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Who gets to see themselves as talented? Biased self-concepts contribute to first-generation students' disadvantage in talent-focused environments☆

Christina A. Bauer [a,*], Veronika Job [a], Bettina Hannover [b]

[a] Faculty of Psychology, University of Vienna, Austria
[b] Department of Educational Science and Psychology, Freie Universität Berlin, Germany

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ABSTRACT

Intellectual talent is commonly regarded as an important factor for success – i.e., "what it takes to succeed" in Western educational contexts. Yet, the differential experiences individuals have may not allow everyone to think of themselves as talented - i.e., as having "what it takes to succeed" - to the same degree. In five studies with 3584 students in Western countries, we show i) that first-generation students see themselves as less intellectually talented than continuing-generation students, ii) that this bias in self-concept contributes to disadvantages in their academic experience and engagement, and iii) how this disadvantage may be reduced.

Quasi-experiments 1a and b (N = 694; 316) show that first-generation students view themselves as relatively less talented, but not less diligent, above and beyond prior performance-levels. Field and experimental Studies 2a-b (N = 1881; 362) show that this bias in students' talent self-concept contributes to disadvantage in first-generation students' academic experience and engagement. Experiment 3 (N = 331) suggests that talent self-concept bias is most consequential in talent-focused environments. If, however, environments emphasize effort, disadvantages connected to talent self-concepts are mitigated.

The experiences first-generation students have in current Western environments seem to make them see themselves as relatively less talented, contributing to disadvantage. Creating effort-focused environments can reduce this disadvantage and promote equality.

In Western educational environments, innate intellectual talent is considered a crucial factor for success (Canning, Muenks, Green, & Murphy, 2019; Leslie, Cimpian, Meyer, & Freeland, 2015). A recent survey of 1820 Western researchers found a general agreement with statements such as "If you want to succeed in [my discipline], hard work alone just won't cut it; you need to have an innate gift or talent" across diverse disciplines (Leslie et al., 2015).[1] Yet, talent is not only seen as a perquisite for success, but as a generally desirable personal trait. Western people have been shown to favor talented "naturals" over diligent "strivers", even if the latter are better qualified for a job (Tsay, 2016; Tsay & Banaji, 2011).

In environments that emphasize the importance of talent, the extent to which students see themselves as talented may be consequential. Students who think of themselves as relatively less talented might feel distressed and be less engaged (Bian, Leslie, Murphy, & Cimpian, 2018; Eccles & Wigfield, 2002). Yet, the differential experiences individuals have may not allow everyone to think of themselves as talented to the same extent (Eccles & Wigfield, 2002). In the present research, we investigate gaps in students' talent self-concept based on their first-generation status. We suggest that first-generation students - i.e., students whose parents did not complete a college degree – may view themselves as relatively less talented than their continuing-generation peers, even controlling for prior performance levels. We expect this bias to be specific to talent self-concept and not to show for effort-related components of the self-concept such as diligence self-concept. Further, we suggest that talent self-concept bias is consequential, contributing to disadvantages in first-generation students' academic experience and engagement in current Western talent-focused environments. Finally, we investigate whether creating effort-focused environments, instead of talent-focused ones, buffers negative consequences of talent self-concept bias.

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* Corresponding author at: Wächtergasse 1, Room 503, 1010 Wien, Austria.
E-mail address: christina.bauer@univie.ac.at (C.A. Bauer).

[1] While agreement levels were higher in some fields than others, talent was construed as relevant across disciplines.

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1. First-generation status: A crucial educational component of socioeconomic background

Students' first-generation status indicates whether or not their parents or caregivers hold a university degree. While other components of students' socioeconomic background such as family income focus on individuals' economic standing, students' first-generation status specifically focuses on individuals' educational standing. The present research investigates effects of students' first-generation status on talent self-concept and downstream consequences. Additionally, we examine the specificity of these effects by comparing effects of first-generation status to effects of economic components of students' socioeconomic background.

2. Disadvantages of first-generation students in academic environments

As efforts to reduce barriers to higher education increase, more and more first-generation students are enrolling at universities. Currently, around one third to one half of university students in Western countries are first-generation students (Cataldi, Bennett, & Chen, 2018; Orr, Gwosc, & Netz, 2011), making them the largest disadvantaged minority group at many Western universities. Despite progress in access to higher education, first-generation students continue to face various disadvantages at universities: They, for example, report feeling less comfortable (House, Neal, & Kolb, 2020; Janke, Rudert, Marksteiner, & Dickhäuser, 2017; Phillips, Stephens, Townsend, & Goudeau, 2020) and are less likely to engage in challenging academic activities that can provide important learning opportunities (Rubin, 2012; Soria & Stebleton, 2012). Such impediments in first-generation students' experience and engagement contribute to decrements in their academic achievement (Cataldi et al., 2018; Ishitani, 2006; Mehta, Newbold, & O'Rourke, 2011; Soria & Stebleton, 2012).

Previous research highlights that the disadvantages first-generation students experience largely emerge due to mismatches between their background and what is being valued in academic contexts. For example, first-generation students' rather collectivistic values were shown to conflict with Western universities' emphasis on individualistic values. This cultural mismatch has been shown to impair first-generation students' engagement and performance by making academic tasks appear more difficult for first-generation students (Dittmann, Stephens, & Townsend, 2020; Phillips et al., 2020; Stephens, Fryberg, Markus, Johnson, & Covarrubias, 2012). Other research indicates that first-generation students are perceived and treated as less intellectually capable by teachers and students because their background does not match the current prototypical image of a talented person (Ashley, Duberley, Sommerlad, & Scholarios, 2015; De Boer, Bosker, & van der Werf, 2010; Jussim & Harber, 2005; Timmermans, de Boer, & van der Werf, 2016).

The present research highlights a novel type of mismatch that contributes to first-generation students' disadvantages: the interplay between students' talent self-concept and the talent-focus in academic environments. We propose that first-generation students' tendency to view themselves as relatively less talented contributes to disadvantage in current talent-focused academic environments (i.e., environments that do not match first-generation students' self-concept well). Further, we suggest that these down-stream consequences can be buffered by an environment that emphasizes effort over talent (i.e., environments that better match first-generation students' self-concept).

3. Talent self-concept

Talent is commonly defined as individuals' "innate… aptitude" (American Association of Psychology, n.d.) – i.e., the inherent potential individuals are born with (see also: Cambridge Dictionary, 2023; Oxford English Dictionary, n.d.). Reflecting this formal definition, laypeople, too, commonly view talent as being innate and fixed rather than malleable (Southwick et al., 2023). This distinguishes talent from related constructs like skills and intelligence, which, compared to talent, tend to be seen as more malleable (Dweck, 2015; Southwick et al., 2023).

If someone is thought to be relatively talented, this person is seen as having a higher potential for achievement in a given domain – i.e., as being able to achieve better skill levels and outcomes than others if they put in the same amount of effort. Conversely, if someone is thought to be less talented than other individuals, they are seen as being more limited in their innate potential, not being capable of reaching the same skill and performance levels as others, and generally having to work harder for any given achievement (Nyström, Jackson, & Salminen Karlsson, 2019; Tsay, 2016; Tsay & Banaji, 2011). Indeed, when people were led to see an employee as lacking talent as opposed to effort-based skills in their job, they showed an increased likelihood to recommend the person to quit their career rather than work on improving their skill level (Southwick et al., 2023).

Talent is inferred from an individuals' performance (e.g., grades) and exerted effort (e.g., time spent studying) in relation to others in a given context (e.g., classmates). Growing up, people come to perceive a compensatory relationship between talent and effort as two key sources of achievement (Weiner & Kukla, 1970). Being talented is seen as implying that success comes relatively easily, without much effort. Conversely, having to exert a lot of effort is seen as indicating a lack of talent. If a child is thus perceived to exert more effort than others to achieve a given outcome, teachers, parents, and even the child may start to believe that their intellectual talent is rather low in the current domain. Inferring talent from effort can contribute to biased perceptions of individuals' talent if situational factors that make it more difficult for individuals to succeed are neglected.

In the present research, we focus on students' talent *self-concept*. This specific part of individuals' self-concept reflects an individuals' subjective perception of how much intellectual talent they have.[2] In Western academic environments where talent is highly valued (Leslie et al., 2015), talent self-concepts may be consequential. If relevant others in a given environment (e.g., professors at universities) signal that talent is crucial for success, it should be difficult for individuals to not be concerned with the question of how talented they are. Indeed, as classic research suggests (Bandura, Freeman, & Lightsey, 1999; Eccles, 2005; Eccles & Wigfield, 2002), the extent to which students perceive to have what it takes to succeed in a given domain shapes students' experience and engagement in this domain. For instance, women's relatively lower engagement in STEM fields could be traced back to their relatively lower STEM-related self-concepts (Eccles, 2005; Tellhed, Bäckström, & Björklund, 2017). Accordingly, in current Western talent-focused academic environments, a low intellectual talent self-concept may cause disadvantage in students' experience and engagement.

The present research builds on and extends prior research that has documented gaps between first- and continuing-generation students' academic confidence. This research showed that first-generation students report lower levels of academic self-efficacy (Belmi, Neale, Reiff, & Ulfe, 2020; Cruce, Kinzie, Williams, Morelon, & Xingming, 2005; Hellman, 1996; Ivcevic & Kaufman, 2013; Ramos-Sánchez & Nichols, 2007), indicating that they feel relatively less confident about their academic skills overall. In the present research, we examine talent and diligence self-concepts to gain a deeper understanding of students' academic confidence. We theorize that first-generation students may not think of themselves as being less qualified on all qualities considered relevant for

[2] Note that, even when individuals think of themselves as having a fixed amount of talent, individuals' talent self-concept – i.e., their *subjective perception* of this amount of talent – likely changes over time. Since talent cannot be observed directly, people may see themselves as being more or less talented depending on situational cues (e.g., after getting positive or negative feedback).

academic success. Instead, they may view themselves as less talented, but not as less diligent. This differentiation is important given that being talented is commonly seen as more desirable than being diligent (Tsay, 2016; Tsay & Banaji, 2011). Further, it can help us understand when and how disadvantage occurs. As we propose, first-generation students may specifically experience disadvantage in talent-, but less so in effort-focused environments.

4. Potential sources of biases in talent self-concept

Our hypothesis that first generation students perceive themselves as less talented than continuing generation students is grounded in previous self-concept research (Eccles, 2005). First-generation students grow up with parents who did not complete a university degree and who have thus been socialized with cultural values, habitus and knowledge that differ from the prevalent culture at universities. Partly as a result, the background-specific characteristics that first-(vs. continuing-) generation students bring to the table - i.e., their own cultural values, habitus, and prior knowledge – tend to be less in line with what is commonly valued in academic contexts (Dittmann et al., 2020; Mehta et al., 2011; Stebleton & Soria, 2013). Such mismatches may affect talent self-concepts in two ways (Eccles, 2005).

First, as mentioned above, experiencing mismatch in performance situations can make first-generation students feel that achievement is more difficult for them (Stephens et al., 2012). Yet, in Western cultural contexts, such experiences are often misattributed to individuals rather than external factors (Goudeau & Cimpian, 2021; Goudeau & Croizet, 2017; Markus & Kitayama, 2010; Menon, Morris, Chiu, & Hong, 1999) and may thus make first-generation students think of themselves as less talented.

Second, first-generation students may internalize stereotypes associating intellectual talent with individuals from families with high levels of formal education (Ashley et al., 2015; Browman & Miele, 2019; Fiske, Cuddy, Glick, & Xu, 2002), leading them to be seen and treated as less talented, even by well-meaning others such as their parents or teachers (Ditton, Bayer, & Wohlkinger, 2019; Middendorff, Isserstedt, & Kandulla, 2008).

Prior research thus offers support for our prediction that first-generation students think of themselves as relatively less talented (e.g., Goudeau & Croizet, 2017). We are the first to test it.

5. Talent-focused environments

Research suggests that talent-focused environments (Bian et al., 2018; Leslie et al., 2015) may contribute to the disadvantage of minoritized students (Bauer & Hannover, 2021). Studies with female and ethnic minority students specifically showed that talent- vs. effort-focused environments trigger stereotype threat and doubts about belonging, thus impairing students' experience and engagement in respective domains (Bian et al., 2018; Rattan et al., 2018).

We contribute to this line of research by proposing a novel mechanism through which disadvantage can be triggered in talent-focused environments: lowered talent-self concepts. Perceiving oneself as being relatively less talented in an environment that emphasizes the importance of being talented creates a mismatch in self-concept and context-level expectations that may lead to disadvantage.

Correlational evidence supports our predictions (Darnon, Jury, & Aelenei, 2018). This research suggests that first-generation students achieve better grades when they focus on learning rather than on demonstrating their abilities. Although this research focuses on students' goal orientations rather than context-level talent-focus, it is consistent with the idea that effort-focused contexts that *allow* first-generation students to focus on learning rather than demonstrating ability may reduce disadvantage associated with talent self-concept.

6. The present research

The present research (see Fig. 1 for an overview) aims to investigate, if

- first-generation students view themselves as less intellectually talented (but not less diligent) than continuing-generation students (left panel in Fig. 1: Quasi-experimental Studies 1a & 1b)
- such systematic bias in talent self-concept contributes to disadvantages in first-generation students' academic experience and engagement in current Western talent-focused environments (middle panel: Field Study 2a; Experimental Study 2b testing for causality)
- negative consequences of biased talent self-concepts can be reduced in environments that emphasize effort rather than talent as relevant for success (right panel: Experimental Study 3).

We focus on students' academic experience and engagement as crucial outcomes that have been shown to predict academic achievement (Chapell et al., 2005; Mehta et al., 2011; Putwain, Stockinger, Nathaniel, Suldo, & Daumiller, 2021; Soria & Stebleton, 2012).[3] Complementing assessments of students' behavioral engagement, we investigate students' academic experience on a cognitive (academic worries), and affective (anxiety) level, capturing evaluative consequences of talent self-concepts.

Our studies are conducted using samples of university students from diverse fields primarily in Germany, the second-most populous Western country. In a large field study ($N = 1881$), we also investigate our core hypothesis with students from different Western countries beyond Germany (Study 2a). All materials and data as well as crucial code for this research are freely accessible at the Open Science Framework (OSF): https://osf.io/4a7rj/?view_only=8b6a887364564af0a806e4344fad4fbe. For each study, we report how we determined our sample size, all data exclusions (if any), all manipulations, and all measures.

7. Overview Studies 1a-b

The primary goal of quasi-experimental Studies 1a and 1b is to demonstrate that students' talent self-concept varies systematically depending on their first-generation status. Specifically, we expect that first-generation students perceive themselves as less intellectually talented than continuing-generation students. Since students' first-generation status (i.e., the experience of growing up with parents without a university degree) cannot be manipulated experimentally, we compare first- and continuing-generation students in a quasi-experimental approach. Systematic differences in students' self-concept can be seen as evidence that first- generation students' experience led them to think of themselves as less talented, compared to their continuing-generation peers.

8. Study 1a

Beyond the primary goal to investigate gaps in talent self-concept, Study 1a had two additional aims. First, Study 1a investigated whether first-generation students are more prone to recall a recently experienced academic failure as being caused by "[their] lacking talent". Such construals of failures may help maintain biases in students' self-concepts (Ehrlinger & Dunning, 2003).

[3] We have assessed students' confidence in their potential to succeed (Studies 2a-3) as well as students' interest (2b-3) as additional outcomes. All results are reported in the Supplement. Results are in line with the hypothesis that first-generation students' talent self-concept may impair their confidence and interest. Yet, due to the conceptual overlap between students' talent self-concept and confidence in their potential and since not all studies include interest, we chose to focus on students' academic experience and engagement as the most theoretically and practically important outcomes in the main text.

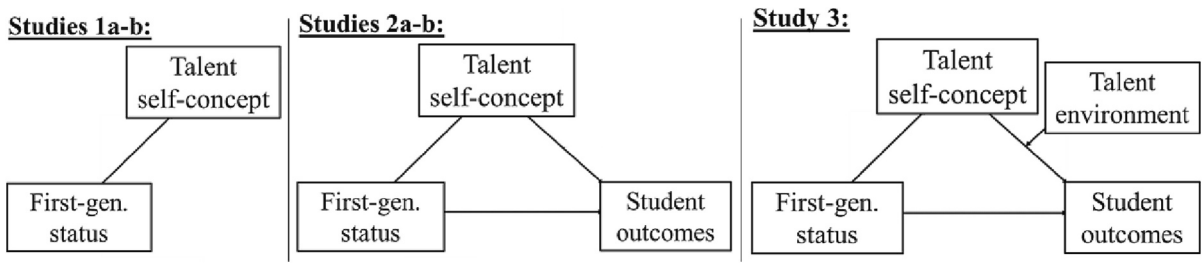

Fig. 1. Overview of Studies.

Second, Study 1a tested the specificity of investigated effects on self-concepts and related construals by comparing talent- with effort-related views. We predict that, while first-generation students think of themselves as less talented and are more likely to see academic failures as being caused by "[their] lacking talent", they do not think of themselves as less diligent, and are not more likely to see failures as being caused by "lacking effort".

8.1. Participants and procedure

We aimed to recruit as many participants as possible from diverse disciplines and locations given our resources, to maximize the generalizability of our findings. Based on power analyses using G-Power (Erdfelder, Faul, & Buchner, 1996) with an estimated effect size of $d = 0.30$ – similar to previously found first-generation status effects on motivational outcomes (Cruce et al., 2005; Ramos-Sánchez & Nichols, 2007) –, and 80% power, we aimed to recruit at least 278 participants. To be able to reach students from diverse universities and academic fields, participants were recruited through diverse German-speaking student groups on the social media platform Facebook. The survey was conducted online and was said to investigate the experiences of students at universities. As incentive, participants could win online shopping vouchers with a total worth of 200 Euros. In total, 694 participants completed our online questionnaire. Sensitivity analyses indicate that the minimum effect size we could detect with this sample with 80% power is $d = 0.19$. Overall, 70.2% (487) of participants were female (207 male). The mean age was 24.11 years ($SD = 4.41$).

8.2. Measures

8.2.1. First-generation status

To assess students' first-generation status, we asked students to indicate the highest educational degree their parents had obtained. If neither parent had completed a three-year university degree (the standard for undergraduate degrees in Germany), individuals were classified as first-generation students (coded as 1). Individuals with at least one parent having completed a college degree were classified as continuing-generation students (coded as 0). Overall, 50.7% (337) of participants were first-generation students.

8.2.2. Talent and diligence self-concept

We adapted a self-concept scale by Campbell (1990), asking participants how they saw themselves when they thought about their academic experiences at the university. Specifically, to assess talent-self-concept, we asked to what extent participants saw themselves as "talented" and "gifted" (1 = "does not apply at all", 7 = "fully applies"; $\alpha = 0.76$). To assess diligence self-concept, we asked how "diligent" they saw themselves (1 = "does not apply at all", 7 = "fully applies").

8.2.3. Recollection of academic failure being caused by "lacking talent"

To assess the extent to which students recalled an experienced academic failure as being caused by "lacking talent", we asked students to think of the last situation at the university in which they felt they experienced an academic failure - i.e., a situation in which they were "disappointed with their achievement". Students were then asked to indicate on a scale from 0 to 100% to what extent "lacking talent" contributed to this academic failure (nine participants failed to complete this measure, four of which were in their first semester, possibly not being able to recall an experience of failure yet). Two additional items asked students to indicate on a scale from 0 to 100% to which extent they thought i) "lacking effort" and ii) "other factors" contributed to their failure. Responses had to add up to 100%.

8.3. Results

Correlations between all variables are reported in Table 1.

8.3.1. Differences in talent and diligence self-concept

A linear regression confirmed our hypothesis that students' first-generation status shaped their talent self-concept, with first-generation students seeing themselves as less intellectually talented, compared to continuing-generation students, $b = -0.18$, $SE = 0.07$, $d = 0.20$, $t(692) = -2.68$, $p = .008$. In line with the idea that first-generation students do not show a general bias in all self-concepts, this effect of generation status did not show for diligence self-concept, $b = -0.12$, $SE = 0.09$, $t(692) = -1.38$, $p = .169$.

8.3.2. Differences in recollection of academic failure being caused by "lacking talent"

Mirroring effects on students' self-concept, first-generation students ($M = 21.43$, $SD = 20.70$) were more likely to recall a recently

Table 1
Study 1a: Correlation between all Variables.

Variables	1	2	3	4
1 first-generation status				
2 talent self-concept	−0.10*			
3 diligence self-concept	−0.05	0.19***		
4 recollection of failure being caused by "lacking talent"	0.09*	−0.18***	0.10**	
5 recollection of failure being caused by "lacking effort"	0.02	−0.01	−0.21***	−0.44***

Note. *** < 0.001, ** < 0.01, * < 0.05.

experienced academic failure as being caused by "[their] lacking talent" than other students ($M = 18.11$, $SD = 17.89$), $b = 3.32$, $SE = 1.48$, $d = 0.17$, $t(683) = 2.24$, $p = .025$, but they were not more likely to recall failure as being caused by "lacking effort", $b = 1.12$, $SE = 2.16$, $t(683) = 0.52$, $p = .603$.[4]

Participants' responses had to add up to 100%. Accordingly, in line with first-generation students' inclination to see "lacking talent" as relatively more important, they ascribed less importance to "other factors" ($M = 26.32$, $SD = 25.51$) than continuing-generation students ($M = 30.77$, $SD = 26.82$), $b = -4.44$, $SE = 2.00$, $d = 0.17$, $t(683) = -2.22$, $p = .027$.

8.4. Discussion

Results from Study 1a show that, as predicted, first-generation students think of themselves as less intellectually talented than continuing-generation students. This bias in students' talent self-concept was reflected in the way students thought about their performance experiences. First-generation students were more likely than continuing-generation students to recall an experienced academic failure as being a result of "[their] lacking talent". Such differences in subjective performance perceptions may contribute to the maintenance of pre-existing bias in talent self-concept (Ehrlinger & Dunning, 2003).

In line with the idea that first-generation-status effects are specific to individuals' talent self-concept and do not show for all academic self-concepts broadly, first-generation students did not see themselves as less diligent and were also no more likely than continuing-generation students to recall an academic failure as being caused by "lacking effort".

9. Study 1b

Study 1a found systematic gaps in first- vs. continuing-generation students' talent self-concept as predicted. Yet, it is still possible that these differences were caused not primarily by students' first-generation status, but other, related components of students' socioeconomic background (e.g., economic rather than educational components) or by differences in prior performance-levels. To address these limitations of Study 1a, Study 1b investigated whether students' first-generation status predicts students' talent self-concept beyond other facets of socioeconomic background as well as students' prior performance-levels.

9.1. Participants and procedure

Based on a power analysis using G-Power (Erdfelder et al., 1996) estimating an effect size of $d = 0.30$ (based on results from Study 2a, which was conducted prior to Study 1b), and a target of 80% power, we aimed to recruit at least 278 participants. A total of 316 participants completed our online questionnaire in response to the same online recruitment procedure as in Study 1a (only this time participants could win a 300 Euro shopping voucher). Sensitivity analyses indicate that the minimum effect size we could detect with this sample with 80% power is $d = 0.28$. Reflecting Germany's higher education system, the overwhelming majority of students (98%, 308 students) studied at a public university (1 at a private university, 2 at a university of applied sciences and 8 at a distance university). Twenty-six percent (83) indicated that they studied humanities, 22% (68) STEM (Science, Technology, Engineering, Mathematics), and 21% (67) social sciences (27% other, 4% missing). Eighty-six percent (273) were women (40 men, 3 other). The mean age was 24.10 years ($SD = 4.86$).

9.2. Measures

9.2.1. Talent self-concept and first-generation status

To assess talent self-concept, we again asked students how "talented" and "gifted" they saw themselves (1 = "does not apply at all", 7 = "fully applies"; $\alpha = 0.83$). In addition to explaining that the survey was about individuals' academic experiences, we also asked students to think of their intellectual capabilities when answering questions in this study, to ensure that students think of intellectual talent (rather than e.g., artistic talent). First-generation status was assessed as in Study 1a. Overall, 51% of students (161) were first-generation students.

9.2.2. Other facets of students' socioeconomic background

Besides students' first-generation status, we assessed students' educational resources as a second, related indicator of students' educational background (PISA; Hopstock & Pelczar, 2011) as well as students' family income and financial aid as two indicators for students' economic background. To assess educational resources students had while growing up, we followed previous research in asking students "how many books their family had at home" with responses ranging from 1 ("none") to 7 ("over 500"; Hopstock & Pelczar, 2011). To assess family income and financial aid, we asked students to indicate their families' annual income as well as whether or not they received need-based financial aid (called BAföG, short for Bundesausbildungsförderungsgesetz, in German). Overall, 19% of students (60) received financial aid.

9.2.3. Prior performance-levels (control variable)

Prior performance was assessed by asking students to indicate their current GPA. Mean values were imputed for missing GPA data (7.9% of participants did not indicate their GPA data) to prevent participants who did not indicate this data from being excluded. In the Supplement, we report analyses using alternative methods to deal with missing data (multiple imputation and listwise deletion). They show results to be robust across different approaches.

9.3. Results

As evident in correlation Table 2, both indicators for students' educational background - students' first-generation status as well as students' educational resources -, but none of the two indicators for students' economic background (financial aid, family income) were correlated with students' talent self-concept.

Further, as evident in Table 3, when entering all predictors together in a regression model, students' first-generation status remained as the only significant predictor (with prior performance-levels, and financial aid being marginal and all other predictors being non-significant).

Table 2
Study 1b: Correlation between all Variables.

Variables	1	2	3	4	5
1 talent self-concept					
2 first-generation status	−0.13*				
3 educational resources	−0.13*	−0.28**			
4 financial aid	0.07	0.14*	−0.19***		
5 family income	0.00	−0.19**	0.19**	−0.21***	
6 prior performance	−0.17**	0.09†	−0.21***	0.00	−0.12*

Note. *** < 0.001, ** < 0.01, * < 0.05, † < 0.10

[4] Do first- and continuing-generation students think of themselves as exerting similar or different amounts of effort? Our results do not answer this question. Responses on how much lacking effort contributed to failures cannot be easily interpreted as to how much effort individuals exerted (thresholds for how much effort is seen as sufficient may, for example, vary with first-generation status)

Table 3
Study 1b: Regression Model Predicting Students' Talent Self-Concept.

Variable	β	*b*	*SE*	*t*(279)	*p*
edu. background: first-generation status	−0.13*	−0.26	0.13	−2.01	0.045
edu. background: educational resources	0.05	0.03	0.05	0.74	0.462
econ. background: financial aid	0.11†	0.28	0.16	1.77	0.077
econ. background: family income	−0.02	- < 0.001	0.00	−0.33	0.738
prior performance	−0.11†	−0.19	0.11	−1.75	0.081

Note. Edu. = educational; econ. = economic; * < 0.05, † < 0.10

9.4. Discussion

Results of Study 1b confirm that students' first-generation status predicts students' talent self-concept beyond other components of students' socioeconomic background as well as prior performance levels.

10. Overview Studies 2a-b

The overarching goal of Studies 2a-b is to investigate down-stream consequences of first-generation students' more negative talent self-concept on students' academic experience and engagement. We do so following a causal-chain approach (Spencer, Zanna, & Fong, 2005): Field Study 2a uses mediational analyses to investigate the relationship between first-generation status, talent self-concept, and outcomes. Experimental Study 2b then tests the assumed causal direction between talent self-concept and investigated outcomes – complementing quasi-experimental studies (Studies 1a-b) suggesting a causal link between first-generation status and talent self-concept.

11. Study 2a

Overall, Study 2a had two goals. First, it aimed to replicate systematic differences in talent self-concept found in Studies 1a and 1b in an even larger sample of Western students, including samples from multiple countries. Second, Study 2a investigates potential down-stream consequences using mediation analyses. It tests, whether first-generation students' relatively lower talent self-concept predicts disadvantages in their academic experience and engagement.

11.1. Participants and procedure

We aimed to recruit as many participants as possible given our resources, to increase the generalizability of our findings. Based on a power analysis using G-Power (Erdfelder et al., 1996) estimating an effect size of $d = 0.30$, and a target of 80% power, we aimed to recruit at the very least 278 participants. Participants were recruited through Western student groups on the social media platform Facebook as well as the online platform Prolific, where we filtered for individuals who were currently studying at universities in the USA, Canada, or Europe. Again, the survey was conducted online and was said to investigate the experiences of students at their university. In total, 1881 participants completed our online questionnaire. Sensitivity analyses indicate that the minimum effect size we could detect with this sample with 80% power is $d = 0.11$. Overall, 70% of participants (1306) studied in Germany, 18% (329) in the United Kingdom, 10% (179) in the United States, and 4% in another Western country. Sixty-nine percent (1294) were women (580 male, 7 other). The mean age was 24.11 years (SD = 5.38).

11.2. Measures

11.2.1. First-generation status, talent and diligence self-concept

First-generation status was again assessed by asking students for their parents' highest educational level. Students whose parents completed a standard university degree (e.g., US-American four-year degrees, German three-year degrees) were coded as continuing-generation students, all other students as first-generation students. Overall, 52% of students (978) were first-generation students. Talent and diligence self-concepts were again assessed by asking participants how they saw themselves when they thought about their academic experiences at the university. Specifically, for talent self-concept, we asked students to what extent they agreed to the items "I consider myself talented" and "I consider myself gifted" (1 = "strongly disagree", 7 = "strongly agree"; $\alpha = 0.83$). Diligence self-concept was again assessed analogously, asking students to what extent they considered themselves as "diligent" and "hardworking" (1 = "strongly disagree", 7 = "strongly agree"; $\alpha = 0.76$). Due to an error, only the part of the sample that we recruited through Prolific rather than Facebook (606 out of 1881 participants) completed the diligence self-concept measure (we had created two separate surveys for both platforms to be able to track the recruitment progress independently).

11.2.2. Prior performance-levels (control variable)

Prior performance was again assessed by asking students to indicate their current GPA. To make GPA scores from different countries comparable, we also assessed the scale format that is used at students' institutions. All scores were converted to a four-point GPA score. Such a scale was used in 84% of cases for whom we had GPA data (the US and Germany, with 4.0 being the highest score in the US and the lowest in Germany; German scores were thus reversed). The remaining 16% of GPA data (13% using UK-scores, 2% Spanish, 1% French, 0.1% Scottish) were recoded with the highest possible score being converted to 4.0, and the worst possible score indicative of failing a class being converted to 0 (see Supplement for details on conversion and analyses of country-level differences). Mean values were imputed for missing GPA data (16.6% of participants did not indicate their GPA data) to prevent participants who did not indicate this data from being excluded.

11.2.3. Academic experience

To investigate students' academic experience in the academic context, we assessed students' cognitive worries about the sufficiency of their intellectual capabilities as well as affective test anxiety. Worries about intellectual capabilities were assessed by asking individuals to what extent they agreed with the following two statements: "At university, I sometimes worry that I'm just not smart enough" and "Sometimes I think I just don't have enough talent to do really well in class" ($\alpha = 0.90$), with responses ranging from 1 (strongly disagree) to 7 (strongly agree).[5] Test anxiety levels were assessed with a 5-item scale by Duncan and McKeachie (2010). Again, individuals indicated their level of agreement to the statements (e.g., "I feel my heart beating fast when I take an exam"; $\alpha = 0.83$) on a scale from 1 (strongly disagree) to 7 (strongly agree).

[5] Confirmatory factor analyses confirmed that this scale assessing individuals' worries as well as all other scales are distinguishable from cognitive talent self-concept. A model with each of the outcomes loading on separate factors had a significantly better fit than a model in which talent-self-concept loads on the same factor as academic worries, $\Delta\ \chi^2\ (4, N = 1881) = 1153.4$, $p < .001$, test anxiety, $\Delta\ \chi^2\ (4, N = 1881) = 1510.2$, $p < .001$, and engagement, $\Delta\ \chi^2\ (4, N = 1881) = 1510.2$, $p < .001$.

Table 4
Study 2a: Correlations between Talent Self-Concept, Academic Experience (Worries and Anxiety), and Engagement.

Variables	1	2	3	4
1 first-generation status				
2 talent self-concept	−0.15***			
3 academic worries	0.10***	−0.43***		
4 anxiety	0.07**	−0.27***	0.55***	
5 engagement	−0.05*	0.18***	−0.17**	−0.17**

Note. *** < 0.001, ** < 0.01, * < 0.05.

11.2.4. Behavioral engagement

To assess the extent to which individuals would engage in challenging rather than easy academic exercises, we let individuals choose a level of difficulty (1 = "extremely easy" to 8 = "extremely difficult") in an academic exercise. This measure has been used as a standardized measure for engagement in prior research (Bauer, Boemelburg, & Walton, 2021; Yeager et al., 2019) and has been shown to be associated with other important engagement outcomes such as students' selection of advanced university courses (Yeager et al., 2019). Students were told the task they were about to do would assess logical thinking skills.

11.3. Results

11.3.1. Gaps in talent and diligence self-concept

As in Studies 1 and 2, linear regression analyses confirmed our hypothesis that students' first-generation status predicted students' talent self-concept with first-generation students thinking of themselves as less intellectually talented than continuing-generation students, $b = -0.34$, $SE = 0.05$, $d = 0.29$, $t(1879) = -6.36$, $p < .001$. This effect remained stable even when controlling for students' prior performance levels $b = -0.30$, $SE = 0.05$, $t(1878) = -5.69$, $p < .001$. Again, first-generation students did not see themselves as less diligent, $b = -0.002$, $SE = 0.10$, $t(604) = -0.02$, $p = .986$.[6]

11.3.2. Relationship between talent self-concept and students' academic experience and engagement

As evident in Table 4, students' talent self-concept was significantly related to students' academic experience and behavioral engagement. The less students thought of themselves as talented, the more they worried about their intellectual capabilities, the more test anxiety they experienced, and the less they tended to engage in challenging academic exercises.

11.3.3. Gaps in students' academic experience and behavioral engagement

To investigate gaps between first and continuing generation students' academic experience and engagement, we conducted linear regressions with first-generation status and prior performance-levels subsequently entered as predictors. Results were in line with hypotheses: compared to other students, first-generation students experienced heightened levels of worries about their intellectual capabilities, $b = 0.34$, $SE = 0.08$, $d = 0.20$, $t(1879) = 4.43$, $p < .001$ ($b = 0.29$, $SE = 0.08$, $t(1878) = -3.86$, $p < .001$), as well as test anxiety, $b = 0.20$, $SE = 0.06$, $d = 0.15$, $t(1879) = 3.16$, $p = .006$ ($b = 0.18$, $SE = 0.06$, $t(1878) = 2.78$, $p = .006$), and tended to engage less in challenging academic exercises, $b = -0.16$, $SE = 0.07$, $d = 0.10$, $t(1867) = -2.21$, $p = .027$ ($b = -0.13$, $SE = 0.07$, $t(1866) = -1.84$, $p = .066$).

[6] Confirming that differential results on diligence and talent self-concepts were not explained by sample differences (as mentioned above, only 606 participants were presented with the diligence measure), first-generation status still predicted talent self-concepts in the sample that had completed the diligence measure, $b = -0.32$, $SE = 0.11$, $t(604) = -2.95$, $p = .003$.

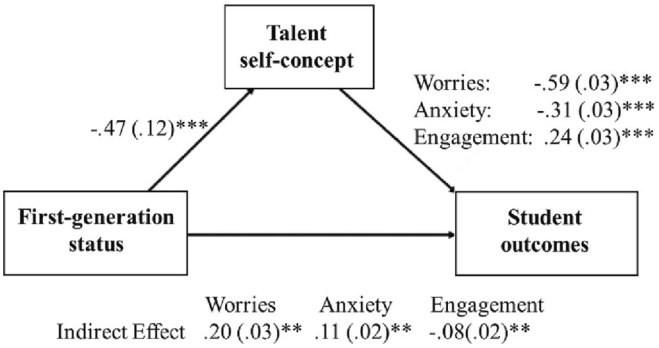

Fig. 2. Results of Mediation Analyses in Study 2a.
Note. unstandardized coefficients with SEs in parentheses are reported; * $p <$ .05, ** $p <$ .01,
*** $p <$ .001.

11.3.4. Mediation analyses

To investigate whether bias in talent self-concept may contribute to first-generation students' disadvantages, we conducted mediation analyses (see Fig. 2). As expected, we found significant indirect effects of first-generation status on all three outcomes, worries about intellectual capabilities: $c = 0.20$, $SE = 0.03$, 95%CI = [0.14; 0.27], test anxiety: $c = 0.11$, $SE = 0.02$, 95%CI = [0.07; 0.14], engagement: $c = -0.08$, $SE = 0.02$, 95%CI = [−0.12; −0.05] (direct effects, worries: $c' = 0.14$, $SE = 0.07$, [−0.001; 0.27], test anxiety: $c' = 0.09$, $SE = 0.06$, 95%CI = [−0.03; 0.22], engagement: $c' = -0.08$, $SE = 0.07$, 95%CI = [−0.22; 0.06]).

11.4. Discussion

Study 2a yielded two important findings. First, replicating results from Studies 1a and 1b in an even bigger sample of Western students from multiple countries, first-generation students thought of themselves as less intellectually talented as compared to continuing-generation students, even when controlling for prior performance levels. Second, consistent with the idea that gaps in students' talent self-concept may contribute to first-generation students' disadvantage, differences in talent self-concept mediated differences in first- vs. continuing-generation students' academic experience and behavioral engagement.

While these mediation analyses offer support for our mediation model, they are not sufficient to draw conclusions on the directionality of relationships. Complementing correlational Field Study 2a, Experimental Study 2b manipulates the mediator (talent self-concept) following a causal chain approach testing directionality in mediation models (Spencer et al., 2005).

12. Study 2b

The mediation model presented in Study 2a hypothesizes that students' first-generation status shapes their talent self-concept (path a) and that this talent self-concept, in turn, impacts students' experience and engagement at the university (path b). Study 2a tested the full model on a correlational level, and quasi-experimental studies (Studies 1a-b) tested path a. As a third and final step following the causal chain approach (Spencer et al., 2005), we conducted Study 2b to test the causal link between talent self-concept and outcomes (path b).

Following previous research (Anderson, Brion, Moore, & Kennedy, 2012; Markus & Wurf, 1987), we led students to think of themselves as being low vs. high in intellectual talent by having them complete very difficult vs. easy tasks said to assess students' intellectual talent. This approach is based on previous research showing individuals to infer how talented they are in a given domain from how difficult they feel it is for them to succeed in this domain (Miele, Browman, & Vasilyeva, 2020). In line with our mediation model suggesting that the effect of students'

talent self-concept on outcomes (path b) occurs for first- and continuing-generation students alike, our pre-registered hypothesis was a main effect of the manipulation on all outcomes: https://aspredicted.org/XKX_LSB.

12.1. Participants

Based on an estimated effect size of $d = 0.40$ in line with effects of a similar study (Ehrlinger & Dunning, 2003), we aimed to recruit at least 156 participants. Participants were again reached through diverse student groups on the social media platform Facebook. In total, 362 participants completed our online questionnaire. Sensitivity analyses indicate that the minimum effect size we could detect with this sample with 80% power is $d = 0.26$. Overall, 86% of participants (311) indicated to be women (42 men, 2 other, 7 missing). The mean age was $M = 24.56$, $SD = 4.46$ years.

12.2. Procedure

We reasoned that down-steam consequences of students' talent self-concept are most pronounced in environments that signal innate talent to be important. To establish such a talent-focused environment, we introduced all participants to a talent-focused study program after providing informed consent. Students were then randomly assigned to one of two experimental conditions, leading participants to think of themselves as rather talented (high talent self-concept condition) or untalented (low talent self-concept condition). Last, participants completed a questionnaire with outcome variables (e.g., experienced anxiety) and demographic information.

To establish a talent-focused environment as the basis of our experiment, we followed previous research by Bian et al. (2018), introducing students to a study program portrayed as valuing talent. Specifically, we told all students that professors involved in the study program most frequently mentioned "gifted, smart, responsible, intelligent, talented" as characteristics of students who best fit the study program ("responsible" served as filler). To strengthen the talent-focus, all participants were asked to recall these ideal student characteristics on the next page.

Then came the experimental manipulation that used individuals' performance experience to manipulate their perception of how talented they are. Following previous research (Anderson et al., 2012; Markus & Wurf, 1987), we led students to think of themselves as being low vs. high in intellectual talent by having them complete very difficult vs. easy tasks that were said to assess students' intellectual talent.

Students specifically had to complete five Raven's matrices tasks said to assess intellectual talent under time pressure. Tasks were relatively easy in the high talent-condition, and relatively difficult in the low talent condition. Analyses of students' performance confirmed that the two different task sets varied in their difficulty level. Students in the high talent condition were able to solve more tasks ($M = 4.15$, $SD = 0.92$) than students in the low talent condition ($M = 0.71$, $SD = 0.84$), $F(1, 360) = 1338.43$, $p < .001$, $\eta^2 = 0.78$.

12.3. Measures

12.3.1. First-generation status, and talent self-concept

We assessed students' first-generation status (52% of students were first-generation students) as in Study 2b. Students' current talent self-concept serving as a manipulation check in this study was assessed as in Study 1b ($\alpha = 0.78$).

12.3.2. Academic experiences and behavioral engagement

To assess students' worries and anxiety levels in the study program we asked students "to imagine that you are taking a course that is part of this study program". For worries about intellectual capabilities, we adapted the two items we used in Study 2a to our study program context: "If I would take a class in this study program, I would worry that I'm just not smart enough" and "If I would take a class in this study program, I would worry sometimes that I just don't have enough talent to do really well in school" ($\alpha = 0.90$), with responses ranging from 1 ("not at all true") to 7 ("totally true"). For anticipated state anxiety levels, we used seven items adapted from Bian et al. (2018) asking students to imagine they would take a class in the respective study program and to indicate their level of agreement to the items (e.g., "I would feel nervous", $\alpha = 0.90$) on a scale from 1 ("totally disagree") to 7 ("totally agree"). To assess students' engagement, we adapted the measure from Study 2a, letting individuals choose a difficulty level in a task that was presented as being part of the study program's selection test.

12.4. Results

12.4.1. Manipulation check: Talent self-concept

Results from an ANOVA with the experimental condition as independent variable confirm that our manipulation was successful in changing students' talent self-concept: Students in the high talent condition ($M = 4.34$, $SD = 0.95$) saw themselves as more intellectually talented than students in the low talent condition ($M = 4.00$, $SD = 1.29$), $F(1, 360) = 8.15$, $p = .005$, $\eta^2 = 0.02$.

12.4.2. Relationship between talent self-concept and outcomes

As can be seen in Table 5, students' talent self-concept was significantly related to all outcomes, similar to findings in Study 2a.

12.4.3. Pre-registered analyses

As predicted and pre-registered ANOVAs testing effects of experimental condition showed significant main effects of our manipulation on all of the three investigated outcomes: Compared to participants in the high talent condition, participants in the low-talent-condition showed heightened levels of anxiety (low talent: $M = 4.24$, $SD = 1.05$ vs. high talent: $M = 3.90$, $SD = 0.95$), $F(1, 360) = 10.56$, $p = .001$, $\eta^2 = 0.03$, increased worries about their intellectual capabilities (low talent: $M = 4.61$, $SD = 1.63$ vs. high talent: $M = 4.22$, $SD = 1.54$), $F(1, 360) = 5.48$, $p = .020$, $\eta^2 = 0.02$, and reduced engagement (low talent: $M = 4.15$, $SD = 1.70$ vs. high talent: $M = 4.92$, $SD = 1.40$), $F(1, 360) = 22.40$, $p < .001$, $\eta^2 = 0.06$.

12.4.4. Exploratory analyses

Complementing pre-registered analyses, we conducted exploratory analyses to check whether condition effects were similar for first- and continuing-generation students. Descriptively, all four condition effects were in the same predicted direction and, for the three outcomes, there was no indication that effects differed between student groups, anxiety: $F(1, 358) = 0.07$, $p = .790$, worries: $F(1, 358) = 2.22$, $p = .137$, and engagement: $F(1, 358) = 0.03$, $p = .854$. For the manipulation check, the interaction effect reached significance, $F(1, 358) = 4.02$, $p = .046$, $\eta^2 = 0.01$: the condition effect was bigger, and only reached significance for continuing-generation students: M_{diff}-0.59, $F(1, 172) = 10.60$, $p = .001$, $\eta^2 = 0.06$, and not for first-generation students, M_{diff}-0.11, $F(1, 186) =$

Table 5
Study 2b: Correlations between Talent Self-Concept, Academic Experience (Worries, and Anxiety), and Engagement.

Variables	1	2	3
1 talent self-concept			
2 academic worries	−0.33***		
3 anxiety	−0.32***	0.65***	
4 engagement	0.25***	−0.24***	−0.19***

Note. *** < 0.001, ** < 0.01, * < 0.05, † < 0.10.

0.52, $p = .473$.[7] In line with this finding, the indirect effects of the manipulation through talent self-concept (condition ➔ talent self-concept➔ outcomes) were significant for continuing-generation students, anxiety: 95%*CI* = [−0.29;-0.04], worries: 95%*CI* = [−0.44; −0.08], engagement: 95%*CI* = [0.01; 0.39], but not first-generation students, anxiety: 95%*CI* = [−0.13;0.06], worries: 95%*CI* = [−0.19; 0.10], engagement: 95%*CI* = [−0.06; 0.15].

Why may the condition effect on the manipulation check be non-significant for first-generation students? The interaction effect testing whether the condition effect on talent self-concepts varies by first-generation-status only narrowly met significance levels. This makes it seem conceivable that the non-significant effect occurred by chance. Further support for this possibility comes from power analyses. For the nine reported tests for which we expected significant effects in this pre-registered study (four main condition effects, two subgroup condition effects for talent self-concept, and three correlations between talent self-concept and outcomes) the chance that at least one test, powered between 74% and 99%, does not reach significance is 1-(0.97*0.97*0.97*0.97*0.77*0.74*0.99*0.99*0.99) = 51%. Among the nine tests, the first-generation student subgroup effect powered at 77% is the second-least powered one. A non-significant result on this analysis is thus the second most likely to occur.

12.5. Discussion

Our mediation model hypothesizes that students' first-generation status shapes their talent self-concept (path a), which, in turn, impairs student outcomes (path b). Testing path b, results from Study 2b confirm the assumed causal connection between talent self-concept and outcomes. A manipulation that led students to think of themselves as less (vs. more) talented impaired students' academic experience and engagement, as hypothesized and pre-registered. As a third and final step in the causal chain approach testing mediation models (Spencer et al., 2005), these results complement correlational tests of the full mediation model (Study 2a) and quasi-experimental evidence testing path a (Studies 1a-b). We can thus conclude that bias in students' talent self-concept contributes to first-generation students' disadvantage.

13. Study 3

We assumed that the connection between students' talent self-concept and disadvantages observed in Studies 2a-b was grounded in the talent-focus prevalent in current Western academic environments. Perceiving oneself as relatively less talented should be most impactful when the environment signals talent to be important. Study 3 tested this assumption experimentally. We specifically investigated if the connection between first-generation students' talent self-concept and adverse outcomes could be reduced through an experimental creation of environments focused on effort- rather than talent-related characteristics.

13.1. Participants

Based on a power analysis using Monte Carlo simulations with 80% power for the planned moderated mediation analyses (see supplementary code), estimating the relationship between talent self-concept and outcomes to be reduced from $r = 0.35$ in the talent- to $r = 0.05$ in the effort-condition, we aimed to recruit 340 participants. Participants were reached through diverse German student groups on the social media platform Facebook. In total, 340 participants completed our online questionnaire. No exclusions were made. This sample size thus provided exactly 80% power to detect the estimated effect size. Overall, 74% of participants (252) indicated to be women (82 male, 6 other). The mean age was 24.69 years (*SD* = 4.38).

13.2. Procedure

After providing informed consent, students were randomly assigned to one of two conditions - the talent- or effort-focus condition - and completed the respective manipulation material as well as a final questionnaire with outcome variables and demographic information.

To manipulate the perceived importance of talent vs. effort in a given setting, we used material developed by Bian et al. (2018). Students were introduced to a study program that was presented to value talent (as in Study 2b) or effort. Specifically, students were told that professors involved in the study program most frequently mentioned "gifted, smart, respectful, intelligent, talented" (characteristics that overall highlight the idea that individuals succeed through intellectual talent) vs. "engaged, motivated, respectful, hardworking, passionate" (characteristics that overall highlight the idea that individuals succeed through engagement in effort exertion) as characteristics of students who best fit the study program ("respectful" served as filler; Bian et al., 2018). To strengthen the manipulation, on the next page, participants were asked to recall these ideal student characteristics. Overall, participants recalled most of the five ideal student characteristics correctly, $M = 4.33$ (*SD* = 1.01). This did not differ by condition, $F(1,338) = 1.62$, $p = .204$. The condition variable was dummy-coded (0 = effort condition, 1 = talent condition).

13.3. Measures

13.3.1. First-generation student status, prior performance levels, talent self-concept

First-generation status (62.6% of students (213) were first-generation students) and prior performance levels (GPA; mean levels imputed for the 6.2% of missing GPA data) were assessed exactly as in previous studies with German samples. Talent self-concept was assessed as in Study 2b ($\alpha = 0.89$).

13.3.2. Academic experience, and engagement

Academic experiences (worries about intellectual capabilities, $\alpha = 0.90$, and state anxiety levels, $\alpha = 0.83$) and engagement in the study program were assessed as in Study 2b (items were again adapted to the study program context).

13.4. Results

Would first-generation students' talent self-concept be connected to greater disadvantages when the environment signals talent (rather than effort) to be important? Moderated mediation analyses testing our model (see Fig. 3) overall support this reasoning. The moderated

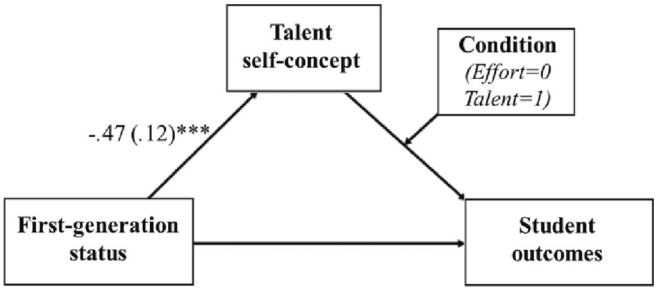

Fig. 3. Results of Moderated Mediation Analyses in Experimental Study 3.
Note. Overall moderated mediation model. Unstandardized coefficients (and SEs in parentheses) are reported; *** $p < .001$.

[7] If first-generation students' condition effect is non-significant for the manipulation check, but significant for outcomes, could that mean that the relationship between manipulation check and outcomes differs by student groups? Ruling out this possibility, there was no such generation-status x condition interaction all $p > .10$.

Table 6
Study 3: Direct and indirect effects of first-generation status on outcomes in moderated mediation model.

	direct effect	indirect effect		
		talent condition	effort condition	difference (moderated mediation index)
Anxiety	0.19 (0.11)	0.16 [0.07;0.27] (0.05)**	−0.07 [−0.07;0.17] (0.04) †	0.09 [0.003;0.21] (0.05)*
Worries	0.20 (0.16)	0.34 [0.15;0.57] (0.11)**	0.25 [0.11;0.42] (0.08)**	0.09 [−04.;0.26] (0.08)
Engag.	−0.19 (0.13)	−0.18 [−0.33;-0.07] (0.07)**	−0.06 [−0.17;0.04] (0.05)	−0.13 [−0.29;-0.001] (0.07)*

Note. Unstandardized coefficients with [95% Confidence Intervals] and (SEs) are reported; † $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$.

Table 7
Study 3: Correlations between Talent Self-Concept, Academic Experience (Worries, Anxiety), and Engagement by Experimental Condition.

Variables	1	2	3	4
talent-focused condition				
1 first-generation status				
2 talent self-concept	−0.26***			
3 academic worries	0.24**	−0.51***		
4 anxiety	0.23**	−0.40***	0.64***	
5 engagement	−17*	0.38***	−0.22**	−0.13†
effort-focused condition				
1 first-generation status				
2 talent self-concept	−0.16*			
3 academic worries	0.07	−0.39***		
4 anxiety	0.08	−0.18*	0.58***	
5 engagement	−0.10	0.13†	−0.10	−0.16*

Note. *** < 0.001, ** < 0.01, * < 0.05, † < 0.10

mediation index testing changes in indirect effects suggest that the effort-treatment reduced first-generation status ➔talent➔outcome pathways significantly for two of three outcomes (see Table 6).

Complementing this test of our overall model, we report analyses testing different parts of our model in the following. Overall, results suggest that the effort-treatment worked by decoupling individuals' talent self-concept from outcomes – i.e., making individuals' talent self-concept less predictive of outcomes (see Table 7).

13.4.1. Gaps in talent self-concept

Testing the path from predictor (first-generation status) to mediator (talent self-concept) in our model, linear regressions again showed that first-generation students perceived themselves as less intellectually talented than other students: first-generation status predicted students' talent self-concept, $b = -0.47$, $SE = 0.12$, $d = 0.44$, $t(338) = -4.01$, $p < .001$, even when controlling for prior performance levels, $b = -0.45$, $SE = 0.12$, $t(337) = -3.87$, $p < .001$. Entering experimental condition and the condition x first-generation status interaction in a third step yielded no significant effects, $b = 0.21$, $SE = 0.18$, $t(335) = 1.13$, $p = .259$, $b = 0.29$, $SE = 0.23$, $t(335) = -1.23$, $p = .220$, respectively. First-generation students' reduced belief in their talent showed irrespective of whether the environment signaled talent to be important (see Table 7).

13.4.2. First-generation status ➔ talent self-concept ➔outcome pathways

Similar to the results of our Field Study 2a, in the talent condition, the first-generation status ➔talent➔outcome effects were significant for all three outcomes (see Table 6) and significant first-generation status gaps showed on all outcomes, too, academic anxieties: $b = 0.48$, $SE = 0.15$, $d = 0.48$, $t(175) = 3.15$, $p = .002$, worries: $b = 0.79$, $SE = 0.25$, $d = 0.49$, $t(175) = 3.20$, $p = .002$, and engagement: $b = -0.43$, $SE = 0.19$, $d = 0.36$, $t(175) = -2.31$, $p = .022$. In contrast, in the effort condition, the first-generation status➔talent self-concept➔outcome pathways did not reach significance in two out of three cases (see Table 6) and no significant first-generation gaps showed, academic anxieties: $b = 0.15$, $SE = 0.15$, $t(161) = 1.02$, $p = .311$, worries: $b = 0.21$, $SE = 0.23$, $t(161) = 0.89$, $p = .375$, engagement: $b = -0.22$, $SE = 0.17$, $t(161) = -1.29$, $p = .199$.

13.4.3. Are reductions in first-generation status effects explained by improvements in first-generation students' outcomes?

Analyses overall support this: The effort-treatment significantly improved two out of three outcomes for first-generation students, academic anxieties: $b = 0.61$, $SE = 0.14$, $d = 0.61$, $t(211) = 4.43$, $p < .001$, worries: $b = 0.94$, $SE = 0.21$, $d = 0.63$, $t(211) = 4.57$, $p < .001$, engagement: $b = -0.11$, $SE = 0.16$, $t(211) = -0.68$, $p = .499$, while there was no significant, and one marginal improvement for continuing-generation students: academic anxieties: $b = 0.28$, $SE = 0.15$, $d = 0.32$, $t(125) = 1.82$, $p = .072$, worries: $b = 0.36$, $SE = 0.28$, $t(125) = 1.29$, $p = .200$, engagement: $b = 0.11$, $SE = 0.20$, $t(125) = 0.51$, $p = .609$.

13.4.4. Decoupling of talent self-concepts from outcomes

In line with our model (see Fig. 3), there was a moderating effect of our treatment on the connection between talent self-concept and outcomes. As correlation Table 7 illustrates, talent self-concept was consistently less predictive of outcomes when the environment signaled effort vs. talent to be important. This decoupling effect, reducing the connection between talent self-concept and outcomes, was significant for two out of three outcomes, as talent x condition interactions show, anxiety levels: $b = -0.21$, $SE = 0.09$, $t(336) = -2.19$, $p = .029$; engagement: $b = 0.28$, $SE = 0.11$, $t(336) = 2.44$, $p = .015$. While in the predicted direction (see also correlations, Table 7), the interaction did not reach significant levels for worries: $b = -0.20$, $SE = 0.14$, $t(336) = -1.46$, $p = .145$. The first-generation ➔talent➔outcome pathways not being reduced significantly for worries (see above and Table 6) thus seems to be due to the talent-outcome decoupling effect not reaching significance.

13.5. Discussion

Overall, results support the assumption that down-stream consequences of first-generation students' talent self-concept can be mitigated through the creation of effort- rather than talent-focused environments: For all three investigated outcomes, first-generation students' more negative talent self-concept was connected to lower levels of disadvantage when the environment signaled effort rather than talent to be important. Only in one case, this reduction did not meet significance

levels: First-generation students' lower talent self-concept was connected to heightened worries about being smart enough in both experimental conditions. Some variance in significance levels may be expected with multiple outcomes. Yet, this could also indicate that a one-time effort intervention may not be able to totally erase the perceived importance of talent and its down-stream consequences, given the current prevalence of talent-focus. Broader cultural change may be necessary to reduce disadvantages connected to talent self-concepts broadly.

14. General discussion

Intellectual talent is commonly seen as an important and highly desirable success factor in Western educational contexts (Leslie et al., 2015; Muenks et al., 2020; Yeager et al., 2019). Yet, the differential experiences individuals have may not allow everyone to think of themselves as talented to the same degree. Across our studies involving >3000 students we consistently found a first-generation status gap in students' talent self-concept: even when controlling for performance levels, students who grew up as first-generation students systematically thought of themselves as less intellectually talented than continuing-generation students. Further, in line with this negative self-concept, they were more prone to recall an experienced academic failure as being the result of "[their] lacking talent". This bias in students' talent self-concept is consequential. As mediation analyses and experimental data manipulating talent self-concepts show (Studies 2a-b), it contributes to first-generation students' disadvantage on a cognitive (experienced academic worries), affective (experienced anxiety levels), and behavioral (engagement) level in talent-focused environments. Connections between first-generation students' more negative talent self-concept and adverse consequences could however be reduced when participants were exposed to experimentally created environments that emphasized the importance of effort rather than talent (Experimental Study 3).

Previous research showing first-generation students to display a lower sense of self-efficacy (Belmi et al., 2020; Cruce et al., 2005; Hellman, 1996; Ivcevic & Kaufman, 2013; Ramos-Sánchez & Nichols, 2007) suggests that first-generation students may be less confident overall in their academic qualities. Yet, as our research suggests, first-generation students do not doubt all of their academic qualities. They see themselves as less talented but not as less diligent (Study 1a & 2a). Accordingly, down-stream disadvantages of first- vs. continuing-generation students were more pronounced in talent- vs. effort-focused environments.

In showing how first-generation students' more negative talent self-concept contributes to disadvantages in talent (vs. effort)-focused environments, our work suggests a novel type of mismatch that contributes to first-generation students' disadvantages. Previous research indicates that first-generation students' disadvantages often results from a mismatch between first-generation students' background (e.g., first-generation students' more collectivistic values) and what is valued in academic contexts (e.g., academic environments' emphasis on individualistic values; Stephens et al., 2012). While previous work has mostly focused on mismatches in cultural values, here, we show that a mismatch between first-generation students' relatively lower talent self-concept and academic environments' focus on talent contributes to disadvantages, too.

Our research also suggests potential pathways for interventions. Results of experiment 3 indicate that an effective way to strengthen first-generation students' confidence in their ability to succeed may be to change their perceptions about *what it takes* to succeed: creating environments that stress that effort rather than talent is crucial for academic success renders students' talent self-concept less consequential. In two out of three investigated outcomes, the effort- (vs. talent-) focused manipulation reduced the connection between first-generation students' talent-self-concept and adverse outcomes to non-significant levels.

Despite endeavors to create effort-focused-environments, a talent-focus is still wide-spread (Leslie et al., 2015). Indeed, the disadvantages we found first-generation students to experience in the field (Study 2a) were similar to effects found in a talent-focused experimental condition (Study 3). It may take time to change learning cultures broadly, and finding complementary intervention methods may thus be important. While boosting students' talent self-concept may only help maintain talent-focused environments, other changes in students' self-concept may be more helpful. One promising approach may be to highlight the strengths that are connected to being a first-generation student - e.g., how first-generation students have often learned to deal with challenging school work without relying on parental support (Bauer et al., 2021; Hernandez, Silverman, & Destin, 2021; Stephens, Hamedani, & Destin, 2014). In previous research, this approach has indeed been shown to boost students' long-term academic engagement and performance (Bauer et al., 2021; Bauer, Job, Walton, & Stephens, 2023).

14.1. Limitations and future directions

A limitation of the present studies is that most participants recruited through Facebook (Studies 1a-b, 2b, 3) were women – presumably reflecting a response bias, with women being more motivated to participate in surveys (Smith, 2008). Results suggest that effects of first-generation status occurred above and beyond any gender effects (results overall held even when controlling for gender, see Supplement; results were also consistent between studies with and without gender imbalances). Using more gender-balanced samples, future research should, however, explore the intersection between first-generation status and gender, given that women tend to see themselves as relatively less talented, similar to first-generation students (Bravata et al., 2020; Deaux, 1979; C. S. Dweck, Davidson, Nelson, & Enna, 1978). Would female-identified first-generation students show a double disadvantage in how talented they see themselves and the down-stream consequences they experience?

A second exciting avenue for future research lies in the origins of talent self-concept bias. Our research offers insights that future research can build upon. Results suggest that bias i) cannot be explained by prior performance-levels and ii) is more closely tied to students' educational rather than economic background. Based on previous research, it seems plausible that experiences of mismatch contribute to talent self-concept bias. Two mechanisms stand out: Firstly, first-generation students match the prototype of intellectually talented people less, being stereotyped as relatively less talented (Ashley et al., 2015; Browman & Miele, 2019). They may internalize such stereotypes, contributing to talent self-concept bias. Secondly, in performance situations, experiences of mismatch can make first-generation students feel that succeeding is more difficult for them (e.g., Stephens et al., 2012), which may make them view themselves as relatively less talented (Goudeau & Cimpian, 2021; Goudeau & Croizet, 2017). As previous mismatch research suggests, these processes may be more pronounced for first-generation students than other low-SES students whose parents have been socialized in academic environments (Stephens et al., 2012). Future research could use longitudinal study designs to test these processes. Would experiences of mismatch and related processes such as perceived difficulty predict long-term changes in talent self-concept? Would such processes be more pronounced for first-generation than low-income students? Results from such studies would not only help us understand how talent self-concept bias emerges, but also how it might be prevented – e.g., by changing prototypes of intellectually talented individuals or by helping individuals re-attribute perceived difficulty to external factors rather than lacking talent (Goudeau & Croizet, 2017).

Once bias in talent self-concept emerges (e.g., through experiences of mismatch), recursive processes may help maintain it. As our research suggests, first-generation students may construe their experiences in ways that may reinforce talent self-concept bias, e.g., being more likely

to see academic failures as a result of "lacking talent" (Study 1b). Other recursive processes may involve other people. Previous research has shown that individuals who perceive themselves as less competent also *appear* less competent to others (Anderson et al., 2012). When individuals were led to see themselves as rather incompetent in a given area, they used signals in their self-presentation (e.g., a less confident tone and posture) that led other participants to perceive them as less competent. It seems plausible that, in talent-focused environments, impairments in first-generation students' talent self-concept may lead them to act in ways that signal lower competence. Indeed, students' tendency to choose to engage less in challenging academic tasks (Field Study 2a) could constitute one such signal. Such behaviors could trigger a vicious cycle: if observed by relevant others (e.g., teachers or peers), these behaviors could affect others' expectations and behaviors (e.g., the provision of less challenging feedback) in ways that may reinforce first-generation students' talent self-concept and connected disadvantage.

What may moderate down-stream effects of students' talent self-concept? Our research suggests that first-generation students' talent self-concept is more strongly connected to disadvantages when talent (rather than effort) is signaled to be crucial for individuals' success. The perceived importance of intellectual talent and connected down-stream effects may vary depending on the academic field students are in, and situational cues. Previous research has already shown academic fields to differ in the importance placed on intellectual talent (with talent being seen as more important in math than geography, for example; Leslie et al., 2015). Yet, even within a given field, situational cues may shape how important intellectual talent is thought to be at a given moment (Muenks et al., 2020): most study programs may, for example, contain both, assignments that are thought to be attainable with effort (e.g., reading assignments or replicating experiments) as well as assignments thought to require talent (e.g., coming up with novel ideas in an essay; creating a new experiment). Future research could use experience sampling methods to capture situational fluctuations in importance-of-talent-perceptions and connected consequences for first-generation students' disadvantages.

Relatedly, future research should investigate perceived malleability of intellectual talent as a moderator of effects in talent-focused environments. In line with formal definitions (American Association of Psychology, n.d.; Oxford English Dictionary, n.d.; Cambridge Dictionary, 2023), people largely see talent as fixed and innate rather than malleable. Yet, there is still variability (Southwick et al., 2023). Would first-generation students who see talent as at least somewhat malleable show less detrimental effects of lower talent self-concepts? Future field studies assessing perceived malleability of talent could test such a moderation effect. Further, future intervention studies could explore, whether leading individuals to see talent as more malleable rather than fixed could help improve first-generation students' academic experience and engagement. Such an intervention that re-defines talent as a malleable, effort-based attribute may complement attempts to shift individuals' focus away from (fixed) talent towards effort (Study 3), helping individuals realize the importance of effort.

Finally, future research should examine possible intercultural differences. Our research investigated large student samples from Western countries, where talent is seen as crucial for individuals' success. In contrast, Eastern, collectivistic societies have been shown to put a stronger focus on effort (Rattan, Savani, Naidu, & Dweck, 2012). It thus seems likely that first-generation students, even when doubting their talent, would experience less detrimental consequences in these contexts. What is more, it would be exciting to investigate if, given the low perceived importance and salience of intellectual talent, first-generation students who were socialized in collectivistic cultures might not show reduced levels of talent self-concept. Maybe environments that focus on effort rather than talent would not only mitigate down-stream consequences of students' talent self-concept, but could even prevent first-generation students from thinking of themselves as relatively less talented in the first place.

14.2. Conclusion

Societies increasingly strive to provide equal opportunities for diverse groups of individuals in educational settings - equal opportunities not just to perform well, but also to be able to develop an adaptive view of themselves, feel well and engage in opportunities. Yet, in current Western talent-focused environments, the experiences first-generation students have growing up lead them to think of themselves as being relatively less talented. This systematic difference in self-concept does not only impair first-generation students' academic experience and engagement, but it also threatens societies' values for equality. Better valuing first-generation students' strengths and reshaping the academic climate to focus more on effort-based learning rather than talent may help reduce first-generation students' disadvantage and advance progress on societal goals.

Open practices

All materials and data are accessible at: https://osf.io/4a7rj/?view_only=8b6a887364564af0a806e4344fad4fbe.

Declaration of Competing Interest

None.

Data availability

data is shared at: https://osf.io/4a7rj/?view_only=8b6a887364564af0a806e4344fad4fbe

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jesp.2023.104501.

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