

Effects of Praise and “Easy” Feedback on Children’s Persistence and Self-Evaluations

Grace Bennett-Pierre¹, Taylor Chernuta¹, Rawan Altamimi², and Elizabeth A. Gunderson³

¹Department of Psychology and Neuroscience, Temple University

²Department of Psychology, New York University

³Department of Psychological and Brain Sciences, Indiana University Bloomington

Author Note

Grace Bennett-Pierre <https://orcid.org/0000-0001-7857-3114>

Elizabeth Gunderson <https://orcid.org/0000-0001-7108-2283>

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concerning this article should be addressed to Grace Bennett-Pierre, Department of Psychology

and Neuroscience, 1701 N. 13th Street, Philadelphia, PA 19122. Email: grace.bennett-

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Abstract

Praise is thought to affect children’s responses to failure, yet other potentially-impactful messages about effort have been rarely studied. We experimentally investigated the effects of praise and “easy” feedback after success on children’s persistence and self-evaluations after failure. Children ($n=150$, $M_{\text{age}}=7.97$, $SD=.58$ years) from the mid-Atlantic region of the US (73 girls, 79% White) heard one of five types of feedback from an experimenter after success on online tangram puzzles: process praise (“You must have worked hard on that puzzle”), person praise (“You must be good at puzzles”), process-easy feedback (“It must have been easy to rotate and fit those pieces together”), person-easy feedback (“It must have been an easy puzzle for you”), or a control. Next, children failed to complete a harder tangram puzzle. Preregistered primary analyses revealed no differences in persistence and self-evaluation between person versus process praise, or person-easy versus process-easy feedback. Exploratory analyses showed that hearing process praise led to greater persistence after failure than the control condition ($d = .61$), and that process-easy feedback led to greater strategy generation than the control condition. The effects of adult feedback after success may be more context-dependent than previously thought.

Keywords: Persistence, Mindset, Praise

Introduction

Selecting, exerting effort at, and persisting on challenging tasks are important for learning. However, there are individual differences in the extent to which people - including children – do so (Dweck & Leggett, 1988). Given the importance of challenge-seeking for learning, decades of research have tried to determine what factors contribute to children’s challenge-seeking, including the development of belief systems that support challenge-seeking (e.g., Blackwell et al., 2007). In particular, the relation between parents’ verbal responses to success (praise) and children’s motivational beliefs and challenge-seeking behaviors have been identified as a key area of study (e.g., Gunderson et al., 2013, 2018). Both *process praise*, which emphasizes malleable effort as being responsible for success, and *person praise*, which emphasizes a fixed aspect of a person as responsible for success, have been shown to predict children’s motivational beliefs and impact their persistence and challenge-seeking (Mueller & Dweck, 1998; Gunderson et al., 2013; Pomerantz & Kempner, 2013). Motivational beliefs, also referred to as theories of intelligence or mindsets, are the set of beliefs a person holds about the extent to which intelligence is malleable via a person’s effort (a *growth mindset*) versus a fixed trait that cannot be changed (a *fixed mindset*) (Blackwell et al., 2007). Furthermore, holding a learning goal (as opposed to holding a performance goal), is associated with selecting more challenging tasks that hold an opportunity to learn (and potentially fail) as opposed to easy tasks that ensure success (Elliot & Dweck, 1988).

Hearing more process praise in early childhood is associated with having a stronger growth mindset by 2nd grade, which is, in turn, associated with better school performance in 4th grade (Gunderson et al., 2013, 2018). Eight- to 12-year-old children who heard more person praise (as reported by their mothers) over a ten day period held more fixed mindsets six months

later (Pomerantz & Kempner, 2013). When 7th-graders’ reports of their parents’ person and process praise were used, hearing more person praise was associated with greater fixed mindsets, and hearing more process praise was associated with greater growth mindsets (Boncquet et al., 2022).

In an experimental context, 4th and 5th-grade children who hear process praise after success are more likely to persist, select challenging tasks, and attribute failure to malleable effort than children who hear person praise or control statements (Henderlong Corpus & Lepper, 2007 found this only for girls; Mueller & Dweck, 1998). The experimental effect of process (versus person) praise leading to greater challenge-seeking and persistence holds across early to middle childhood, including preschoolers (Cimpian et al., 2007, but see Henderlong Corpus & Lepper, 2007 for an overall praise effect), 5- to 6-year olds (Kamins & Dweck, 1999; Morris & Zentall, 2014; Zentall & Morris, 2010), and 5th-graders (Mueller & Dweck, 1998). However, process praise may backfire in adolescence due to adolescents’ tendency to interpret process praise as indicating adults’ low ability beliefs (Amemiya & Wang, 2018). The positive effect of process praise on persistence has also been demonstrated across different contexts (an imagined drawing task, a tangram puzzle task, and in a pen-and-paper standardized test). Not only are children sensitive to process versus person praise, some research suggests that even young children (5- to 6-year olds) are sensitive to the proportion of process to person praise that they receive, with greater proportions of process praise leading to greater persistence (Zentall & Morris, 2010). College students may also be sensitive to process versus person praise: they reported greater intrinsic motivation after process praise relative to person praise, though behavioral measures of persistence (e.g., taking home additional puzzles, having their scored puzzles sent to them) did not differ by praise condition (Haimovitz & Henderlong Corpus, 2011).

Participants in these studies came from the Midwest, East Coast, and West Coast of the United States, as well as Belgium (Boncquet et al., 2022). One recent study did not replicate the experimental finding that process praise increases challenge-seeking and persistence relative to person praise with 9-13-year-old students in China (Y. Li & Bates, 2019), raising questions about the original finding and the role cultural context might play in children’s responses to praise (Yeager & Dweck, 2020).

Importantly, praise is likely not the only way that parents communicate their beliefs about challenge-seeking and persistence. For example, some research has found that children can predict their parents’ beliefs about failure, and that these beliefs are associated with children’s growth mindset (Haimovitz & Dweck, 2016). Further, adults’ messages about the role of effort in success on challenging tasks promote children’s persistence (Leonard et al., 2020). A prior study investigated the prevalence of another type of parent talk that the authors hypothesized would shape children’s challenge-seeking: parent talk about whether and how tasks are “hard” or “easy” to complete (Bennett-Pierre et al., 2023). Across two observational datasets, parents spontaneously talked about difficulty with their 3- to 10-year-old children in naturalistic contexts. Similar to parent praise, most difficulty talk was general (statements like “that was easy!”). However, some difficulty statements emphasized aspects of a person as the reason for difficulty (e.g., “That was really easy *for you*”) while others emphasized features of a task as the reason for difficulty (e.g., “See how it’s going to be easy to make those lines there?”). As a result, the authors hypothesized that there is a functional similarity between parents’ labeling of task difficulty as related to aspects of a person (*person-easy* feedback) or task features (*process-easy* feedback) and previously studied types of parent praise (e.g., person vs. process praise). Specifically, similar to person praise, when children hear that a task was easy because of a fixed

aspect of a person after success, they may be more discouraged after failure than if they hear that a more malleable feature of the task was responsible for their success. This observational study provided some support for a similarity between these types of feedback: mothers who used more process-focused difficulty talk also used more process praise (Bennett-Pierre et al., 2023).

In the current study, we set out to test the causal effect of person-easy and process-easy feedback on children’s challenge-seeking and persistence, using a method based on prior experimental work on praise. We hypothesized that children would interpret person-easy feedback to imply that there are differences between people in what is “easy” (or “hard”) *for them*. This focus on their individual characteristics could evoke fixed ability beliefs and in turn lead to lower challenge-seeking. Conversely, process-easy feedback locates the source of relative difficulty within a task. By emphasizing the processes and strategies involved in task completion as a source of ease, process-easy feedback could support a growth mindset and increased challenge-seeking and persistence.

Current Study

In the present study, we experimentally manipulated the “easy” feedback children heard after success to see if this influenced their challenge-seeking and persistence after failure. We also sought to conceptually replicate prior findings that person and process praise would impact challenge-seeking and persistence after failure. We randomly assigned 7- to 8-year-old children to hear person or process praise, person or process easy feedback, or a control statement after success on an online tangram puzzle game (five between-subjects conditions). Our design closely matched prior experiments examining how person and process praise shape children’s persistence after failure. First, we asked children to complete tangram puzzles (like Henderlong Corpus & Lepper, 2007). Second, we gave children two success experiences (completing

tangram puzzles) after which the experimentally-assigned feedback was delivered and then one failure experience (not completing a tangram puzzle), which replicated the ratio of success (two) to failure (one) that prior studies have used (Cimpian et al., 2007; Morris & Zentall, 2014). We used the person and process praise feedback language used in prior studies (Li & Bates, 2019; Mueller & Dweck, 1998), and our completion feedback was similar to some prior studies (Kamins & Dweck, 1999; Morris & Zentall, 2014). Finally, we chose all but one of our dependent measures from prior experimental praise studies (Cimpian et al., 2007; Mueller & Dweck, 1998). We included items to measure a motivational composite including children’s challenge-seeking, persistence, and attributions for failure (which going forward we will refer to as “persistence items”), as well as children’s self-evaluations.

Our study also differed from prior work in some ways. Unlike many prior studies with younger children (under 9 years old), we gave children direct experience with a real (rather than imagined) task, in order to increase the external validity of our findings (though see Henderlong Corpus & Lepper, 2007 as an exception). We also investigated an intermediate age group (7-to 8-year-olds) compared with prior studies that have looked at younger (Cimpian et al., 2007; Henderlong Corpus & Lepper, 2007; Kamins & Dweck, 1999; Morris & Zentall, 2014; Zentall & Morris, 2010) or older (Koestner et al., 1989; Y. Li & Bates, 2019; Mueller & Dweck, 1998) children. Due to the COVID-19 pandemic, we administered our study over Zoom, rather than in person, which differs from other praise studies. We selected 7-to 8-year-olds because in a pilot sample, 5- to 6-year-old children struggled to use our remote design.

Our preregistered hypotheses were that 1) children who heard process praise would have greater persistence and higher self-evaluations after failure than children who heard person praise, and 2) children who heard process-easy feedback would have greater persistence and

higher self-evaluations after failure than children who heard person-easy feedback (preregistration link: https://osf.io/2u65t?view_only=2c26b3f4bdc14aa9908994d4e1c929c7). In addition to these primary preregistered hypotheses, we also investigated the relation between parent beliefs (growth mindsets, failure mindsets, parent mastery orientation, and beliefs about their child’s persistence) and their child’s behavioral challenge-seeking after failure. Few studies have investigated parent beliefs and child behavior in the same sample. We did not find any significant relation between parent beliefs and child behavior and report these analyses in Appendix B.

Methods

Participants

Child participants (pre-registered $N = 150$) and one of their parents were recruited using paid Facebook and Instagram ads, posts in Facebook groups focused on parenting, and flyers posted in the ANONYMIZED NAME community. Ads and Facebook groups were targeted towards families on the East Coast of the US. We also invited participants from an existing lab database. An additional 42 children were recruited but were excluded from the analytic sample based on our pre-registered exclusion criteria: the child did not finish the online session for any reason (e.g., time constraint, withdrawal) or did not finish all of the measures ($n = 15$), the child succeeded in completing the third, “failure” puzzle ($n = 10$), or the experimenter made an error in task administration ($n = 17$). Families received \$15 for their participation.

Our pre-registered sample size was determined using G*Power for a priori power analysis (Faul et al., 2007). We calculated power to detect a large effect size ($d = 0.80$) for between-groups t -tests, with 80% power at $\alpha = .05$ (two-tailed). We based this effect size on prior research using similar methods (Zentall & Morris, 2010), which found large between-group

effects (partial eta-squared=.17-.19, equivalent to $d = 0.90$ or higher). To detect a large effect size ($d = 0.80$) between two groups, each group would need a sample size of 26. To increase power for our exploratory analyses, we increased the sample size per condition to 30 (150 total across 5 conditions). This sample size allows us to detect effect sizes of partial eta-squared = .08 in our exploratory between-groups ANOVA, with 80% power and $\alpha = .05$ (two-tailed).

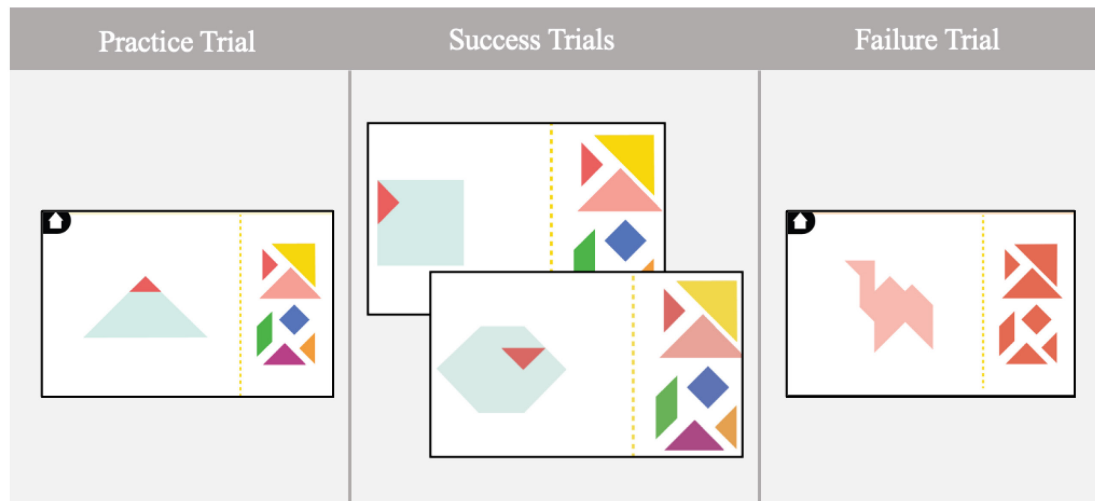
Our analytic sample included 150 7- and 8-year-olds ($M = 7.97$ years, $SD = .58$) who completed the study (73 girls, 75 boys, and 2 whose parents responded “other” for gender) between November 2021 and December 2022. Parents completed an optional demographics survey: according to their parents’ report ($N_{child_race} = 117$), 79% of children were White, 3% were Black, 4% were Asian or Asian American, and 14% were multi-racial. Seven percent of children were Hispanic. Families participating in the study reported high levels of parental education (parents’ highest level of education: $M = 17.23$ years, $SD = 1.31$ years, where 18 years is a graduate degree) and annual income ($M = \$85,890$, $SD = \$22,930$).

Procedure

Interested parents completed a short survey to sign up for the lab database and were then emailed with the study consent using REDCap (Harris et al., 2009, 2019). After completing the consent form, parents received an automatic email with a parent survey through REDCap. Parent measures were presented in a fixed order across participants: Dimensions of Mastery Questionnaire, Strategy and Attribution Questionnaire, Theory of Intelligence Questionnaire, and Failure Mindset Questionnaire, with optional demographics questions coming at the end (see Appendix B for details). After parents completed the surveys, they received an automatic email to schedule a Zoom session with their child and the experimenter. The Zoom session lasted around 30 minutes.

Practice Trial

Each child session was administered by one of five trained experimenters. Children first watched a short (1.5 minute) video introducing them to tangram puzzles from an online game website (IXL Learning, 2023). Children were told they would complete two different kinds of puzzles and that although their parent would be sitting next to them, we really wanted to see how they completed the puzzles all by themselves. After the introductory video, the experimenter gave remote control of the screen to the child and had them complete three pieces from the easiest puzzle in the Tangram game (a triangle, IXL Learning, 2023) (Figure 1). If the child struggled to do so, the experimenter provided additional scripted scaffolding until the child demonstrated that they could complete those pieces.

Figure 1*Tangram Puzzles Presented to Child Participants*

Note. From *Tangrams* [Photographs], by IXL Learning, 2023

(<https://www.abcya.com/games/tangrams>).

Success Trials and Pre-Failure Self-Evaluation

After the practice trial, children saw the next easiest tangram puzzle (a square), and were told, “You’ll have a few minutes to work on this puzzle – I’ll let you know when it’s time to go to the next one”. Children were given as much time as they needed to complete the puzzle. The experimenter recorded the amount of time the child took by starting a timer on their phone when they told children “Ready and go!” and stopping the timer when the ending animation played on the puzzle. We recorded this as Trial 1 Time for use in exploratory analyses as a proxy for children’s puzzle-solving skills. When children completed the puzzle, the experimenter stopped screensharing and delivered the condition-dependent feedback. All children heard, “You finished the puzzle!” with additional feedback by condition:

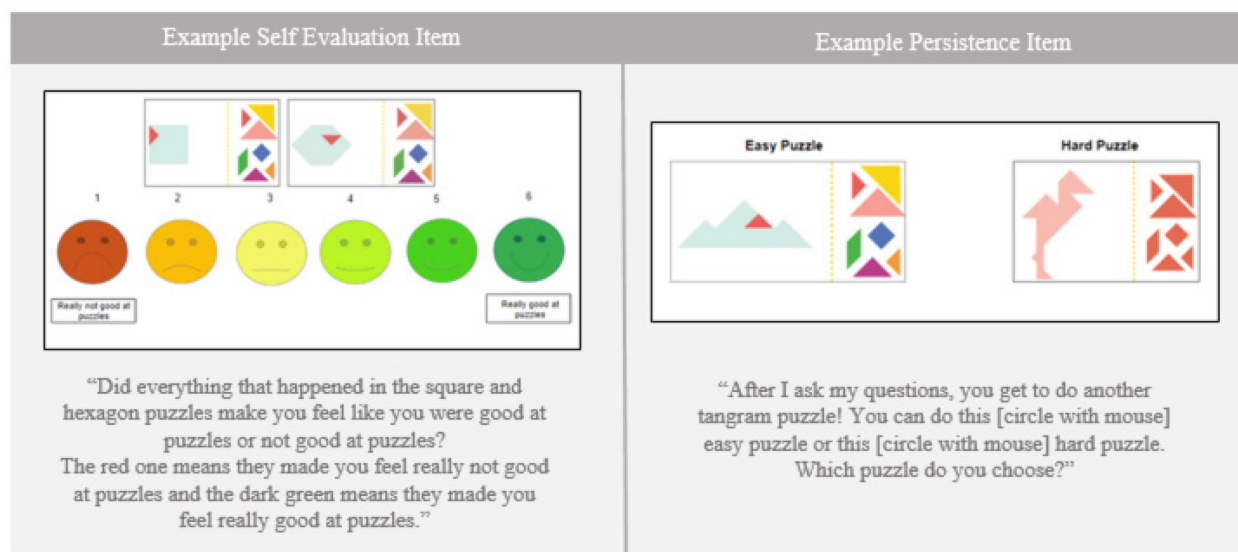
- Person praise: “You must be good at puzzles.”
- Process praise: “You must have worked hard on that puzzle.”

- Person easy feedback: “It must have been an easy puzzle for you.”
- Process easy feedback: “It must have been easy to rotate and fit those pieces together.”
- Control: no additional feedback

After that, the experimenter shared the third puzzle from the “easy” level (a hexagon) (see Figure 1), and children again completed the puzzle and received the same condition-dependent feedback. Following these two “success” trials, the experimenter administered the three pre-failure self-evaluation questions using Powerpoint (see examples in Figure 2).

Figure 2

Example Self-Evaluation and Persistence Items Shown to Child Participants



Note. From *Tangrams* [Photographs], by IXL Learning, 2023

(<https://www.abcya.com/games/tangrams>).

Failure Trial and Post-Failure Self-Evaluation and Persistence

Next, the experimenter shared the first puzzle from the “hard” level of the Tangram puzzle game (a camel; see Figure 1). Children were given the same instructions as the first two puzzles, however, this time, the experimenter stopped them after two minutes, saying “Time’s

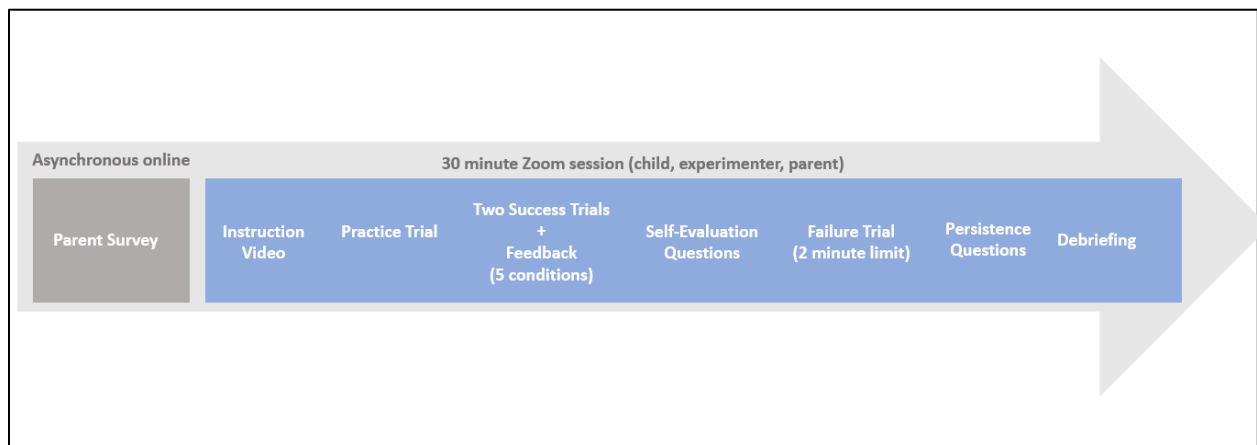
up! We’re going to stop working on this puzzle now. You didn’t finish the puzzle.” The experimenter administered the persistence questions and post-failure self-evaluation questions using PowerPoint (Figure 2). These items were always administered in the same fixed order (see Figure 3).

Debriefing

At the end of these questions, the experimenter gave the child a debriefing, which explained that it usually took children their age a lot longer than they’d had to finish the camel puzzle, that it’s okay to not finish something the first time we try it, and that children and adults can practice to get better at challenging tasks. If the child had indicated that they wanted to work on the camel puzzle again, they were allowed to do so and the experimenter provided additional support to help them complete it successfully.

Figure 3

Study Procedure



Materials and Measures

Puzzle Task

We selected tangram puzzles from a popular online educational game website (IXL Learning, 2023) (Figure 1). Prior work has used real-world tangram puzzles in a similar design

with both preschoolers and 4th graders (Henderlong Corpus & Lepper, 2007). ABCya (IXL Learning, 2023) markets their tangram game as being aligned with the Common Core State Standards for Kindergarteners to 3rd graders (National Governors Association Center for Best Practices, Council of Chief State School Officers, 2010). Each puzzle has seven pieces that players have to click and drag into the puzzle. Once all seven pieces have been placed in the correct locations, a fun image is shown in place of the puzzle to indicate that it was solved successfully. The game has three levels (“easy”, “medium” and “hard”); we used the “easy” level for the practice trial and two success trials and the “hard” level for the failure trial. In the “easy” level, each puzzle piece is a different color, and the game highlights where each piece goes in a set order. In the “hard” level, all puzzle pieces are the same color, and the player decides the location and order of each piece.

Self-Evaluation Items

The three child self-evaluation items were adapted from Cimpian et al. (2007) and answered on a six-point Likert scale with a smiley face representing each option (Figure 2). One question asked children about their liking of the puzzles, another asked children how the puzzles made them feel (from happy to sad), and the third asked children how the puzzles made them feel about their puzzle skill. For all three questions, a 6 represented the highest level and 1 represented the lowest level of liking, happiness, and self-competence. We averaged children’s responses to these three questions after the success trials (“pre-failure self-evaluation”) and after the failure trial (“post-failure self-evaluation”) to create two separate composite scores.

Reliability for the pre- and post-failure self-evaluation composite scores was acceptable (pre-failure: $\alpha = .65$; post-failure: $\alpha = .71$). Our main analyses examined post-failure self-evaluations; see Appendix D for analyses involving pre- and post-failure self-evaluations.

Persistence Items

The persistence items included several used in prior work (Cimpian et al., 2007; Mueller & Dweck, 1998) as well as several new items:

- First, children were asked “After I ask my questions, you get to do another tangram puzzle! You can do this easy puzzle or this hard puzzle. Which puzzle do you choose?” (“Puzzle Choice”, new item) Selecting the easy puzzle was coded as a 0, and selecting the hard puzzle was coded as a 1.
- Second, children were asked “If you had a chance to do something tomorrow, would you do more tangram puzzles, or would you do something else?” (“Later Task”, item adapted from Cimpian et al., 2007). Choosing to do something else was coded as a 0 and choosing to do more tangram puzzles was coded as a 1.
- Third, children were asked two questions about their attributions for their failure to finish the Failure puzzle: “Think about the third, Camel tangram puzzle – the one you didn’t finish - and why you did not finish it. 1) Some kids say, ‘I didn’t have enough time’ but other kids say, ‘I’m not good enough at puzzles’. Which kids are you like?” 2) Some kids say, ‘I wasn’t good at that puzzle’ but other kids say ‘I didn’t work hard enough on that puzzle’. Which kids are you like?” (“Attribution 1 and 2”, items adapted from Mueller & Dweck, 1998; presentation format from Harter, 1982). If children said they were not good enough at puzzles (Attribution 1) or at that puzzle (Attribution 2), these were coded as 0 (ability attributions); if they said they didn’t have enough time or didn’t work hard enough on the puzzle, this was coded as 1 (non-ability attributions), consistent with prior work. For each question, we asked a follow up about whether the child’s answer was “really true” or “sort of true” for them (consistent with the format

from Harter, 1982), however, we did not pre-register analyzing responses to these follow-up questions and do not report those data here.

- Fourth, children were asked about their strategies for completing the Camel puzzle: “Think about the Camel tangram puzzle that you didn’t finish – if you got to work on it again, what kinds of things would you do next?” (“Strategy”, item adapted from Cimpian et al., 2007). After children gave a response, all children were prompted once with, “Is there anything else you would try?” Consistent with Cimpian et al. (2007), we manually coded children’s responses as a 1 if they provided at least one solution or attempt to solve the puzzle (e.g., “I’d try putting the big triangles in the legs”) and a 0 if they provided any other response (e.g., “I don’t know”) (See Appendix A for detailed coding scheme). Trained research assistants transcribed children’s responses to the strategy question, and 20% of transcriptions were double-transcribed, with 93% word agreement. A separate group of research assistants coded children’s responses, and 20% were double-coded, with 87.5% agreement. Disagreements were resolved via discussion.
- Finally, children were asked, “If we have time at the end, would you like to work on the camel puzzle again?” (“Hard Puzzle Again”, item adapted from Cimpian et al., 2007). If children said yes, this was coded as a 1, and if they said no, this was coded as a 0.

For all of the forced-choice items, if children did not respond, the experimenter provided a prompt: “Hm, if you had to pick one, which one would you pick?” Following prior work that used four of our six items, (Cimpian et al., 2007; Zentall & Morris, 2010; Morris & Zentall, 2014), we averaged children’s responses to these six questions to create a composite score. We found that reliability for all six items were low ($\alpha = .43$). When we removed the two attribution items, reliability rose but remained relatively low ($\alpha = .51$) (see Appendix D for exploratory

analyses excluding the attribution items, which showed the same pattern of results as the main analyses reported below).

Results

Preliminary Analyses

Means and standard deviations for all study variables, overall and within condition, are reported in Table 1. Correlations between all study variables are shown in Table 2. Data, analysis scripts, and materials are available on OSF (https://osf.io/jw6y3/?view_only=5e64c1c911274fdca84fffe4788c206).

Table 1*Means and Standard Deviations for Study Variables*

	All Participants (<i>n</i> = 150)	Person Praise (<i>n</i> = 30)	Process Praise (<i>n</i> = 30)	Person Easy (<i>n</i> = 30)	Process Easy (<i>n</i> = 30)	Control (<i>n</i> = 30)
Variables	<i>M (SD)</i>	<i>M (SD)</i>	<i>M (SD)</i>	<i>M (SD)</i>	<i>M (SD)</i>	<i>M (SD)</i>
Child Age (years)	7.97 (.58)	8.04 (.59)	7.92 (.65)	8.02 (.58)	7.96 (.49)	7.93 (.62)
Child Gender	73 girls, 75 boys, 2 other	14 girls, 16 boys	11 girls, 18 boys, 1 other	15 girls, 15 boys	14 girls, 15 boys, 1 other	19 girls, 11 boys
Trial One Time (minutes)	2.18 (1.16)	1.90 (.69)	1.92 (.68)	2.08 (.77)	2.89 (1.75)	2.13 (1.31)
Child Pre-Failure Self Evaluation	5.15 (.76)	5.31 (.77)	5.14 (.78)	5.02 (.76)	5.06 (.83)	5.23 (.65)
Child Post-Failure Self Evaluation	3.90 (1.15)	4.07 (1.12)	3.78 (1.16)	3.70 (1.11)	3.83 (1.25)	4.10 (1.15)
Child Persistence	.58 (.23)	.59 (.21)	.64 (.22)	.56 (.29)	.59 (.19)	.50 (.23)

Table 2*Correlations Among All Study Variables*

	1.	2.	3.	4.	5.
1. Child Age	-				
2. Child Gender (0=girl, 1=boy)	.07	-			
3. Trial One Time	-.20*	-.15	-		
4. Pre-Failure Self Evaluation	-.09	.04	-.04	-	
5. Post-Failure Self Evaluation	.10	.01	-.22**	.27***	-
6. Persistence	.25**	-.02	-.10	.10	.42***

Note. * $p < .05$, ** $p < .01$, *** $p < .001$.

For Child Gender only, we used data from $n=148$ participants who identified as either boys or girls.

Pre-Registered Primary Analyses

We hypothesized that children who received process praise would have higher post-failure self-evaluations and show greater persistence than children who received person praise. Contrary to our predictions, we found no significant difference between the process praise and person praise conditions in post-failure self-evaluation (process praise: $M = 3.78$, $SD = 1.16$; person praise: $M = 4.07$, $SD = 1.12$; $t(58) = .99$, $p = .329$, $d = .25$) or persistence (process praise: $M = .64$, $SD = .22$; person praise: $M = .59$, $SD = .21$; $t(58) = -.85$, $p = .400$, $d = -.22$).

We also predicted that children who received process easy feedback would have higher post-failure self-evaluations and greater persistence than children who received person easy feedback. Contrary to our predictions, we again found no significant difference between the process easy and person easy conditions in post-failure self-evaluations (process easy: $M = 3.83$, $SD = 1.25$; person easy: $M = 3.70$, $SD = 1.11$; $t(58) = -.44$, $p = .664$, $d = -.11$) or persistence (process easy: $M = .59$, $SD = .19$; person easy: $M = .56$, $SD = .29$; $t(58) = -.58$, $p = .567$, $d = -.15$).

To further investigate Hypotheses 1 and 2, we conducted one-way ANOVAs to test the overall effect of condition on post-failure self-evaluation and persistence. Condition did not significantly predict children's post-failure self-evaluation ($F(4, 145) = .71$, $p = .585$, $\eta^2 = .02$) nor children's persistence ($F(4, 145) = 1.44$, $p = .224$, $\eta^2 = .04$)¹. We then conducted post-hoc pairwise comparisons for post-failure self-evaluation and persistence using Holm's sequential

¹ We conducted additional exploratory analyses (not preregistered) excluding the control condition, in which we examined the remaining four conditions in 2 (content: person vs. process) x 2 (type: praise vs. easy) ANOVAs predicting post-failure self-evaluation and persistence. There were no significant main effects or interactions. See Appendix D for details.

Bonferroni correction and found that none of the pairwise comparisons were significant (persistence for process versus control conditions $p = .24$, all other $ps = 1$).

Pre-Registered Exploratory Analyses

We next conducted pre-registered exploratory analyses. First, we tested whether children in the person and process praise conditions differed from the control condition in post-failure self-evaluations and persistence. Comparing the person praise to control condition, we found no significant differences in post-failure self-evaluations (person praise: $M = 4.07$, $SD = 1.12$; control: $M = 4.10$, $SD = 1.15$; $t(58) = .11$, $p = .910$, $d = .03$) or persistence (person praise: $M = .59$, $SD = .21$; control: $M = .50$, $SD = .23$; $t(58) = -1.58$, $p = .120$, $d = .41$). Comparing the process praise to control conditions, we found no significant difference in post-failure self-evaluations (process praise: $M = 3.78$, $SD = 1.16$; control: $M = 4.10$, $SD = 1.15$; $t(58) = 1.08$, $p = .283$, $d = .28$). However, children in the process praise condition ($M = .64$, $SD = .22$) were significantly more persistent than children in the control condition ($M = .50$, $SD = .23$; $t(58) = -2.36$, $p = .022$, $d = .61$).

We also explored whether the two “easy” feedback conditions would result in lower post-failure self-evaluation and persistence scores and lower self-evaluation scores than the process praise and control conditions. We found that none of these conditions significantly differed ($ps > .05$).

Additional Exploratory Analyses

Next, we conducted additional exploratory analyses examining condition differences in post-failure self-evaluation and persistence, using mixed-effects models with items nested within participants. In our preregistered analyses, we averaged items to form composite scores of post-failure self-evaluation and persistence, following prior research (e.g., Cimpian et al., 2007;

Morris & Zentall, 2014; Mueller & Dweck, 1998). However, using mixed-effects models allows us to maintain greater information within our dependent variables (Muradoglu et al., 2023).

Further, in these models, we examined whether additional measures, like Trial 1 Time and child age, predicted children’s self-evaluations or persistence. In addition, despite random assignment, Trial 1 Time significantly differed across conditions ($F(4, 145) = 3.93, p = .005; \eta^2 = .10$), with the highest Trial 1 Time in the process easy condition ($M = 2.89$ minutes, $SD = 1.75$) and the lowest in the person praise condition ($M = 1.90, SD = .69$; see Table 1 for all conditions). Including Trial 1 Time also allowed us to account for this unexpected difference in puzzle solving skills between conditions.

We conducted two generalized linear mixed-effects models to examine whether condition predicted children’s post-failure self-evaluations and persistence, with participant as a random effect. In these models, we controlled for person-level variables of child age and Trial 1 time and fixed effects of item (Table 3).

In the model predicting post-failure self-evaluations (Table 3, Model 1), the possible responses on each item ranged from 1 to 6, and we treated the DVs as normally distributed. Condition did not significantly predict self-evaluation ($X^2(4, n = 150) = 3.19, p = .526$). We found that longer time spent on Trial 1 was significantly related to lower post-failure self-evaluations ($B = -.22, SE = .09, p = .010$). No other covariates were significant predictors ($ps > .151$).

In the model predicting persistence (Table 3, Model 2), each item was scored as 0 or 1, and we treated the DV as binomially distributed. Children in the process praise condition showed greater persistence than those in the control condition ($B = .75, SE = .31, p = .014$), and older children showed greater persistence than younger ones ($B = .52, SE = .17, p = .002$). There were

also significant differences in levels of responding across items (X^2 (5, $n = 150$) = 127.05, $p < .001$).

Table 3

Linear Mixed Effects Models with Children’s Post-Failure Self-Evaluations and Persistence as Outcomes

	Post-Failure Self Evaluation (<i>n</i> = 150)	Persistence (<i>n</i> = 150)
Variable	Model 1	Model 2
	<i>B</i> (<i>SE</i>)	<i>B</i> (<i>SE</i>)
Person-level predictors		
Person Praise (ref: Control)	-.10 (.29)	.40 (.30)
Process Praise (ref: Control)	-.37 (.29)	.75 (.31)*
Person Easy (ref: Control)	-.42 (.29)	.28 (.30)
Process Easy (ref: Control)	-.10 (.30)	.54 (.31)
Child Age	.11 (.16)	.52 (.17)**
Trial 1 Time	-.22 (.09)**	-.07 (.09)
Item-level predictors		
Puzzle Feelings (reference: Liking)	.09 (.12)	
Puzzle Competence (reference: Liking)	.00 (.12)	
Later Task (ref: Puzzle Choice)		-.81 (.26)**
Attribution 1 (ref: Puzzle Choice)		2.10 (.30)***
Attribution 2 (ref: Puzzle Choice)		-.37 (.25)
Strategy (ref: Puzzle Choice)		1.33 (.27)***
Hard Puzzle Again (ref: Puzzle Choice)		1.02 (.26)***

* $p < .05$, ** $p < .01$, *** $p < .001$

Note: These models use random intercepts for child.

Finally, when we examined the intercorrelations of the six child persistence items, we found that they were not very highly correlated (Table 4). As a result, we examined condition differences for each persistence item separately by running six logistic regression models with condition, Trial 1 time and child age predicting each item (Table 5). We applied a Bonferroni correction for six comparisons, and considered $p < .008$ to be significant. We found one

significant effect of condition (Table 5, Model 5): children in the process easy condition were more likely to generate a strategy if asked to complete the failure puzzle again compared with children in the control condition ($B = 2.07$, $SE = .75$, $p = .006$). We also found a significant effect of child age (Table 5, Model 1): older children were more likely to choose a harder puzzle after failure than younger children.

Table 4*Correlations Among Child Persistence Items*

	Puzzle Choice	Later Task	Attribution 1	Attribution 2	Strategy
Puzzle Choice	-				
Later Task	.18*	-			
Attribution 1	.05	-.01	-		
Attribution 2	.11	-.06	.14	-	
Strategy	.19*	-.01	-.03	.07	-
Hard Puzzle Again	.41***	.20*	.17*	-.04	.24**

* $p < .05$, ** $p < .01$, *** $p < .001$.

Table 5*Logistic Regression Models with Children's Persistence Items as Outcomes*

	Puzzle Choice	Later Task	Attribution 1	Attribution 2	Strategy	Hard Puzzle Again
Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
	<i>B (SE)</i>					
Person Praise (ref: Control)	-.44 (.54)	.46 (.58)	.22 (.67)	.81 (.55)	.83 (.58)	.24 (.53)
Process Praise (ref: Control)	.26 (.54)	.33 (.59)	.83 (.76)	.18 (.56)	1.55 (.67)	.138 (.62)
Person Easy (ref: Control)	-.53 (.54)	.62 (.58)	.47 (.71)	.39 (.55)	.36 (.55)	.24 (.53)
Process Easy (ref: Control)	-.03 (.55)	.38 (.60)	.39 (.73)	-.25 (.58)	2.07 (.75)*	.86 (.59)
Child Age	.87 (.31)*	.20 (.32)	.17 (.42)	.70 (.31)	.45 (.36)	.48 (.33)
Trial 1 Time	-.20 (.17)	-.06 (.17)	.13 (.24)	.11 (.16)	-.37 (.19)	.07 (.18)

* $p < .008$ (significance level after Bonferroni correction for 6 comparisons)

Discussion

We experimentally tested the effects of previously investigated person and process praise, as well as a novel kind of adult feedback – person and process easy feedback. We hypothesized that process praise and process-easy feedback would increase children’s self-evaluations and persistence after failure relative to the person praise and person-easy feedback. Surprisingly, we did not find that process praise increased children’s post-failure self-evaluations or persistence when compared to person praise, in contrast to prior work (Morris & Zentall, 2014; Mueller & Dweck, 1998). Furthermore, “easy” feedback did not influence children’s self-evaluation or persistence. However, we did find that children who received process praise demonstrated greater persistence after failure than children in the control condition, consistent with some prior work (e.g., Henderlong Corpus & Lepper, 2007; Mueller & Dweck, 1998). In exploratory analyses, we also found that older children were more persistent than younger ones, and that children who spent more time completing the first puzzle (a proxy for skill) had lower self-evaluations after failure. We discuss each of these findings in turn.

Effects of Person and Process Praise

Our study, despite using the same dependent measures as prior work, differed in design in several ways that might contribute to our different pattern of results with respect to the effects of person and process praise. First, we looked at an intermediate age group – 7–8-year-olds – compared to prior work that has investigated either younger (e.g., 4- to 6-year-olds; Cimpian et al., 2007; Kamins & Dweck, 1999; Morris & Zentall, 2014; Zentall & Morris, 2010) or older ages (e.g., 5th-graders, Mueller & Dweck, 1998). We selected this age group in part because research directly probing individual differences in children’s motivational beliefs (e.g.,

Gunderson et al., 2013) has used 7-8-year-olds as the lower bound (though see Muradoglu et al., 2022 for a new scale for 4- to 5-year olds). On a practical level, we initially piloted the study with 5-6-year olds and found they lacked the computer skills needed to solve puzzles on a computer in the Zoom format. We did find that the older children (e.g., closer to nine years old) in our sample were overall more persistent after failure than the younger children (e.g., closer to seven years old). Future work could explore whether there is developmental change in children’s reactions to success and failure within the early to middle childhood period and try to determine why.

Second, unlike most prior work, we used a real (rather than imaginary) task, and we did not use a pen-and-paper assessment that could be construed as a “test”. Most studies of children older than those in our study (e.g., 9- to 11-year-olds) have asked children to complete Raven’s Progressive Matrices or an Embedded Figures task in a group administration classroom setting (Koestner et al., 1989; Y. Li & Bates, 2019; Mueller & Dweck, 1998). While Mueller & Dweck (1998) found a significant effect of process praise versus person praise on children’s persistence and self-evaluations, Li & Bates (2019) and Koestner et al. (1989) did not, though Koestner et al. (1989) differed significantly in design because it lacked a failure experience.

For children younger than those in our study (e.g., preschool through 1st grade), many studies (Cimpian et al., 2007; Kamins & Dweck, 1999; Morris & Zentall, 2014) have asked children to imagine successes and failures at drawing pictures or doing other tasks (e.g., cleaning up after snack time) in a one-on-one setting. These studies found significant effects of process versus person praise on children’s post-failure self-evaluation and persistence. The exception is Henderlong Corpus and Lepper (2007), who asked 9- to 11-year-olds to solve as many real tangram puzzles as they could in two, 6-minute individual sessions. In the same study, 4- and 5-

year-olds completed a similar procedure, but the session time was shorter. Using this real, game-based task Henderlong Corpus and Lepper (2007) found that hearing any type of praise increased children’s persistence after failure, but did not find differences by praise type. This is somewhat similar to our findings that process praise improved persistence compared to a control (though in our study, persistence after person praise was directionally, but not significantly, higher than the control).

Our study is also unique in its real-world task design, in that children had direct experience with their success and failure, and we did not give pre-determined success and failure feedback (e.g., telling all children, “you got 60% of these correct”; Henderlong Corpus & Lepper, 2007). As a result, children’s success and failure experiences in our study differed from one another – children completed the success puzzles more or less quickly, and some children were a few pieces away from completing the failure puzzle while others had placed only one piece. We purposefully designed the study in this way because we thought it was important to test an ecologically valid success and failure experience, but it likely introduced more variability than prior designs. Future work could treat success and failure as a gradient (e.g., how close was a participant to finishing the task?) and see if this influences children’s interpretation of their performance and subsequent challenge-seeking and persistence. Compared to designs where children’s experience of failure was more homogenous, our design may have led to an underestimation of the effect of feedback. However, investigating these “messier” success and failure experiences could prove important for understanding what children do in real educational contexts where children must reason flexibly about effort and challenge.

Third, compared to other studies that experimentally manipulated praise after failure, we changed the dosage of success and failure. Although we intentionally kept the proportion of

success and failure the same as prior studies (two to one; Cimpian et al., 2007; Kamins & Dweck, 1999; Morris & Zentall, 2014) we reduced the overall number of successes (from four to two) and failures (from two to one). Other studies included one success and one failure experience, but those experiences were multi-item tests (e.g., Mueller & Dweck, 1998) or involved children solving multiple puzzles (Henderlong Corpus & Lepper, 2007). We made this change to limit the length of the study session to thirty minutes. However, it is possible that a single failure trial was insufficient for children to believe that they failed, or to believe that it was a “true” failure and not a fluke. Indeed, Kamins and Dweck (1999) cite this as the reason they included two failure trials in their study. It is possible that including only one failure experience weakened the impact of person praise on children’s post-failure self-evaluations, persistence, and challenge-seeking. Future work could directly test this hypothesis by parametrically manipulating the number of failure experiences prior to manipulating person and process feedback.

Fourth, our feedback was focused on completion outcome – “you did (did not) finish the puzzle” (similar to studies with younger children, e.g., Cimpian et al., 2007) – and did not include an evaluative component (e.g., “you did really well”, “that won’t get you a star”) like other prior work (e.g., Henderlong Corpus & Lepper, 2007; Morris & Zentall, 2014). The addition of an evaluative statement might compound the effect of praise on children’s responses after failure. Future work could test the hypothesis that explicit evaluation from an adult enhances the negative effects of person praise on children’s persistence. In addition to studying these effects individually, future research could help disentangle the effects of these four main design decisions on children’s persistence and self-evaluations, namely age, task type, failure dosage, and evaluative feedback embedded in praise statements. For example, few studies have

had younger children (4- to 6-year-olds) complete real tasks, and future work could investigate if young children have different self-evaluation and persistence reactions when they do a real, rather than imagined, task. Similarly, further investigation of how praise shapes older children’s (9- to 11-year-olds’) reactions could incorporate whether a task is interpreted in the framework of school-related assessment or if it is interpreted as a game-based task.

Effects of Person- and Process-Easy Feedback

Our primary goal in this study was to investigate the effect adults’ explicit messages about difficulty had on children’s challenge-seeking, persistence, and self-evaluations. Given that our preregistered analyses did not find that “easy” feedback, whether process- or person-focused, changed children’s challenge-seeking, is it worth it to continue doing research on this type of feedback? Given our unexpected findings about person and process praise, we think that future work is warranted, and could incorporate the design elements described above (more failure trials, adding evaluative statements, examining a wider age range, moving back to an in-person task context) to investigate the effects of “easy” talk on children’s motivation broadly. In addition, our exploratory analyses did reveal a more specific effect: children who heard process-easy feedback (“It must have been easy to rotate and fit those pieces together”) produced more strategies after failure than children in the control condition. This suggests that this type of feedback could direct children’s attention towards task features as a cause for success or failure.

Further, we examined “easy” talk because it allowed us to match the design and therefore extend on prior work investigating the effect of person and process praise on children’s challenge-seeking and persistence. Future work is needed to examine the impact that feedback about how (and why) tasks are “hard” has on children’s challenge-seeking and persistence (e.g., “It was really hard to build that tower,” e.g., Haimovitz & Dweck, 2016; Leonard et al., 2020).

For example, future work could test whether hearing person versus process “hard” feedback (“That must have been a hard puzzle for you” versus “It must have been hard to rotate and fit those pieces together”) after experiencing a failure might lead to different interpretations of that failure and different patterns of challenge-seeking and persistence afterwards. Prior work suggests that children are sensitive to adults’ statements about the relative difficulty of tasks (e.g., being for a grown-up or for a child; Leonard et al., 2020). However, Leonard and colleagues (2020) measured the amount of time that children persisted on a task after an adult’s difficulty statement together with the adult’s demonstrated persistence, both of which happened before children experienced struggle (Leonard et al., 2020). It is still an open question whether adults’ difficulty statements after a child struggles on a task influence their future challenge-seeking and persistence.

Effects of Age and Prior Skill

We also explored these results using a different modeling approach, which allowed us to control for a proxy for puzzle-solving skill (trial one time), age, and responses to individual persistence items. We found that older children were more persistent than younger ones, particularly in reporting a preference to do another hard puzzle (versus an easy one). Because we controlled for puzzle-solving skill, this finding points to a potential age-related difference in challenge-seeking and persistence after failure, over and above improvements in actual puzzle skill, among 7- to 8-year-olds. We also found that children who took longer on the first success trial – perhaps indicating lower puzzle skill coming into the study – showed lower self-evaluations after failure than those who finished the first trial faster. Combined with the lack of association between puzzle-solving skill and self-evaluation *before* failure, this provides

tentative evidence that experiences of failure could be more impactful for children who are already struggling.

Limitations and Future Directions

Our study has several limitations which could be addressed in future research. First, we pre-registered our study and determined our sample size based on effect sizes found in prior studies of the effect of adult praise on children’s persistence (e.g., Zentall & Morris, 2010). Although we were well-powered to detect the relatively large effect size found by this prior study (and several others: Morris & Zentall, 2014; Cimpian et al., 2007), we may have been limited in our ability to detect smaller effects. Future work could replicate our findings with a larger sample. We also note that our sample was US-based, predominantly White with high levels of parent education and income, which could limit the generalizability of our findings but is similar to the samples in many (but not all) prior experimental praise studies. This study was also conducted remotely on Zoom, which may have altered the experimental context compared to in-person studies, for example, by creating greater psychological distance between the experimenter and child.

In addition, a somewhat surprising take-away from our study is that the six items we used to measure children’s persistence and challenge-seeking did not correlate very strongly with one another. Prior research has treated these items as composites in analyses (as we did in our pre-registered, primary analyses), because we had expected these items to measure an integrated set of motivational beliefs relating to children’s attributions for failures, learning goals, ability to generate strategies, and task persistence. Future work should try to understand whether the low intercorrelations among these items reflects measurement error or indicates that children’s responses to failure are multi-dimensional. For example, it might be theoretically important to

disentangle whether these kinds of feedback have distinct effects on children’s choices to persist versus not (e.g., do another puzzle versus move to another task) or their task choices when they are required to continue doing the same kind of task. Specifically, in many classroom contexts, a child may not have the option to completely disengage from a task and select something else. Therefore, it might be particularly important to know what children do in these types of situations.

Further, we measured children’s challenge-seeking, persistence, and attributions using binary self-report items. Although this allowed us to replicate and extend prior work on praise using similar items (e.g., Cimpian et al., 2007; Zentall & Morris, 2010; Morris & Zentall, 2014), future research could use continuous measures to capture more fine-grained variability in children’s motivational responses. For example, some researchers have used time-based measures (Leonard et al., 2021; De Meester et al., 2024) to test the relationship between different kinds of adult behavior or messages, respectively, and children’s task persistence specifically. Future studies could ask whether adults’ praise and “easy” feedback impact a time-based persistence measure, such as giving a child a novel puzzle after failure and seeing how long they spend working on it.

Conclusion

We found that process praise increased children’s challenge-seeking and persistence after failure compared to a baseline of no praise, even with a previously unstudied age group (7- to 8-year-olds) and modality (online puzzle games). Unexpectedly, we did not find a negative effect of person praise on children’s challenge-seeking and persistence, and no effect of person- or process-focused “easy” feedback. These null results suggest that the effects of these types of feedback may be more fragile and context-dependent than the effect of process praise. Future

research should examine the experimental factors that we identified (including age, imagined versus real contexts, dosage of success and failure, completion feedback versus evaluative feedback, and measures of challenge-seeking) to tease apart the factors that influence children's persistence and challenge-seeking.

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Appendix

1. Appendix A: Coding Scheme for Child Strategy Question
2. Appendix B: Parent Measures and Results
3. Appendix C: Full Correlation Table of Child Measures
4. Appendix D: Additional Exploratory Analyses

Appendix A: Coding Scheme for Child Strategy Question

This coding scheme was adapted from Cimpian et al. (2007)

Code	Description	Examples
1	“mastery-oriented”: provides one or more solutions to the puzzle/not finishing the puzzle	<u>Ex 1</u> : “um if I got to work on it again, I would use the last two pieces and try to fit them together. The last three pieces. Um I would also try to move the pieces around a little bit to see if they fit better that way.” <u>Ex 2</u> : “Uh I, I don’t know, yeah/ I might try like to uh put like the big triangles in the legs.” <u>Ex 3</u> : “Try to be faster/ Just try to be faster.” <u>Ex 4</u> : “I’d try to put the pieces in different places.” <u>Ex 5</u> : “I want to do better next time.” <u>Ex 6</u> : “I’d finish it.”
0	“helpless”: all other responses	<u>Ex 1</u> : “I don’t know.” <u>Ex 2</u> : “Uhh I’m not sure/Maybe uh yeah maybe. I’m not sure.” <u>Ex 3</u> : “Um I don’t know, yeah I’m not sure/ Maybe like a harder harder puzzle.”*

*Note, for this example, if a child gives a response that includes switching to another task, then this will be coded as a 0.

Appendix B: Parent Methods and Results

Parent Methods

Participants

Our analytic sample included the parents of the 150 7- and 8-year-olds who completed the study. Thirteen parents in the analytic sample were missing one item across all the parent measures, one parent missed two items; data from these parents were calculated based on the available items. Almost all parents completing the survey were women (95%), 3% were men, and 2% were agender or non-binary. Eighty seven percent of parents identified as White, 3% of parents identified as Black, 7% of parents identified as Asian or Asian American, and 3% of parents identified as multi-racial. Three percent of parents were Hispanic.

Parent Measures

Measures

Dimensions of Mastery Questionnaire (DMQ). Parents completed the Persistence on Cognitive Tasks (9 items, $\alpha = .85$) and Negative Reactions to Failure (5 items, $\alpha = .79$) subscales of the Dimensions of Mastery Questionnaire (Morgan et al., 2019). Parent reported on a scale from 1 (not at all typical of my child) to 6 (very typical of my child) how their child engaged in persistence-related behaviors and responded negatively to failure. We calculated a mean score for each subscale, so that a higher score indicated that the child showed greater persistence on cognitive tasks and a more negative reactions to failure, respectively.

Strategy and Attribution Questionnaire (SAQ). Parents also reported their beliefs about their own mastery orientation, their expectations for success and anxiety about failure, and behavior that prevented them from achieving their goals (Aunola et al., 1999). Parents reported on a scale from 1 (strongly disagree) to 6 (strongly agree) how much they agreed with 15

statements such as “When I get ready to start a task, I am usually certain that I will succeed in it” or “I do not have the means to affect the way my life goes” (reverse-coded). Consistent with prior research (Aunola et al., 1999), we created a single mean score across all items, where higher scores represent greater parent mastery orientation ($\alpha = .82$).

Theories of Intelligence (TOI). Parents completed a three-item version of Dweck’s Theory of Intelligence questionnaire (Blackwell et al., 2007), which assessed parents’ beliefs about the fixedness of ability. Parents responded on a scale from 1 (strongly disagree) to 6 (strongly agree) to statements such as “You have a certain amount of intelligence, and you can’t really do much to change it.” We reverse-coded all items so that a higher score represented a more growth (relative to fixed) mindset. Items were then averaged to form a mean score ($\alpha = .93$).

Failure Mindsets (FM). Parents completed a six-item scale assessing their belief in failure as an “enhancing” experience that promotes learning or as a “debilitating” experience that should be avoided (Haimovitz & Dweck, 2016). Parents responded on a scale from 1 (strongly disagree) to 6 (strongly agree) how much they agreed with statements such as “The effects of failure are positive and should be utilized.” Three items were reverse-coded, so that higher scores represent a more failure-as-enhancing mindset. We then averaged all items to form an overall score ($\alpha = .82$).

Parent Results

Preliminary Analyses

Means and standard deviations for parent variables, overall and within condition, are reported in Table B1. Correlations between parent variables are shown in Table B2.

Pre-Registered Exploratory Analyses

We pre-registered several exploratory questions involving parents’ beliefs. Specifically, we examined whether, controlling for condition, parents with more incremental mindsets, failure-as-enhancing mindsets, and greater mastery motivation would have children with higher post-failure self-evaluations and greater persistence. We also asked whether, controlling for condition, parents’ reports of their child’s cognitive persistence would be positively associated with the child’s post-failure self-evaluations and persistence, and whether parents’ reports of their child’s negative reactions to failure would be negatively associated with these child outcomes. We addressed these questions using five generalized linear models with children’s self-evaluation score as the dependent variable (Table B3) and five generalized linear models with children’s average persistence score as the dependent variable (Table B4), with each parent measure as an independent variable and condition dummy-coded. We found that none of the parent measures were associated with children’s self-evaluation nor persistence ($ps > .05$).

Parent Discussion

Parent reports of their child’s cognitive persistence and their child’s negative reactions to failure were not significantly related to children’s actual persistence after failure. If our behavioral measures of children’s persistence are meaningful, this means that the parents in our sample were not very accurate in their assessment of what their child would do when faced with a challenging situation. Prior work on parents’ beliefs about their child’s competence suggests that this inaccuracy may not be surprising (Miller, 1988). However, a mismatch between parent expectations and children’s actual reactions to failure could have consequences – for example, parents may not provide optimal feedback when their child experiences struggle, or parents may believe that they are communicating a particular mindset but are not. Of course, our design does not allow us to make a causal claim about the relation between parent beliefs and child behavior.

A strength of our study is that we assessed parent beliefs and examined children’s behavior after experimentally manipulated feedback in the same sample, which has not often been done. The simultaneous design allowed us to look at a relation between parents’ own beliefs – about their own mastery orientation, their growth mindset, and their failure mindset – and children’s actual behavior, controlling for the experimental condition children were assigned. However, we did not find any of the hypothesized relations between parent beliefs and child behaviors, adding to mixed findings in the literature on the relation(s) between parent motivational beliefs and their children’s challenge-seeking (Gunderson et al., 2013; Haimovitz & Dweck, 2016; K. Li et al., 2023).

One limitation to findings is that most parents who participated were women. We did not attempt to control for which parent participated, but in future work it would be interesting to know if we’d find the same relations (or lack thereof) between non-mother parent beliefs and child behavior. Some prior work shows differences in parent beliefs about child competence depending on parent gender, but others do not (Miller, 1988).

Table B1*Means and Standard Deviations for Parent Variables*

	All Participants (n =150)	Person Praise (n=30)	Process Praise (n=30)	Person Easy (n=30)	Process Easy (n=30)	Control (n=30)
Variables	<i>M (SD)</i>	<i>M (SD)</i>	<i>M (SD)</i>	<i>M (SD)</i>	<i>M (SD)</i>	<i>M (SD)</i>
DMQ: Cognitive Persistence Subscale	4.00 (.91)	4.16 (.92)	4.07 (.83)	3.79 (.81)	4.21 (.97)	3.80 (.98)
DMQ: Negative Reactions to Failure Subscale	3.82 (1.08)	3.80 (1.03)	3.59 (1.10)	4.11 (.95)	3.71 (1.28)	3.89 (1.04)
Strategy and Attribution Questionnaire	4.85 (.59)	4.81 (.64)	4.90 (.59)	4.82 (.52)	4.77 (.69)	4.92 (.51)
Theories of Intelligence	4.48 (1.28)	4.34 (1.50)	4.56 (1.09)	4.58 (1.37)	4.27 (1.25)	4.64 (1.21)
Failure Mindset	4.64 (.85)	4.98 (.73)	4.71 (.74)	4.23 (.78)	4.59 (1.05)	4.71 (.80)

Note. FM – Failure Mindset Questionnaire, TOI - Theories of Intelligence Questionnaire, SAQ – Strategies and Attribution Questionnaire, DMQ – Dimensions of Mastery Questionnaire.

Table B2*Correlations Among All Study Variables Including Parent Measures*

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
1. Child Age										
2. Child Gender (girl=0, boy=1)	.07									
3. T1 Time	-.20*	-.15								
4. Pre-Failure Self Evaluation	-.09	.04	-.04							
5. Post-Failure Self Evaluation	.10	.01	-.22**	.27***						
6. Persistence	.25**	-.02	-.10	.10	.42***					
7. Parent DMQ – Cognitive Persistence	.02	.10	-.08	.00	-.03	.11				
8. Parent DMQ – Negative Reactions to Failure	-.12	-.08	.00	-.01	.00	-.07	-.50***			
9. Parent SAQ	.00	-.14	.05	.08	-.01	.12	.12	-.22**		
10. Parent TOI	-.13	-.24**	.01	.07	-.12	-.04	.08	-.10	.23**	
11. Parent Failure Mindsets	-.12	.03	-.01	.11	.05	.10	.14	-.25**	.40***	.16

* $p < .05$, ** $p < .01$, *** $p < .001$, FM – Failure Mindset Questionnaire, TOI - Theories of Intelligence Questionnaire, SAQ – Strategies and Attribution Questionnaire, DMQ – Dimensions of Mastery Questionnaire. For Child Gender only, we used data from $n=148$ participants who identified as either boys or girls.

Table B3*Generalized Linear Models with Parent Measures Predicting Child Post-Failure Self-Evaluations*

Variable	Post-Failure Self-Evaluation				
	Model 1	Model 2	Model 3	Model 4	Model 5
	<i>B (SE)</i>				
Parent DMQ – Cognitive Persistence	-.04 (.11)				
Parent DMQ – Negative Reactions to Failure		-.00 (.11)			
Parent Strategy and Attribution Questionnaire			-.03 (.16)		
Parent Theory of Intelligence				-.11 (.07)	
Parent Failure Mindset					.03 (.12)
Person Praise (ref: Control)	-.02 (.30)	-.03 (.30)	-.04 (.30)	-.07 (.30)	-.04 (.30)
Process Praise (ref: Control)	-.31 (.30)	-.32 (.30)	-.32 (.30)	-.33 (.30)	-.32 (.30)
Person Easy (ref: Control)	-.40 (.30)	-.40 (.30)	-.40 (.30)	-.41 (.30)	-.39 (.30)
Process Easy (ref: Control)	-.25 (.30)	-.27 (.30)	-.27 (.30)	-.31 (.30)	-.26 (.30)

* $p < .05$, ** $p < .01$, *** $p < .001$, FM – Failure Mindset Questionnaire, TOI - Theories of Intelligence Questionnaire, SAQ – Strategies and Attribution Questionnaire, DMQ – Dimensions of Mastery Questionnaire.

Table B4*Generalized Linear Models with Parent Measures Predicting Child Persistence*

	Persistence				
Variable	Model 1	Model 2	Model 3	Model 4	Model 5
	<i>B (SE)</i>				
Parent DMQ – Cognitive Persistence	.02 (.02)				
Parent DMQ – Negative Reactions to Failure		-.01 (.02)			
Parent Strategy and Attribution Questionnaire			.05 (.03)		
Parent Theory of Intelligence				-.01 (.01)	
Parent Failure Mindset					.03 (.02)
Person Praise (ref: Control)	.08 (.06)	.09 (.06)	.09 (.06)	.09 (.06)	.08 (.06)
Process Praise (ref: Control)	.13 (.06)*	.13 (.06)*	.14 (.06)*	.14 (.06)*	.14(.06)*
Person Easy (ref: Control)	.06 (.06)	.06 (.06)	.06 (.06)	.06 (.06)	.07 (.06)
Process Easy (ref: Control)	.09 (.06)	.09 (.06)	.10 (.06)	.09 (.06)	.10 (.06)

* $p < .05$, ** $p < .01$, *** $p < .001$, FM – Failure Mindset Questionnaire, TOI - Theories of Intelligence Questionnaire, SAQ – Strategies and Attribution Questionnaire, DMQ – Dimensions of Mastery Questionnaire.

Table C1

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.
Pre-Failure Self-Evaluation Items														
1. Pre-Failure Liking														
2. Pre-Failure Feeling	.44***													
3. Pre-Failure Competence	.34***	.37***												
4. . Pre-Failure Self Evaluation (composite)	.78	.77***	.75***											
Persistence Items														
5. Puzzle Choice	.09	-.12	-.05	-.03										
6. Later Task	.09	.19*	.14	.18*	.18*									
7. Attribution 1	-.11	-.13	.09	-.07	.05	-.01								
8. Attribution 2	.05	.02	.12	.09	.11	-.06	.14							
9. Strategy	.10	.12	-.08	.06	.19*	-.01	-.03	.07						
10. Hard Puzzle Again	.07	.02	-.01	.04	.41***	.20*	.17*	-.04	.24**					
11. Persistence (6-item composite)	.11	.04	.07	.10	.67***	.44***	.37***	.42***	.48***	.65***				
Post-Failure Self-Evaluation Items.														

12. Post-Failure Liking	.21**	.14	.11	.20*	.40***	.20*	.09	.11	.17*	.33***	.44***			
13. Post-Failure Feeling	.19*	.17*	.06	.18*	.36***	-.02	.01	.04	.14	.10	.22**	.55***		
14. Post-Failure Competence	.27**	.15	.22**	.28**	.22**	.02	.20*	.25**	.16	.20*	.35***	.46***	.34***	
15. Post-Failure Self Evaluation (composite)	.28**	.19*	.16*	.27**	.42***	.09	.13	.16*	.20*	.27**	.42***	.85***	.78***	.75***

Note. * $p < .05$, ** $p < .01$, *** $p < .001$.

Appendix D: Additional Exploratory Analyses

Composite Persistence Score Excluding Self-Evaluation Items

Although we pre-registered creating a composite “persistence” score using all six post-failure items, we recognize that several recent studies with similar design (Cimpian et al., 2007; Zentall & Morris, 2010; Morris & Zentall, 2014) did not include attribution questions in their composite scores. To determine whether our findings differed from prior work due to our inclusion of these items, we re-ran our primary and exploratory analyses with a composite persistence score composed of only four items (removing the two attribution items). We found the same pattern of responses as we did with the six-item composite. Persistence did not differ significantly between children in the process and person praise conditions ($t(58) = -1.31, p = .197, d = -.34$), or between the process and person easy condition ($t(58) = -1.10, p = .278, d = -.28$). The one-way ANOVA did not yield a significant difference in persistence across the conditions ($F(4,145) = 1.59, p = .180, \eta^2 = .04$). We again found that children in the process praise condition showed more persistence than children in the control condition ($t(58) = -2.39, p = .020, d = -.62$). However, no other condition differences were significant $ps > .05$).

Analyses with 2 (Content: Person vs. Process) x 2 (Type: Praise vs. Easy) ANOVAs

To further consider whether there were condition differences in children’s post-failure self-evaluation and persistence, we ran two one-way ANOVAs with feedback content (“person” versus “process”) and feedback type (“praise” versus “easy”) and an interaction of content and type predicting self-evaluation and persistence. Content did not significantly predict children’s post-failure self-evaluation ($F(1, 116) = .14, p = .714, \eta^2 = .00$) nor children’s persistence ($F(1, 116) = .98, p = .324, \eta^2 = .01$). Type also did not significantly predict children’s post-failure self-evaluation ($F(1, 116) = .54, p = .464, \eta^2 = .00$) or persistence ($F(1, 116) = .74, p = .393, \eta^2 =$

.01). The interaction of content by type was also not significant (post-failure self-evaluation: $F(1, 116) = 1.00, p = .320, \eta^2 = .01$); persistence: $F(1, 116) = .01, p = .906, \eta^2 = .00$).

Pre-Failure and Post-Failure Self-Evaluations

Finally, we investigated whether children’s self-evaluations differed when they had received feedback after success (but before failure) versus after their failure experience, and if this relationship varied by condition. We ran a linear mixed effects model with self-evaluation items as the DV, time as a within-subjects factor, condition as a between-subjects factor, and a time x condition interaction. The model included a random effect of participant. There was a significant main effect of time, with children having lower self-evaluations after failure compared to before failure ($X^2(1, n = 150) = 312.38, p < .001$). There was not a significant main effect of condition ($X^2(4, n = 150) = 4.26, p = .372$), nor was there a significant time x condition interaction ($X^2(4, n = 150) = 1.30, p = .861$).

Table D1*Logistic Regression Models with Children’s Pre- and Post-Failure Self-Evaluation Items as Outcomes*

	Pre-Failure Liking	Pre-Failure Feeling	Pre-Failure Competence	Post-Failure Liking	Post-Failure Feeling	Post-Failure Competence
Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
	<i>B (SE)</i>					
Person Praise (ref: Control)	-.15 (.26)	.48 (.24)	-.07 (.26)	.12 (.39)	-.51 (.35)	.10 (.36)
Process Praise (ref: Control)	-.19 (.26)	.23 (.24)	-.31 (.26)	-.35 (.39)	-.33 (.35)	-.43 (.36)
Person Easy (ref: Control)	-.23 (.26)	.03 (.24)	-.40 (.26)	-.34 (.39)	-.52 (.35)	-.41 (.36)
Process Easy (ref: Control)	-.04 (.27)	.00 (.24)	-.43 (.27)	-.10 (.40)	-.15 (.36)	-.06 (.37)
Child Age	-.08 (.15)	-.23 (.13)	-.08 (.15)	.28 (.22)	.07 (.20)	-.01 (.20)
Trial 1 Time	-.12 (.08)	.10 (.07)	-.05 (.08)	-.24 (.12)	-.29 (.10)*	-.14 (.11)

* $p < .008$ (significance level after Bonferroni correction for 6 comparisons).