Journal of Experimental Child Psychology 173 (2018) 116–135

Contents lists available at ScienceDirect

Journal of Experimental Child Psychology

journal homepage: www.elsevier.com/locate/jecp

The specificity of parenting effects: Differential relations of parent praise and criticism to children's theories of intelligence and learning goals

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ARTICLE INFO

Article history:
Received 29 September 2017
Revised 8 February 2018

Keywords:
Theories of intelligence
Learning goals
Parent praise
Parent criticism
Feedback
Parenting

ABSTRACT

Individuals who believe that intelligence can be improved with effort (an *incremental theory of intelligence*) and who approach challenges with the goal of improving their understanding (a *learning goal*) tend to have higher academic achievement. Furthermore, parent praise is associated with children's incremental theories and learning goals. However, the influences of parental criticism, as well as different forms of praise and criticism (e.g., process vs. person), have received less attention. We examine these associations by analyzing two existing datasets (Study 1: $N = 317$ first to eighth graders; Study 2: $N = 282$ fifth and eighth graders). In both studies, older children held more incremental theories of intelligence, but lower learning goals, than younger children. Unexpectedly, the relation between theories of intelligence and learning goals was nonsignificant and did not vary with children's grade level. In both studies, overall perceived parent praise positively related to children's learning goals, whereas perceived parent criticism negatively related to incremental theories of intelligence. In Study 2, perceived parent *process praise* was the only significant (positive) predictor of children's learning goals, whereas perceived parent *person criticism* was the only significant (negative) predictor of incremental theories of intelligence. Finally, Study 2 provided some

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https://doi.org/10.1016/j.jecp.2018.03.015

support for our hypothesis that age-related differences in perceived parent praise and criticism can explain age-related differences in children's learning goals. Results suggest that incremental theories of intelligence and learning goals might not be strongly related during childhood and that perceived parent praise and criticism have important, but distinct, relations with each motivational construct.

Introduction

Beliefs about intelligence and goal orientations related to academic performance are thought to form coherent "motivational frameworks" that influence academic success (e.g., Dweck & Leggett, 1988; Gunderson et al., 2013; Gunderson, Sorhagen, et al., 2018). Implicit *theories of intelligence* (Dweck, 2006) fall onto a spectrum ranging from a strong belief that intelligence is fixed and unchangeable (an *entity theory*) to a strong belief that intelligence is malleable and can be improved with effort (an *incremental theory*). Incremental theories of intelligence lead to more adaptive approaches to academics, including persistence in the face of challenges, enjoyment of difficult tasks, and higher grades in school (e.g., Aronson, Fried, & Good, 2002; Blackwell, Trzesniewski, & Dweck, 2007; Yeager et al., 2016). Entity theories, on the other hand, are associated with maladaptive responses, including avoiding challenging tasks and lying to inflate one's score on a test (Mueller & Dweck, 1998). Similarly, goal orientation theory has identified two major motivational goals that students adopt: *learning goals,* which focus on improving mastery and competence (often for intrinsic enjoyment), and *performance goals,* which focus on proving competence to others and avoiding the appearance of having low ability (e.g., E. Anderman & Midgley, 1997; Elliott & Dweck, 1988; Nicholls, 1984). Learning goals lead to higher intrinsic motivation, persistence after failure, and higher academic achievement (e.g., Elliott & Dweck, 1988; Grant & Dweck, 2003). In contrast, performance goals lead to lower intrinsic motivation, lower self-worth and less effort after failure, and ultimately lower academic achievement.

Traditionally, researchers have argued that incremental theories of intelligence lead to learning goals (e.g., Blackwell et al., 2007; Dweck & Leggett, 1988), but some studies have raised questions about whether this is true for young children (Pomerantz & Saxon, 2001). In the current studies, we investigated age differences in theories of intelligence and learning goals as well as perceived parent praise and criticism among first to eighth graders with three overarching goals: (a) to understand age-related differences in incremental theories of intelligence and learning goals and their relation to each other, (b) to investigate how each construct is related to parents' praise and criticism, and (c) to determine whether age-related differences in parent praise and criticism can help to explain age-related differences in theories of intelligence and learning goals. Understanding how praise and criticism are associated with young children's academic motivation has substantial practical implications for parents and other caregivers who seek to provide academic feedback that will enhance children's motivation and achievement.

Our approach draws on multiple theoretical perspectives on motivation, including Dweck and colleagues' social-cognitive theory of motivation integrated with attribution theory (Dweck & Leggett, 1988; Hong, Chiu, Dweck, Lin, & Wan, 1999) and cognitive evaluation theory (a subtheory of self-determination theory; Deci & Ryan, 1980). We also draw on expectancy-value theory, especially when considering parents as socializers (Wigfield & Eccles, 2000). All three theoretical perspectives have substantial empirical support. Thus, we made our specific predictions in cases when these theories and prior research align, as described below. In cases where these theories are in tension with one another, or do not make clear predictions, we present exploratory hypotheses that rely on additional assumptions.

Age differences in theories of intelligence

A substantial body of research on age differences in conceptions of intelligence has concluded that older children are more likely than younger children to view intelligence as stable over time and situations (for a review, see Stipek & Mac Iver, 1989). However, the belief that intelligence is stable over time and situations is distinct from the belief that intelligence is internally controllable (Pomerantz & Saxon, 2001). In a cross-sequential study of fourth to sixth graders, older children were more likely than younger children to view intelligence as internally controllable, that is, to hold an incremental theory of intelligence (Pomerantz & Saxon, 2001). Pomerantz and Saxon (2001) theorized that the age-related increase in the belief that intelligence is controllable stems from children's experiences and that as most children transition through elementary school, they increasingly acquire evidence that their ability is contingent on their own actions. An alternative explanation, which we return to in the Discussion, is that this increase reflects a more general reduction in essentialism and categorical rigidity with age (Heyman & Gelman, 2000).

Indeed, although there are few studies focusing on age-related differences in entity and incremental theories of intelligence (i.e., degree of internal controllability of intelligence), and most involve restricted age ranges, they typically find age-related increases in incremental theories in the first- to eighth-grade range. For example, one study found that fifth and sixth graders had higher levels of incremental theories than first and second graders (Gunderson, Hamdan, Sorhagen, & D'Esterre, 2017). Others showed that entity beliefs declined from third grade to sixth grade (Haimovitz, Wormington, & Corpus, 2011; Pomerantz & Saxon, 2001; Stipek & Gralinski, 1996) and incremental theories increased from fifth grade to sixth grade (Gonida, Kiosseoglou, & Leondari, 2006). To our knowledge, the current studies are the first to examine age differences in theories of intelligence from first grade to eighth grade using a consistent method across ages. Based on previous research, we predicted that theories of intelligence would become more incremental across this age range.

Age differences in learning goals

If learning goals are part of the same motivational framework as incremental theories of intelligence, we might expect to find similar age-related differences, that is, that older students have higher learning goals. However, theoretical considerations and empirical evidence suggest that learning goals decline across elementary and middle school. Expectancy-value theory has identified age-related differences in children's school environments (e.g., a stronger focus on performance at older ages) that lead to a reduction in intrinsic motivation and self-concept over time (Eccles, Midgley, & Adler, 1984). Supporting this, a large body of work reports that learning goals decrease with age starting in late elementary school and beyond (e.g., L. Anderman & Anderman, 1999; Gonida & Cortina, 2014; Midgley, Anderman, & Hicks, 1995).

However, it is less clear whether this decline in learning goals begins at the transition to middle school or earlier. We suggest that this decline should depend on when the school (and possibly home) environment begins to emphasize performance. Accordingly, we predict that it will occur gradually across the elementary and middle school years and may be reflected in the home environment, as well as the school environment, as parents begin to focus more on their children's academic performance and become more critical. A reduction in praise and an increase in criticism from parents and teachers may reduce children's learning goals over time, especially at the transition from late elementary to middle school. Although evidence specifically examining age differences in learning goals is sparse in early elementary school, academic motivation and optimism decline over the course of elementary school (Freedman-Doan et al., 2000; Jacobs, Lanza, Osgood, Eccles, & Wigfield, 2002). Based on these theoretical and empirical considerations, our second main hypothesis was that older children will have lower learning goals than younger children.

Relation between theories of intelligence and learning goals

According to Dweck and colleagues' attribution/social-cognitive theory of motivation, theories of intelligence form the conceptual framework through which individuals interpret achievement-

related events; individuals' achievement-related emotions, attributions, goals, and behaviors flow from this conceptual framework (Dweck & Leggett, 1988; Elliott & Dweck, 1988). In this model, incremental theories of intelligence lead directly to learning goals, and correlational studies (e.g., Blackwell et al., 2007; Robins & Pals, 2002), a meta-analysis (meta-analytic correlation = .19) (Burnette, O'Boyle, VanEpps, Pollack, & Finkel, 2013), and experimental evidence (Dinger & Dickhäuser, 2013) support this prediction. However, the limited findings in children are inconsistent; one study found the expected correlation among second and third graders (Schwinger, Steinmayr, & Spinath, 2016), but a longitudinal study with fourth to sixth graders found that higher learning goals predicted lower entity theories over time, not the other way around as has been found in adults (Pomerantz & Saxon, 2001).

Given the mixed evidence, we conducted an exploratory analysis with the expectation that the relation between incremental theories and learning goals would be stronger at older ages than at younger ages. Students' conceptions of academic performance might not yet be stable in first and second grades when children first enter formal schooling (Eccles et al., 1984; Wigfield et al., 1997). With each additional year, students have more opportunities to integrate information about their performance, effort, and ability from their experiences and from socializers, including parents, teachers, and peers (Eccles et al., 1984). Relatedly, prior work based on expectancy-value theory has found that components of motivation (competency beliefs, task values, and interest) are more strongly interrelated in late elementary school than in early elementary school (Wigfield et al., 1997).

Parent praise and criticism

Expectancy-value theory emphasizes that parents are important socializers whose attitudes and behaviors are consistently related to their children's motivation (e.g., Frome & Eccles, 1998). Indeed, substantial evidence shows that parents' expectations and beliefs about their children's success affect children's motivation and achievement (Wigfield et al., 2015). However, this research has not typically focused on specific parental behaviors such as praise and criticism. Here, we drew on two theoretical perspectives that focus on praise and criticism and integrated and extended these models to make predictions about the role of parents' praise and criticism in children's motivation.

Praise

First, according to cognitive evaluation theory (CET), the needs for self-determination and competence lead to intrinsic motivation; furthermore, positive feedback (praise) in a context of self-determination always leads to higher intrinsic motivation (Deci & Ryan, 1980). Learning goals and intrinsic motivation are deeply related in that both involve the desire to learn for its own sake (Grant & Dweck, 2003; Schwinger et al., 2016), and we believe that CET's predictions about intrinsic motivation can be extended to learning goals. In most contexts, CET predicts positive effects of praise on intrinsic motivation and, by extension, learning goals (Cameron, Banko, & Pierce, 2001; Henderlong & Lepper, 2002; Kelley, Brownell, & Campbell, 2000; Schwinger et al., 2016).

Second, according to attribution/social-cognitive theory of motivation (Hong et al., 1999), different types of praise communicate different success attributions and values that directly affect children's theories of intelligence. Specifically, process praise, which attributes success to effort (e.g., "You must have worked hard at these problems") or directly praises a child's effort, actions, or strategies (e.g., "You did a good job drawing"), leads students to adopt the belief that their effort can change their ability (an incremental theory) and to adopt stronger learning goals; experimental and longitudinal studies support these effects (Cimpian, Arce, Markman, & Dweck, 2007; Gunderson et al., 2013; Mueller & Dweck, 1998; Zentall & Morris, 2010). In contrast, person praise (praise that attributes success to a fixed trait [e.g., "You must be smart at these problems"] or uses generic language to label a child as having a positive trait [e.g., "You are a good drawer"]) encourages children to view their intelligence as fixed and uncontrollable (an entity theory) (Cimpian et al., 2007; Mueller & Dweck, 1998; Pomerantz & Kempner, 2013; Zentall & Morris, 2010).

Using these theories and empirical findings, we made predictions about the effects of parent praise. Both CET and attribution/social-cognitive theory are aligned in strongly predicting positive effects of process praise on learning goals and incremental theories (Gunderson et al., 2013), and we expected to

find these relations in the current studies. For person praise, however, the prediction was not so straightforward. Attribution/social-cognitive theory predicts negative effects of person praise on incremental theories and learning goals in some contexts (i.e., after failure) but positive or neutral effects in others (i.e., after success). CET suggests that any kind of praise—including person praise—can increase intrinsic motivation (and thus, we expect, learning goals) if it is provided in a self-determined context. Given the potentially conflicting effects of person praise in different situations and on different motivational processes, we did not expect a strong association between parents' person praise and learning goals or incremental theories.

Next, we considered the effects of overall amount of praise on children's theories of intelligence. According to attribution/social-cognitive theory, the impact of praise on theories of intelligence depends on the type of praise. In the real world, children receive a mix of person and process praise from their parents (Gunderson et al., 2013). Thus, our exploratory hypothesis was that the positive effects of person praise may counteract the negative effects of process praise, thereby generating a weak (or no) overall association between praise and children's theories of intelligence. Consistent with this, parents' overall amount of praise to their toddlers in an observational study was unrelated to children's motivational frameworks 5 years later (Gunderson et al., 2013).

Finally, we considered the effects of overall praise on learning goals. As noted previously, CET predicts positive effects of praise on learning goals, and attribution/social-cognitive theory also predicts positive effects of praise on learning goals in most situations (with only one exception—situations in which person praise is followed by a failure experience) (Mueller & Dweck, 1998). We suspect that situations in which person praise is followed by failure are likely a small portion of overall praise contexts, especially during elementary school (Pomerantz & Kempner, 2013). Thus, our exploratory hypothesis was that we will find an overall positive relation between parent praise and children's learning goals.

Criticism

The impact of criticism has received much less attention than that of praise. In fact, the association between parents' criticism and children's theories of intelligence and learning goals has never, to our knowledge, been tested. Nevertheless, we can again derive predictions from the literature. According to CET, negative feedback (criticism) leads to lower feelings of self-determined competence and, therefore, lower intrinsic motivation (and, by extension, lower learning goals and possibly more entity-oriented theories of intelligence) (Deci & Ryan, 1980). Consistent with this, parents' criticism predicted high school students' concern over mistakes and higher performance avoidance goals (Madjar, Voltsis, & Weinstock, 2015).

According to attribution/social-cognitive theory, criticism that attributes failure to lack of ability (person criticism) should be especially problematic because it encourages a maladaptive entity theory of intelligence. In contrast, process criticism, which attributes failure to lack of effort, may lead to more incremental theories. Consistent with this, after an experimenter gave 5- and 6-year-olds person-based criticism (e.g., "I'm very disappointed in you"), children showed substantially lower persistence and more negative affect—behaviors associated with a fixed theory of intelligence—than after process-based criticism (although this was not compared with no criticism) (Kamins & Dweck, 1999). Based on this alignment of multiple theories and evidence, one of our main hypotheses was that person criticism will relate to lower incremental theories of intelligence.

When considering the impact of overall criticism, we see that CET predicts that all forms of criticism should negatively affect motivation (especially learning goals, but possibly extending to theories of intelligence as well). Attribution theory predicts especially negative effects of person criticism on incremental theories but less negative (or possibly positive) effects of process criticism on incremental theories. We speculated that process criticism may be a small percentage of overall criticism in parent–child interactions and, therefore, presented a tentative hypothesis that overall parent criticism will negatively relate to both learning goals and incremental theories.

Mediation of age-related differences

In addition to exploring whether parents' praise and criticism affect individual differences in children's theories of intelligence and learning goals, we also asked whether age-related differences in

learning goals or theories of intelligence could be explained by age-related differences in parents' praise and criticism. To our knowledge, few studies have examined differences in parents' praise and criticism based on children's age. As noted previously, expectancy-value theorists have argued that school environments become more performance oriented at older ages (Eccles et al., 1984) and that children's perceptions of their parents as holding performance goals increase over the transition to middle school (Friedel, Cortina, Turner, & Midgley, 2010). We speculated that as parents receive increasingly realistic (sometimes negative) feedback from teachers about their children's academic performance, they may react with more criticism (and less praise) out of displeasure and/or in an effort to encourage their children to work harder. Thus, a major and unique prediction of the current research was that lower parent praise and higher parent criticism among older students than among younger ones can help to explain lower learning goals among older students. However, given that we expected theories of intelligence to be more incremental among older students than among younger ones (the opposite of our expectation for learning goals), we did not expect age-related differences in parent praise and criticism to explain age-related differences in theories of intelligence.

The current research

The current research aimed to elucidate age differences in incremental theories of intelligence and learning goals over a broad age range. We also examined parent praise and criticism as a potential source of both *individual differences* and *age-related differences* in these two motivational constructs. We examined the relations of each motivational construct to overall perceived parent praise and criticism as well as to person and process praise and criticism.

We adopted a secondary data analysis approach with two existing cross-sectional datasets. Each dataset contains measures of all relevant variables (child theories of intelligence, child learning goals, perceived parent praise, and perceived parent criticism) among children in the target age range (Study 1: first to eighth graders; Study 2: fifth and eighth graders). We note that Study 1 included only items assessing parents' overall praise and criticism, whereas Study 2 included items assessing ability (person) and effort (process) praise and criticism. Therefore, our main hypotheses relating to specific types of praise and criticism could be tested only in Study 2.

Each study used children's reports of their parents' praise and criticism. Prior research has shown that children's reports of their parents' behaviors are better predictors than parents' self-reports of children's outcomes on a variety of measures (e.g., Barry, Frick, & Grafeman, 2008; Haines, Neumark-Sztainer, Hannan, & Robinson-O'Brien, 2008). The datasets were collected during 1997 to 1999, prior to the broad public dissemination of research on theories of intelligence. This is beneficial in avoiding response biases associated with children's or parents' knowledge of research in this area; we discuss potential limitations in the Discussion.

To summarize, we tested four main hypotheses and four exploratory hypotheses derived from theory and prior research. The four main hypotheses were as follows:

1. Theories of intelligence will be more incremental and learning goals will be lower among older students than among younger ones.
2. Parent process praise will positively relate to both learning goals and incremental theories of intelligence.
3. Parent person criticism will negatively relate to incremental theories of intelligence.
4. Lower parent process praise and higher parent person criticism among older students than among younger ones will partially account for lower learning goals among older students.

The four exploratory hypotheses were as follows:

5. There will be a positive relation between incremental theories of intelligence and learning goals that is weaker among younger students and stronger among older students.
6. Overall parent praise will positively relate to children's learning goals.
7. Overall parent criticism will negatively relate to both learning goals and incremental theories of intelligence.

8. Lower parent overall praise and higher parent overall criticism among older students than among younger ones will partially account for lower learning goals among older students.

Study 1

Method

Participants

Participants were first to eighth graders (N = 317; M_{age} = 10.66 years, SD = 2.44; 177 girls) drawn from 31 classrooms at one school in a suburban area of Northern California in the western United States (see Appendix Table B1 for details by grade level).

Procedure

All students who received signed parental consent were invited to participate. Children completed all measures in a one-on-one session as part of a larger study of socioemotional development and achievement during the 1997–1998 school year (Robins, Hendin, & Trzesniewski, 2001). Children completed the questions on a laptop with headphones while an animated wizard read each item. Items were intermixed across scales and presented in a single order. There was missing data only on the measure of perceived parent criticism (n = 4 missing). Path analyses were conducted using Mplus 7.11 (Muthén & Muthén, 1998–2012).

Measures

All items are listed in Appendix A.

Incremental theories of intelligence were assessed using three items on a scale from 1 (*not at all true*) to 5 (*very true*) adapted from Dweck, Chiu, and Hong (1995). Reliability was ω = .68 (Dunn, Baguley, & Brunsden, 2014). Responses were reverse-coded, with higher scores indicating a stronger incremental theory.

Learning goals were assessed using three items on a scale from 1 (*not true at all*) to 5 (*very true*) adapted from Anderman and Midgley (1997) and Midgley, Feldlaufer, and Eccles (1989). Items assessed a preference for challenge and persistence after failure (ω = .54). Higher scores indicated stronger learning goals.

Perceived parent praise was assessed using a single item, "My parents often give me praise for doing well," rated from 1 (*not true at all*) to 5 (*very true*).

Perceived parent criticism was assessed using a single item, "My parents sometimes criticize me for not doing well," rated from 1 (*not true at all*) to 5 (*very true*).

Analytic plan

To reduce the potential for Type I error given the large number of hypotheses we tested, we set our alpha level to .01 for all analyses. To account for measurement error, we used latent variables to model theories of intelligence and learning goals. Mean scale scores are presented in Tables 2 and 3 only for descriptive purposes. Structural equation models (SEMs) and path analyses were conducted in Mplus 7.11 using full information maximum likelihood (FIML) estimation, which uses all available data to estimate model parameters (Muthén & Muthén, 1998–2012). In each study, Model 1 tested relations among grade level, learning goals, and theories of intelligence, and Model 2 examined relations of overall parent praise and criticism to grade level, learning goals, and theories of intelligence. Model 3 (Study 2 only) tested the relations of person and process praise and criticism to grade level, learning goals, and theories of intelligence. Models 2 and 3 also modeled indirect relations of grade level to learning goals and theories of intelligence via parent praise and criticism.

Model fit was assessed using the root mean square error of approximation (RMSEA), with values <.06 being considered good fit; the comparative fit index (CFI), with values $\geq$.95 being considered good fit (>.90 acceptable); the Tucker–Lewis index (TLI), with values $\geq$.95 being considered good (>.90 acceptable); and the standardized root mean square residual (SRMR), with values <.08 being considered good (Hu & Bentler, 1999). Preliminary analyses established scalar invariance across grades (see Appendix C). Model fit statistics for all models are presented in Table 1.

Table 1
Model fit statistics for all models.

Model	RMSEA [90% CI]	CFI	TLI	SRMR
Study 1, Model 1: Grade, theories of intelligence, and learning goals	.000 [.000, .056]	1.00	1.001	.031
Study 1, Model 2: Overall parent praise and criticism	.037 [.000, .065]	.972	.949	.034
Study 2, Model 1: Grade, theories of intelligence, and learning goals	.046 [.000, .076]	.968	.950	.036
Study 2, Model 2: Overall parent praise and criticism	.040 [.014, .060]	.974	.962	.037
Study 2, Model 3: Specific types of parent praise and criticism	.039 [.009, .061]	.979	.963	.033

Note. RMSEA, root mean square error of approximation; CI, confidence interval; CFI, comparative fit index; TLI, Tucker–Lewis index; SRMR, standardized root mean square residual.

Table 2
Study 1: Means and correlations with grade for all variables (N = 317 students).

Measure	N	M (SD)	Correlation with grade (r)
1. Grade level	317	5.01 (2.33)	–
2. Incremental theory of intelligence	317	3.72 (1.10)	.39**
3. Learning goal	317	3.94 (0.83)	−.16*
4. Perceived parent praise	317	4.26 (1.08)	.02
5. Perceived parent criticism	313	2.21 (1.43)	.02

* $p < .01$.
** $p < .001$.

Results

Descriptive statistics for all measures, as well as correlations with grade level, are presented in Table 2 (see Appendix Table B2 for correlations). The correlation between grade level and incremental theories of intelligence, $r(315) = .39$, $p < .001$, significantly differed from the correlation between grade level and learning goals, $r(315) = -.16$, $p = .004$; test of difference between dependent correlations, $t = 7.5$, $p < .001$ (Revelle, 2017).

Relations among theories of intelligence, learning goals, and grade level

We conducted a path analysis with grade level as a predictor of latent factors for theories of intelligence and learning goals (Fig. 1: Model 1). Grade level was positively related to incremental theories of intelligence, with an increase of one grade level associated with a .20-*SD* increase in theories of intelligence ($SE = .02$, $p < .001$). In contrast, an increase of one grade level was associated with a .08-*SD* decrease in learning goals ($SE = .03$, $p = .010$). Theories of intelligence and learning goals were not significantly related after accounting for grade level (correlation = −.07, $SE = .09$, $p = .433$).

To examine the hypothesis that theories of intelligence would be more strongly related to learning goals at older ages than at younger ages, we regressed learning goals on grade, theories of intelligence, and the Grade × Theories of Intelligence interaction using the XWITH command for latent variable interactions in Mplus. The Grade × Theories of Intelligence interaction was not significant ($B = .06$, $SE = .04$, $p = .089$). (Fit statistics are not available for this type of analysis.)

Role of perceived parent praise and criticism

To simultaneously assess our exploratory hypotheses regarding relations among overall parent praise, parent criticism, child learning goals, child theories of intelligence, and grade level, we conducted path analysis Model 2 (Fig. 1). Consistent with Hypothesis 6, overall perceived parent praise was a significant positive predictor of learning goals ($\beta = .31$, $SE = .07$, $p < .001$) but not of theories of intelligence ($\beta = .02$, $SE = .06$, $p = .703$). Partially consistent with Hypothesis 7, perceived parent criticism was a significant negative predictor of theories of intelligence ($\beta = -.18$, $SE = .06$, $p = .002$) but not of learning goals ($\beta = -.16$, $SE = .07$, $p = .024$). Finally, contrary to Hypothesis 8, there was no significant relation between grade and perceived parent praise or perceived parent criticism ($ps > .50$). Such a relation is a prerequisite for mediation; therefore, Hypothesis 8 was not supported in this sample.

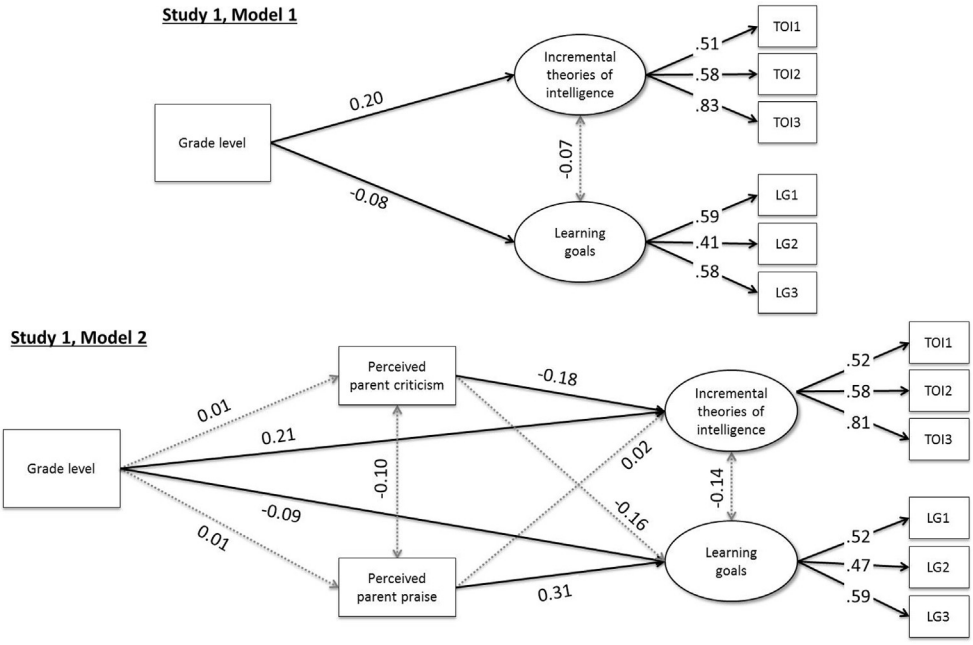

Fig. 1. Study 1 path analyses. Estimates are standardized on the *y* variable. Significant relations ($p < .01$) are indicated by solid black lines. Nonsignificant relations are indicated by dashed gray lines. TOI, Theory of Intelligence; LG, Learning Goal.

Study 2

In Study 1, among first to eighth graders, incremental theories of intelligence were higher, whereas learning goals were lower, among older children than among younger children. Furthermore, overall perceived parent criticism was associated with lower incremental theories of intelligence, whereas overall perceived parent praise was associated with higher learning goals. Study 2 extended Study 1 by including items assessing children's perceptions of their parents' praise and criticism of their effort and ability (rather than simply overall amount of praise and criticism). This allowed us to test our hypotheses regarding the specific types of perceived praise and criticism.

The Study 2 dataset also differed from the Study 1 dataset in that it included only fifth and eighth graders (rather than first to eighth graders). This is because the Study 2 dataset was originally designed to capture the transition from elementary to middle school, which has been shown to be influential in the development of academic motivation (Blackwell et al., 2007; Wigfield, Eccles, Mac Iver, Reuman, & Midgley, 1991). We consider the implications of these differences between Study 1 and Study 2 further in the Discussion.

Method

Participants

Participants were fifth and eighth graders ($N = 282$; $M_{age} = 12.53$ years, $SD = 1.56$; 154 girls) (see Appendix Table B3 for details). Fifth graders were recruited from two schools in the same school district in Northern California. School 1 was the same school that was observed in Study 1.[1] School 2 was

[1] There were $n = 58$ children who completed Study 1 and Study 2. To assess whether these children affected the pattern of results in Study 2, we reran the Study 2 models with these children excluded. The results did not significantly differ from those reported in the main text (i.e., there were no significant differences in model fit comparing models that were freely estimated with models constrained to match the main text path coefficients).

a K–8 (kindergarten to eighth grade) school. Eighth graders were recruited from School 2. Participants were from 12 classrooms with an average of 23.5 students per classroom (*SD* = 4.1, range = 16–32).

Procedure

All students who received signed parental consent were invited to participate. The participation rate was approximately 75%. Students completed paper-and-pencil questionnaires in a group setting as part of a larger study of motivation and socioemotional development (Donnellan, Trzesniewski, Robins, Moffitt, & Caspi, 2005). The items were intermixed with items from other scales. Data collection took place during the spring of the 1998–1999 school year.

Measures

Incremental theories of intelligence were assessed using three items on a 5-point scale from 1 (*strongly disagree*) to 5 (*strongly agree*) adapted from Dweck (1999). All items were reverse-coded so that higher scores indicate more incremental beliefs (ω = .68).

Learning goals were assessed using four items on a 5-point scale from 1 (*strongly disagree*) to 5 (*strongly agree*) (ω = .70) adapted from the task goal orientation scale by Midgley et al. (1998).

Perceived parent praise was reported by children using two items on a 7-point scale from 1 (*never*) to 7 (*always*) (ω = .81). The items assessed the frequency of perceived parent praise of children's "effort in school" (*process praise*) and "academic abilities" (*person praise*).

Perceived parent criticism was reported by children using two items on a 7-point scale from 1 (*never*) to 7 (*always*) (ω = .80). The items assessed the frequency of perceived parent criticism of children's "effort in school" (*process criticism*) and "academic abilities" (*person criticism*).

Analytic plan

Our analytic plan was the same as in Study 1. We used a significance criterion of $p < .01$ and used latent variables and FIML estimation in Mplus 7.11. We also conducted two separate models with perceived parent praise and criticism; Model 2 included two latent variables for praise and criticism to assess relations with overall praise and criticism, and Model 3 used four manifest variables to assess relations unique to each type of praise and criticism. Preliminary analyses established scalar invariance across age on all measures (see Appendix C).

Results

Descriptive statistics for all measures are presented in Table 3 (see Appendix Table B4 for correlations).

Table 3
Study 2: Means (and standard deviations) on all measures by grade.

	Full sample		Fifth graders	Eighth graders	Effect size of grade difference
	N	*M* (*SD*)	*M* (*SD*)	*M* (*SD*)	*d*
Incremental theory of intelligence	279	3.47 (1.12)	3.33 (1.15)	3.71 (1.03)	0.35
Learning goal	282	3.70 (0.82)	3.87 (0.76)	3.40 (0.82)	−0.61
Overall perceived parent praise	267	5.04 (1.80)	5.36 (1.62)	4.54 (1.94)	−0.46
Perceived parent process praise	264	5.05 (2.01)	5.43 (1.84)	4.43 (2.13)	−0.50
Perceived parent person praise	265	5.05 (1.89)	5.31 (1.74)	4.63 (2.04)	−0.36
Overall perceived parent criticism	273	2.57 (1.81)	2.24 (1.52)	3.11 (2.09)	0.48
Perceived parent process criticism	269	2.56 (1.98)	2.16 (1.67)	3.20 (2.26)	0.52
Perceived parent person criticism	266	2.59 (1.98)	2.30 (1.78)	3.06 (2.20)	0.38

Note. Positive effect sizes indicate that 8th graders had higher scores than 5th graders; negative effect sizes indicate that 8th graders had lower scores than 5th graders. Independent-samples t-tests indicated significant differences between grade levels ($p < .01$) for all variables. Because of significant differences in variance between grades for some measures, we calculated effect sizes using the square root of the unweighted average of the group variances (rather than the pooled variance), as recommended by Bonett (2008).

Relations among theories of intelligence, learning goals, and grade level

We conducted a path analysis (Fig. 2: Study 2, Model 1) with grade level as a predictor of the latent variables for theories of intelligence and learning goals. Path coefficients were standardized on the *y* variable only to allow for easy interpretation of grade-level effects and to make these effects comparable to Study 1. An increase of one grade level was associated with a 0.24-*SD* decrease in learning goals (*SE* = .04, $p < .001$) and a 0.11-*SD* increase in incremental theories of intelligence, although this effect did not reach significance (*SE* = .05, *p* = .020). Controlling for grade level, theories of intelligence and learning goals were not significantly related (correlation = −.10, *SE* = .08, *p* = .208).

We next tested whether the Grade × Theories of Intelligence interaction was a significant predictor of learning goals using the XWITH command to test latent variable interactions in Mplus. The Grade × Theories of Intelligence interaction was not significant (*B* = .08, *SE* = .05, *p* = .159).

Overall perceived parent praise and criticism

We tested our exploratory hypotheses using two latent variables for overall perceived parent praise and criticism (Fig. 2: Study 2, Model 2). Perceived parent praise was a significant predictor of learning goals (β = .46, *SE* = .08, $p < .001$) but not of theories of intelligence (β = −.11, *SE* = .09, *p* = .230). In

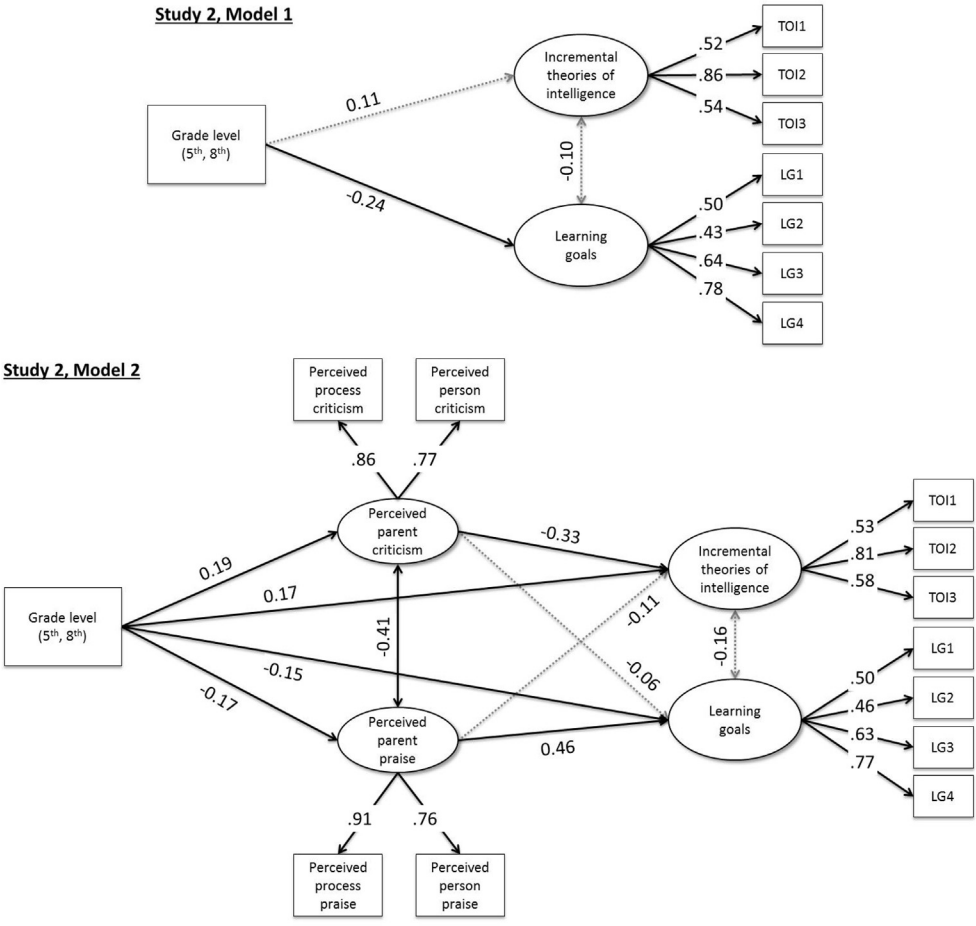

Fig. 2. Study 2 Models 1 and 2. Coefficients are standardized on *y* variables. Significant relations ($p < .01$) are indicated by solid black lines. Nonsignificant relations are indicated by dashed gray lines. TOI, Theory of Intelligence; LG, Learning Goal.

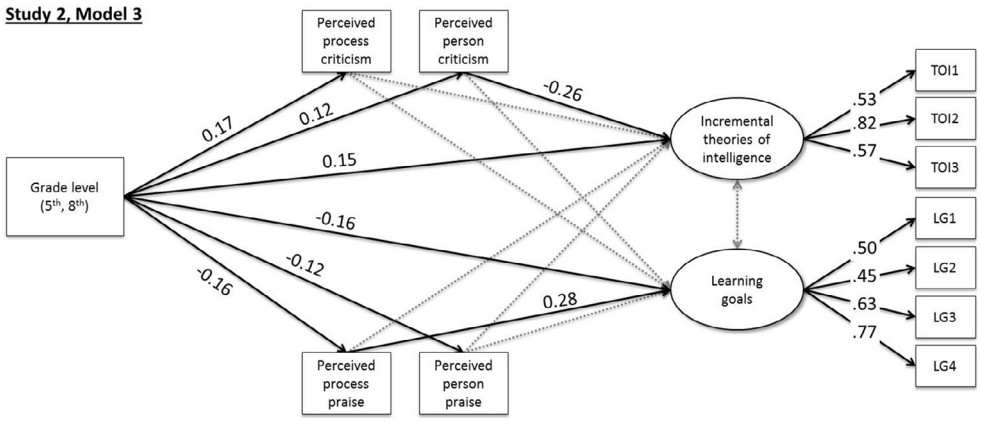

Fig. 3. Study 2 Model 3. Coefficients are standardized on *y* variables. Significant relations ($p < .01$) are indicated by solid black lines. Nonsignificant relations are indicated by dashed gray lines. For simplicity, nonsignificant path coefficients are not shown and significant covariances between perceived parent praise and criticism items are not shown (see Appendix Table B5 for these values). TOI, Theory of Intelligence; LG, Learning Goal.

contrast, perceived parent criticism was a significant negative predictor of incremental theories of intelligence ($\beta = -.33$, $SE = .10$, $p = .001$) but was not significantly related to learning goals ($\beta = -.06$, $SE = .09$, $p = .467$). Grade level was a significant direct predictor of both theories of intelligence ($\beta = .17$, $SE = .05$, $p = .001$) and learning goals ($\beta = -.15$, $SE = .05$, $p = .001$).

Furthermore, an increase of one grade level was associated with a .19-*SD* increase in perceived parent criticism ($SE = .04$, $p < .001$) and a .17-*SD* decrease in perceived parent praise ($SE = .04$, $p < .001$). Consistent with Hypothesis 8, there was a significant indirect effect from grade level to perceived parent praise to learning goals (bias-corrected bootstrap estimation with 1000 draws, 99% confidence interval [CI] = [−.118, −.014]). Unexpectedly, there was also a significant indirect effect from grade level to perceived parent criticism to theories of intelligence (99% $CI_{1000\ bootstraps}$ = [−.144, −.004]).

Specific types of perceived parent praise and criticism

Finally, we tested our main hypotheses about specific types of parent praise and criticism by modeling perceived parent process praise, person praise, process criticism, and person criticism as separate manifest variables (Fig. 3: Study 2, Model 3). Grade level was positively related to both types of praise and negatively related to both types of criticism (*p*s < .01). Perceived process praise was a significant predictor of learning goals ($\beta = .28$, $SE = .09$, $p = .002$), whereas the other types of praise and criticism were not (*p*s > .01).[2] Perceived person criticism was a significant predictor of theories of intelligence ($\beta = -.26$, $SE = .10$, $p = .007$), but the other types of praise and criticism were not (*p*s > .01). Grade level had a significant positive relation to theories of intelligence ($\beta = .15$, $SE = .05$, $p = .002$) and a negative relation to learning goals ($\beta = -.16$, $SE = .04$, $p < .001$). Significant indirect effects were found from grade level to perceived process praise to learning goals (99% $CI_{1000\ bootstraps}$ = [−.078, −.005]) and from grade level to perceived person criticism to theories of intelligence (99% $CI_{1000\ bootstraps}$ = [−.109, −.002]).

[2] We also tested a model in which the relation of perceived process praise to learning goals and theories of intelligence was moderated by grade level. This was motivated by prior research suggesting that older children are more likely than younger children to believe that effort and ability are inversely related (Barker & Graham, 1987; Nicholls, 1978) and that children who believe that effort and ability are inversely related find effort praise to be less motivational (Lam, Yim, & Ng, 2008). However, the Grade × Perceived Parent Process Praise interaction was not a significant predictor of learning goals ($p = .381$) or of theories of intelligence ($p = .392$), indicating that the relation of process praise to each motivational construct did not significantly differ between fifth and eighth graders.

Discussion

Data from two large cross-sectional studies of students in elementary through middle school shed light on age-related differences in two motivational constructs—theories of intelligence and learning goals—and the role of parents' praise and criticism in explaining both individual differences and age-related differences in motivation. We tested four main hypotheses and four exploratory hypotheses derived by integrating attribution/social-cognitive theory, CET, and expectancy-value theory. Our results suggest that incremental theories of intelligence and learning goals might not be strongly related during childhood and that perceived parent praise and criticism have relatively specific associations with theories of intelligence and learning goals. Below, we describe several findings that are particularly noteworthy and discuss their implications for theory, future research, and practice.

Theories of intelligence and learning goals

This is the first article, to our knowledge, to chart age-related differences in theories of intelligence and learning goals from first grade to eighth grade and to show their divergent relations with children's age in a single study. Specifically, theories of intelligence were more incremental, whereas learning goals were lower, among older students than among younger ones. In light of prior research and theory indicating that incremental theories of intelligence lead to learning goals (e.g., Blackwell et al., 2007; Dweck & Leggett, 1988), this result may appear to be surprising.

The disconnect between theories of intelligence and learning goals is further bolstered by our finding that these motivational constructs were not significantly correlated in either study, suggesting that this connection might be weaker in young children than in adults. Moreover, the association did not seem to grow stronger with age in our studies, suggesting that it might not be until high school age or older that theories of intelligence and learning goals become more cohesive. We should also note, however, that their relation is not large even among adults ($r = .19$) (Burnette et al., 2013), suggesting that individuals hold more nuanced combinations of beliefs about academic abilities and goal orientations than might be expected given existing theorizing. More research is needed to understand the consequences of these nuanced combinations of beliefs. For example, researchers could compare the relative impact of learning goals versus theories of intelligence on overall academic performance across a range of ages. In addition, researchers could examine whether theories of intelligence are most predictive of academic success in the context of low learning goals; this could help to explain the fact that most research showing the impact of theories of intelligence has focused on children in middle school or above (e.g., Aronson et al., 2002; Blackwell et al., 2007; Yeager et al., 2016) when learning goals are lower than in early elementary school.

The divergent relations of theories of intelligence and learning goals to child age appear to be surprising; however, these age-related differences are consistent with some previous research. For example, lower learning goals among older students than among younger ones is consistent with research showing a decline in academic self-concept and intrinsic motivation as environments become increasingly performance oriented (and parent praise is lower, as we show here) (Wigfield et al., 2015). Older children's higher level of incremental theories is consistent with empirical work on age differences in beliefs about ability (Gunderson et al., 2017; Haimovitz et al., 2011; Stipek & Gralinski, 1996). Both social and cognitive theories have been proposed to explain this age-related difference. Pomerantz and Saxon (2001) theorized that as most children transition through elementary school, they learn through personal experience and/or observation of peers that their ability is controllable and contingent on their own actions. For example, the increase in performance-oriented school environments might provide opportunities for children to observe and evaluate their own and peers' academic outcomes and associated efforts, indirectly teaching them an incremental theory of intelligence while, at the same time, reducing learning goals and intrinsic motivation through the greater emphasis on performance outcomes and external rewards (thereby accounting for the seemingly counterintuitive finding of divergent trajectories of theories of intelligence and learning goals).

We also suggest an alternative theory: The overall age-related increase in incremental theories may be related to a more global shift from viewing traits as unchangeable to a more flexible view of human

attributes, consistent with decreasing rates of essentialism and categorical rigidity among older children (Heyman & Gelman, 2000). This cognitive shift may allow children to think more flexibly about the nature of intelligence and to reject the idea that people can never change how smart they are. Of course, this cognitive shift might be the result of environmental input, but the specific inputs are beyond the scope of this investigation. Based on this theory, we would expect that individual differences in categorical flexibility would correlate with individual differences in theories of intelligence.

Role of perceived parent praise

This is the first study to show a positive relation between the overall amount of perceived parent praise and children's learning goals across such a broad age range (first grade to eighth grade). Furthermore, we found that children who reported receiving more process praise—a type of praise that gives children the message that effort is valued and important for success—had higher learning goals than those who received less process praise, even among children who reported equal amounts of parental person praise.

Some studies have suggested that children in late elementary school begin to believe that effort and ability are inversely related (Barker & Graham, 1987; Nicholls, 1978) and that children who endorse this inverse relation interpret process praise as an indicator of low ability, making it less motivating (Lam et al., 2008). However, we found that parents' effort praise was positively related to children's learning goals in both fifth and eighth grades. One possible explanation is that receiving process praise from parents at an early age makes children more likely to endorse a positive relation between effort and ability; this could in turn lead them to view subsequent parent process praise as an indicator of high ability as well. Future research on parent praise could include direct assessments of children's beliefs about the relationship between effort and ability in order to test these possibilities.

In contrast, neither overall praise nor process or person praise was significantly related to children's theories of intelligence. This result was unexpected given previous studies finding this relation (Gunderson et al., 2013). However, the current studies included older children and measured praise using child report rather than naturalistic observations. Further research using a variety of methods within a single sample could help to determine whether these methodological differences explain the different results.

Another potential explanation is that the relation between amount of parent praise and child motivation might be nonlinear and depend on the appropriateness of the praise (Lee, Kim, Kesebir, & Han, 2016). Specifically, when praise is aligned with children's level of success, children have better academic and well-being outcomes, whereas when parents either over- or under-praise their children, children's outcomes are less adaptive (Brummelman et al., 2014). This complexity may help to explain the lack of relation between praise and theories of intelligence in the current studies because the appropriateness of praise was not examined. Understanding these potentially complex interactions among types of praise, appropriateness, and frequency, as well as how these differ based on children's own developmental level, may have important theoretical and practical implications.

Role of perceived parent criticism

A key novel aspect of the current studies was our investigation of the relations between perceived parent criticism and children's motivation. In our path analyses, we found that overall amount of perceived parent criticism was negatively related to incremental theories of intelligence in both studies and was not significantly related to learning goals in either study. When examining specific aspects of criticism, perceived parent person criticism was a consistently negative correlate of incremental theories of intelligence. In other words, children who reported that their parents criticized their academic abilities more frequently were more likely to believe that intelligence is fixed and unchangeable compared with children who received less frequent criticism of their abilities. This was true even after accounting for frequency of process criticism, person and process praise, and children's grade level. This result stands in contrast to the lack of relation between parents' praise and theories of intelligence discussed previously. Our results suggest that parents' person criticism may have a substantially greater impact than parents' praise on this critical aspect of children's academic motivation.

This finding sets the stage for further research to explore important questions about the nature and impact of parents' academic criticism on children's learning and motivation, such as the following examples: What kinds of utterances do parents typically use to criticize their children's academic achievement? Do direct (e.g., "That wasn't a very good way to do that") and indirect (e.g., "Maybe you can think of another way to do it") forms of criticism (Kamins & Dweck, 1999) have different effects? Is there any amount of "appropriate" criticism that is beneficial to children, similar to appropriate amounts of praise (Lee et al., 2016)? More research is needed to develop a coherent theory of parents' academic praise and criticism and to provide practical guidance to parents on how to respond to children's failures in a way that encourages children to develop an adaptive motivational system.

Praise and criticism as mediators of age-related differences in motivation

Finally, the current studies were unique in examining whether age-related differences in learning goals or theories of intelligence could be explained (mediated) by age-related differences in parent praise or criticism. We found support for this in Study 2. Older children reported less perceived parent praise than younger children, and this lower level of parent praise in turn was related to lower learning goals among older children (a significant indirect effect). Further analyses isolated this effect to parents' process praise, showing that lower learning goals among older students than among younger ones could be at least partially attributed to less process praise from parents.

Surprisingly, in Study 2 we also found that older children reported more perceived parent criticism, which in turn was related to lower incremental theories of intelligence (a significant indirect effect). This indirect effect was primarily driven by perceived parent person criticism. This was surprising because the overall age difference, after controlling for parent praise and criticism, indicated that older students had higher incremental theories of intelligence than younger ones; therefore, higher levels of parent criticism among older students than among younger ones were working against this overall age difference (sometimes called inconsistent mediation or a suppressor effect). This suggests that, if not for the countervailing effect of higher parental criticism, middle school students might show even stronger incremental theories of intelligence. A fruitful area for future research could be to examine multiple potential mediators of the age-related difference in theories of intelligence simultaneously. This may reveal that cognitive factors such as categorical flexibility mediate the relation between age and stronger incremental theories, whereas environmental factors such as parents' person criticism serve as suppressors.

Unexpectedly, in Study 1 older children did not report significantly higher levels of praise or lower levels of criticism than younger children. One potential reason is methodological. Study 1 used only one item each to assess parent praise and criticism and used potentially ambiguous terms to assess frequency ("often" and "sometimes"). Study 2 included multiple items and more specific response choices. This may have led to more precise responses in Study 2 that allowed us to detect the predicted age-related differences. Future research, using strong measurements of perceived parent praise and criticism across ages, would be helpful to determine whether these age-related trends in perceived parent praise and criticism are replicable.

Limitations

One limitation of the current studies is that the data are cross-sectional. It is possible that age-related differences reflect cohort differences rather than developmental change. Although a longitudinal study would help to confirm these results, we believe that the consistency of these age-related differences across a broad age range—first grade to eighth grade in Study 1—supports the idea that they represent true developmental changes.

The data are correlational; therefore, we cannot determine the direction of causality. Our theory suggests that parents' behaviors (praise and criticism) affect children's motivation; prior experimental and longitudinal studies support this causal direction (e.g., Gunderson et al., 2013; Mueller & Dweck, 1998; Zentall & Morris, 2010). However, it is possible that children's academic motivation affects their parents' praise and criticism. For example, children with low learning goals might avoid academic challenges and elicit criticism of their effort from their parents. It is also possible that the effects

may be bidirectional. Future research using longitudinal methods (e.g., cross-lagged analyses) or experimental methods (e.g., interventions to change parents' use of praise and/or criticism) is needed to disentangle these effects.

The data were collected during the 1997–1998 and 1998–1999 school years. Although replicating these findings in a more recent cohort would improve generalizability, our use of data collected before growth mindsets received wide publicity likely reduced any influence of parents' awareness of growth mindset research on the results.

Another limitation is that our use of child report to assess parents' praise and criticism leaves open the possibility that children's own theories of intelligence and goal orientations biased their perception of their parents' feedback. However, children's report of parents' behaviors tends to more strongly relate to children's outcomes than parents' report, perhaps because children's report incorporates aspects of objective reality children's perception, and children's attributional style, all of which may influence children's beliefs and behaviors (e.g., Barry et al., 2008; Haines et al., 2008). In addition, our measures of parent praise and criticism included only one or two items, potentially reducing reliability of the measures. The reliability of the incremental theories and learning goals scales was also relatively low. Although our latent variable approach accounts for measurement error, nonsignificant relations involving these measures should be interpreted with caution. Future studies using more reliable scales and combining children's and parents' reports would lend additional validity to these findings.

Finally, our study focused on parents' praise and criticism and did not assess other potentially important environmental factors such as socialization and feedback by teachers. As we have noted, age-related difference in the school environment contribute to age-related differences in children's learning goals (Eccles et al., 1984). The role of teachers versus parents may change with child age; for example, in one study, compared with parents' perceptions, teachers' perceptions of students' academic competence become increasingly related to students' self-concepts over the elementary school years (Spinath & Spinath, 2005). Future research that includes feedback from both parents and teachers could provide a more complete picture of the environmental processes affecting students' motivation.

Conclusion

Learning goals and incremental theories both are related to adaptive responses to challenge and greater academic achievement (e.g., Blackwell et al., 2007; Elliott & Dweck, 1988; Grant & Dweck, 2003) and are positively related to each other, at least in older students and adults (Burnette et al., 2013). Here, we showed that despite their similarities, they show divergent relations to child age and to parents' praise and criticism in elementary and middle school. We conclude that the early development of these critical motivational constructs is more complex than previously recognized. It may be fruitful for research on motivational interventions in early elementary and middle school to specifically target learning goals, which are more proximally related to children's academic outcomes than theories of intelligence (Gunderson, Park, Maloney, Beilock, & Levine, 2018), rather than assuming that influencing children's theories of intelligence will lead to stronger learning goals.

These results have practical implications for parents and other caregivers who seek to encourage their young children's adaptive motivation. Making parents aware of the potentially positive effects of process praise and the potentially debilitating effects of person criticism might provide parents with more specific ideas about how to help encourage their children to adopt goals and behaviors that sustain academic motivation.

Acknowledgments

This work was supported by a grant to Richard W. Robins and Rand D. Conger from the National Institute on Drug Abuse (R01DA017902). We thank the participating families, staff, and research assistants who took part in this study.

Appendix A

Measures

Study 1: Theories of intelligence [Original scale: 1 = not at all true, 5 = very true; reverse-coded so that 1 = very true, 5 = not at all true]

1. You can't really change how smart you are.
2. How smart you are is something about you that you can't change very much.
3. You have a certain amount of smartness, and you can't really do much to change it.

Study 1: Learning goals [1 = not true at all, 5 = very true]

1. I enjoy working on challenging tasks.
2. I will usually keep working on homework until it is completed.
3. I generally seek out challenging tasks.

Study 1: Parent praise [1 = not true at all, 5 = very true]

1. My parents often give me praise for doing well.

Study 1: Parent criticism [1 = not true at all, 5 = very true]

1. My parents sometimes criticize me for not doing well.

Study 2: Theories of intelligence [Original scale: 1 = strongly disagree, 5 = strongly agree; reverse-coded so that 1 = strongly agree, 5 = strongly disagree]

1. You can't really change how smart you are.
2. How smart you are is something about you that you can't change very much.
3. I have a certain amount of smartness, and I can't really do much to change it.

Study 2: Learning goals [1 = strongly disagree, 5 = strongly agree]

1. I like schoolwork that I'll learn from even if I make a lot of mistakes.
2. I feel most successful in school when I learn something I didn't know before.
3. I like schoolwork the best when it really makes me think.
4. The main reason I do my work in school is because I like to learn.

Study 2: Perceived parent praise [1 = never, 4 = about half the time, 7 = always]
DURING THE PAST MONTH, when you and your parent(s) have spent time talking or doing things together, how often did they ...

1. Praise you for your academic abilities
2. Praise you for your effort in school.

Study 2: Perceived parent criticism [1 = never, 4 = about half the time, 7 = always]
DURING THE PAST MONTH, when you and your parent(s) have spent time talking or doing things together, how often did they ...

1. Criticize you for your academic abilities.
2. Criticize you for your lack of effort in school.

Appendices B and C. Supplementary material

Supplementary data associated with this article can be found, in the online version, at https://doi.org/10.1016/j.jecp.2018.03.015.

References

Anderman, L. H., & Anderman, E. M. (1999). Social predictors of changes in students' achievement goal orientations. *Contemporary Educational Psychology, 24*, 21–37.

Anderman, E. M., & Midgley, C. (1997). Changes in achievement goal orientations, perceived academic competence, and grades across the transition to middle-level schools. *Contemporary Educational Psychology, 22*, 269–298.

Aronson, J., Fried, C. B., & Good, C. (2002). Reducing the effects of stereotype threat on African American college students by shaping theories of intelligence. *Journal of Experimental Social Psychology, 38*, 113–125.

Barker, G. P., & Graham, S. (1987). Developmental study of praise and blame as attributional cues. *Journal of Educational Psychology, 79*, 62–66.

Barry, C. T., Frick, P. J., & Grafeman, S. J. (2008). Child versus parent reports of parenting practices: Implications for the conceptualization of child behavioral and emotional problems. *Assessment, 15*, 294–303.

Blackwell, L. S., Trzesniewski, K. H., & Dweck, C. S. (2007). Implicit theories of intelligence predict achievement across an adolescent transition: A longitudinal study and an intervention. *Child Development, 78*, 246–263.

Bonett, D. G. (2008). Confidence intervals for standardized linear contrasts of means. *Psychological Methods, 13*, 99–109.

Brummelman, E., Thomaes, S., Overbeek, G., Orobio de Castro, B., van den Hout, M. A., & Bushman, B. J. (2014). On feeding those hungry for praise: Person praise backfires in children with low self-esteem. *Journal of Experimental Psychology: General, 143*, 9–14.

Burnette, J. L., O'Boyle, E. H., VanEpps, E. M., Pollack, J. M., & Finkel, E. J. (2013). Mind-sets matter: A meta-analytic review of implicit theories and self-regulation. *Psychological Bulletin, 139*, 655–701.

Cameron, J., Banko, K. M., & Pierce, W. D. (2001). Pervasive negative effects of rewards on intrinsic motivation: The myth continues. *The Behavior Analyst, 24*, 1–44.

Cimpian, A., Arce, H.-M. C., Markman, E. M., & Dweck, C. S. (2007). Subtle linguistic cues affect children's motivation. *Psychological Science, 18*, 314–316.

Deci, E. L., & Ryan, R. M. (1980). The empirical exploration of intrinsic motivational processes. *Advances in Experimental Social Psychology, 13*, 39–80.

Dinger, F. C., & Dickhäuser, O. (2013). Does implicit theory of intelligence cause achievement goals? Evidence from an experimental study. *International Journal of Educational Research, 61*, 38–47.

Donnellan, M. B., Trzesniewski, K. H., Robins, R. W., Moffitt, T. E., & Caspi, A. (2005). Low self-esteem is related to aggression, antisocial behavior, and delinquency. *Psychological Science, 16*, 328–335.

Dunn, T. J., Baguley, T., & Brunsden, V. (2014). From alpha to omega: A practical solution to the pervasive problem of internal consistency estimation. *British Journal of Psychology, 105*, 399–412.

Dweck, C. S. (1999). *Self-theories: Their role in motivation, personality, and development*. Philadelphia: Psychology Press.

Dweck, C. S. (2006). *Mindset: The new psychology of success*. New York: Random House.

Dweck, C. S., Chiu, C.-Y., & Hong, Y.-Y. (1995). Implicit theories and their role in judgments and reactions: A world from two perspectives. *Psychological Inquiry, 6*, 267–285.

Dweck, C. S., & Leggett, E. L. (1988). A social-cognitive approach to motivation and personality. *Psychological Review, 95*, 256–273.

Eccles, J. S., Midgley, C., & Adler, T. (1984). Grade-related changes in the school environment: Effects on achievement motivation. In J. G. Nicholls (Ed.), *The development of achievement motivation* (pp. 238–331). Greenwich, CT: JAI.

Elliott, E. S., & Dweck, C. S. (1988). Goals: An approach to motivation and achievement. *Journal of Personality and Social Psychology, 54*, 5–12.

Freedman-Doan, C., Wigfield, A., Eccles, J. S., Blumenfeld, P., Arbreton, A., & Harold, R. D. (2000). What am I best at? Grade and gender differences in children's beliefs about ability improvement. *Journal of Applied Developmental Psychology, 21*, 379–402.

Friedel, J. M., Cortina, K. S., Turner, J. C., & Midgley, C. (2010). Changes in efficacy beliefs in mathematics across the transition to middle school: Examining the effects of perceived teacher and parent goal emphases. *Journal of Educational Psychology, 102*, 102–114.

Frome, P. M., & Eccles, J. S. (1998). Parents' influence on children's achievement-related perceptions. *Journal of Personality and Social Psychology, 74*, 435–452.

Gonida, E. N., & Cortina, K. S. (2014). Parental involvement in homework: Relations with parent and student achievement-related motivational beliefs and achievement. *British Journal of Educational Psychology, 84*, 376–396.

Gonida, E. N., Kiosseoglou, G., & Leondari, A. (2006). Implicit theories of intelligence, perceived academic competence, and school achievement: Testing alternative models. *American Journal of Psychology, 119*, 223–238.

Grant, H., & Dweck, C. S. (2003). Clarifying achievement goals and their impact. *Journal of Personality and Social Psychology, 85*, 541–553.

Gunderson, E. A., Gripshover, S. J., Romero, C., Dweck, C. S., Goldin-Meadow, S., & Levine, S. C. (2013). Parent praise to 1- to 3-year-olds predicts children's motivational frameworks 5 years later. *Child Development, 84*, 1526–1541.

Gunderson, E. A., Hamdan, N., Sorhagen, N. S., & D'Esterre, A. P. (2017). Who needs innate ability to succeed in math and literacy? Academic-domain-specific theories of intelligence about peers versus adults. *Developmental Psychology, 53*, 1188–1205.

Gunderson, E. A., Park, D., Maloney, E. A., Beilock, S. L., & Levine, S. C. (2018). Reciprocal relations among motivational frameworks, math anxiety, and math achievement in early elementary school. *Journal of Cognition and Development, 19*, 21–46.

Gunderson, E. A., Sorhagen, N. S., Gripshover, S. J., Dweck, C. S., Goldin-Meadow, S., & Levine, S. C. (2018). Parent praise to toddlers predicts fourth grade academic achievement via children's incremental mindsets. *Developmental Psychology, 54*, 397–409.

Haimovitz, K., Wormington, S. V., & Corpus, J. H. (2011). Dangerous mindsets: How beliefs about intelligence predict motivational change. *Learning and Individual Differences, 21*, 747–752.

Haines, J., Neumark-Sztainer, D., Hannan, P., & Robinson-O'Brien, R. (2008). Child versus parent report of parental influences on children's weight-related attitudes and behaviors. *Journal of Pediatric Psychology, 33*, 783–788.

Henderlong, J., & Lepper, M. R. (2002). The effects of praise on children's intrinsic motivation: A review and synthesis. *Psychological Bulletin, 128*, 774–795.

Heyman, G. D., & Gelman, S. A. (2000). Beliefs about the origins of human psychological traits. *Developmental Psychology, 36*, 663–678.

Hong, Y.-Y., Chiu, C.-Y., Dweck, C. S., Lin, D. M. S., & Wan, W. (1999). Implicit theories, attributions, and coping: A meaning system approach. *Journal of Personality and Social Psychology, 77*, 588–599.

Hu, L.-T., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling, 6*(1), 1–55.

Jacobs, J. E., Lanza, S., Osgood, D. W., Eccles, J. S., & Wigfield, A. (2002). Changes in children's self-competence and values: Gender and domain differences across grades one through twelve. *Child Development, 73*, 509–527.

Kamins, M. L., & Dweck, C. S. (1999). Person versus process praise and criticism: Implications for contingent self-worth and coping. *Developmental Psychology, 35*, 835–847.

Kelley, S. A., Brownell, C. A., & Campbell, S. B. (2000). Mastery motivation and self-evaluative affect in toddlers: Longitudinal relations with maternal behavior. *Child Development, 71*, 1061–1071.

Lam, S. F., Yim, P. S., & Ng, Y. L. (2008). Is effort praise motivational? The role of beliefs in the effort–ability relationship. *Contemporary Educational Psychology, 33*, 694–710.

Lee, H. I., Kim, Y. -H., Kesebir, P., & Han, D. E. (2016). Understanding when parental praise leads to optimal child outcomes. *Social Psychological and Personality Science*. Advance online publication. http://doi.org/10.1177/1948550616683020.

Madjar, N., Voltsis, M., & Weinstock, M. P. (2015). The roles of perceived parental expectation and criticism in adolescents' multidimensional perfectionism and achievement goals. *Educational Psychology, 35*, 765–778.

Midgley, C., Anderman, E. M., & Hicks, L. (1995). Differences between elementary and middle school teachers and students: A goal theory approach. *Journal of Early Adolescence, 15*, 90–113.

Midgley, C., Feldlaufer, H., & Eccles, J. S. (1989). Change in teacher efficacy and student self- and task-related beliefs in mathematics during the transition to junior high school. *Journal of Educational Psychology, 81*, 247–258.

Midgley, C., Kaplan, A., Middleton, M., Maehr, M. L., Urdan, T., Anderman, L. H., ... Roeser, R. (1998). The development and validation of scales assessing students' achievement goal orientations. *Contemporary Educational Psychology, 23*, 113–131.

Mueller, C. M., & Dweck, C. S. (1998). Praise for intelligence can undermine children's motivation and performance. *Journal of Personality and Social Psychology, 75*, 33–52.

Muthén, L. K., & Muthén, B. O. (1998–2012). *Mplus user's guide* (7th ed.). Los Angeles: Muthén & Muthén.

Nicholls, J. G. (1978). The development of the concepts of effort and ability, perception of academic attainment, and the understanding that difficult tasks require more ability. *Child Development, 49*, 800–814.

Nicholls, J. G. (1984). Achievement motivation: Conceptions of ability, subjective experience, task choice, and performance. *Psychological Review, 91*, 328–346.

Pomerantz, E. M., & Kempner, S. G. (2013). Mothers' daily person and process praise: Implications for children's theory of intelligence and motivation. *Developmental Psychology, 49*, 2040–2046.

Pomerantz, E. M., & Saxon, J. L. (2001). Conceptions of ability as stable and self-evaluative processes: A longitudinal examination. *Child Development, 72*, 152–173.

Revelle, W. (2017). *paired.r {psych}: Test the difference between (un)paired correlations.* Retrieved from <https://www.personality-project.org/r/html/paired.r.html>.

Robins, R. W., & Pals, J. L. (2002). Implicit self-theories in the academic domain: Implications for goal orientation, attributions, affect, and self-esteem change. *Self and Identity, 1*, 313–336.

Robins, R. W., Hendin, H. M., & Trzesniewski, K. H. (2001). Measuring global self-esteem: Construct validation of a single-item measure and the Rosenberg Self-Esteem Scale. *Personality and Social Psychology Bulletin, 27*(2), 151–161. https://doi.org/10.1177/0146167201272002.

Schwinger, M., Steinmayr, R., & Spinath, B. (2016). Achievement goal profiles in elementary school: Antecedents, consequences, and longitudinal trajectories. *Contemporary Educational Psychology, 46*, 164–179.

Spinath, B., & Spinath, F. M. (2005). Development of self-perceived ability in elementary school: The role of parents' perceptions, teacher evaluations, and intelligence. *Cognitive Development, 20*, 190–204.

Stipek, D. J., & Gralinski, J. H. (1996). Children's beliefs about intelligence and school performance. *Journal of Educational Psychology, 88*, 397–407.

Stipek, D. J., & Mac Iver, D. (1989). Developmental change in children's assessment of intellectual competence. *Child Development, 60*, 521–538.

Wigfield, A., & Eccles, J. S. (2000). Expectancy-value theory of achievement motivation. *Contemporary Educational Psychology, 25*, 68–81.

Wigfield, A., Eccles, J. S., Mac Iver, D., Reuman, D. A., & Midgley, C. (1991). Transitions during early adolescence: Changes in children's domain-specific self-perceptions and general self-esteem across the transition to junior high school. *Developmental Psychology, 27*, 552–565.

Wigfield, A., Eccles, J. S., Yoon, K. S., Harold, R. D., Arbreton, A. J. A., Freedman-Doan, C., & Blumenfeld, P. C. (1997). Change in children's competence beliefs and subjective task values across the elementary school years: A 3-year study. *Journal of Educational Psychology, 89*, 451–469.

Wigfield, A., Eccles, J. S., Fredricks, J. A., Simpkins, S., Roeser, R. W., & Schiefele, U. (2015). Development of achievement motivation and engagement. In M. E. Lamb & R. M. Lerner (Eds.), *Handbook of child psychology and developmental science* (7th ed., Vol. 3). Hoboken, NJ: John Wiley.

Yeager, D. S., Romero, C., Paunesku, D., Hulleman, C. S., Schneider, B., Hinojosa, C., ... Dweck, C. S. (2016). Using design thinking to improve psychological interventions: The case of the growth mindset during the transition to high school. *Journal of Educational Psychology, 108*, 374–391.

Zentall, S. R., & Morris, B. J. (2010). "Good job, you're so smart": The effects of inconsistency of praise type on young children's motivation. *Journal of Experimental Child Psychology, 107*, 155–163.