion, by rationally realizing that perception is not a mere reflection of reality (e.g., the sun does not really rise or set) and by recognizing the operation of biases in other people, but the illusion survives in one blind spot – the perception of bias in the self.

The finding that children perceive themselves to be objective is hardly surprising. Piaget (1954), among other researchers of social perspective taking (e.g., Gopnik & Astington, 1988; Wimmer & Perner, 1983), documented that children have a hard time conceptualizing their perspective as just a perspective, distinguishable from reality. In a similar vein, the finding that young children do not perceive others as susceptible to bias was also expected from the literature on detection of bias (e.g., Mills & Keil, 2008). This literature shows that usually children younger than 10-years-old do not predict that potentially biasing factors, such as the friendship between two people, will affect people's decisions. However, studies that simultaneously ask about children's perceptions of bias regarding themselves and others, particularly after providing children with a description of the biases at play, are scarce. Elashi and Mills' studies (2015), using different methods and biases from ours, found that 7- to 10-year-olds already show the BBS. The convergence between their and our results (except that, in our Study 2, 8-year-olds did not reliably show the BBS) strengthens our confidence in the proposed developmental trajectory, even if the exact age (7 vs. 8 vs. 9 years of age) is up for debate. Additionally, our studies shed light into younger children's (i.e., 5-year-olds') perceptions of their own and others' susceptibility to bias, once bias is explained. These children accurately recalled the descriptions of bias and understood that biased behavior is less desirable than unbiased behavior. However, they still perceived themselves and others as unbiased, in contrast to the *seeing bias* and *continuity* hypotheses.

The results of this set of studies also have theoretical implications for the mechanisms believed to be at the roots of the BBS. Some researchers favor a more motivational account of the BBS (e.g., Leary, 2007), while others favor a more cognitive account (e.g., Pronin et al., 2002). Although the degree to which motivational and cognitive mechanisms can truly be separated is itself debatable (e.g., Tetlock & Levi, 1982), and although the two accounts are not mutually exclusive, we believe that the present work primarily supports the cognitive account. The most immediate implication of the present results is that it is unlikely that the BBS is a mere instance of a self-enhancing tendency, such as the better-than-average effect. The age discrepancy between evidence for the better-than-average effect (much earlier) and for the BBS (much later) suggests that, although the two effects might share some common ground, the processes that underlie the two are dissociable. The alternative explanation that the BBS emerges later than the better-than-average effect because young children do not consider unbiased behavior to be more positive than biased behavior is not likely true, given the results of Study 4.

Still, another alternative explanation for the age discrepancy is that the BBS requires more cognitively complex or demanding operations to occur than the better-than-average effect, but their nature is essentially the same. Children may have responded to the better-than-average measures used in Studies 1 and 2 thinking solely of themselves, not others (e.g., “I’m nicer” as an equivalent of “I’m nice”; Klar & Giladi, 1999). For the BBS measures in Studies 2 and 3, however, children had to think of themselves and how others would respond in the same situation. The sheer difference between the amounts of information involved in the two effects could explain the emergence delay of the BBS relative to the better-than-average. This alternative explanation cannot be ruled out by the present studies. We attempted to make the two measures as comparable and simple as possible. For instance, in Study 1, half of the better-than-average items asked for self-assessments (e.g., “How nice are you?”) and other-assessments (e.g., “How nice are kids your age?”) separately. Similarly, Study 3’s BBS measure asked separately for self-assessments (e.g., “Who would you like better?”) and other-assessments (e.g., “Who would he/she like better?”). However, a host of factors (e.g., bias descriptions, bias domains, social desirability norms, plausibility constraints, perspective taking skills) likely play a role in how children respond to both kinds of measures, complicating straightforward conclusions about the extent to which the BBS is a unique bias relative to other self-enhancing biases. Rather than decisive, we regard the present results as convergent evidence supporting the contention that the BBS and the better-than-average effect are not fully overlapping effects, which has been made since the BBS was identified (Pronin et al., 2002) but has received little empirical attention (for an exception see, Scopelliti et al., 2015).

Another theoretical implication suggested by our results, although not tested in our studies, is that naïve realism is plausibly an earlier and more basic root of the BBS than the introspection illusion. Across development, people believe they are unbiased, which is consistent with naïve realism. However, it is unlikely that 5-year-old children introspect to look for evidence of the operation of bias and, in the absence of such evidence, declare themselves unbiased. Children this young have been shown to struggle with introspection tasks, such as think aloud procedures (Kipp and Pope, 1997). Moreover, late preschoolers and kindergarteners seem to be unaware of the richness of people's stream of consciousness, usually underestimating others', but also their own, mental activity (e.g., Flavell, Green, & Flavell, 1993). Flavell and collaborators (2000) state "As one of many examples, 5-year-olds, who at the experimenter's instigation had clearly just been thinking silently about which room in their house they keep their toothbrush in, often denied that they had just been thinking." (p. 98). This is not to say that 5-year-olds cannot introspect, for they show incipient abilities to do so when asked to (e.g., by reporting feelings, Flavell, 1999; by describing how they solved arithmetic problems, Siegler, 1998). We would argue that it is unlikely that 5-year-olds will spontaneously introspect, and furthermore, look for fleeting thoughts, not salient feelings or images, that would be evidence for bias.

On the other hand, the introspection illusion has proven to be a powerful mechanism implicated in adults' BBS (e.g., Pronin, 2009). Thus, it is possible that as children grow older and become more proficient at introspecting, the introspection illusion may be what keeps the BBS in place. According to our own and Elashi and Mills' (2015) results, there is a time during development, likely around 7 or 8 years of age, when children cease to regard others as unbiased, but still see themselves as unbiased. Speculatively, the mechanism that prevents children from seeing bias in themselves, when they already are able to perceive bias in others, may be their over-reliance on their own introspective contents (i.e., the introspection illusion). Speculatively too, whenever adults are trying to assess their proneness to bias, they may start out with the default hypothesis, given by naïve realism, that they are unbiased, and test this hypothesis using introspection. The introspective search would probably find evidence of plausibility constraints (e.g., that they could not have done something that goes against their beliefs) and no evidence of bias, and therefore confirm the initial hypothesis of being bias free. Even when people would apply their lay theories that everyone may be affected by biasing factors, including themselves, they would apply them to a lesser degree to themselves than to others, supported by finding introspective evidence for plausibility constraints and absence of bias.

An important clarification on our results and interpretation is that, although 5 to 8-year-olds perceived themselves and others to be unbiased in our studies, and we interpret that result as stemming from naïve realism, we are not assuming that these children fail to appreciate the distinction between reality and perception or cognition. Even 5-year-olds understand that perceivers have one perspective over reality and that this perspective may be incomplete (e.g., false belief tasks, Wimmer & Perner, 1983) or mistaken (e.g., appearance-reality distinctions, Flavell, 1986). More likely, although children understand at some level that reality is not as they or others perceive it, at a more basal level they still have the illusion that reality is immediate. This illusion is the same illusion that is detected with adults (Ross & Ward, 1996).

A potential concern with our results is that the youngest children in our sample, 5-year-olds, may not grasp the concept of bias and so their answers in our tasks might have been influenced by altogether different processes than older children's answers. For example, in Study 2 the younger children might have said that they run faster than their peers because they have a tendency to self-enhance. When asked about how a particular peer would reply, they answered that the other child would say she runs as fast as their peers, not because they perceive the peer to be unbiased, but because they think the peer would run slower than they would and are honest about it (e.g., Mills & Keil, 2005). Moreover, when given the opportunity to downgrade their answer after the explanation of the better-than-average effect, the youngest children might have failed to do so simply because they did not understand the operation of bias. While we believe this concern to be justified, there is some evidence both from the past literature and from our studies that does not conform well to this alternative explanation. First, our 8-year-olds in Study 2 showed results similar to the 5-year-olds, yet 8-year-olds have a more sophisticated understanding of bias (e.g., Mills & Grant, 2009). Second, 5-year-olds remembered the description of the biases in Study 3, which means that they had that information available while making their judgments. Further, they indicated that the biased behavior was less desirable than the unbiased behavior in Study 4, again suggesting that they grasp at least some relevant aspects of bias. Third, the developmental literature provides other indications that young children have a nascent understanding of bias (e.g., 6-year-olds endorse explanations related to bias for biased behavior; Mills, Al-Jabari, & Archacki, 2012). Finally and importantly, even if it is the case that 5-year-olds do not have a good-enough understanding of bias, we still believe that studying how they expect others and themselves to respond and behave in situations where bias might be involved, these findings are consequential for our understanding of the development of person perception and its biases. More specifically, knowing that the BBS occurs more often in older children may provide important insights regarding how and when interventions to reduce the BBS will be effective.

A somewhat related issue is that some biases might be easier for young children to understand and detect than others. For example, maybe it is easier to see that people tend to favor others from their ingroup (e.g., that boys tend to play with boys) and why that might be undesirable (e.g., it’s not fair for girls who would like to play that game), than to see that people tend to use self-serving attributions for successes and failures and why that might be a problem. If this is true, the developmental differences that we found in our studies may vary substantially depending on the biases assessed. However, the main goal of this research was to examine the BBS (and the better-than-average effect) at several points in childhood, without making any strong assumptions or conclusions about at which age children do and do not perceive bias in themselves and others.

The results of this research project raise some interesting questions. One of them is what happens around middle childhood, in tasks like the ones we used, that triggers children to start perceiving others as likely biased.

Plausibly, a critical player in the emergence of the BBS is the ongoing development of Theory of Mind (ToM) abilities. ToM is not a unitary capacity—the cognitive building blocks as well as the neural substrates for a full-blown ToM continue to develop well beyond early childhood (e.g., Saxe, Carey, & Kanwisher, 2004). While children can attribute beliefs that are different from their own to others by at least 4 years of age (e.g., in false belief tasks; Wellman, Cross, & Watson, 2001; Wimmer & Perner, 1983), children seem to assume that the differences stem from a mistaken view of reality or ignorance about that reality, which is somewhat different from believing that they may stem from bias. In early childhood, children seem to believe that people's beliefs come from an external source, that reality is directly knowable and that it dictates what one thinks (e.g., Kuhn, Cheney, & Weinstock, 2000). Only later, in middle childhood, do children seem to start grasping that beliefs about reality are generated by human minds (Kuhn et al., 2000). This accomplishment is sometimes labelled interpretive or constructivist ToM (Carpendale & Chandler, 1996) and emerges around 7 or 8 years of age. The notion of bias, as a product of unconscious cognitive processes involved in the re-construction of reality, probably needs this more sophisticated form of ToM. In a related vein, it is around middle childhood that children seem to become aware that other perspectives are not sporadic events, but rather that they are prevalent in the social world and that some of those perspectives have a socially shared contents (e.g., awareness of public regard; Halim, Ruble, & Amodio, 2011).

Another possibility is that the perception of everyone as unbiased is a more basic or automatic inference, which will function as an anchor in social perception. Taking into account how bias may have affected other people's behavior may rely on a more deliberative adjustment process. Before middle childhood, children seem to have difficulty in making such adjustments in their social perceptions (e.g., Hagá, Garcia-Marques, & Olson, 2014), which could underlie the observed pattern of BBS in the present studies. This possibility could even be tested with adults, using classic cognitive overload or speeded response paradigms. Finally, children may start to perceive others as biased through explicit socialization with lay theories of bias, communicated by parents or teachers, for example (e.g., natural pedagogy, Csibra & Gergely, 2009).

Another question raised by the present results is whether there are efficient ways to intervene at the age when children start perceiving others as biased to foster the idea that their own judgments are affected by biases, too, and that these biases largely operate unconsciously and so do not leave introspective traces. Such an intervention has been successful with adults (Pronin & Kugler, 2007), and the notion of reducing the BBS before it becomes too entrenched sounds promising. Moreover, the BBS has been shown to have the bright side of increasing people's critical reasoning when evaluating other people's claims (Mata, Fiedler, Ferreira, & Almeida, 2013). Making people believe from early on that they are susceptible to bias, too, could have the positive consequence of fostering rational scrutiny of one's own reasoning, beyond the more direct consequence of reducing interpersonal conflict over disagreements.

Summing up, the results of the current research converge with theorizing about the BBS that postulates that both naïve realism and the introspection illusion are at the origin of the BBS and that people do not perceive themselves as less biased than others just because they wish to keep a flattering view of themselves. Beyond providing cumulative evidence, the present research critically adds to the extant literature by presenting data on age-related differences regarding the BBS and by suggesting that although cognitive sophistication is unrelated to the degree to which people think they are less biased then others (West, Meserve, & Stanovich, 2012), some cognitive sophistication is needed to perceive bias at all. Returning to Sophocles' quote, one is tempted to wish that across development everyone would get to see what is near as clearly as one gets to see what is far off.

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Figure Captions

Figure 1: Mean ratings for self in comparison to others in Study 1 (left pane) and Study 2 (right pane). Positive values mean that participants rated themselves as better-than-average. Error bars represent 95% confidence intervals of the mean.

Figure 2: Percentage of participants who showed the bias blind spot across three age groups (5, 8, and 11 years) in Study 2—left pane—and across three grade levels (mean ages 5, 9, and 12 years) in Study 3—right pane. Error bars represent Wilson score 95% confidence intervals.

Figure 3: Percentage of participants who chose the biased option (0, 1, 2, or 3 times out of 3) to explain why a peer behaved in a bias-consistent way in Study 3.

Supplemental Material for "The Bias Blind Spot Across Childhood"

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Part I -- Script Questions and Items for Studies 1-4

Study 1.

- Do you think you are [*item in absolute form*], not [*item in absolute form*], or something in between?

    if first option: Really [*item in absolute form*] or a little [*item in absolute form*]?

    if second option: Really not [*item in absolute form*] or a little not [*item in absolute form*]?

- What about other kids your age? Do you think they are [*item in absolute form*], not [*item in absolute form*], or something in between?

    follow-up questions as above

- Do you think you are [*item in comparative form*], as [*item in absolute form*] as, or less [*item in absolute form*] than kids your age?

    if first option: Much [*item in comparative form*] or a little [*item in comparative form*]?

    if second option: Much less [*item in absolute form*] or a little less [*item in absolute form*]?

Items – absolute	Items – comparative
nice	nicer
annoying	more annoying
smart	smarter
lazy	lazier

Study 2.

Better-than-average.

- Some [boys/girls] your age [*item in positive/negative absolute form*] and some [boys/girls] [*item in negative/positive absolute form*]. What about you? Do you think you [*item in string of comparative forms*] than [boys/girls] your age?

  if positive option: Much [*item in positive comparative form*] or a little [*item in positive comparative form*]?

  if negative option: Much [*item in negative comparative form*] or a little [*item in negative comparative form*]?

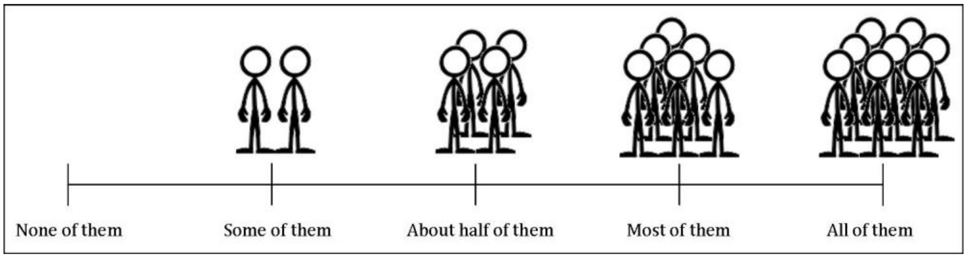
Items – positive absolute	Items – negative absolute	Items – comparative (positive/negative counterbalanced order)
run really fast	run more slowly	run faster, the same speed, or slower
draw really well	don't draw that well	draw better, as well as, or worse
are not bossy at all	are really bossy	are less bossy, about as bossy, or bossier

False consensus.

- Which one of these [*item*] do you like better: [*option a/b*] or [*option b/a*]?

Items	Option A	Option B
toys	the sticky-ball 	the sun-bouncy ball 
ice cream flavors	chocolate	vanilla

Of all the [girls/boys] your age, how many of them do you think would also pick [*participant's choice: option a or b*]?



Bias blind spot.

Remember when I asked you [*question reminder*]? Most of the [boys/girls] your age [*bias description*].

bias	question reminder	bias description
better-than-average	if you run faster or slower than other kids	told me that they run faster than other [boys/girls], simply because kids (and adults, too) usually think they are better than other people
false consensus	which one was your favorite: chocolate or vanilla ice cream	think that other [boys/girls] will like the same ice cream flavor as they themselves do, simply because kids (and adults, too) usually think that others like the same things that they like themselves

- Now, yesterday I spoke with this [boy/girl], called [Peter/Anna], and [he/she] was the same age as you. What do you think [Peter/Anna] told me? [*question and follow-up*]

bias	question	follow-up
better-than-average	Do you think [he/she] told me that [he/she] runs faster, the same speed, or slower than [boys/girls] your age?	Much faster or a little faster? *or* Much slower or a little slower?
false consensus	How many [boys/girls] did [he/she] think would pick the same flavor as [he/she] did?	[*same pictorial scale as in false consensus measure*]

- Ok. And you told me that [*answer reminder*]. Now, [*objective criterion and follow-up as above*]

bias	answer reminder	objective criterion
better-than-average	you run [*participant's previous answer*] [boys/girls] your age	if you were in a running race with a bunch of [boys/girls] your age, and I got to watch it, what do you think I would find out? That you ran faster, at same speed, or slower than the [boys/girls] in the race?
false consensus	[*participant's previous answer*] [boys/girls] your age like better the same flavor as you do – [*participant's choice*].	if I counted how many [boys/girls] your age picked [*participant's choice*] and not [*unselected option*], what do you think I would find out? That none of them picked [*participant's choice*], only some of them did, about half of them did, most of them did, or all of them picked [*participant's choice*]?

Curse of knowledge.

- Can you guess which animal this is? [*trial*]

    if hard trial (unless participant's guess is correct): No, it isn't a [*participant's answer*].

    if show trial: Look – it's a [*item*]

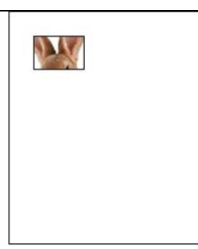
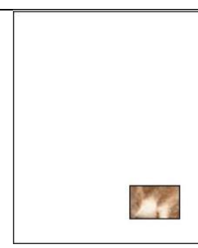
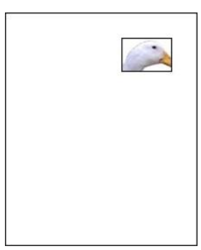
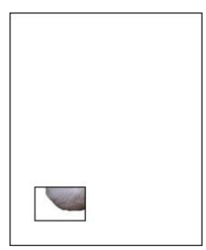
    - Was it easy or hard for you to guess? [*or in show trials*: Was it easy or hard for you to guess before I showed you the picture?]

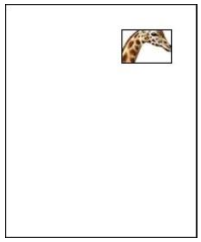
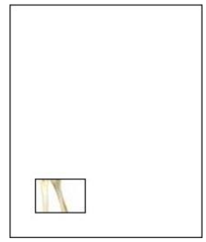
    if answer is 'easy': Very easy or just a little easy?

    if answer is 'hard': Very hard or just a little hard?

- Now, yesterday I asked [Anna (this other girl your age)/Peter (this other boy your age)] to guess which animal is this, but I didn't show [her/him] the picture that is behind the white sheet. Do you think it was easy or hard for [her/him] to guess?

    Follow-up as above

	Trials	
Items	Easy	Hard and Show[a]
bunny		
duck		

giraffe		

[a] In show trials, the items were revealed to the participants immediately after their guesses; in easy and hard trials the items were revealed only at the end of the procedure.

Study 3. (Translated from Portuguese)

Gender-based ingroup bias. This boy and this girl are really nice. Do you know what? They are both really nice, but a lot of [boys/girls] like this [boy/girl] better than this [girl/boy], just because [he's a boy/she's a girl] like them.

- What about you? Do you think you'd like this boy better, this girl better, or both the same? (counterbalanced order)

  if same-gender is chosen: Why do you think you would like this [boy/girl] better – because [he's/she's] actually nicer than the [girl/boy] or because [he's a boy/she's a girl] just like you? (counterbalanced order)

- And what about [Peter/Anna] (a [boy/girl] your age with whom I spoke yesterday)? Who do you think [he/she] liked better?
- Let's see what [Peter/Anna] answered. [He/She] said [he/she] liked the [boy/girl] better. Do you think [he/she] said that because the [boy/girl] is actually nicer than the [girl/boy] or because [he's a boy/she's a girl] just like [him/her]? (counterbalanced order)

Better-than-average. There are very friendly [girls/boys] and [girls/boys] who are less friendly. There are very clever [girls/boys] and [girls/boys] who are less clever. And there are [girls/boys] who are a bit annoying and others who aren't annoying at all. Do you know what? Many [girls/boys] think they are friendlier, cleverer, and less annoying than the other [girls/boys] just because they like themselves a lot.

- What about you? Would you think you're cleverer than [girls/boys] your age, less clever, or as clever as the other [girls/boys]? (counterbalanced order)

  if cleverer is chosen: Why would you think you're cleverer – because you're actually cleverer or because you like yourself a lot? (counterbalanced order)

- And what about [Peter/Anna] (a [boy/girl] your age with whom I spoke yesterday)? Would [he/she] think [he's/she's] cleverer than other kids, less clever, or as clever as the others? (counterbalanced order)
- Let's see what [Peter/Anna] said. [He/She] said [he's/she's] cleverer than the other kids. Do you think [he/she] said that because [he/she] likes [himself/herself] a lot or because [he's/she's] actually cleverer? (counterbalanced order)

Preference for the lucky. These two [boys/girls] are very nice. But this [boy/girl] had good luck: [he/she] found some coins on the floor. It could have happened to the other [boy/girl] too, but it happened to [him/her]. This [boy/girl] had bad luck: [he/she] had invited some friends to a picnic, but the picnic didn't happen because it rained that day. It could have happened to the other [boy/girl], but it happened to [him/her]. Do you know what? They are both nice, but many [boys/girls] like this one better than this one just because [he/she] was lucky this time around.

- What about you? Who do you think you'd like better? This one who was lucky, this one who was unlucky, or both the same? (counterbalanced order) *if lucky is chosen:* Why do you think you'd like this one better – because he's actually nicer than the other one or because he was lucky? (counterbalanced order)

- And what about [Peter/Anna] (a [boy/girl] your age with whom I spoke yesterday)? Who do you think [he/she] liked better?
- Let's see who [Peter/Anna] liked better. [He/She] said [he/she] liked this kid better. Do you think [he/she] said that because this kid is actually nicer than the other one or because [he/she] was lucky? (counterbalanced order)

Do you still remember what I said before? Not what you answered, but what I told you.

- Many [boys/girls] like the kid who was lucky, the kid who was unlucky, or both the same?
- Many [boys/girls] think they're cleverer than other kids, less clever, or as clever as the others?
- Many [boys/girls] like this boy better, this girl better, or both the same?

Study 4.

Do you know how sometimes teachers give stickers to kids who are being good? Well, in this game there's a teacher who has star stickers to give. Your job is to try to guess which kid the teacher will give the sticker to.

Ok, so I'm going to tell you about some kids and the things they do. And you'll tell me which kid the teacher will give the sticker to.

Practice. This kid never kicks other kids. This kid is always kicking other kids.

- Who do you think the teacher will give the star sticker to?

That's right. The teacher will give the sticker to this kid, because he has been better. (*or if participant's answer wasn't correct*: No. Actually, the teacher will give the sticker to this kid, because he has been better. See?)

This kid never shares her crayons. This kid always shares her crayons.

- Who do you think the teacher will give the star sticker to?

  That's right. The teacher will give the sticker to this kid, because she has been better. (*or if participant's answer wasn't correct*: No. Actually, the teacher will give the sticker to this kid, because she has been better. See?)

Now, in the next ones you won't be able to see which kid the teacher will give the sticker to. You'll just have to guess.

Gender-based ingroup bias. This [girl/boy] says [she/he] likes boys and girls the same and plays with boys and girls. This [girl/boy] says [she/he] likes [girls better than boys/boys better than girls] and only plays with [girls/boys]. (counterbalanced order)

- Who do you think the teacher will give the star sticker to – the one who likes boys and girls the same or the one who likes [girls/boys] better? (counterbalanced order)

Better-than-average. This kid says [he's/she's] nicer, cleverer, and less annoying than the other kids in [his/her] class. This kid says [he's/she's] just as nice, clever, and annoying as the other kids in [his/her] class. (counterbalanced order)

- Who do you think the teacher will give the star sticker to – the one who says [he’s/she’s] cleverer than the others or the one who says [he’s/she’s] just as clever? (counterbalanced order)

Preference for the lucky. One time there was a kid who was lucky – [she/he] found some money on the street. There was another kid who was unlucky – he couldn’t have a picnic with his friends because it rained that day. Now, this kid over here likes the lucky kid better and only plays with the lucky kid. This kid over here likes the lucky kid and the unlucky kid the same and plays with both. (counterbalanced order)

- Who do you think the teacher will give the star sticker to – the one who likes the lucky kid better or the one who likes both kids the same? (counterbalanced order)

Part II – Non-Focal Measures of Study 2 (Procedure and Results)

Study 2 entailed two focal measures (i.e., the better-than-average and the bias blind spot measures) and two other measures (i.e., false consensus and curse of knowledge measures). The reasons for including these measures in the study, as well as the reasons for moving their detailed descriptions and results to a supplemental material document, can be found in the manuscript.

False consensus measure.

Procedure. For this measure, participants first stated a preference (e.g., between vanilla and chocolate ice cream). Then, participants were asked to predict how many other children their age would share that preference in a 5-point pictorial scale, ranging from none (coded as -2) to all (coded as +2) children. The other points were labeled as follows: *some* (point -1), *about half* (point 0), and *most* (point +1) children. As for the better-than-average measure, positive values indicate that children are showing the bias. There was another false consensus item regarding children's preferences between two toys in the lab.

Results. We calculated a 3 (age group) X 2 (domain: ice cream vs. toy) mixed-design ANOVA on participants' prediction of how many children would share their preferences. Overall, the false consensus effect emerged, with participants on average predicting that more than half of their peers would share their preferences, as attested by the statistically significant intercept, $F(1, 57) = 13.36$, $MSE = 1.26$, $p = .001$, $\eta_p^2 = .190$. However, participants did not clearly show the effect in the domain we used to formulate the BBS item, namely regarding the preferred ice cream flavor ($M_{5\text{yr-olds}} = 0.15$, 95% CI [-0.31, 0.61]; $M_{8\text{yr-olds}} = 0.40$, 95% CI [-0.06, 0.86]; $M_{11\text{yr-olds}} = 0.15$, 95% CI [-0.31, 0.61]). There was no age main effect, $F < 1$, nor interaction of age with domain, $F(2, 57) = 1.74$, $MSE = 0.81$, $p = .186$, $\eta_p^2 = .057$.

BBS measure regarding false consensus.

Procedure. The procedure was identical to the BBS measure regarding the better-than-average effect. Briefly, participants heard a simplified description of the bias ("Most of the kids your age think that other kids will like the same ice cream flavor as they themselves do, simply because kids (and adults, too) usually think that others like the same things that they like themselves."). Then, participants were asked to guess how a supposedly previous participant answered the original question (regarding the ice cream flavor item). Positive values indicate that participants predicted the other's response to be biased. Next, participants were reminded of their own original answers and were asked to provide a new answer in face of an imagined objective criterion (“Now, if I counted how many kids your age picked [participant’s choice of flavor] and not [other flavor], what do you think I would find out?”). Positive values indicate that participants are showing the bias, thus not recognizing their own susceptibility to it.

Results. As mentioned earlier, we opted not to include the BBS trial regarding the false consensus effect in the main analyses of the BBS measure because children did not originally show the false consensus effect in the used domain (i.e., ice cream flavor). This absence of the effect rendered the children’s answers regarding themselves in the BBS measure hard to interpret. Specifically, when children provide unbiased answers (e.g., predicting that only half of their peers would share their preference), it was hard to know whether children recognized their own susceptibility to the described bias and were avoiding it or whether they were not susceptible to the bias in the first place. We ran an analysis identical to the one we used for the BBS measure on the better-than-average trial, looking at the children who showed the BBS (i.e., predicted that the peer would give a more biased estimate than themselves) and who did not show the BBS (i.e., predicted that the peer would give an identically (un)biased or less biased estimate as themselves). Results were very similar to the ones we obtained above. There was a significant association between age group and showing the BBS, χ^2 (2, N = 60) = 12.53, p = .002, *Cramer’s V* = .457. Fewer 5-year-olds than expected by chance showed the BBS, b(x = 4; 20, 0.4) = .035, while 8-year-olds were at chance level, b(x = 8; 20, 0.4) = .180. More 11-year-olds than expected by chance showed the BBS, b(x = 15; 20, 0.4) = .001.

Curse of knowledge measure.

Procedure. Inspiration for this measure came from Kelley and Jacoby’s (1996) finding that when people had previously seen the solution to an anagram, they rated this anagram as easier for others to solve. In our study, participants saw three cards, one at a time and in a counterbalanced order. Each card had a small window, behind which one could see a part of an animal. In one of the trials, the window was placed in a position such that it was easy to tell which animal was behind (e.g., showing the beak of a duck) – this card was used in the *easy* trial. In the other two trials the window position made it very hard for the participants to guess which animal was behind the card (e.g., showing part of the back of a rabbit) – these cards were used in the *hard* and *show* trials, detailed below. Animals rotated between kinds of trials so that eventual differences in the difficulty of guessing which animal was behind the card could not be attributed to the particular animals (e.g., familiarity or cognitive availability of a given animal). Participants started each trial by trying to guess the hidden animal. Then, they rated how easy it had been for them to guess and how easy it would be for an age and gender-matched peer. These ratings were coded with four values: (-3) for very hard, (-1) for a little hard, (+1) for a little easy, and (+3) for very easy. In the *easy* and *hard* trials, participants provided these ratings without seeing which animal was in fact hidden by the card. However, in the *show* trial, which had been as hard as the *hard* trial, participants saw the hidden animal before providing the ratings. If participants were "cursed by their knowledge" in this measure, they would rate the *show* trial as easier than the *hard* trial.

Results. We calculated a 3 (age group) X 2 (trial: hard vs. show) X 2 (target: self vs. other) mixed-design ANOVA on participants' ratings of how difficult it was to guess the animal behind the card. Overall, participants rated the trials as difficult to guess, as attested by the statistically significant intercept, $F(1, 56) = 51.06$, $MSE = 5.39$, $p = .001$, $\eta_p^2 = .477$. Moreover, older children rated them as harder to guess than younger children, $F(2, 56) = 7.18$, $p = .002$, $\eta_p^2 = .204$ ($M_{5yr\text{-}olds} = -0.29$, 95% CI [-0.82, 0.24]; $M_{8yr\text{-}olds} = -1.30$, 95% CI [-1.82, -0.78]; $M_{11yr\text{-}olds} =$

-1.65, 95% CI [-2.17, -1.13]). However, the predicted effect of trial – children rating the trials for which they had seen the solution (i.e., *show* trials) as easier to guess than the trials for which they had not seen the solution (i.e., *hard* trials) – did not emerge, $F < 1$. There was no statistically significant interaction of trial with age, $F < 1$, nor any other significant effect. Including participants' ratings of the *easy* trials as a covariate does not change the results. Thus, we did not obtain a curse of knowledge effect with our measure. As a reminder, this measure was included in the study to explore whether and how children of different ages would simultaneously show biases assuming others to be different from the self and biases assuming others to be similar to the self. We did not measure children's BBS regarding the curse of knowledge effect.

References

Kelley, C. M., & Jacoby, L. L. (1996). Adult egocentrism: Subjective experience versus analytic bases for judgment. *Journal of Memory and Language*, *35*(2), 157-175.