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Identity-Based Motivation: Testing Assumptions of Ecological Validity, Individual Differences and Within-Person Fluctuations

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ABSTRACT

Introduction-Objective: We outline and test three key assumptions of identity-based motivation theory. First, in everyday life, people draw both difficulty-as-importance and difficulty-as-impossibility inferences when tasks or goals feel hard to think about (ecological validity). Second, how much people endorse each inference is both an individual difference and context sensitive (trait-like and state-like). Third, strong (unambiguous) contexts shift momentary endorsement (context matters).

Methods: Five studies ($N = 2746$, undergraduates except Study 2) apply autobiographical recall, secondary data analyses, daily diaries, and experimental methods. All use validated difficulty-as-importance and difficulty-as-impossibility scales.

Results: Ecological validity: people recall making both inferences a few times monthly (Study 1, $N = 986$). Trait–state: difficulty-as-importance and difficulty-as-impossibility scores differ between and fluctuate within persons about equally (Study 2, $N = 733$ elementary-to-high-school-aged students; Study 4, $N = 260$, $n = 2789$ two-week daily diaries). Trait difficulty-as-impossibility predicts preference for easier tasks (Study 3, $N = 216$); trait difficulty-as-importance predicts daily meaningful engagement with school (Study 4). Daily difficulty-as-importance and difficulty-as-impossibility are associated with daily self-esteem, self-compassion, and self-efficacy (Study 4). Context: Strong contexts shape momentary difficulty-as-importance and difficulty-as-impossibility scores (Study 5, $N = 551$).

Conclusion: Results support three key assumptions and suggest that difficulty mindsets can be meaningfully considered as consequential traits and as fluctuating states affected by strong (unambiguous) contexts.

1 | Introduction

Identity-based motivation (IBM) theory is a situated social cognition theory of self, self-concept, and identity that focuses on an often-overlooked aspect of motivation and self-regulation: the inferences people draw about themselves from their metacognitive experiences of difficulty (Oyserman 2007, 2009, 2015, 2024). IBM theory specifies two inferences people can draw when thinking about potentially self-relevant tasks or goals that feel difficult. People can infer that difficulty signals self-relevance and value (difficulty-as-importance–this is important to me, "no pain, no gain") and self-irrelevance and low odds of success (difficulty-as-impossibility–this is not for me, "know when to walk away"). A large body of research shows that these inferences matter, but as we outline in the current paper, research to date has not tested three core assumptions on which IBM theory is based. We address this gap across five studies with almost three thousand participants.

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1.1 | Identity-Based Motivation Theory

IBM theory applies a situated social cognition approach to self, self-concept, and identity (Oyserman 2007, 2015), predicting that people prefer to act and make sense of their metacognitive experiences in ways that fit their identities, but which aspects of identity come to mind and what they imply are dynamically constructed given features of the situation. These three elements, termed action-readiness, procedural readiness, and identity content and certainty, recursively connect: contextual cues can trigger a particular inference from metacognitive experience and hence shift in self-perception and action, and the reverse, self-perceptions can shape inferences from metacognitive experience and action. Making sense of the effect of the inferences people draw from their metacognitive experiences when thinking about a task or goal feels difficult has yielded a fruitful line of research (Oyserman 2024). Yet, as we highlight next, though supporting evidence exists, three core assumptions of ecological validity, construct stability-malleability, and context effects have not been directly tested.

1.1.1 | Measuring Difficulty Mindsets: Construct Reliability and Validity

Building on earlier research (e.g., Oyserman et al. 2015; Smith and Oyserman 2015), Fisher and Oyserman (2017) developed brief, reliable scales of each difficulty mindset (difficulty-as-importance Ex: "Sometimes if a task feels difficult to me, my gut says that it really matters for me"; difficulty-as-impossibility Ex: "Sometimes if a task feels difficult, my gut says it is impossible for me"). Empirically, people on average endorse difficulty-as-importance and reject difficulty-as-impossibility, scoring above the midpoint with scores skewed toward the upper range on the former and below the midpoint with scores skewed toward the lower range on the latter (for a review, Oyserman 2024). The measures have been validated cross-culturally; Yan et al. (2024) documented configural and metric measurement invariance for each scale across eight countries.[1]

IBM theory predicts that each difficulty mindset serves a different purpose, with difficulty-as-impossibility focusing attention on odds of success and difficulty-as-importance focusing attention on value (e.g., Aelenei et al. 2017; Oyserman 2007, 2015). Indeed, scores on difficulty-as-impossibility and difficulty-as-importance scales often have different patterns of association and distinct magnitudes of correlations with other measures relevant to self-regulation and task engagement. Examples include different patterns of association for positive self-perceptions of control (locus of control, work self-efficacy), resilient character (grit, growth or fixed mindset, mental toughness), and goal formation (construal level, learning and performance goals, promotion and prevention focus; Fisher and Oyserman 2017; Kiper et al. 2024). Thus, locus of control, growth mindset, and prevention scores are not correlated with difficulty-as-importance scores and have small-to-moderate-sized correlations with difficulty-as-impossibility scores (Fisher and Oyserman 2017).[2] Further supporting the prediction of distinct purpose, difficulty-as-importance scores do not predict difficulty-as-impossibility scores–the confidence interval of the correlation often includes zero, and correlations are sometimes positive, other times negative (Efthymiadou et al. 2025; Fisher and Oyserman 2017; O'Donnell et al. 2023; Yan et al. 2024).

1.1.2 | Ecological Validity

While not directly testing the chronic accessibility of each difficulty mindset, interventions have used IBM theory (e.g., in Romania, Florea and Negru-Subtirica 2025; in the U.S. Oyserman et al. 2006; Oyserman et al. 2025).[3] These interventions were designed to shift the accessibility and endorsement of difficulty-as-importance and difficulty-as-impossibility and increase the number and concreteness of strategies students link to their school-focused possible identities. Indeed, receiving the intervention with fidelity is associated with positive changes in student academic trajectories (Oyserman et al. 2006, 2021, 2025). Moreover, in these studies, effects are mediated in part by effects on identity-based motivation. Some initial research suggests an association between endorsing difficulty-as-importance and healthier inflammatory regulation, an association not found for growth mindset and grit measures of self-control (Destin et al. 2024). The implication we draw is that variability in the extent people endorse each difficulty mindset matters in real-world situations outside of the lab and that in their everyday lives, people draw self-relevant inferences from their meta-cognitive experiences of difficulty. Yet we found neither autobiographical recall studies nor diary studies that could provide a sense of how frequently people draw these inferences in their daily lives.

1.1.3 | State and Trait

We looked for but did not find studies directly testing the extent to which variability in difficulty-as-importance and difficulty-as-impossibility scores is attributable to between-person (trait-like) differences or within-person (state-like) differences. What we found is a body of research documenting associations between how much people endorse each difficulty mindset and outcomes, implying that researchers assume that these measures are relatively trait-like. For example, researchers report that endorsing difficulty-as-importance is associated with more focus on mastery goals (Yan and Wang 2021), math identity (Mielicki et al. 2022), experiencing time as a more expandable and a less finite resource (Choi and Oyserman in press), and being agnostic as to whether to use effortful or less effortful means of goal attainment (Kiper et al. 2024).

In contrast, endorsing difficulty-as-impossibility is associated with preferring less effortful means of goal pursuit (controlling for difficulty-as-importance scores, Kiper et al. 2024). It is also associated with less confidence or efficacy in attaining one's possible identities and having strategies to do so (Efthymiadou et al. 2025), less focus on pursuing mastery-approach goals (Yan and Wang 2021), and less preference for working with and finding oneself capable of solving complex number problems (i.e., using fractions and percentages, Mielicki et al. 2022). While not stated, as such, using a between-person measure implies some belief in the stability of between-person differences. We also did not find studies testing within-person fluctuations in endorsement difficulty-as-impossibility and difficulty-as-importance.

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We did find studies that randomly assign participants to an accessible difficulty-as-importance or difficulty-as-impossibility mindset, based on the premise that both difficulty mindsets are available, though not always accessible in memory. These studies show that an on-the-mind difficulty-as-importance rather than difficulty-as-impossibility mindset increases identity certainty, task performance, and persistence (e.g., Aelenei et al. 2017; Choi and Oyserman 2026; Oyserman et al. 2018; Smith and Oyserman 2015). In contrast, an on-the-mind difficulty-as-impossibility mindset rather than a difficulty-as-importance mindset reduces the pain of letting go of unattainable goals and reduces vulnerability to reasoning biases (sunk cost, escalation of commitment) in situations in which persistence no longer serves a person's interests (Choi and Oyserman 2026). While yielding interesting results, these studies do not test within-person variability in mindset endorsement.

1.1.4 | The Effect of Strong (Unambiguous) Contexts

Situated social cognition theories assume that human judgments are based on the subset of all the information available in memory that is currently on the mind (Wyer 2008) and feels relevant to the at-hand judgment task (Schwarz 2024). Features of the situation can make information stored in memory momentarily top-of-mind and hence accessible for use (Smith and Semin 2004). People use the content of their thinking and the inferences they draw from their experience of thinking (i.e., metacognition) when making judgments (Schwarz 2024). What is on people's minds is a function of features of the person and of the situation. At the person level, information can become chronically top of mind with repeated use (e.g., Higgins 1996). At the situation level, situations vary in strength with consequences for judgment and behavior (e.g., Cihangir et al. 2010; Smith and Conrey 2009). Thus, while strong situations provide clear cues as to the inference to be drawn, reducing individual variability in response, weaker situations are more ambiguous as to the inference to be drawn, and as a result, responses will vary given individual differences in top-of-mind information.

We did not find IBM studies directly manipulating the strength of a situation. Instead, we found studies documenting that after participating in school-based identity-based motivation programs meant to instill the idea that difficulty can imply importance and does not always imply low odds, students endorsed difficulty-as-importance more (e.g., Florea and Negru-Subtirica 2025; Oyserman et al. 2021; Oyserman et al. 2025) and difficulty-as-impossibility less (e.g., Oyserman et al. 2021, 2025). What these studies cannot say is whether, without explicit instruction, endorsement of difficulty mindsets shifts in contexts that unambiguously imply that odds of success are low.

1.2 | Summary of Research-to-Date

Research to date establishes valid, reliable scales to measure endorsement of difficulty-as-importance and difficulty-as-impossibility. Using these scales, researchers document associations between difficulty-as-importance and difficulty-as-impossibility scale scores and action, implying but not testing that difficulty mindset endorsement has trait-like features. Researchers also show that the momentarily accessible difficulty mindset predicts action, implying but not testing that difficulty mindset endorsement has state-like features. Third, researchers document associations between participation in educational programming and endorsement of each difficulty mindset, but do not test the prediction that momentary endorsement shifts in response to strong contextual cues.

2 | Current Studies

2.1 | Hypotheses

We test our three predictions across five studies.

H1 (tested in Study 1) Ecological validity: IBM predicts that people draw difficulty-as-importance and difficulty-as-impossibility inferences in their daily lives; we found no studies operationalizing a measure of this. We use elicited recall to operationalize the frequency of difficulty-as-importance and difficulty-as-impossibility inferences from experiences of difficulty.

H2a to H2c (tested across Studies 2–4) Trait and state: IBM theory predicts that people chronically differ (trait-like) in difficulty-as-importance and difficulty-as-impossibility but that their endorsements are also context-sensitive (state-like). Yet, no studies measured trait-like and state-like aspects of endorsement scores or their consequences. We operationalize trait-like and state-like aspects as variance proportions (intraclass correlations).

H2a (tested in Studies 2, 4): Endorsement scores vary between and within persons.

H2b (tested in Study 3): Trait scores predict preferring and choosing ease over difficulty. H2c (tested in Study 4): Trait and daily state scores are associated with daily fluctuations in self-perception and goal-focused action.

H3 (tested in Study 5) Context matters for endorsement: IBM theory predicts that contexts shape how much people endorse difficulty-as-importance and difficulty-as-impossibility. Studies have not directly examined this; we do so by examining the effect of strong (unambiguous) vs. weak (ambiguous) contexts on momentary endorsement of difficulty-as-importance and difficulty-as-impossibility.

2.2 | Procedure and Measures

2.2.1 | Transparency and Openness

The first author presented earlier analyses at two conferences in 2024 and 2025 (Burbidge and Oyserman 2024, 2025). No papers were published using these data. Appendix A provides all measures and response scales. OSF https://osf.io/s6ugv/overview provides open access to the supplemental materials, anonymized data, and R code for all studies; for the pre-registered studies (Studies 3, 4c, and 5), we provide the pre-registrations and pre-registered analyses. In the current paper, we provide analyses that are powered given the collected sample sizes,

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reflecting simplification of study design and analyses. Following the template provided by Willroth and Atherton (2024), a full overview of any deviations from our initial pre-registrations and rationales is provided in Table S1.

We obtained IRB approval before collecting data (Studies 1, 3, 5 #UP-15-0055; Studies 4a to 4c #UP-19-00570). Study 2 was a secondary analysis of data (Ahrens and Oyserman 2025; Carter and Oyserman 2019). We conducted all analyses using R statistical software (R Core Team 2025), calculating ICCs and their 95% confidence intervals using the ICC R package (v2.4.0; Wolak et al. 2012) with repeated measurements nested within persons to assess the within-person and between-person components of variability in endorsement (Studies 2, 4).

2.2.2 | Power Analyses and Stop Rules for Data Collection

Next, we report how we determined our sample size, all data exclusions (if any), all manipulations, and all measures in each study. We label correlation sizes with Ratner's (2009) rules of thumb: very small $r \leq 0.19$, small $0.2 \leq r \leq 0.39$, moderate $0.40 \leq r \leq 0.59$, large $0.6 \leq r \leq 0.79$, and very large $0.8 \leq r \leq 1$. If we did not have prior data to estimate expected effect sizes and adequate sample sizes, our stop rule was the closing of the subject pool at the end of a semester (Study 1, Fall 2024; Study 4a, Fall 2019; Study 4b, Spring 2021) or the secondary data available to us (Study 2). In Study 3 (Fall 2022), 4c (Spring 2022), and Study 5 (Fall 2022 and Fall 2024), we conducted a priori power analyses with G*Power (Faul et al. 2007) to compute the required sample size given a power of 0.80, an alpha of 0.05, a two-tailed test, and either a small main effect ($f^2 = 0.04$, Study 3, Study 4c, difficulty-as-impossibility as the predictor) or a small interaction effect ($f^2 = 0.01$, Study 5, context by time interaction on difficulty-as-impossibility as the outcome). We chose estimated effect sizes using guidelines provided in the G*Power interface. The recommended sample size for Study 3 was 199 participants. For Study 5, it was $n = 246$ (82 people per condition); to be conservative, we planned to collect 100 participants per condition. This required running the study across two semesters and pooling the data to obtain our planned sample size. The recommended sample size for Study 4c was $n = 199$, more people than we could obtain for a diary study in any one semester. We addressed this by creating a sufficiently powered trait-level dataset ($N = 260$) by pooling Studies 4a to 4c as Study 4. For day-level analyses, we are sufficiently powered to test day-level relationships for each study and above the recommended minimum of 100 level-2 observations (Maas and Hox 2005).

2.2.3 | Exclusions

We excluded scale responses from participants who missed over half of the scale items. Study 3–5 had other specific exclusion criteria: In Study 3, we excluded people ($n = 5$) who did not follow instructions to add 10 puzzles to their set. In Study 4, per Nezlek (2012) and Meade and Craig (2012), we (1) excluded people who completed < five daily reports, (2) kept only the first report on days with multiple completed reports, and (3) excluded daily reports that were completed outside the time window or had failed attention checks (see Supporting Information, Studies 4a–4c, Sample Exclusions). We retained 83.3% of daily reports ($n = 2789$; $M = 11.45$ per person, $SD = 2.13$). In Study 5, we excluded people who did not attempt any of the eight core puzzles ($n = 41$), averaged < 5 s per puzzle ($n = 22$),[4] mistook the puzzle task for a mnemonics task ($n = 2$), gave nonsense responses ($n = 1$), or figured out that blocked condition puzzles were unsolvable ($n = 1$). (2), gave nonsense responses ($n = 1$), or figured out the puzzles in the blocked condition were unsolvable ($n = 1$).

We examined data quality, identifying participants who gave identical numeric ratings across all items within each difficulty mindset endorsement scale (i.e., straight-liners). Straight-liners on each difficulty mindset scale were flagged. Straight-lining was uncommon (< 10%) in most studies but common at the day-level in the diary responses (Study 1 $n = 95$, Study 2 $n = 33$, Study 3, $n = 17$; Study 4, $n = 21$ for trait responses and $n = 1082$ for daily responses, Study 5, $n = 12$). As a quality check, we re-ran each study's main analysis with and without straight-liners. Results were consistent, so we report analyses using the full sample without straight-liner exclusions.

2.2.4 | Samples

Undergraduates received course credit to participate except in the secondary data analysis Study 2, which included data across three time points from elementary to high school-aged students (Supporting Information provides links to the open-access datasets). Sample sizes are in Table 1, as are demographics for groups representing at least 10% in any study sample; Tables S4 and S5 provide demographics for studies with pooled data (Study 2, Study 4). Studies 3–5 each included participants from different semesters. In Studies 3 and 5, participation occurred twice during the semester; in Studies 4a–4c, it entailed a baseline survey and a 14-day daily diary study during the semester ($n = 2789$ daily reports).

2.3 | Results: Descriptive Information on the Difficulty Mindset Scales

As Table 2 details, difficulty mindset scales were reliable, functionally orthogonal, and differed significantly in endorsement ($ps < 0.001$); people endorsed difficulty-as-importance (above the neutral midpoint) and rejected difficulty-as-impossibility (below the midpoint).

3 | Study 1

Study 1 tests H1 (ecological validity).

3.1 | Method

Students filled out a questionnaire with mostly demographic questions requested by other researchers and, near the beginning of the questionnaire, the following two blocks: Block 1: Fisher and Oyserman's (2017) 4-item difficulty-as-importance

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TABLE 1 | Study 1–5 sample sizes and participant demographics.

	Study 1[a]	Study 2[b]	Study 3	Study 4[c]	Study 5
Sample size	986	733	216	260	551
Age mean	20.07	14.05	20.07	19.95	20.11
Age SD	1.90	1.57	1.89	2.05	2.03
% White	26.24	51.16	28.70	22.31	25.77
% Hispanic	16.71	26.06	15.28	10.38	13.97
% Asian	39.36	1.09	33.80	27.69	33.03
% Black	8.88	11.46	4.63	5.38	5.81
% Another race-ethnicity	6.44	10.10	17.59	26.54	20.87
% Male	33.01	46.66	33.33	25.00	30.13
% Female	66.26	53.34	65.74	60.00	68.97

[a]Study 1 is a subset of the 1227 students who signed up for the subject pool that semester; demographics reflect the subject pool sample.
[b]From T1 data.
[c]Pooled across Studies 4a–4c. Another Race-Ethnicity = The race-ethnicity options provided to participants varied by study; see Table S2 for details. Percentages do not add up to 100% due to missing data and variations in response data. Table S3 includes demographics for groups making up < 10% of any sample.

TABLE 2 | Difficulty-as-importance and difficulty-as-impossibility scales: reliability (α), Means, SDs, correlations between scale scores, and paired *t*-tests of differences between mean scores.

Study	Variable	*n*	α	Mean	SD	Correlation (*p*-value)	Paired *t*-test of Means[a]
1	Difficulty-as-importance	985	0.81	4.15	0.83	−0.03 (0.352)	39.04
	Difficulty-as-impossibility	985	0.85	2.53	0.97		
2	Difficulty-as-importance T1	733	0.88	3.37	0.82	−0.10 (0.006)	19.21
	Difficulty-as-impossibility T1	733	0.85	2.49	0.84		
	Difficulty-as-importance T2	660	0.91	3.17	0.85	0.07 (0.054)	15.96
	Difficulty-as-impossibility T2	660	0.86	2.47	0.81		
	Difficulty-as-importance T3	348	0.89	3.23	0.74	0.10 (0.068)	11.44
	Difficulty-as-impossibility T3	348	0.88	2.60	0.78		
3	Difficulty-as-importance	216	0.69	4.69	0.93	−0.03 (0.640)	18.82
	Difficulty-as-impossibility	216	0.80	2.67	1.24		
4	Difficulty-as-importance	260	0.80	4.28	0.86	−0.21 (< 0.001)	23.29
	Difficulty-as-impossibility	260	0.75	2.33	0.88		
	Difficulty-as-importance (day)	1980	0.78	4.13	1.10	−0.13 (< 0.001)	42.98
	Difficulty-as-impossibility (day)	1980	0.77	2.58	1.05		
5	Difficulty-as-importance T1	551	0.67	4.77	0.94	0.04 (0.353)	30.69
	Difficulty-as-impossibility T1	551	0.78	4.71	1.09		
	Difficulty-as-importance T2	551	0.81	2.76	1.26	0.08 (0.048)	24.99
	Difficulty-as-impossibility T2	551	0.84	2.93	1.36		

[a]All *t*-tests are significant at $p < 0.001$, people endorse difficulty-as-importance more than difficulty-as-impossibility. Studies 4a–4c are pooled as Study 4. Response options Study 2: 1 = strongly disagree, 5 = strongly agree; Studies 1 and 3–5: 1 = strongly disagree, 6 = strongly agree. Daily-measure reliability is computed using a three-level model approach with scale items nested within days and days within persons (Nezlek 2017).

scale, Ex: "If a task feels difficult, my gut says that it really matters for me," and 4-item difficulty-as-impossibility scale, Ex: "If a task feels difficult, my gut says that it may be impossible for me." with scale items randomized. Block 2: single-item recall of inferring difficulty-as-importance and difficulty-as-impossibility.

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3.2 | Results and Discussion

Table S6 provides scale response options, sample size, reliability, means, standard deviations, and correlations among scales. Supporting H1, students recalled experiencing both difficulty-as-importance and difficulty-as-impossibility about a few times a month (median = 7). Recall distributions were left-skewed (see Figure S1); most students recalled frequently experiencing each inference. As predicted, students recalled inferring importance and impossibility from their own experiences of difficulty when thinking about tasks and goals.

4 | Study 2

Study 2 tests H2a (endorsement scores vary between and within persons).

4.1 | Method and Measures

Students completed the 6-item difficulty-as-importance and difficulty-as-impossibility endorsement scales from Oyserman et al. (2015) at three time points (T1 $n = 733$, T2 $n = 660$, T3 $n = 348$).[5] Elapsed time was 1–37 weeks between T1 and T2 (Dataset 1 $M = 4.73$ weeks, SD = 2.29; Dataset 2 $M = 33.83$ weeks, SD = 0.93) and 2 to 56 weeks between T2 and T3 (Dataset 1 $M = 18.19$ weeks, SD = 9.36; Dataset 2 $M = 39.72$ weeks, SD = 10.89). Due to missing data, the T1 to T3 time lapse was larger, 6–90 weeks (≥ one semester in Dataset 1, $M = 21.57$ weeks, SD = 10.11; ≥ one school year in Dataset 2, $M = 73.20$ weeks, SD = 10.54).

4.2 | Results and Discussion

4.2.1 | Testing H2a

We tested H2a by calculating intraclass correlations (ICCs) and their 95% confidence intervals (CIs) with the three measurement occasions nested within students.[6] The ICCs and their CIs suggest that the scales vary meaningfully between (trait-like) and within (state-like) people (difficulty-as-importance ICC = 0.45, 95% CI [0.40, 0.50]; difficulty-as-impossibility ICC = 0.42, 95% CI [0.36, 0.47]). The overlapping CIs imply that the difficulty mindsets do not differ in their ICCs; we verified this with a Bayesian approach, estimating each null regression model with weakly informative priors, yielding difficulty-as-importance ICC = 0.45, 95% Credible Interval [0.40, 0.50]; difficulty-as-impossibility ICC = 0.41, 95% Credible Interval [0.36, 0.47]. We infer that difficulty-mindset scale scores have indistinguishable ICCs (are equally trait-and state-like).

4.2.2 | Exploratory Analyses

Follow-up exploratory analyses revealed that the ICCs for both scales were consistently <0.50 across participants' T1 school-age level (pre-high school vs. high school), implying no distinct differences in variability between the developmental age groups (Figure S3). We also explored whether endorsement scores changed over time (Figure S2). From T1 to T3, difficulty-as-importance scores declined ($b = -0.02$, $t = -6.03$, $p < 0.001$) and difficulty-as-impossibility scores increased ($b = 0.01$, $t = 2.23$, $p = 0.026$). Supporting Information (Study 2, Endorsement Across Time) provides multiple regression equations and detailed results.

5 | Study 3

Study 3 tests H2b (trait scores predict preferring and choosing ease over difficulty).

5.1 | Method and Measures

A pilot study ($N = 102$) confirmed that students found the solving word puzzles task engaging and valuable for developing skills for getting good grades (Supporting Information, Study 3, Pilot).

Students participated at two points in time ($M = 8.82$ days, SD = 14.95 apart). At T1, they filled out a questionnaire including mostly demographic questions requested by other researchers and, near the beginning of the questionnaire, the Fisher and Oyserman (2017) difficulty mindset scales with items appearing in randomized order. At T2, they read: "You will work on a set of 10 word-puzzles for this task. Working on word-puzzles is a useful way to develop the kinds of sharp analytic skills that help people get good grades in school. Working on word-puzzles is particularly useful for developing this grade-bolstering skill when the word-puzzles are difficult." They then reported their preferences: "I would prefer the puzzles most people can solve," and "I would prefer the puzzles most people cannot solve" (1 = not at all, 5 = very much), and set up their task: "Okay, put together a training set of 10 puzzles. How many of those 10 would you select from each kind of puzzle? How many would you include from the puzzles that most people can solve? How many would you include from the puzzles most people cannot solve?". Students then provided their gender, age, and race-ethnicity.

5.2 | Results and Discussion

5.2.1 | Descriptive Analyses

Students preferred ($M = 3.54$, SD = 1.10) easy puzzles, did not prefer ($M = 2.95$, SD = 1.18) difficult ones, and created sets of ~40% difficult puzzles, $M = 3.80$, SD = 2.01. Those preferring difficult puzzles put more in their set, $r(216) = 0.69$, $p < 0.001$, and put fewer difficult ones in their set if they preferred easy ones, $r(216) = -0.56$, $p < 0.001$.

5.2.2 | Testing H2b

Supporting H2b, linear multiple regressions predicting T2 preferences and choices from T1 difficulty-as-impossibility and difficulty-as-importance scores revealed that people scoring higher in difficulty-as-impossibility subsequently preferred easy puzzles ($b = 0.20$, $t = 3.49$, $p < 0.001$) and not difficult puzzles ($b = -0.24$, $t = -3.89$, $p < 0.001$), adding fewer difficult ones to their puzzle set ($b = -0.35$, $t = -3.21$, $p = 0.002$).

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Difficulty-as-importance scores did not shape later preferences for easy ($b = 0.13$, $t = 1.72$, $p = 0.087$) or difficult ($b = 0.05$, $t = 0.58$, $p = 0.566$) puzzles or choice (adding difficult puzzles to their set, $b = -0.13$, $t = -0.89$, $p = 0.379$). Supporting Information (Study 3, Follow-Up Time Lag Analysis) details that results were stable when we controlled for the lag in days between T1 and T2. We infer that people have insight into the consequences of their chronic beliefs, with difficulty-as-impossibility endorsers choosing the less effortful means of task completion and difficulty-as-importance endorsers showing indifference to means.

6 | Study 4

Study 4 tests H2a (between- and within-person variability) and H2c (trait and daily state scores are associated with daily fluctuations in self-perception and goal-focused action).

6.1 | Method and Measures

Students completed a baseline questionnaire (T1) and a 14-day daily diary (T2 to T15). At T1, students completed the Fisher and Oyserman (2017) 4-item difficulty-as-importance and 4-item difficulty-as-impossibility mindset scales, 10-item goal self-efficacy scale (following Bandura 2006), 10-item Rosenberg (1965) self-esteem scale, and a 6-item self-compassion scale (two items each from the over-identification, self-kindness, and self-judgment subscales; Raes et al. 2011), and then their gender, age, and race-ethnicity. Next, they watched an introductory video explaining that they would receive a link each evening for 14 days and should complete each daily diary as close to bedtime as possible. In Study 4a, students had from 9 p.m. to 11 a.m. the next day to complete the daily link, following prior diary studies (e.g., Newman et al. 2020; Oishi et al. 2007). Given student feedback indicating that 9 p.m. was too late, we opened the link at 5 p.m. in Studies 4b and 4c and retained the next day by 11 a.m. cut-off.

T2 to T15 were 14 consecutive days; students completed the daily diary with day-level versions of the measures administered at T1 [6-item goal self-efficacy scale, Nezlek (2005); 4-item self-esteem scale; 3-item self-compassion scale] and three diary-specific measures. The diary-specific measures were: (1) daily meaningful school engagement: "Today I did schoolwork the hard way (e.g., I took notes), I read the assignments before class;" and in Studies 4b and 4c, (2) daily experience of difficulty: "Did you experience difficulty working on a task today?" and (3) daily goal engagement: "Did you work on any of your goals today?". Daily difficulty-as-importance and difficulty-as-impossibility items appeared on days they reported experiencing difficulty, and the daily goal self-efficacy items only on days they reported goal engagement.

6.2 | Results and Discussion

6.2.1 | Descriptive Analyses

Difficulty-as-importance and difficulty-as-impossibility scores were distributed across the full scale on most days and did not converge across the 14 days (see Figure S4). Daily self-esteem ($\alpha = 0.80$), goal self-efficacy ($\alpha = 0.76$), and self-compassion ($\alpha = 0.60$) were reliable; see Table S7 for overall and by study scale descriptives. We found significant, negative, small-to-moderate-sized correlations between trait and daily difficulty-as-impossibility and daily positive self-perceptions (self-esteem, goal self-efficacy, and self-compassion). These associations were smaller-sized and positive for daily and trait difficulty-as-importance (daily very-small-sized significant associations, trait small and not always significant at $p < 0.05$, see Table S8). Students reported meaningful engagement with school on 58.11% of days, and at least once during the 2 weeks, they experienced difficulty while working on a task (98.23%) and worked on their goals (98.04%). This was the case in about half of their daily reports (experiencing difficulty: Study 4b 48.33%, Study 4c 49.32%; working on a goal: Study 4b 57.35%, Study 4c 65.68%). Experiencing difficulty and working on goals, $r(1575) = 0.22$, $p < 0.001$ (small-sized correlation).

6.2.2 | Testing H2a

Supporting H2a, difficulty-as-importance and difficulty-as-impossibility scores include trait-like and state-like aspects.[7] We calculated ICCs and their 95% CIs with daily scores nested within students (see Table S9 and Figure S5). Difficulty-as-importance score ICCs ranged from 0.51 to 0.62, pooled ICC = 0.59 (95% CI [0.55, 0.64]); difficulty-as-impossibility score ICCs ranged from 0.44 to 0.50, pooled ICC = 0.46 (95% CI [0.41, 0.52]).

6.2.3 | Testing H2c

Supporting H2c, trait and state difficulty mindset scores mattered in distinct ways for positive self-perceptions and action. We created two sets of two-level models (example equations in Appendix B) to examine the relative impact of trait and state difficulty-as-importance and difficulty-as-impossibility on daily task engagement and self-perception. In each model, both difficulty mindset scores were entered simultaneously so that the effect of each, controlling for the other, could be ascertained. In the first set of models, the level-2 predictor was the trait difficulty-as-importance or difficulty-as-impossibility score, and the outcome was daily meaningful school engagement, self-efficacy, self-esteem, or self-compassion. In the second set of models, the level-1 predictor was the group-mean-centered daily difficulty-as-impossibility or difficulty-as-importance score, and the outcome was daily meaningful school engagement, goal self-efficacy, self-esteem, or self-compassion. Appendix B details our rationale for this plan. We present analyses using the pooled dataset (see Supporting Information for by-study results).

As the top panel of Figure 1 details, controlling for study and simultaneously entering the trait scores, people higher in trait difficulty-as-importance were more likely to report engaging with school in a meaningful way on any given day ($b = 0.28$, $z = 2.78$, $p = 0.005$, $R^2 = 0.04$). This was not the case for trait difficulty-as-impossibility ($b = 0.03$, $z = 0.34$, $p = 0.738$); it was associated with less goal self-efficacy, $b = -0.22$, $t = -4.77$, $p < 0.001$, $R^2 = 0.07$, lower self-esteem, $b = -0.29$, $t = -5.56$, $p < 0.001$, $R^2 = 0.06$, and less self-compassion, $b = -0.25$, $t = -4.59$, $p < 0.001$, $R^2 = 0.04$, on any given day. Trait difficulty-as-importance was not significantly associated with daily goal self-efficacy $b = 0.04$, $t = 0.82$, $p = 0.416$; self-esteem $b = -0.09$,

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$t = -1.74$, $p = 0.083$; or self-compassion $b = -0.03$, $t = -0.46$, $p = 0.647$.

The bottom panel of Figure 1 depicts associations of daily difficulty-as-importance and difficulty-as-impossibility scores with each daily outcome variable, controlling for study and time (day of diary report) and simultaneously entering the daily endorsement scores. On days students endorsed difficulty-as-importance more, they engaged more meaningfully with school ($b = -0.48$, $z = 5.82$, $p < 0.001$, $R^2 = 0.06$), felt more efficacious ($b = 0.15$, $t = 6.55$, $p < 0.001$), had better self-esteem ($b = 0.18$, $t = 6.88$, $p < 0.001$), and were more self-compassionate ($b = 0.17$, $t = 6.49$, $p < 0.001$). In contrast, on days they endorsed difficulty-as-impossibility, they did not consistently engage meaningfully with school ($b = 0.11$, $z = 1.51$, $p = 0.130$), felt less efficacious ($b = -0.32$, $t = -15.57$, $p < 0.001$, $R^2 = 0.08$), had worse self-esteem ($b = -0.45$, $t = -19.02$, $p < 0.001$, $R^2 = 0.11$), and were less self-compassionate ($b = -0.32$, $t = -13.42$, $p < 0.001$, $R^2 = 0.07$). Wald tests with unstandardized regression coefficients reveal that the daily difficulty-as-impossibility negative associations were significantly larger than the daily difficulty-as-importance positive ones (daily goal self-efficacy $X^2 = 263.90$, $p < 0.001$, self-esteem $X^2 = 368.29$, $p < 0.001$, and self-compassion $X^2 = 220.02$, $p < 0.001$).

7 | Study 5

Study 5 tests H3 (context matters for endorsement).

7.1 | Method and Measures

Students participated at two points, about 2 weeks apart ($M = 13.42$ days, SD = 20.30). At T1, they filled out a questionnaire including mostly demographic questions requested by other researchers and, near the end of the questionnaire, the Fisher and Oyserman (2017) difficulty mindset scales with items appearing in randomized order. At T2, students worked on 16 word-puzzle anagrams, one per screen (Figure 2 depicts an example), completed the difficulty mindset scales again, judged the task ("How easy or difficult was the word-puzzle task?" 1 = very easy, 7 = very difficult, "To me, these puzzles felt important to solve." "To me, these puzzles felt impossible to solve. https://osf.io/s6ugv/overview" 1 = strongly disagree, 6 = strongly agree), and reported gender and age.[8]

Half of the word puzzles were a core set of eight moderately difficult, single-solution puzzles (Gilhooly and Johnson 1978); the

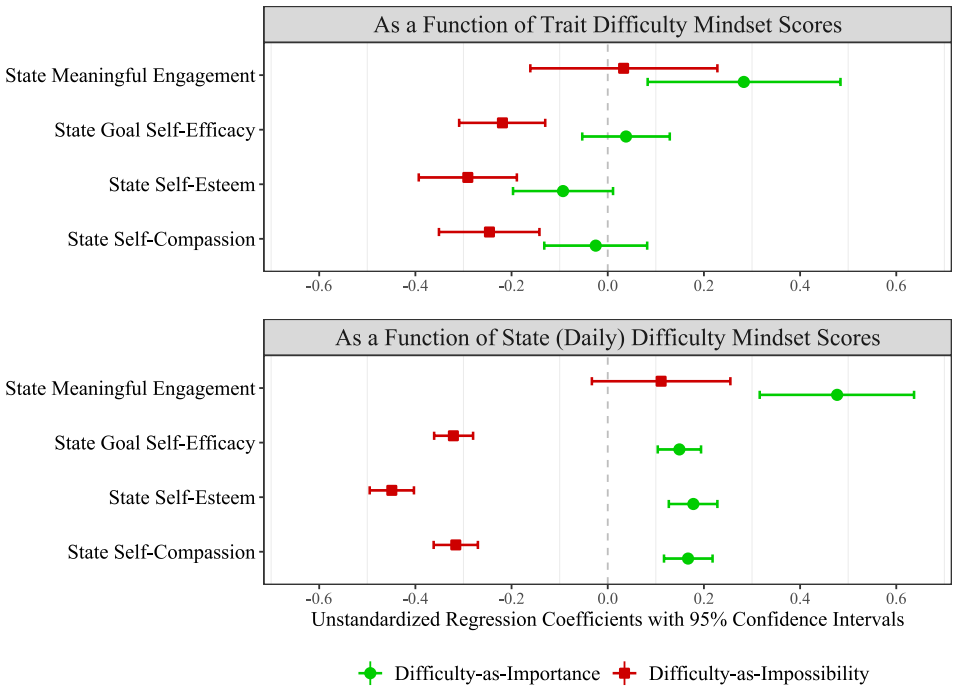

FIGURE 1 | Associations between trait and state difficulty-as-importance and difficulty-as-impossibility, daily meaningful engagement with school, and daily self-perception.

FIGURE 2 | Example word-puzzle screen: participants type A solution or press "I can't figure it out". All of the word puzzles are located in Table S10.

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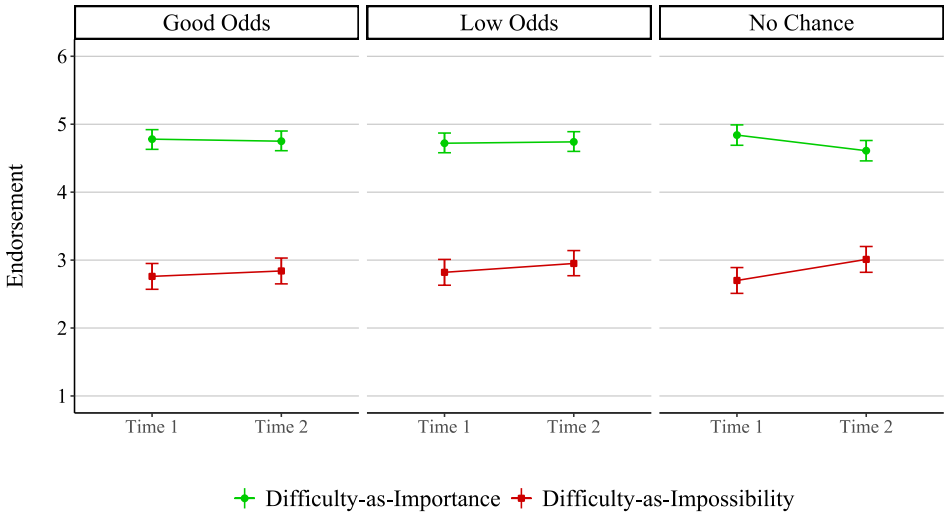

FIGURE 3 | Difficulty-as-impossibility and difficulty-as-importance endorsements are sensitive to contexts signaling no chance of success, not otherwise.

other eight puzzles depended on randomization to one of three sets. Each set provided a hint of the odds of success (good odds, low odds, no chance). In the good odds context, the core set was mixed with a set of easier-to-solve, multiple-solution puzzles (EnchantedLearning.com 2019). In the low odds context, the core set was mixed with a set of moderately difficult, single-solution puzzles (Gilhooly and Johnson 1978). In the no chance of success context, the core set was mixed with a set of unsolvable puzzles (Calef et al. 1992).

7.2 | Results and Discussion

7.2.1 | Manipulation Checks

Our manipulation checks suggested successful context manipulation. First, students found the puzzle task important ($M=4.02$, $SD=1.72$) regardless of random assignment (for scores, see Supporting Information, Study 5, Subjective Importance). Second, randomization affected how impossible the task felt. It felt more impossible to students randomized to the no chance ($M=4.06$, $SD=1.72$) rather than the low ($M=3.00$, $SD=1.69$, $t(548)=6.08$, $p<0.001$) or good ($M=2.59$, $SD=1.61$, $t(548)=8.43$, $p<0.001$) odds of success contexts; the task felt more impossible to those in the low vs. good odds of success context, $t(548)=2.38$, $p=0.047$. Third, randomization shifted how difficult the task felt: Students randomized to the no chance of success context ($M=5.39$, $SD=0.92$) rated the task as harder than those randomized to the low ($M=4.68$, $SD=1.28$, $t(548)=5.54$, $p<0.001$) or good ($M=4.17$, $SD=1.42$, $t(548)=9.54$, $p<0.001$) odds contexts, as did those randomized to the low vs. good odds context, $t(548)=4.04$, $p=0.002$.

7.2.2 | Testing H3

We tested H3 with two repeated-measures ANCOVAs with time as a within-subjects factor and context as a between-subjects factor predicting difficulty-as-importance or difficulty-as-impossibility. Our predictors were context, time, and their interaction; the other difficulty mindset score and the semester of data collection served as controls. Though not significant at a $p<0.05$ threshold, the predicted context and time interaction was marginally significant in each ANCOVA, difficulty-as-impossibility ($F(2, 548.76)=2.28$, $p=0.104$, $f=0.08$)[9] and difficulty-as-importance ($F(2, 548.71)=2.87$, $p=0.058$, $f=0.09$).[10] Given this, we conducted pairwise comparisons to examine the effect of time on difficulty mindset endorsement in each context.

As depicted in Figure 3, students randomly assigned to experience the difficult task in a context signaling no chance of success subsequently endorsed difficulty-as-impossibility more. $t(551)=-3.81$, $p<0.001$, and difficulty-as-importance less, $t(553)=2.92$, $p=0.004$. We did not find a significant change in difficulty mindset scale scores among those randomly assigned to the good (difficulty-as-impossibility $t(547)=-0.93$, $p=0.352$; difficulty-as-importance $t(548)=0.31$, $p=0.756$) or low odds (difficulty-as-impossibility $t(547)=-1.71$, $p=0.089$; difficulty-as-importance $t(549)=-0.23$, $p=0.817$) contexts. Endorsements remain stable in contexts providing weak cues and shift in those providing strong signals that success cannot be attained (difficulty-as-importance scores drop, and difficulty-as-impossibility scores rise).

8 | General Discussion

We outlined three core assumptions of IBM theory (ecological validity, trait-like and state-like with consequences for self-perception and action, and strong contexts matter) and tested them across five studies with about 2000 college students and 700 elementary-to-high school-aged students. We found support for the predictions derived from each assumption. Ecological validity: In their everyday lives, people recall inferring difficulty-as-importance and difficulty-as-impossibility a few times a month on average (Study 1). Trait and state: difficulty-as-importance and difficulty-as-impossibility have meaningful trait-like and context-sensitive (state-like) features (Studies 2–5), with ICC scores at about the midpoint. Traits and states each matter; on days when people were higher than their average on difficulty-as-importance, they reported more meaningful engagement with schoolwork, and more self-compassion, self-efficacy, and

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self-esteem. On days they scored higher than their average on difficulty-as-impossibility, they reported less self-compassion, self-efficacy, and self-esteem. Trait difficulty-as-impossibility scores were also associated with daily fluctuations in these measures of self-perception, while trait difficulty-as-importance beliefs were associated with more daily meaningful engagement with schoolwork. Context matters: strong contextual cues signaling that success is blocked momentarily shift both difficulty mindset scale scores (Study 5).

8.1 | Theoretical Contributions

Our results address gaps in extant IBM research and contribute to the broader literatures on self-perceptions, emotion and motivation, and social cognition. Regarding IBM research, we document that difficulty-as-importance and difficulty-as-impossibility experiences occur with some frequency, that scale endorsements have trait-like and state-like features, and that both trait and state endorsements matter for self-perceptions and action. We also show that endorsement of both difficulty mindsets shifts when people experience contexts that unambiguously cue blocked opportunities. While benchmarks for what qualifies as a meaningful amount of within-person variation have not been established, we infer that difficulty mindsets reflect both trait-like between-person differences and state-like within-person variability for two reasons. First, the ICCs suggest that scores vary about equally between and within persons. Second, a meta-analytic review of the ICCs of applied psychological constructs (e.g., ego depletion, work engagement) by Podsakoff et al. (2019) found that ICCs vary greatly, with an average ICC of 48%; difficulty-as-importance and difficulty-as-impossibility ICCs are close to this average.

Moreover, our studies contribute to the broader literature on self-perceptions, including self-esteem, self-compassion, and goal self-efficacy in two ways. First, we show a unique pattern of relationship between endorsing each difficulty mindset and daily fluctuations in positive self-perceptions. Using multilevel modeling, we unpack the unique association between the trait-level and state-level endorsements of both difficulty mindsets and state self-efficacy, self-esteem, and self-compassion. We specifically show that the negative power of endorsing difficulty-as-impossibility on these aspects of positive self-perception is stronger than the positive power of endorsing difficulty-as-importance, whether predicting daily fluctuations in these measures from trait difficulty mindset scores or examining daily fluctuations in each. Second, both trait difficulty mindset scores are distinct from trait positive self-perception, including self-efficacy, self-esteem, and self-compassion (correlations range from very small to moderate in size; see Tables S6 and S8).

Our results are also relevant to literature on the relationship between emotion and motivation. We find that on days that people endorse difficulty-as-importance more than their average, they also report greater goal self-efficacy and self-esteem; on days they endorse difficulty-as-impossibility more than their average, they also report lower goal self-efficacy and self-esteem. These results may seem to imply that difficulty-as-importance endorsement corresponds with positive emotions more generally, while difficulty-as-impossibility endorsement corresponds with negative emotions. However, this conclusion may not be warranted for at least two reasons. First, evidence suggests that affective tone does not differ between autobiographical writings of memories of difficulty-as-importance and difficulty-as-impossibility (among participants randomly assigned to a recall condition; Choi and Oyserman 2026). Second, fluency is generally experienced positively (Winkielman et al. 2003), and both difficulty-as-importance and difficulty-as-impossibility can be experientially fluent depending on the context. When difficulty-as-importance (vs. difficulty-as-impossibility) is on their minds, people are more likely to believe that they would make progress on their important possible-self goals that year (Choi and Oyserman 2026). When the reverse is the case, they are less likely to find letting go of impossible goals painful (Choi and Oyserman 2026). Moreover, students are more likely to endorse difficulty-as-importance when led to consider their possible identities as fitting, rather than misfitting, the college context (Oyserman et al. 2015).[11] We infer that whether difficulty-as-importance and difficulty-as-impossibility are experienced positively or negatively depends on context. Hence, it would be a mistake to suppose that difficulty-as-importance is always associated with positive emotions or that difficulty-as-impossibility is always associated with negative ones.

Lastly, by addressing basic assumptions, we situate identity-based motivation theory firmly within a situated social cognition approach to human judgment, reasoning, and motivation. We find that people commonly recall making inferences from metacognitive experiences of difficulty, that the situations we engineered to highlight low odds momentarily shift endorsements of each difficulty mindset, that endorsements of both mindsets fluctuate meaningfully day to day, and that when they fluctuate, so do related motivational states and action.

8.2 | Limitations and Future Directions

As is the case for any set of studies, ours has limitations that might be addressed in future research. We consider limitations to generalizability given our samples, measures, and methods. First, regarding samples, while our student samples were diverse, ranging from primary and secondary school to college-aged and included both females and males, and varied in race-ethnicity, they all lived in the United States, and none were non-student adults, which may limit generalizability across societies and developmental phases. Prior research (Fisher and Oyserman 2017) reveals that older and younger Americans endorse difficulty-as-importance more than difficulty-as-impossibility and that age is associated with endorsing both difficulty mindsets less, but not whether mindset endorsement becomes more or less trait-like with age. It is possible that difficulty-as-impossibility endorsement becomes more trait-like as people age, as opportunities generally decrease and constraints on resources increase with age (motivational theory of life-span development, Heckhausen et al. 2010). At the same time, it is also possible that the trait-like aspect of difficulty mindsets declines over time as people age and become wiser, more attuned to contextual nuance (e.g., Grossman et al. 2012). Future research could explore this curvilinear possibility by utilizing longitudinal survey designs

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across developmental trajectories. Robustness could be assessed by using non-student samples and samples outside of the U.S. This might be especially useful given evidence of cultural stability in the pattern of endorsing difficulty-as-importance more than difficulty-as-impossibility and cultural variability in the accessibility of difficulty-as-impossibility mindsets (O'Donnell et al. 2023).

Second, regarding measures, we operationalized contexts, tasks, and goals relevant to our student samples. Beyond school attainment and engagement, future studies could focus on other meaningful goals, from political engagement to financial saving to parenting, that fit different life phases or domains. For example, people who believe pro-environmental action is important and worthwhile may still fail to take even low-effort actions, such as recycling, if they believe their actions are unlikely to meaningfully contribute to the end goal of climate mitigation. Moreover, barriers to pro-environmental action may trigger increases in difficulty-as-impossibility endorsement and subsequently lower feelings of efficacy. In contrast, contexts that unambiguously cue the importance of environmental action may increase people's endorsement of a difficulty-as-importance mindset, bolstering their willingness to act.

Third, regarding methods, we used various methodological approaches–elicited recall, a scenario study, experiments, secondary analysis of survey data, and daily diaries–to address gaps in research to date. Future studies could replicate each using a different method to increase robustness. Of note, Study 4 documents up and down fluctuations in daily endorsements of difficulty-as-importance and impossibility, but Study 5 only documents one antecedent of decreased difficulty-as-importance and increased difficulty-as-impossibility endorsement (a context that unambiguously suggests no odds of success). A focus on odds of success is central to a difficulty-as-impossibility mindset, while a focus on self-relevance is central to a difficulty-as-importance mindset. Hence, future experiments could examine features of contexts central to difficulty-as-importance, for example, by unambiguously cuing the self-relevant importance of engagement.

9 | Conclusions

People draw both difficulty-as-importance and difficulty-as-impossibility inferences in their everyday lives; these inferences both reflect who they are (trait-like) and fluctuate (state-like), and both matter for how they experience themselves and what they do. At the same time, difficulty-as-importance may become more trait-like in early adulthood, implying that people low in difficulty-as-importance may benefit from programs supporting the adoption of a more chronic difficulty-as-importance perspective. Moreover, difficulty-as-impossibility may be more state-like and, when endorsed, more undermining of positive goal self-efficacy, self-esteem, and self-compassion. To the extent that each of these aspects of self-perception is promotive of resilience, people may benefit from contexts that reduce the salience of a difficulty-as-impossibility perspective. In addition to individual benefits, institutions may benefit as well by having students and workers who more persistently engage.

Author Contributions

A.B. conducted the investigations, A.B. and D.O. equally conceptualized the paper and its methodology, A.B. led data curation, formal analysis, and project administration, under D.O. supervision, A.B. and D.O. visualized the data and both wrote the first draft and revisions.

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Funding

The authors have nothing to report.

Ethics Statement

We obtained IRB approval before collecting data (Studies 1, 3, 5 #UP-15-0055; Studies 4a-4c #UP-19-00570); Study 2 entails secondary analysis of available data (Ahrens and Oyserman 2025; Carter and Oyserman 2019).

Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

The data that support findings are openly available (Studies 1, 3, a to 4c, and 5 Open Science Framework at https://osf.io/s6ugv/overview; secondary analyses data for Study 2 Ahrens and Oyserman 2025; Carter and Oyserman 2019).

Endnotes

[1] Mean endorsement is distinct from chronic accessibility. Implicit association, free association, and forced choice studies suggest that Americans associate difficulty more with impossibility than with importance. Moreover, these associations are orthogonal to difficulty-as-importance and difficulty-as-impossibility scores (O'Donnell et al. 2023).

[2] For example, Fisher and Oyserman (2017) report a correlation of −0.40, $p < 0.01$ between internal locus of control and difficulty-as-impossibility, a correlation of −0.34, $p < 0.01$ between growth mindset and difficulty-as-impossibility, and a correlation of 0.49, $p < 0.01$ between prevention focus and difficulty-as-impossibility.

[3] As described by Oyserman et al. (2015), these interventions are meant to change both accessibility (how frequently each mindset comes to mind) and to support endorsement of difficulty-as-importance in school situations in which school tasks and goals feel difficult to think about. As these are not experience-sampling studies, what is measured is endorsement of difficulty-as-importance and difficulty-as-impossibility, with the intervention meant to trigger higher endorsement of the former and lower endorsement of the latter.

[4] We looked for participants whose responses were too fast (M −2.5 SD) or too slow (M +2.5 SD) compared to the sample (between-person) means as outliers; none were found.

[5] Appendix A lists the full set of items for these scales and the 4-item scales used in the other studies. As can be seen, the items are not

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identical but have similar content and yield similar patterns of endorsing difficulty-as-importance more than difficulty-as-impossibility.

[6] ICC, a descriptive statistic ranging from 0 to 1, represents the proportion of between-person to total variance. ICCs < 0.50 indicate that measurements across time are not fully stable, with more variance at the within-person than the between-person level.

[7] We explored age-related differences; the ICC CIs for difficulty-as-importance and difficulty-as-impossibility overlapped in Study 2 (younger participants); they did not overlap for undergrads. Moreover, difficulty-as-impossibility but not difficulty-as-importance ICC CIs overlap for younger (Study 2) and older (Study 4) participants. Difficulty-as-importance may be more trait-like than difficulty-as-impossibility by college, but not in the middle and high school years.

[8] We also asked students to provide their verbal SAT/ACT percentiles, but most could not recall.

[9] Context $F(2,546.89) = 0.25, p = 0.781, f = 0.03$; difficulty-as-importance $F(1,1013.51) = 4.78$, $p = 0.029$, $f = 0.07$; semester $F(1,546.95) = 5.38$, $p = 0.021, f = 0.09$; and time $F(1,548.7) = 13.97, p < 0.001, f = 0.14$.

[10] Context $F(2, 546.64) = 0.12, p = 0.884, f = 0.02$; time $F(1, 553.83) = 3.03$, $p = 0.082$, $f = 0.06$; semester $F(1,549.05) = 0.10$, $p = 0.750$, $f = 0.02$; difficulty-as-impossibility $F(1,1013.60) = 4.72$, $p = 0.030, f = 0.07$.

[11] First-year college students were randomly assigned to one of two situational cues and to one of two possible-self cues. Half read the positive and half the negative (square bracketed version) of the college situations: "After acceptance into the University of Michigan, the college years tend to be smooth going [rocky going]. Students mostly find that they can[not] get to where they hoped to get. That is, UM students mostly can[not] attain the grades, major, and experiences they need, making them likely to find success and satisfaction [obstacle and disappointments] in the next phase of life." Half of students in each situation were then randomly assigned to consider their positive or negative possible identities for the college years: Take a minute to think about your own college years. In the space below, describe who YOU [DO NOT] WANT TO BECOME during college and YOUR STRATEGIES (what you will do) to attain [avoid] this possible self. Fit could be positive, imagining a success-likely context and desired possible identities, or negative, imagining am obstacle and disappointment likely context and undesired possible identities. Students randomly assigned to either positive or negative fit scored higher than those assigned misfit (success-likely context and undesired possible identities or disappointment-likely contexts and desired possible identities).

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Supporting Information

Additional supporting information can be found online in the Supporting Information section. **Table S1:** Pre-registration deviations. **Table S2:** Race-ethnicity labels by Study. **Table S3:** Sample size and full participant demographics by Study. **Table S4:** Study 2: Sample sizes and characteristics by dataset and time point. **Table S5:** Study 4: Sample sizes and characteristics by Study and pooled. **Figure S1:** Students recall difficulty-as-importance experiences as more frequent than difficulty-as-impossibility experiences. **Table S6:** Study 1 scale descriptives (means, standard deviations, alphas) and correlations. **Figure S2:** Difficulty-as-importance decreases, and difficulty-as-impossibility increases over time. **Figure S3:** Difficulty mindset endorsements vary within-person and between-person. **Figure S4:** Difficulty-as-importance and difficulty-as-impossibility scores across 14 days. **Table S7:** Study 4: Scale means, standard deviation (SD), and α reliability across Studies 4a to 4c. **Table S8:** Study 4: Pooled trait measure and daily measure correlations. **Table S9:** Study 4: Intraclass correlations (ICCs) and 95% confidence intervals (CIs). **Figure S5:** Difficulty-as-importance and difficulty-as-impossibility endorsement ICCs. **Table S10:** Study 5: Core and context-specific puzzles with solutions if applicable.

Appendix A

Measures

All response scales are 1 = strongly disagree to 6 = strongly agree, except for Study 2. Study 2 response scales are 1 = strongly disagree to 5 = strongly agree.

Difficulty-as-Importance Scale

Studies 1, 3, 4, and 5 Trait Measure (Fisher and Oyserman, 2017**).**

1. If a task feels difficult, my gut says that it really matters for me.
2. I know a goal is a key one for me when it feels difficult to work on.
3. When a goal feels difficult to attain, then it is probably worth my effort
4. When a task feels difficult, the experience of difficulty informs me that succeeding in the task is important for me.

Study 2 Trait Measure (Oyserman et al. 2015**).**

1. If I'm working on a task that feels difficult, it means that the task is important.
2. A sign that a task is important to me is how difficult it feels while working on it. If it feels difficult, it's important.
3. If a task is difficult, it is probably important for me to do well at it.
4. Struggling to complete a task reminds me that the task is important.
5. Tasks that feel difficult are important tasks.
6. If a task is difficult, it means that it's important for me.

Study 4 Daily Measure, Study-Created.

1. Today, when I experienced difficulty on a task, my gut said that it really mattered for me.
2. Today, when a goal was difficult to attain, I knew that the goal was a key one to work on.
3. Today, when a goal was difficult to attain, I felt that it was worth my effort.
4. Today, when I experienced difficulty on a task, I felt that it was important for me

Difficulty-as-Impossibility Scale

Studies 1, 3, 4, and 5 Trait Measure (Fisher and Oyserman 2017**).**

1. If a task feels difficult, my gut says that it may be impossible for me.
2. I know a goal is impossible for me when it feels difficult to work on.
3. When a goal feels difficult to attain, then it is probably out of my reach.
4. When a task feels difficult, the experience of difficulty informs me that succeeding in the task is just not possible for me.

Study 2 Trait Measure (Oyserman et al. 2015**).**

1. If I feel stuck on a task, it's a sign that my effort is better spent elsewhere.
2. If working on a task feels very difficult, that type of task may not be possible for me.
3. If a task feels too difficult, I should move on to something else.
4. When working on a task feels hard, that feeling means it's not for me
5. Finding a task really difficult tells me that I can't complete that task.
6. If a task feels really difficult, it may not be possible for me.

Study 4 Daily Measure, Study-Created.

1. Today, when I experienced difficulty on a task, my gut said that it might be impossible for me.
2. Today, when a goal was difficult to attain, I knew that the goal was impossible for me.
3. Today, when a goal was difficult to attain, I felt that it was out of my reach.
4. Today, when I experienced difficulty on a task, I felt that succeeding at it was just not possible for me.

Autobiographical Recall: Difficulty-as-Importance and Difficulty-as-Impossibility

Study 1, Study-Created.

How often would you say you have this experience in your own life?

1. Once or twice in my life
2. About once every few years
3. Once a year
4. About twice a year
5. About once every few months
6. Once a month
7. About a few times a month
8. Once a week
9. About a few times a week
10. Once a day
11. More than once a day

Positive Self-Perception Measures

Supporting Information provides trait-level self-perception measures and their correlations with the difficulty mindset measures (exploratory analyses).

Goal Self-Efficacy Scale

Study 4 Daily Measure, per Bandura (2006) created to target study issues.

1. Today, when I needed to take actions to work on my goals, I could do that

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2. Today, I was capable of coming up with strategies to make progress on my goals.
3. Today, when I tried to implement the strategies I came up with, I could not. (R)
4. Today, I was not sure how to turn my goals into concrete actions. (R)
5. Today, I didn't know how to make progress on the goals I have for myself. (R)
6. Today, when I needed to start working on a new goal, I had trouble getting started. (R)
7. Today, when I encountered an obstacle while working on a goal, I had trouble keeping going. R

Self-Esteem

Study 4 Daily Measures, Nezlek (2005).

1. Today, I felt like a failure. (R)
2. Today, I felt I had many good qualities.
3. Today, I thought I was no good at all. (R)
4. Today, I was satisfied with myself on the whole.

Self-Compassion

Study 4 Daily Measure, Study-Created (One item per self-compassion self-kindness, over-identification, and self-judgment subscales; adapted from Raes et al. 2011).

1. Today, I felt compassion toward myself.
2. Today I showed caring, understanding, and kindness toward myself.
3. Today, I was disapproving and judgmental about my own flaws and inadequacies. (R)

Appendix B

Study 4 Multilevel Analysis

Rationale and Explanation

By group-mean centering daily predictor variables, we center scores on each person's 14-day average, removing variance attributable to between-person factors (e.g., response tendencies, individual differences; Hoffman 2015, Chapter 9). The resulting interpretation focuses on how a person deviates from their own day-to-day average (Enders and Tofighi 2007). For reporting effect sizes, we follow Rights and Sterba (2019) and report R^2 effect sizes calculated using model-implied variances. Specifically, we report the proportion of total outcome variance explained by all predictors via fixed slopes. As recommended by Nezlek (2012) and Kreft and De Leeuw (1998), we do not report R^2 separately for level 1 and level 2.

General Equation Notation

The subscript i is for the repeated measurements of each person ($i = 1...n_j$) and the subscript j is for the persons ($j = 1...J$). e_{ij} is the residual error term at the repeated measurements level (Level 1), and u_{0j} is the residual error term at the person level (Level 2). y_{00} is the grand mean for the outcome variable score.

Equation 1: Trait Difficulty Mindset Endorsements Predicting Daily School Engagement.

Level-2 predictor variables: trait difficulty-as-importance, trait difficulty-as-impossibility, study 4b dummy variable, and study 4c dummy variable.

Level-1 outcome variable: daily meaningful schoolwork engagement

$$(\text{outcome variable})_{ij} = \pi_{ij}; \pi \sim \text{Binomial}\ (\mu)$$

$$\pi_{ij} = \text{logistic}\left(\eta_{ij}\right).$$

$$\begin{aligned}\eta_{ij} = {} & y_{00} + y_{01}(\text{trait difficulty} - \text{as} - \text{importance endorsement})_{\text{j}} \\ & + y_{02}(\text{trait difficulty} - \text{as} - \text{impossibility endorsement})_{\text{j}} \\ & + y_{03}(\text{study4bdummy})_{\text{j}} + y_{04}(\text{study4cdummy})_{j} + u_{0j}.\end{aligned}$$

Equation 2: Trait Difficulty Mindset Endorsements Predicting Daily Self-Perceptions.

Level-2 predictor variables: trait difficulty-as-impossibility, trait difficulty-as-importance, study 4b dummy variable, and study 4c dummy variable.

Level-1 outcome variable: daily goal self-efficacy, daily self-esteem, or daily self-compassion.

$$\begin{aligned}(\text{outcome variable})_{ij} = {} & y_{00} + y_{01}(\text{trait difficulty} - \text{as} \\ & - \text{importance endorsement})_{j} \\ & + y_{02}(\text{trait difficulty} - \text{as} \\ & - \text{impossibility endorsement})_{j} \\ & + y_{03}(\text{study4bdummy})_{j} \\ & + y_{04}(\text{study4cdummy})_{j} + u_{0j} + e_{ij}.\end{aligned}$$

Equation 3: Daily Difficulty Mindset Endorsements Predicting Daily School Engagement.

Level-1 predictor variables: group-mean centered daily difficulty-as-importance, group-mean centered daily difficulty-as-impossibility, and time (day of diary report), study 4b dummy variable, and study 4c dummy variable.

Level-1 outcome variable: daily meaningful schoolwork engagement.

$$(\text{outcome variable})_{ij} = \pi_{ij}; \pi \sim \text{Binomial}\ (\mu)$$

$$\pi_{ij} = \text{logistic}\left(\eta_{ij}\right).$$

$$\begin{aligned}\eta_{ij} = {} & y_{00} + y_{10}(\text{daily difficulty} - \text{as} - \text{importance endorsement})_{ij} \\ & + y_{20}(\text{daily difficulty} - \text{as} - \text{importance endorsement})_{ij} \\ & + y_{30}(\text{time})_{ij} + u_{0j}.\end{aligned}$$

Equation 4: Daily Difficulty Mindset Endorsements Predicting Daily Self-Perceptions.

Level-1 predictor variables: group-mean centered daily difficulty-as-impossibility, group-mean centered daily difficulty-as-importance, and time (day of diary report), study 4b dummy variable, and study 4c dummy variable.

Level-1 outcome variable: daily goal self-efficacy, daily self-esteem, or daily self-compassion.

$$\begin{aligned}(\text{outcome variable})_{ij} = {} & y_{00} + y_{10}(\text{daily difficulty} - \text{as} \\ & - \text{importance endorsement})_{ij} \\ & + y_{20}(\text{daily difficulty} - \text{as} \\ & - \text{importance endorsement})_{ij} \\ & + y_{30}(\text{time})_{ij} + u_{0j} + e_{ij}.\end{aligned}$$

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