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BRIEF REPORT

A critical eye: Praise directed toward traits increases children's eye fixations on errors and decreases motivation

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Abstract Although there is evidence that praise of different types (i.e., generic vs. nongeneric) influences motivation, it is unclear how this occurs. Generic praise (e.g., "You are smart") conveys that a child possesses a trait responsible for their performance, whereas nongeneric praise (e.g., "You worked hard") conveys that performance is effort-based. Because praise conveys the basis for success, praise may change the interpretation and salience of errors. Specifically, generic praise may highlight the threatening nature of error (i.e., the child does not possess this trait). Because attention is drawn to threats in the environment, we expected generic praise to increase attention to error. We used eyetracking to measure implicit responses to errors (i.e., visual attention: fixation counts and durations) in order to determine the relation between visual attention and verbal reports of motivation (persistence and self-evaluations) in 30 four- to seven-year-old children. Children first saw pictures attributed to them, for which they received either generic or nongeneric praise. The children then saw pictures attributed to them that contained errors—that is, missing features. As a pretest and posttest, the children saw pictures that were "drawn by other children," half of which contained errors. The results indicated that children who received generic praise ("you are a good drawer") produced more and longer fixations on errors, both their "own" and on "other children's," than did children who received nongeneric praise ("you did a good job drawing"). More fixations on errors were related to lower persistence and lower self-evaluations. These results suggest that generic praise increases attention to errors because error threatens the possession of a positive trait.

Keywords Visual attention · Motivation · Persistence · Self-evaluation · Gaze · Eyetracking · Praise

Children encounter failure multiple times a day. The type of praise that children receive influences their motivation after failure (Cimpian, Arce, Markman, & Dweck, 2007; Kamins & Dweck, 1999; Zentall & Morris, 2010). Praise directed toward effort, or *nongeneric praise* (e.g., "you did a good job"), increases motivation (e.g., high persistence), whereas praise directed toward traits, or *generic praise* (e.g., "you are good at that"), decreases motivation (e.g., low persistence). Less understood is *how* generic praise reduces motivation. One hypothesis proposes that generic praise links traits to performance, such that errors provide evidence that a child lacks a trait responsible for success (Cimpian et al., 2007; Kamins & Dweck, 1999). According to this account, error should be more threatening to children who hear generic praise than to children who hear nongeneric praise (Cimpian, 2010). Generic praise likely increases vigilance for error as well as changing motivational goals (e.g., avoid future error). To investigate the relation between praise and error vigilance, we measured the effect of praise on visual attention to error, an implicit response.

Although most research on motivation has focused exclusively on explicit measures (e.g., verbal responses), implicit measures are particularly important with young children because they are less able to verbalize their goals and cognitive processes (Wooley, 2006). Two studies investigated how self-reported achievement goals influenced implicit responses to failure using an implicit measure, event-related potentials (ERPs). College students with learning goals (i.e., desire to increase knowledge or to master a task) demonstrated more effort toward integrating new information after failure and were more likely to redirect their attention to correct answers after feedback than were students with performance goals (desire to seek positive evaluations and avoid negative

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evaluations; Mangels, Butterfield, Lamb, Good, & Dweck, 2006). Fisher, Marshall, and Nanyakkara (2009) found that third- and fifth-grade children with learning goals were more concerned with fixing the error (i.e., more persistent) than were children with performance goals. These studies suggested that achievement goals influence implicit responses to failure; however, achievement goals were not experimentally manipulated. Thus, it is possible that these results reflect other individual differences (e.g., temperament) that influence both achievement goals and motivation (Elliot & Thrash, 2002). For the present study, we manipulated praise in order to change the meaning of error, and in turn to change motivation. Although in the present study we did not directly measure achievement goals, previous research has suggested that praise does affect achievement goals (Mueller & Dweck, 1998); thus, we focused on how praise changes the interpretation of error and whether that interpretation predicts motivation.

A particularly valuable implicit measure for understanding perceived threat and goals is visual attention, assessed through eyetracking. Isaacowitz (2006) suggested that visual attention is "a tool for motivation, directing gazers toward stimuli that are consistent with their goals" (p. 68). Eyetracking measures process tracing, or the path of information pickup during a task (e.g., Hayhoe & Rothkopf, 2011; van Gog, Paas, van Merrienboer, & Witte, 2005). Although eye fixations are influenced by what is visually salient in the environment (i.e., bottom-up processing), fixations are more closely associated with cognitive goals (i.e., top-down processing; Hayhoe & Rothkopf, 2011; Henderson, Brockmole, Castelhano, & Mack, 2007; Vuilleumier, 2005). On this basis, we would expect errors, such as a missing feature on an object, to be generally salient; however, the number of visual fixations should be related to the interpretation of the error. Limited attentional resources are likely to be directed to stimuli with strong emotional associations, which include threatening stimuli (Browning & Harmer, 2012). For example, adults were slower to disengage from threatening than from nonthreatening faces (e.g., Belopolsky, Devue, & Theeuwes, 2011; Georgiou et al., 2005). Thus, if children who receive generic praise are more likely to show threat vigilance, we would expect them to prioritize attentional resources to threatening stimuli—that is, to errors, because errors pose a threat to the trait responsible for success (Cimpian, 2010; Vuilleumier, 2005). Children who receive nongeneric praise are not expected to interpret error as a threat, and thus their attention to error should be related to the intent to fix the problem. On this basis, we predicted that generic praise would increase fixations on error. Moreover, this interpretation of error as a threat likely decreases motivation after failure to minimize the likelihood of more errors (i.e., more evidence of lack of a trait).

Present study

The present study investigated the relation between error fixations and change in motivation. This study is unique because we manipulated the type of praise (generic vs. nongeneric), in effect manipulating the potential threat of error. We also measured implicit visual attention to error, in the form of the number and duration of fixations. The explicit measures of motivation were verbal responses to self-evaluation and persistence questions, two components of motivational goals. The present study had two goals: (1) to investigate the relation between type of praise and visual attention to errors, and (2) to determine how implicit measures are related to explicit behaviors. We expected that children who received generic praise would produce more fixations on errors than would children who received nongeneric praise, and that increases in the number of fixations on errors would be related to lower motivation after failure.

To control for the overall salience of missing features, we used a pretest/posttest design in which we compared attention to missing features in other children's drawings before receiving different types of praise. Although visual attention might be drawn to the missing features (e.g., an elephant without a trunk) the first time, we expected a decline in visual attention to missing features, because they are less novel on the second presentation. Prior to receiving praise, there should be no differences in how participants in the two conditions attended to error; however, the type of praise that the children received should change their attention to error.

Method

Participants

A sample of 30 children (3.75 to 7.61 years of age; M = 5.46, SD = 1.08; 15 female, 15 male; 90 % Caucasian, 10 % Hispanic) were recruited from the children's area of a public library. The children were randomly assigned to either receive generic praise (n = 14) or nongeneric praise (n = 16). The children received a small prize for participation.

Procedures

Each child was seated at a small table facing a Tobii T-60 eyetracker monitor. The children were given a brief study explanation and then saw a nine-point calibration event. If the calibration was unsuccessful, it was repeated until successful. Pictures of drawings were displayed on the monitor for 5 s each after the descriptions provided below.

Pretest All children were told, "These are pictures other children drew. Some have missing parts," and they were

then shown the four pictures consecutively. Two of the four pictures had missing features (e.g., an elephant without a trunk). The pictures were framed as "being drawn by another child" (hereafter, "other children's" errors) so that the child would not begin the experiment with pictures that he or she had produced in error.

Experimental phase The procedure was adapted from that of Cimpian et al. (2007). Children were told stories about a teacher and the child, in which the teacher asked the child to draw pictures, the child successfully drew the picture, and then the teacher gave either generic ("You are a good drawer") or nongeneric ("You did a good job drawing") praise to the child. All children were then told, "Here is the picture that you drew," and they were shown a picture (matching the description) on the computer screen (see Fig. 1). Note that the experimental pictures were different from the pretest pictures and that the children never drew pictures. After four successful drawing stories, the children were asked self-evaluation questions prior to error. Next, the children were told two stories about pictures with mistakes (e.g., a cat without ears) and were shown corresponding pictures (see Fig. 1). Hereafter, these errors will be referred to as the child's "own" errors. Following these error trials, children were asked self-evaluation and persistence questions in order to measure motivation. One of the persistence questions asked children whether, if they had a chance to draw one of these again, they would want to draw the bus (missing wheels), the cat (missing ears), or the pick-up truck (no missing features). For this choice trial, a corresponding picture with all three options was shown on the computer screen.

Posttest and debriefing The pictures and procedures used in the pretest were repeated for the posttest. After the posttest, each child was told two stories about the error pictures in which the child completed them correctly and received nongeneric praise—for instance, "You found a really good way to draw the bus."

Measures

Motivation The measures of motivation were adapted from Cimpian et al. (2007; see Zentall & Morris, 2010, for the motivation questions). We recorded verbal responses to four self-evaluation and four persistence questions. Self-evaluation questions related to their feelings about the drawing and themselves (e.g., "Did what happened in the dog story make you feel happy or sad?"). Persistence questions related to their desire to continue drawing (e.g., "If you had a chance to do something tomorrow, would you draw or would you do something else?").

Eyetracking For each picture, we manually created areas of interest (AOI) around major (e.g., an elephant's face) and missing features (e.g., the cat's missing ear). We coded two visual attention measures within each AOI: (1) the number of fixations (hereafter, "fixation count") and (2) fixation durations. These measures were recorded on pre- and posttest pictures, error-trial pictures, and choice-trial pictures.

Results

We found no significant differences in the verbal responses to pre- or posterror self-evaluation questions (see Table 1). However, children who received generic praise were significantly less likely than those who received nongeneric praise to indicate that they would persist following errors (see Table 1).

The eyetracking data were analyzed by comparing mean fixation counts and mean fixation durations for missing features by praise conditions. Prior to receiving praise (i.e., pretest), there were no significant differences between the praise conditions on fixation counts, $t(28) = -1.02$, $p = .32$, or fixation durations, $t(28) = 0.72$, $p = .48$, on the missing features of "other children's" pictures (Fig. 2). On the error trials, children given generic praise produced more fixations and fixated longer

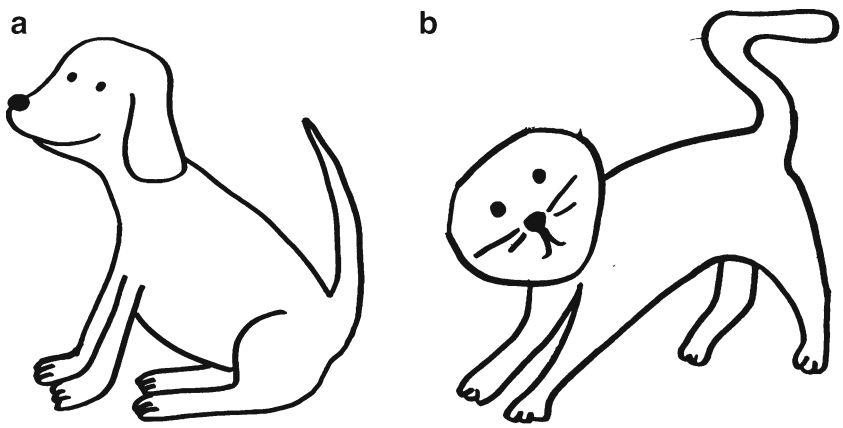

Fig. 1 Examples of pictures shown to all children. **a** Success picture of a dog. **b** Failure picture of a cat

Table 1 Means and standard deviations for verbal persistence and eye fixations

Measure	Condition	*M*	*SD*	*t*	*df*	*p*
Pre-error self-evaluation	Generic	.91	.21	–0.97[a]	16.71[a]	.35
	Nongeneric	.97	.09			
Posterror self-evaluation	Generic	.75	.37	0.24	28	.81
	Nongeneric	.72	.34			
Posterror persistence	Generic	.21	.22	–10.62[a]	22.20[a]	< .001
	Nongeneric	.94	.14			
Fixation count on "own" errors	Generic	13.86	5.22	4.75	28	< .001
	Nongeneric	6.38	3.32			
Duration of fixations on "own" errors	Generic	3.99	2.15	2.28	28	.030
	Nongeneric	2.40	1.65			
Fixation count on "other children's" errors (posttest)	Generic	6.00	2.39	4.01	28	< .001
	Nongeneric	2.81	1.97			
Duration of fixations on "other children's" errors (posttest)	Generic	1.93	0.70	3.95	28	< .001
	Nongeneric	0.97	0.63			

[a] Assuming unequal variances on the basis of Levene's test for equality of variances

on missing features of their "own" pictures than did children given nongeneric praise (see Table 1). Moreover, on the posttest, children who received generic praise produced more fixations and fixated longer on the missing features of "other children's" pictures than did children who received nongeneric praise (see Table 1 and Fig. 2). In other words, children who received generic praise were more likely to fixate on their "own" errors as well as on errors by "other children" than were children who received nongeneric praise. More fixations on missing features of their "own" errors in turn predicted lower persistence, $R^2 = .41$, $F(1, 29) = 19.51$, $p < .001$, and lower self-evaluation scores, $R^2 = .18$, $F(1, 29) = 6.33$, $p < .05$, after failure, suggesting that the more children fixated on errors, the less likely they were to persist on the task or to have positive feelings about themselves and their drawings. Fixation durations, however, did not predict persistence scores, $R^2 = .02$, $F(1, 29) = 0.68$, $p = .42$, or self-evaluations scores, $R^2 = .01$, $F(1, 29) = 0.41$, $p = .53$.

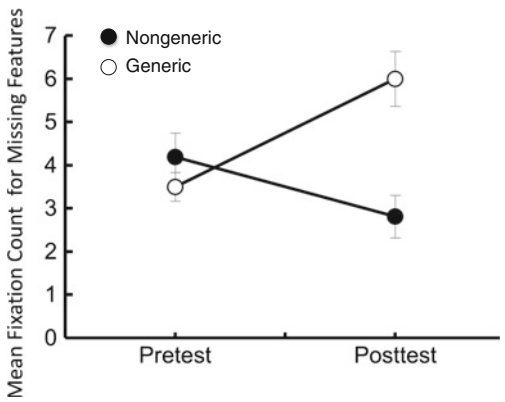

Fig. 2 Change in fixation count on "other children's" errors from pretest to posttest for the generic and nongeneric praise conditions. Standard errors are represented in the figure by error bars

Discussion

This study adds to our understanding of how praise influences motivation by measuring changes in implicit visual attention using eyetracking. The findings demonstrate that children who received generic praise fixated more and for longer durations on errors than did children who received nongeneric praise. Increased fixations were subsequently related to less persistence and less positive self-evaluations, suggesting that a larger number of fixations reflects the threatening nature of errors (Cimpian, 2010). Interestingly, increased fixations on the child's own errors also carried over to others' errors, in effect suggesting that generic praise increases the salience of errors in general. This result provides evidence for broad change in response to errors from pre- to posttest. Furthermore, the change in attention to errors indicates that the threatening nature of error was relatively low for those who received nongeneric praise and relatively high for those who received generic praise.

By examining implicit and explicit measures of motivation, our results allow for a more complete account of how praise influences attention and persistence. Although visual attention would be required in order to fix the error (e.g., Hayhoe & Rothkopf, 2011; van Gog, Paas, van Merrienboer, & Witte, 2005), it is unlikely that the increased fixations exhibited by those who received generic praise reflect extended processing to correct the error, for two reasons. First, the errors presented here were relatively simple, and thus should not require extended processing to correct. For example, adding ears to a cat with missing ears is unlikely to require multiple fixations in order to determine how to fix the error. Second, increased fixations were related to decreases in persistence and lower self-evaluations following error. In other words, the more that children fixated on errors, the less likely they were to persist

and to feel positive about themselves and their pictures, supporting the explanation that fixations reflect the threat of error. Previous research has demonstrated that attentional resources are drawn to threats (e.g., Belopolsky et al., 2011), and increased attention to errors is consistent with the interpretation of error as a threat on the trait causing success. To avoid further evidence that a child lacks the trait responsible for success, the child avoids the task (i.e., does not persist).

A theoretical question that emerges from our results is, what is the relation between error vigilance and achievement goals? Performance goals, which include the belief that failure (or error) is a threat to self, are related to less task motivation (e.g., Dweck & Leggett, 1988). Both children and college students with performance goals demonstrated differences in attention from those with learning goals (Fisher et al., 2009; Mangels et al., 2006). As compared to children with learning goals, children with performance goals demonstrated greater error salience, overestimating the number of errors that they made (Diener & Dweck, 1980). Moreover, praise has a similar effect on achievement goals, such that generic praise is more likely to result in performance goals and reduced motivation (Mueller & Dweck, 1998). Thus, it is likely that changes in visual attention relate to these changes in achievement goals.

Overall, the findings from the present study extend the literature on praise and motivation in three ways. First, we introduced a novel, implicit measure (i.e., eyetracking) that appears to measure achievement goals objectively. Second, we demonstrated that generic praise increases error-related fixations, which are then related to decreases in task persistence and lower self-evaluations. And finally, these findings suggest that praise changes motivation by changing the interpretation of error from a learning experience to a threat. Specifically, generic praise appears to change the child's interpretation of error, such that threat avoidance becomes more critical than task mastery.

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