**Supplementary Materials for “Individual Differences in Students’ Effort Source Beliefs Predict Their Judgments of Ability”**

This document reports various materials, procedures, analyses, and details pertaining to the project, some of which may be important for interpreting the main manuscript.

**Psychometric Details**

**Exploratory Factor Analysis of Effort Source Beliefs Measure**

We conducted an exploratory factor analysis (EFA) of the effort source beliefs measure in Study 1 using the *psych* package in R (Revelle, 2017). The number of factors to extract was determined by Horn’s Parallel Analysis (HPA; Horn, 1965), with polychoric correlations, principal components analysis, and the mean eigenvalue criterion (as recommended for ordinal data by Garrido, Abad, & Ponsoda, 2013). Based on the results of the HPA, we used principal axis factoring (PAF) to extract two factors (initial eigenvalues: 4.28 and 2.02) from the polychoric matrix and then applied an oblimin rotation. Squared multiple correlations were used as initial estimates of communalities.

As shown in Table 3 of the main manuscript, the EFA revealed that all six task-elicited belief items loaded onto Factor 1, while all six self-initiated items loaded onto Factor 2. The correlations between the two factors was .39. These findings suggest that our effort source beliefs measure has a clean and easy-to-interpret factor structure.

**Computing Internal Consistency Reliability**

As mentioned in the note to Table 2, we report omega total (*ωT*) and Cronbach’s alpha (α) for measures with at least three items. Omega is recommended as a replacement for alpha because the latter makes rigid assumptions that can introduce considerable downward bias, especially when scales have a small number of items or are multidimensional (Dunn, Baguley, & Brunsden, 2014; McNeish, 2018; Yang & Green, 2011). To compute omega coefficients, we extracted a single factor for each set of items using the same EFA procedure described above (i.e., polychoric correlations, principal axis factoring, SMCs on the diagonal). We then computed the coefficient from the standardized factor loadings based on the formula supplied by McNeish (2018).

The use of polychoric correlations is recommended for use with ordinal data (including responses to Likert-type items; Flora, LaBrish, & Chalmers, 2012; McNeish, 2018). Initially, we computed the polychoric matrices with a correction for continuity applied (by default) to cells with zero counts. These matrices yielded omega coefficients that were actually lower than alpha in some cases. This appears to be because some of the correlations in these matrices were lower than the correlations in the corresponding Pearson matrices, which is unusual considering that Pearson correlations tend to underestimate the true association between ordinal variables and thus tend to be lower than polychoric correlations between such variables (Cho, Li, & Bandalos, 2009; Holgado-Tello, Chacón-Moscoso, Barbero-García, & Vila-Abad, 2010). We therefore re-computed the polychoric matrices *without* continuity correction, as recommended by Savalei (2011) for studies with small sample sizes and ordinal data with three or more categories. These correlations were slightly larger than the corresponding Pearson correlations and yielded omega coefficients that were higher than the ones we had initially computed. It should be noted that ordinal reliability coefficients (including omegas based on polychoric correlations) “do not measure the reliability of the *observed* scores but rather constitute estimates of the *hypothetical* reliability for latent scale scores based on the sum of the continuous variables that are thought to underlie the observed discrete scores” (Garrido et al., in press, p. 6; see also, Chalmers, 2018).

We do not report reliability coefficients for the overall effort source beliefs measure because the task-elicited items and negatively-coded self-initiated items did not positively load onto a single general factor. Even measures of internal consistency reliability that account for multidimensionality (such as omega total) assume the presence of a single general factor (Rodriguez, Reise, & Haviland, 2016). We do not view the lack of a general factor as problematic for our measure because, similar to how many popular measures have been used (e.g., Higgins et al.’s [2001] regulatory focus questionnaire; Ryan & Connell’s [1989] self-regulation questionnaire), we were primarily interested in the extent to which one belief about effort is stronger than another belief, even though these beliefs may be positively correlated in some contexts.

**Analyses Excluding Outliers**

 The following tables report the statistics for the ANCOVAs discussed in the main text that were conducted after excluding outliers from the predictor variables. They correspond to Tables 4-6 in the main manuscript, which reported the analyses that were conducted with outliers included.

 **Table S1.** Results for Repeated Measures ANCOVAs Predicting Judgments of Others’ Math Ability From Participants’ Effort Source Beliefs, the Target Student’s Effort level (Low [Coded as -1] Versus High [Coded as +1]), and the Effort Source × Effort Level Interaction in Study 1.

|  |  |  |  |
| --- | --- | --- | --- |
|  | Step 1 |  | Step 2 |
| Main effects and interactions | *F* | *df* | *p* | *η2p* |  | *F* | *df* | *p* | *η2p* |
| Effort source beliefs | 1.98 | 1, 107 | .162 | .018 |  | 1.72 | 1, 105 | .193 | .016 |
| Effort level | 5.54 | 1, 107 | .020 | .049 |  | 5.20 | 1, 105 | .025 | .047 |
| Effort Source Beliefs × Effort Level | 7.16 | 1, 107 | .009 | .063 |  | 6.69 | 1, 105 | .011 | .060 |
| Ability mindsets | — | — | — | — |  | 1.56 | 1, 105 | .215 | .015 |
| Ability Mindsets × Effort Level | — | — | — | — |  | .94 | 1, 105 | .336 | .009 |
| Simple Effects | *t* | *df* | *p* | diff. |  | *t* | *df* | *p* | diff. |
| *Effects of effort level (high minus low)* |  |  |  |  |  |  |  |  |  |
| For those with more self-initiated beliefs (‑1.5 *SD*) | .93 | 107 | .355 | .21 |  | .90 | 105 | .371 | .20 |
| For those with more task-elicited beliefs (+1.5 *SD*) | -3.53 | 107 | < .001 | -.78 |  | -3.42 | 105 | < .001 | -.77 |
| *Effects of effort source beliefs (+1.5 SD minus -1.5 SD)* |  |  |  |  |  |  |  |  |  |
| For ratings of low effort targets | 2.94 | 211.09 | .004 | .73 |  | 2.80 | 206.96 | .006 | .70 |
| For ratings of high effort targets | -1.07 | 211.09 | .288 | -.26 |  | -1.07 | 206.96 | .287 | -.27 |

*Note*: Participants’ ability mindsets and the Mindsets × Effort Level interaction were added as predictors in a second step.

**Table S2a.** Results for Repeated Measures ANCOVAs Predicting Judgments of *Others’* Math Ability From Participants’ *Other*-Focused Effort Source Beliefs, the Target’s Effort Level (Low [Coded as -1] Versus High [Coded as +1]), and the Effort Source × Effort Level Interaction in Study 2.

|  |  |  |  |
| --- | --- | --- | --- |
|  | Step 1 |  | Step 2 |
| Main effects and interactions | *F* | *df* | *p* | *η2p* |  | *F* | *df* | *p* | *η2p* |
| Effort source beliefs | 3.83 | 1, 176 | .052 | .021 |  | 4.15 | 1, 175 | .043 | .023 |
| Effort level | 11.26 | 1, 176 | < .001 | .060 |  | 11.25 | 1, 175 | < .001 | .060 |
| Effort Source Beliefs × Effort Level | 8.73 | 1, 176 | .004 | .047 |  | 8.09 | 1, 175 | .005 | .044 |
| Ability mindsets | — | — | — | — |  | .84 | 1, 175 | .360 | .005 |
| Ability Mindsets × Effort Level | — | — | — | — |  | .92 | 1, 175 | .338 | .005 |
| Simple Effects | *t* | *df* | *p* | diff. |  | *t* | *df* | *p* | diff. |
| *Effects of effort level (high minus low)* |  |  |  |  |  |  |  |  |  |
| For those with more self-initiated beliefs (‑1.5 *SD*) | .60 | 176 | .547 | .11 |  | .52 | 175 | .602 | .09 |
| For those with more task-elicited beliefs (+1.5 *SD*) | -4.32 | 176 | < .001 | -.78 |  | -4.22 | 175 | < .001 | -.76 |
| *Effects of effort source beliefs (+1.5 SD minus -1.5 SD)* |  |  |  |  |  |  |  |  |  |
| For ratings of low effort targets | 3.54 | 328.90 |  < .001 | .67 |  | 3.50 | 327.06 | < .001 | .66 |
| For ratings of high effort targets | -1.16 | 328.90 | .246 | -.22 |  | -1.03 | 327.06 | .305 | -.19 |

*Note*: Participants’ ability mindsets and the Mindsets × Effort Level interaction were added as predictors in a second step.

**Table S2b.** Results for Repeated Measures ANCOVAs Predicting Judgments of *One’s Own* Math Ability From Participants’ *Self*-Focused Effort Source Beliefs, the Target’s Effort Level (Low [Coded as -1] versus High [Coded as +1]), and the Effort Source × Effort level Interaction in Study 2.

|  |  |  |  |
| --- | --- | --- | --- |
|  | Step 1 |  | Step 2 |
| Main effects and interactions | *F* | *df* | *p* | *η2p* |  | *F* | *df* | *p* | *η2p* |
| Effort source beliefs | .96 | 1, 176 | .327 | .005 |  | .84 | 1, 175 | .359 | .005 |
| Effort level | 10.87 | 1, 176 | .001 | .058 |  | 10.87 | 1, 175 | .001 | .058 |
| Effort Source Beliefs × Effort Level | 5.20 | 1, 176 | .024 | .029 |  | 4.90 | 1, 175 | .028 | .027 |
| Ability mindsets | — | — | — | — |  | .92 | 1, 175 | .340 | .005 |
| Ability Mindsets × Effort Level | — | — | — | — |  | .98 | 1, 175 | .325 | .006 |
| Simple Effects | *t* | *df* | *p* | diff. |  | *t* | *df* | *p* | diff. |
| *Effects of effort level (high minus low)* |  |  |  |  |  |  |  |  |  |
| For those with more self-initiated beliefs (‑1.5 *SD*) | .07 | 176 | .941 | .01 |  | .02 | 175 | .982 | .004 |
| For those with more task-elicited beliefs (+1.5 *SD*) | -3.73 | 176 | < .001 | -.69 |  | -3.67 | 175 | < .001 | -.68 |
| *Effects of effort source beliefs (+1.5 SD minus -1.5 SD)* |  |  |  |  |  |  |  |  |  |
| For ratings of low effort targets | 1.20 | 332.27 | .232 | .23 |  | 1.18 | 330.41 | .239 | .23 |
| For ratings of high effort targets | -2.40 | 332.27 | .017 | -.47 |  | -2.31 | 330.41 | .021 | -.46 |

*Note*: Participants’ ability mindsets and the Mindsets × Effort Level interaction were added as predictors in a second step.

**Table S3.** Results for Repeated Measures ANCOVAs Predicting Judgments of Others’ *Verbal* Ability From Participants’ Effort Source Beliefs, the Target Student’s Effort Level (Low [Coded as -1] Versus High [Coded as +1]), and the Effort Source × Effort Level Interaction in Study 3.

|  |  |  |  |
| --- | --- | --- | --- |
|  | Step 1 |  | Step 2 |
| Main effects and interactions | *F* | *df* | *p* | *η2p* |  | *F* | *df* | *p* | *η2p* |
| Effort source beliefs | 1.02 | 1, 181 | .313 | .006 |  | 1.00 | 1, 180 | .318 | .006 |
| Effort level | 92.79 | 1, 181 | < .001 | .339 |  | 93.84 | 1, 180 | < .001 | .343 |
| Effort Source Beliefs × Effort Level | 3.64 | 1, 181 | .058 | .020 |  | 2.75 | 1, 180 | .099 | .015 |
| Ability mindsets | — | — | — | — |  | < .001 | 1, 180 | .990 | < .001 |
| Ability Mindsets × Effort Level | — | — | — | — |  | 3.05 | 1, 180 | .083 | .017 |
| Simple Effects | *t* | *df* | *p* | diff. |  | *t* | *df* | *p* | diff. |
| *Effects of effort level (high minus low)* |  |  |  |  |  |  |  |  |  |
| For those with more self-initiated beliefs (‑1.5 *SD*) | 6.92 | 181 | < .001 | 1.14 |  | 6.71 | 180 | < .001 | 1.11 |
| For those with more task-elicited beliefs (+1.5 *SD*) | 3.74 | 181 | < .001 | .62 |  | 3.94 | 180 | < .001 | .65 |
| *Effects of effort source beliefs (+1.5 SD minus -1.5 SD)* |  |  |  |  |  |  |  |  |  |
| For ratings of low effort targets | 2.08 | 360.43 | .038 | .39 |  | 1.89 | 358.80 | .059 | .36 |
| For ratings of high effort targets | -.70 | 360.43 | .483 | -.13 |  | -.52 | 358.80 | .605 | -.10 |

*Note*: Participants’ ability mindsets and the Mindsets × Effort Level interaction were added as predictors in a second step.

**Secondary Materials**

Our three studies also included some additional measures that are not central to the present report. However, because we felt that some of these methodological details might be of interest to certain readers, we provide some information regarding those measures here. A full description of any measure or analysis described in this section is available upon request.

**Math-Specific Ability Mindsets**

 **Study 1**. The majority of participants from Study 1 (103/110) participated in an unrelated study 21-51 days later. This study included a 4-item math-specific ability mindsets scale (Leslie, Cimpian, Meyer, & Freeland, 2015), assessing the extent to which participants believed that innate ability versus effort and dedication is required to succeed in math, as well as a second administration of the general ability mindset scale reported in all of our studies (*M* = 3.87, *SD* = .95, α = .96 ω*T* = .97). In this study, participants were asked to imagine themselves as fifth grade teachers and then had to report how likely they would be to engage in various instructional practices when interacting with an above or below average math student who was struggling to complete a math assignment in their classroom. The participants also responded to questions pertaining to how they would work with students from different ability groups. The ability mindset questionnaire came after these measures and was followed by the math-specific ability mindsets measure. The math-specific ability mindsets measure was preceded by the following instructions:

“In this survey, we are interested in your beliefs about what is required to succeed in math-oriented fields. By math-oriented fields, we are referring to professions that require individuals to have high levels of math skills; e.g., engineers, chemists, accountants, statisticians, computer programmers, etc.. Now, please read each item carefully and rate the extent to which you agree or disagree with the item using the scale that appears below it.”

The scale consisted of the following four items, which were presented in a random order. The wording of these items was slightly modified from Leslie et al.’s (2015) original scale; in particular, the items mentioned “succeeding” in a math field rather than “being a top scholar” in such a field:

1. Succeeding in a math-oriented field requires a special aptitude that just can’t be taught.
2. If you want to succeed in a math-oriented field, hard work alone just won’t cut it; you need to have an innate gift or talent.
3. With the right amount of effort and dedication, anyone can succeed in a math-oriented field.
4. When it comes to math-oriented fields, the most important factors for success are motivation and sustained effort; raw ability is secondary.

Participants responded to the items using a 1 (“Strongly Disagree”) to 6 (“Strongly Agree”) scale. One participant was missing a response for the general mindset scale and all four responses for the math-specific ability mindsets scale; thus, the analyses reported below included only 102 participants. When analyzing participants’ responses to the field-specific ability mindsets measure, we reverse-coded the two fixed mindset items and then averaged across all four items so that higher values indicated growth-oriented beliefs about ability in math (*M* = 3.80, *SD* = .79, α = .79, ω*T* = .83).

The correlation between math-specific ability mindsets and the original administration of the general ability mindset measure (i.e., the one reported in the main text) was *r*(100) = .47, *p* < .001, which was not moderated by the amount of time between participation in the two studies, *β* = -.04, *t*(98) = ‑.45, *p* = .657.[[1]](#footnote-1) This correlation was also similar in magnitude to the correlation between math-specific ability mindsets and the second administration of the general ability mindset measure, *r*(100) *=* .55, *p* < .001. In addition, general ability mindsets were fairly stable across the two time points, *r*(100) *=* .74, *p* < .001, and this association was not moderated by the amount of time between when the students participated in the two studies, *β* = .05, *t*(98) = .78, *p* = .436.

With respect to the relation between math-specific ability mindsets and effort source beliefs, we found a significant but small correlation, *r*(100) = ‑.20, *p* = .043, which was not moderated by the amount of time between participation in the two studies, *β* = -.04, *t*(98) = ‑.37, *p* = .712. *Most critically*, as shown in Table S4, math-specific ability mindsets did not moderate the effect of effort level on ability judgments in Study 1 (see Step 1), and did not reduce the significance of our primary finding (i.e., the effort source beliefs × effort level interaction; see Step 2).

**Table S4.** Results of Repeated Measures ANCOVAs Predicting Ability Judgments From Effort Source Beliefs (Standardized), Math-Specific Ability Mindsets (Standardized), the Target Student’s Effort Level (Low [Coded as -1] Versus High [Coded as +1]), Time Between Completion of Study 1 and the Math-Specific Ability Mindsets Measure, and Relevant Interactions.

|  |  |  |  |
| --- | --- | --- | --- |
|  | Step 1 (*df*s: 1, 100) | Step 2 (*df*s: 1, 99) | Step 3 (*df*s: 1, 97) |
|  | *F* | *p* | *η2p* | *F* | *p* | *η2p* | *F* | *p* | *η2p* |
| Effort source beliefs | — | — | — | 1.42 | .237 | .014 | 1.19 | .279 | .012 |
| Effort level | 6.05 | .016 | .057 | 6.51 | .012 | .062 | 7.29 | .008 | .070 |
| Effort Source Beliefs × Effort Level | — | — | — | 8.72 | .004 | .081 | 8.29 | .005 | .079 |
| Math-specific mindsets | .04 | .837 | <.001 | .00 | .971 | <.001 | .01 | .912 | < .001 |
| Math-Specific Mindsets × Effort Level | .08 | .776 | <.001 | .09 | .762 | <.001 | .18 | .675 | .002 |
| Time between studies (time) | — | — | — | — | — | — | 1.98 | .163 | .020 |
| Math-Specific Mindsets × Time  | — | — | — | — | — | — | .57 | .450 | .006 |
| Effort Level × Time | — | — | — | — | — | — | 3.05 | .084 | .030 |
| Math-Specific Mindsets × Effort level × Time | — | — | — | — | — | — | 1.66 | .201 | .017 |

*Note*: These analyses include any outliers that may exist in the predictor variables. The results of analyses excluding outliers in the predictors may differ from the present results.

**Study 3.** After completing all of the primary materials reported in the main text (which were framed in terms of English writing assignments), participants in *Study 3* completed the same math-specific measure of effort source beliefs as in Study 1 (*M* = .66, *SD* = .89, αs = .87 & .79, ω*Ts* = .91 & .82). This math-specific measure was only weakly correlated with participants’ English-specific effort source beliefs, *r*(182) = .23, *p* = .002. In addition, 154 of the 184 participants in Study 3 completed the same math-specific measure of ability mindsets reported above as part of two studies from an unrelated line of research (*M* = 3.88, *SD* = .93, α = .82, ω*T* = .85). One subsample of participants (*N* = 44) completed the measure 15 days before to 28 days after completing Study 3 as part of the same study on teaching described above. The other subsample (*N* = 110) completed the measure approximately 162 days before to 229 days after completing Study 3 as part of a second study on teaching.[[2]](#footnote-2) The correlation between participants’ math-specific ability mindsets (assessed as part of the separate studies) and the general ability mindset measure (i.e., assessed as part of the primary studies and reported in the main text), *r*(152) = .44, *p* < .001, was not moderated by the absolute value of the time between participation in the two studies, *β* = .008, *t*(150) = .11, *p* = .910. This association was similar in magnitude to the correlation between these constructs reported for Study 1 above, and to the correlation between math-specific ability mindsets and the additional administration of the general ability mindset measure (both assessed as part of the separate studies), *r*(152) *=* .38, *p* < .001. In addition, general ability mindsets were stable across the two time points, *r*(152) *=* .71, *p* < .001, although this association was moderated by the amount of time between when the students participated in the two studies, *β* = -.15, *t*(150) = -2.60, *p* = .010. When we looked at the correlation for the 25 participants for whom the two time points were less than 10 days apart (*M* = 5.6), we found that the correlation was somewhat stronger than the overall correlation, *r*(23) = .89, *p* < .001.

Most importantly, the correlation between math-specific ability mindsets and math-specific effort source beliefs was quite small, *r*(152) = ‑.12, *p* = .151. As in our previous analysis, this association was moderated by the amount of time between participation in the two studies, *β* = .17, *t*(150) = 2.04, *p* = .043. When we looked at the correlation for participants for whom the two time points were less than 10 days apart, we found that the correlation was a bit stronger, *r*(23) *=* -.31, *p* = .133, but still not significant.

**Alternate (Domain-General) Measure of Effort Source Beliefs**

 We created and tested (in all three studies) an alternative, non-vignette-based general academic measure of effort source beliefs. The measure, which was administered after the vignette-based measure and before the ability mindset measure, consisted of the following 2 task-elicited belief items and 2 reverse-scored self-initiated belief items. The items were presented in a random order. Students responded using a 1 (strongly disagree) to 6 (strongly agree) scale. We computed summary scores by subtracting the mean of the self-initiated items from the mean of the task-elicited items (Study 1: *M* = ‑.49, *SD* = 1.00; Study 2: *M* = ‑.44, *SD* = 1.03; Study 3: *M* = ‑.77, *SD* = .94)[[3]](#footnote-3):

1. When someone puts *a lot of effort* into an academic task, it is usually because the task was challenging and they *had* to work hard on it. *(task-elicited belief)*
2. When someone puts *very little effort* into an academic task, it is typically because the task was easy and *did not demand* much effort from them. *(task-elicited belief)*
3. When someone puts *a lot of effort* into an academic task, it is usually because the person was very motivated and *chose* to work hard. *(self-initiated belief; reverse-scored)*
4. When someone puts *very little effort* into an academic task, it is usually because the person was unmotivated and *chose not to* invest that much effort. *(self-initiated belief; reverse-scored)*

As demonstrated in the main text, the vignette-based measure emerged as a robust, consistent, and reliable predictor of predictor of students’ judgments of their own and others’ academic abilities. By contrast, while the alternative measure predicted judgments in Studies 2 and 3, even when controlling for the vignette-based measure (see Table S5), it did not predict judgments in Study 1, even when the vignette-based measure was not included in the analyses, *F*(1, 108) = 2.50, *p* = .117, *η2p* = .023. Furthermore, the correlations between the two task-elicited items (Study 1: *r* = .33, *p* < .001; Study 2: *r* = .33, *p* < .001 ; Study 3: *r* = .25, *p* < .001) and between the two self-initiated items (Study 1: *r* = .38, *p* < .001; Study 2: *r* = .46, *p* < .001; Study 3: *r* = .30, *p* < .001) that formed the basis of the alternative measure were not especially large, suggesting low reliability. Together, these results suggest that our primary vignette-based measure represented a reliable index of students’ effort source beliefs, although in some contexts the alternative measure was a better predictor of participants’ ability judgments. We also note that the correlations between our primary effort source beliefs measure and this alternative measure were not especially large (Study 1: *r* = .26, *p* < .001; Study 2: *r*s = .42 (other-focused) and .38 (self-focused), *p* < .001; Study 3: *r* = .34, *p* < .001). In addition, the correlations between participants’ general ability mindsets and this alternative effort source measure were either small or nonexistent (Study 1: *r* = -.10, *p* = .291; Study 2: *r* = -.21, *p* = .004; Study 3: *r* = -.02, *p* = .770).

**Table S5.** Results of Repeated Measures ANCOVAs Predicting Ability Judgments From Both our Alternative and Primary Measures of Participants’ Effort Source Beliefs (Standardized), Ability Mindsets (Standardized), the Target Student’s Effort Level (Low [Coded as -1] versus High [Coded as +1]), and all Two-Way Interactions with Effort Level. These Analyses Were Conducted Including Outliers in the Predictor Variables.

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Step 1** | **Step 2** | **Step 3** |
|  | *F* | *p* | *η2p* | *F* | *p* | *η2p* | *F* | *p* | *η2p* |
| **Study 1** | dfs: 1, 108 | dfs: 1, 107 | dfs: 1, 107 |
| Alternative effort source measure | 1.22 | .271 | .011 | .53 | .470 | .005 | .93 | .336 | .009 |
| Effort level | 5.64 | .019 | .050 | 5.88 | .017 | .052 | 5.65 | .019 | .050 |
| Alterative Measure × Effort Level | 2.50 | .117 | .023 | .89 | .349 | .008 | 2.15 | .146 | .020 |
| Effort source beliefs | — | — | — | 1.76 | .187 | .016 | — | — | — |
| Effort Source Beliefs × Effort Level | — | — | — | 5.57 | .020 | .049 | — | — | — |
| Ability mindsets | — | — | — | — | — | — | 1.87 | .174 | .017 |
| Ability Mindsets × Effort Level | — | — | — | — | — | — | 1.15 | .287 | .011 |
| **Study 2** | *df*s: 1, 178 | *df*s: 1, 177 | *df*s: 1, 177 |
| Alternative effort source measure | .25 | .616 | .001 | .12 | .725 | < .001 | .44 | .510 | .002 |
| Effort level | 12.74 | < .001 | .067 | 12.89 | < .001 | .068 | 12.69 | < .001 | .067 |
| Alterative Measure × Effort Level | 15.48 | < .001 | .080 | 8.07 | .005 | .044 | 13.83 | < .001 | .072 |
| *Other*-focused effort source beliefs | — | — | — | 3.69 | .056 | .020 | — | — | — |
| Effort Source Beliefs × Effort Level | — | — | — | 3.13 | .078a | .017 | — | — | — |
| Ability mindsets | — | — | — | — | — | — | .65 | .422 | .004 |
| Ability Mindsets × Effort Level | — | — | — | — | — | — | .32 | .570 | .002 |
|  |  |  |  |
| Alternative effort source measure | .93 | .337 | .005 | .76 | .384 | .004 | .51 | .478 | .003 |
| Effort level | 12.37 | < .001 | .065 | 12.48 | < .001 | .066 | 12.32 | < .001 | .065 |
| Alterative Measure × Effort Level | 10.55 | .001 | .056 | 5.89 | .016 | .032 | 9.45 | .002 | .051 |
| *Self*-focused effort source beliefs | — | — | — | < .01 | .965 | < .001 | — | — | — |
| Effort Source Beliefs × Effort Level | — | — | — | 2.50 | .115 | .014 | — | — | — |
| Ability mindsets | — | — | — | — | — | — | 1.21 | .274 | .007 |
| Ability Mindsets × Effort Level | — | — | — | — | — | — | .19 | .661 | .001 |
| **Study 3** |  *df*s: 1, 182 | *df*s: 1, 181 | *df*s: 1, 181 |
| Alternative effort source measure | 2.91 | .090 | .016 | 2.29 | .132 | .013 | 2.89 | .091 | .016 |
| Effort level | 97.11 | < .001 | .348 | 97.97 | < .001 | .351 | 97.83 | < .001 | .351 |
| Alterative Measure × Effort Level | 8.62 | .004 | .045 | 4.96 | .027 | .027 | 8.49 | .004 | .045 |
| Effort source beliefs | — | — | — | .07 | .794 | < .001 | — | — | — |
| Effort Source Beliefs × Effort Level | — | — | — | 2.62 | .107 | .014 | — | — | — |
| Ability mindsets | — | — | — | — | — | — | .023 | .872 | < .001 |
| Ability Mindsets × Effort Level | — | — | — | — | — | — | 2.36 | .126 | .013 |

a Indicates effects that were not significant (*p* > .10) in the analyses excluding outliers from the predictor variables.

**Additional Analyses Not Discussed**

* Preliminary studies were conducted using math-based, other-focused versions of the effort source beliefs measure that contained only three vignettes. These versions of the vignette-based measure were revised to create the six-vignette version discussed in the present work because of relatively low internal consistency reliability. However, it is worth noting that the results of these studies, which are available upon request, were generally consistent with the math-based, other-focused findings from Studies 1 and 2.
* As per Muenks, Miele, and Wigfield (2016), in Studies 1-3, we conducted secondary analyses in which we attempted to categorize participants as *primarily* perceiving a positive, negative, or no relation between levels of effort and ability (based on their ability judgments for the high versus low effort vignettes). We then examined the association between this categorical measure of ability judgments and participants effort source beliefs. The results of these analyses are available upon request.

**Additional Materials and Measures Not Discussed**

* Exploratory items assessing potential mediators and moderators of the effect of effort source beliefs on ability judgments (Studies 1 and 3). These items were administered after the alternative measure of effort source beliefs (described above) and before the ability mindset measure.
* Measures assessing potential motivational and cognitive correlates of participants’ effort source beliefs (Study 2). These measures were administered after the ability mindset measure.
* Toward the end of Studies 1 and 3, we piloted a study that involved participants completing an arithmetic task and assessing their own math ability. The design of the pilot varied between studies. Participants in Study 3 completed a math-focused version of the primary effort source beliefs measure before completing the pilot measure. The pilot and math effort source measures were administered *after* the ability mindset measure.
* Suspicion check items assessing participants’ beliefs about the purpose of study and the vignette materials (Studies 1-3). These items were assessed toward the end of the study, before the demographics questions.
* The demographic questionnaire was administered at the end of the study, before the debriefing. Additional demographics questions (Studies 1-3) include:
	+ US birth and residency status
	+ English proficiency
	+ School/college of affiliation within the university and expected graduation year

**References**

Chalmers, R. P. (2018). On misconceptions and the limited usefulness of ordinal alpha. *Educational and Psychological Measurement, 78*(6),1056–1071*.*

Cho, S.-J., Li, F., & Bandalos, D. (2009). Accuracy of the Parallel Analysis Procedure With Polychoric Correlations. *Educational and Psychological Measurement*, *69*(5), 748–759. http://doi.org/10.1177/0013164409332229

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*(3), 399–412. http://doi.org/10.1111/bjop.12046

Flora, D. B., LaBrish, C., & Chalmers, R. P. (2012). Old and New Ideas for Data Screening and Assumption Testing for Exploratory and Confirmatory Factor Analysis. *Frontiers in Psychology*, *3*, 55. http://doi.org/10.3389/fpsyg.2012.00055

Garrido, L. E., Abad, F. J., & Ponsoda, V. (2013). A new look at horn’s parallel analysis with ordinal variables. *Psychological Methods*, *18*(4), 454–474. http://doi.org/10.1037/a0030005

Garrido, L. E., Barrada, J. R., Aguasvivas, J. A., Martínez-Molina, A., Arias, V. B., Golino, H. F., ... & Rojo-Moreno, L. (in press). Is small still beautiful for the Strengths and Difficulties Questionnaire? Novel findings using exploratory structural equation modeling. *Assessment*

Higgins, E. T., Friedman, R. S., Harlow, R. E., Idson, L. C., Ayduk, O. N., & Taylor, A. (2001). Achievement orientations from subjective histories of success: Promotion pride versus prevention pride. *European Journal of Social Psychology*, *31*(1), 3–23. http://doi.org/10.1002/ejsp.27

Holgado-Tello, F. P., Chacón-Moscoso, S., Barbero-García, I., & Vila-Abad, E. (2010). Polychoric versus Pearson correlations in exploratory and confirmatory factor analysis of ordinal variables. *Quality & Quantity*, *44*(1), 153–166. http://doi.org/10.1007/s11135-008-9190-y

Horn, J. L. (1965). A rationale and test for the number of factors in factor analysis. *Psychometrika*, *30*(2), 179–185. http://doi.org/10.1007/BF02289447

Leslie, S. J., Cimpian, A., Meyer, M., & Freeland, E. (2015). Expectations of brilliance underlie gender distributions across academic disciplines. *Science*, *347*(6219), 262-265.

McNeish, D. (2018). Thanks coefficient alpha, we’ll take it from here. *Psychological Methods, 23*(3), 412-433. http://doi.org/10.1037/met0000144

Muenks, K., Miele, D. B., & Wigfield, A. (2016). How students’ perceptions of the source of effort influence their ability evaluations of other students. *Journal of Educational Psychology*, *108*(3), 438–454. http://doi.org/10.1037/edu0000068

Revelle, W. (2017). psych: Procedures for Personality and Psychological Research. Evanston, IL: Northwestern University.

Rodriguez, A., Reise, S. P., & Haviland, M. G. (2016). Evaluating bifactor models: Calculating and interpreting statistical indices. *Psychological Methods*, *21*(2), 137–150. http://doi.org/10.1037/met0000045

Ryan, R. M., & Connell, J. P. (1989). Perceived locus of causality and internalization: Examining reasons for acting in two domains. *Journal of Personality and Social Psychology*, *57*(5), 749–761. http://doi.org/10.1037/0022-3514.57.5.749

Savalei, V. (2011). What to do about zero frequency cells when estimating polychoric correlations. *Structural Equation Modeling: A Multidisciplinary Journal*, *18*(2), 253–273. http://doi.org/10.1080/10705511.2011.557339

Yang, Y., & Green, S. B. (2011). Coefficient alpha: A reliability coefficient for the 21st Century? *Journal of Psychoeducational Assessment*, *29*(4), 377–392. http://doi.org/10.1177/0734282911406668

1. For all reported analyses that included time as a moderator, the outcome was the variable *not* assessed in the original study (e.g., math-specific ability mindsets). We also conducted moderation analyses in which the outcome *was* the variable from the original study (e.g., effort source beliefs), but these did not change our interpretation of potential moderation effects. [↑](#footnote-ref-1)
2. There were 7 participants who completed the measure as part of both studies. For these participants, we used their score from the study that they completed closest to Study 3. Note that 6 participants from Study 1 also completed the second study (in addition to completing the first study); for these participants, we always used their math-specific ability mindsets from the first study. [↑](#footnote-ref-2)
3. We do not report internal consistency reliability for the summary scores because the TE items and negatively-coded SI items did not positively load onto a single factor. [↑](#footnote-ref-3)