

# The Struggle Is Relative: A Comparative Processing Perspective on Academic Self-Concept and Student Mental Health

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Academic self-concept (ASC) is a prominent predictor of educational achievement and student mental health. Although it is widely accepted that ASC is fundamentally comparative, little is known about different comparison types driving students' ASC construal and its impact on mental health. Therefore, we examined whether self-evaluations relative to criteria-based, social, temporal, dimensional, and counterfactual comparison standards represent independent factors that contribute to general ASC. Next, we assessed the association of general ASC and its comparison-based facets with achievement emotions and psychopathology. University students ( $N=348$ ) completed an online survey of general ASC as well as subordinate comparison-based ASC facets, positive and negative achievement emotions, psychological distress, and symptoms of student burnout. We further assessed comparison frequency, student task values, and achievement levels. Factor analysis indicated that criteria-based, social, temporal, dimensional, and counterfactual standards reflect mainly distinct yet correlated comparison domains. General ASC construal was most strongly based on the criteria-based and social facets. Favourable general ASC predicted lower learning-related anxiety, psychological distress, and student burnout. Largely similar correlations emerged for all comparison-based ASC facets, whereby the criteria-based and social facets were particularly strong predictors of learning-related anxiety. Our findings support the view that ASC construal relies on comparisons with multiple standards. Criteria-based and social comparisons were particularly dominant and may be the main drivers of learning-related anxiety. Carefully designed follow-up studies with longitudinal designs and interventions are warranted.

Mental health problems are highly prevalent among university students (Auerbach et al., 2016) and associated with worse academic outcomes, attrition, and disease burden throughout the entire lifespan (Vigo et al., 2016). A key factor contributing to mental health problems is students' view on their own academic competence – dubbed *academic self-concept* (ASC). Researchers in educational and motivation psychology have long been intrigued by ASC due to its intimate relationship with academic achievement (Guay et al., 2010; Marsh et al., 2020; Wigfield & Koenka, 2020). Moreover, unfavourable general ASCs (e.g., reflected in statements like “*I am doing poorly as a student*”) have been associated with higher levels of psychopathology (Brumariu et al., 2022), arguably because they undermine students' sense of control while increasing uncertainty and negative affect (Bandura, 1997; Sagone & Caroli, 2014). However,

surprisingly little is known about how students construe their ASC and what facets of ASC may be particularly relevant to mental health.

Following Shavelson et al. (1976)'s influential definition, self-concepts can be thought of as multifaceted hierarchical representations of prior experiences, whereby a relatively stable general self-concept (or “global self-esteem”) resides at the top, broader-area concepts such as ASC in the middle, and situationally variable self-concepts at the lowest level. Indeed, abundant evidence supports an extreme intraindividual specialization of self-concepts in various domains (e.g., academic, social, physical) or subdomains (e.g., math versus verbal ASC; Klein, 2012; Markus & Wurf, 1987; Marsh et al., 2020; Marsh & Martin, 2011). Shavelson et al. (1976) further proposed that self-concepts are both descriptive and evaluative, whereby different comparison stan-

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dards and their importance could vary between individuals and situations. This idea aligns with frame-of-reference theories positing that all self-judgments rely on comparisons rather than on some internal utility scale (Markus & Wurf, 1987; Marsh et al., 2020; Morina, 2021; Tversky, 1972; Vlaev et al., 2011).

Accordingly, a student evaluating their general ASC as unfavourable implicitly bases this judgment on unfavourable comparisons with certain standards (e.g., social standard: “*I am doing worse than my fellow students*”) – even if the standard is not explicitly mentioned. By debasing ASC, unfavourable comparisons may also affect mental health, since the frequency of subjectively aversive comparisons has been associated with lower levels of well-being and higher levels of psychopathology (e.g., McCarthy & Morina, 2020; Morina et al., 2022; Morina & Schlechter, 2023). Thus, comparison processes are central in ASC construal and may help elucidate pathways to mental health outcomes among young adults undergoing education.

The view that ASC is fundamentally comparative in nature is supported by the finding that ASC does not align perfectly with “objective” markers of success (e.g., achievement, grades, learning processes). Instead, ASC is moderated by the availability of certain comparison standards (for meta-analysis, see Wolff & Möller, 2022). For instance, students with similar abilities have less favourable ASCs if average achievement at their school is high rather than low (i.e., Big-Fish-Little-Pond-Effect; e.g., Hoferichter et al., 2018), which is typically attributed to social comparison (i.e., other students’ performance serves as a comparison standard; Huguet et al., 2009). Moreover, ASC for subdomains has been found to depend on achievement levels in other subdomains (e.g., higher math grades typically correlate with lower verbal ASC), suggesting dimensional comparison (i.e., some other personal attribute – like performance in another domain – serves as a standard). Similarly, objective achievement change over time positively correlates with ASC, hinting at a role of temporal comparisons in ASC (e.g., past performance serving as a standard; Wolff et al., 2018). Together, there is compelling evidence that ASC is a function of multiple types of comparison.

A comprehensive recognition of comparison processes in self-judgment (for review, see Morina, 2021) and ASC has only been growing more recently (e.g., Marsh et al., 2020; Wolff & Möller, 2022). Historically, comparison standards have been addressed rather in isolation, most prominently social (Festinger, 1954), temporal (Albert, 1977), and – in specific educational contexts – dimensional comparisons (Möller & Marsh, 2013). Yet, other potentially relevant comparison types and a multi-standard perspective on comparisons have been neglected. For instance, educational psychology’s focus on academic achievement as an “objective” reference for ASC formation has produced

valuable insights but neglects (achievement) criteria as one of the most important comparison standards in the learning environment. That is, achievement criteria are inherently comparative (i.e., defined by social, individual, and/or criterial norms; Brunstein & Heckhausen, 2008), leading some researchers to conceptualize criteria-based self-assessments (e.g., self-evaluation relative to the school’s standards) as a separate facet of ASC (Dickhäuser et al., 2002; Hoferichter et al., 2018). Another relatively understudied standard consists of counterfactuals (Hoppen et al., 2020). That is, individuals may construe their ASC by comparing their actual abilities with their abilities in an imagined, alternative, counterfactual reality (e.g., *If I had done an internship prior to my studies, learning new things now would be easier for me*). Thus, several potentially important comparison facets have received relatively little attention, and their joint role in ASC construal remains unclear.

Relevant insights come from Dickhäuser and colleagues (Dickhäuser et al., 2002; Dickhäuser & Reinhard, 2006) who designed a scale to assess general ASC without explicit reference to any standard (e.g., *Learning new things for me is... difficult/easy*). Additionally, they developed structurally similar – but conceptually subordinate – scales tapping into ASC facets based on specific standards, namely: criteria-based (e.g., *Measured against the requirements of the course, learning new things for me is... difficult/easy*), temporal (e.g., *When I look at my development over time, learning new things for me is now... more difficult/easier than before*), and social (e.g., *Learning new things for me is... more difficult/easier than for my fellow students*) (for domain-specific ASC facets, also see: Dickhäuser, 2005). In multiple studies, they found that these ASC facets load on independent factors and correlate to varying degrees with the superordinate general ASC and affective outcomes. Strikingly, the criteria-based facet was most strongly associated with general ASC ( $r$ s between .69–.75) and test anxiety (Study 3:  $r$  = -.38), whereas the temporal facet was least strongly associated with general ASC ( $r$ s between .42–.63) and test anxiety ( $r$  = -.14). Together, there is initial evidence that multiple comparison-based facets inform general ASC and differ in their importance for student mental health.

## The Present Study

The first main aim of this study was to assess comparison-based facets of ASC among university students more comprehensively than prior studies and to explore their respective roles in the construal of general ASC. To this end, we employed and extended measures of general ASC and conceptually subordinate facets, namely self-judgments relative to criteria-based, social, temporal, dimensional, and counterfactual comparison standards. We expected these five facets to represent independent factors (H1)<sup>1</sup> that inform and contribute to general ASC to varying degrees

<sup>1</sup> Comparison standards have sometimes been classified as internal/external in studies addressing subdomain ASCs (e.g., math versus verbal ASC; Dickhäuser, 2005; Wolff & Möller, 2022). However, we assess a broader range of comparison standards and there are no prior data to suggest that they can be mapped on an internal/external dichotomy.

(H2). In particular, based on prior studies (Dickhäuser et al., 2002) and theoretical considerations (cf. supra), we expected general ASC to rely most heavily on the criteria-based ASC facet. That is, criteria (e.g., grades, explicit learning goals) can be expected to be the most salient and “objective” markers of success used by students in construing self-evaluations. Similarly, given the salience of other students’ performance and students’ ability to monitor their own development, we expected this to be followed by the social comparison and temporal comparison facets (Wolff & Möller, 2022). Due to a lack of prior findings, we did not specify expectations regarding the dimensional and counterfactual facets. Note, for example, that dimensional comparisons appear to be involved in the construal of subdomain ASC (e.g., math versus verbal ASC; Wolff & Möller, 2022; academics’ research versus teaching self-concept; Wolff et al., 2023), but its role in students’ general ASC remains unknown (i.e., how ASC may be construed in comparison to other life-domains, such as sport).

Our second main aim was to investigate the associations of general ASC (and on an exploratory basis, of all ASC facets) with affective outcomes and risk of psychopathology. Based on research linking more positive self-concepts to higher self-efficacy, controllability beliefs (e.g., Sagone & Caroli, 2014), and to lower levels of anxiety (Brumariu et al., 2022), we hypothesized that individuals with a more favourable general ASC would experience more positive emotions and display less psychological distress (H3). In particular, we tested correlations with learning-related enjoyment and anxiety – two highly consequential positive and negative achievement emotions (Pekrun, 2016). As more distal outcome variables, we measured frequent symptoms of depression, anxiety, and stress as a general marker of psychological distress, as well as symptoms of the burnout syndrome as a more specific marker of study-related stress (e.g., exhaustion, cynicism, diminished sense of efficacy).

Again, we expected some ASC facets to be more influential than others (H4). Note that this hypothesis is of an exploratory nature since it partially depends on the factorial independence of the ASC facets (i.e., the first main aim of this study). Moreover, the evidence basis concerning the differential impact of certain comparison standards on wellbeing and mental health is relatively thin. Still, on a tentative basis, we expected that the criteria-based ASC facet would be among the most prominent correlates of the affective and mental health outcomes due to its expected role in general ASC construal. Moreover, based on studies linking comparative thinking with depression and anxiety levels, we expected symptoms of psychopathology to be associated particularly strongly with the social comparison-based ASC facet (for meta-analysis, see McCarthy & Morina, 2020), as well as with unfavourable criteria-based, temporal, and counterfactual comparisons (Morina et al., 2022). More speculatively, temporal comparisons might be more closely related to symptoms of burnout (e.g., exhaustion, loss of interest, lowered efficacy), since this syndrome tends to be more frequent among students who have been enrolled for a longer time (Salmela-Aro & Read, 2017).

Finally, in order to allow comparability with other studies and to further elucidate the hypothesized relationships, we assessed a set of variables that may converge with ASC, motivational processes, and achievement. In particular, we measured (a) the frequency of engaging in each type of comparison, (b) the subjective importance and significance of studying (i.e., subjective task values like interest, achievement value, career centrality), which may boost both achievement and satisfaction (Eccles & Wigfield, 2020; Pekrun, 2006; Wach et al., 2016), and (c) achievement levels in terms of self-reported grade-point averages.

## Method

### Participants

The study was completed by 348 university students (277 women, 70 men, 1 diverse/nonbinary person). Inclusion criteria (assessed via self-report screening) were age between 18 and 35 years, current enrolment as a student and having completed at least one half-term of their study programme, and German language proficiency. Recruitment took place via advertisements on social media and locally at University of Münster through emailing-lists and advertisements on campus. Prior to inclusion, candidates were informed about purpose, content, and type of the survey and gave digital informed consent. In return for completion, they received a small financial compensation or partial course credits. This study was approved by the research ethics committee of University of Münster. Before data collection, we determined the minimum desired sample size at  $N=300$ , mainly based on the consideration that this provides good adequacy for factor analytic purposes (Comrey & Lee, 1992), whilst ensuring stable estimates of correlation coefficients (Schönbrodt & Perugini, 2013).

On average, participants were 23.6 years old ( $SD=3.6$ ) and had completed 3.9 half-terms of their study programme ( $SD=2.7$ , range=1-17). Fifty-three participants (15.2%) had already obtained a university degree in a different subject before enrolling in their current subject. Ninety-three (26.7%) were current psychology students, whereas the others were enrolled in various other subjects. Coarsely categorized, the most frequently named other subject areas were related to educational sciences (17.0%), medicine (8.6%), economics (8.0%), other social sciences or social work (6.6%), languages (5.2%), law (4.9%), sport sciences (4.6%), mathematics (4.3%), and biology (3.7%).

### Academic self-concept

**General ASC.** We devised a 5-item scale to assess general ASC based on the “absolute self-concept” scale developed by Dickhäuser et al. (2002). Items require respondents to judge their giftedness, ability to learn new things, intelligence, study-related abilities, and ability to manage study tasks, on bipolar 7-point Likert-type scales (e.g., *Learning new things for me is...*; anchors:  $-3=hard$ ,  $+3=easy$ ). Critically, the items do not provide any frame of reference. Average scores were calculated across items, with higher scores indicating a more favourable general ASC. Internal consistency was good ( $\alpha=.85$ ).

**Comparison-based ASC facets.** The five comparison-based ASC facets were assessed with structurally similar scales, each consisting of six or five items (an item addressing “managing study tasks” was included in all facets except criteria-based ASC, where a parallel item could not be formulated; cf. Dickhäuser et al., 2002). Respondents made self-judgements relative to criteria-based (5 items; e.g., *Measured against the requirements of my studies...*;  $\alpha=.88$ ), temporal (6 items; e.g., *When I look at my development over time, ...*;  $\alpha=.86$ ), social (6 items; e.g., *For me, learning new things in my studies is ... more difficult/easier than for my fellow students*;  $\alpha=.89$ ), dimensional (6 items; e.g., *Relative to other areas of my life, ...*;  $\alpha=.89$ ), and counterfactual (6 items; e.g., *If certain things had been different in my life, learning new things now would be more difficult/easier for me*;  $\alpha=.93$ ) standards. All items were rated on bipolar 7-point Likert-type scales, whereby the anchors were adapted to complete the sentence (e.g.,  $-3$ =*more difficult*,  $0$ =*similarly difficult/easy*,  $+3$ =*easier*). Note that to highlight the comparative nature of the questions, we modified the anchors and corresponding values by including the “similar” label at the mid-point, corresponding to the value of 0. Accordingly, negative and positive self-evaluations relative to the standard result in negative and positive scores, respectively. Scores of the counterfactual ASC-facet were reverse-coded prior to all analyses because, unlike the other subscales, negative scores indicate a more positive current self-concept relative to a counterfactual reality. Then, average scores for each scale were calculated, whereby higher scores indicate a more favourable ASC facet. The ASC facet scales were presented in a fixed order and only *after* the general ASC scale as not to influence the frames of reference participants would naturally use.

**Comparison frequency.** Following each ASC facet scale, we assessed the frequency of respective comparison type in the past three weeks, using 5-point Likert scales ( $1$ =*never*;  $5$ =*all the time*).

### Achievement emotions, psychological distress, and student burnout

**Achievement emotions.** To assess negative and positive emotions frequently experienced by university students, we employed the German versions of the learning-related Anxiety and Enjoyment scales from the Achievement Emotions Questionnaire (AEQ; Pekrun et al., 2011). The AEQ-Anxiety scale consists of 11 items (e.g., *I worry whether I'm able to cope with all my work*) while the AEQ-Enjoyment scale consists of 10 items (e.g., *I enjoy the challenge of learning the material*), requiring agreement on 5-point scales ( $1$ =*strongly disagree*;  $5$ =*strongly agree*). Average scores were calculated across items, where higher scores indicate higher levels of anxiety ( $\alpha=.89$ ) and enjoyment ( $\alpha=.85$ ), respectively.

**Psychological distress.** As a measure of common symptoms of psychopathology, we used the German 21-item version (Nilges & Essau, 2015) of the Depression Anxiety Stress Scales (DASS-21; Lovibond & Lovibond, 1995). Items consist of statements describing depression, anxiety, and stress-related symptoms, requiring respondents to indicate whether it applied to them in the past 7 days on 4-point

scales ( $0$ =*did not apply to me at all*;  $3$ =*applied to me very much or most of the time*). The sum score across all items ( $\alpha=.95$ ) served to quantify general psychological distress.

**Student burnout.** To assess symptoms associated with the burnout syndrome, we used the German version of the student-adapted Maslach Burnout Inventory (MBI; Maslach et al., 1997) in its short form (MBI-SS-KV; Wörfel et al., 2015). Its nine items consist of statements reflecting symptoms of emotional exhaustion or fatigue, cynicism or indifference, and low subjective professional efficacy. Respondents indicate how frequently they have experienced each symptom on 7-point scales ( $1$ =*never*;  $7$ =*every day*). Since the scale can be adequately interpreted based on a single factor (Turhan et al., 2021), we calculated an average score across all items ( $\alpha=.90$ ), higher scores reflecting higher levels of student burnout.

### Subjective student task values

To measure relevant aspects of student task values, we devised three 4-item scales tapping into study interest, achievement value, and career centrality. Items required respondents to indicate how much each statement applied to them on 5-point Likert scales ( $1$ =*not at all*,  $5$ =*very much*). The three scales were summarized separately by calculating average scores, since factor analytic studies suggest that value dimensions (e.g., intrinsic, extrinsic) reflect different constructs (Simonton & Garn, 2020).

**Interest.** The interest scale refers to an intrinsic, substantive interest in the subject of study. Items were based on the Study Interest Questionnaire (SIQ; Schiefele et al., 1993), whereby we selected only statements without emphasis on study-related affect (e.g., *When I'm in a library or on the internet, I like to browse for content about topics related to my study subject*; scale  $\alpha=.61$ ).

**Achievement value.** The achievement value scale refers to extrinsic value, such as the subjective importance of obtaining good grades. We selected and adapted suitable items from other task value scales for high school students (Eccles et al., 2005; Pintrich & De Groot, 1991). One of the four selected items was statistically unrelated to the others ( $r_s < |.05|$ ) and was therefore omitted. The other items (e.g., *It is important for me to get high grades in my courses*) displayed good internal consistency ( $\alpha=.87$ ).

**Career centrality.** The career centrality scale refers to the subjective importance of being a student for one's life and identity. Items (e.g., *I generally believe that my studies define the type of person that I am*; scale  $\alpha=.68$ ) were selected and adapted from the SIQ (Schiefele et al., 1993), as well as the Work Centrality Scale (Paullay et al., 1994).

### Academic achievement

As an index of academic achievement, we collected self-reported grade point average (GPA) on a 5-point scale broadly corresponding to the German grade system ( $1$ =*very good (1.0-1.3)*;  $5$ =*did not pass (4.3-5.0)*). Scores were recorded such that higher values reflect higher achievement.

## Procedure

Data were collected via an online survey platform (Unipark; Questback GmbH, 2017). Respondents were first informed about the study, screened for eligibility, and asked to give digital informed consent. Next, we collected demographic data, the ASC and comparison frequency scales, followed by the AEQ and the student task value scales. Then, participants filled out the short form of the MBI and the DASS-21. Self-reported GPA was assessed as the final question of the survey. Finally, participants were referred to a separate website explaining how to receive their participant compensation.

## Statistical analyses

To test whether the five comparison-based ASC facets represent distinct factors (H1), we first conducted confirmatory factor analysis (CFA). Specifically, we tested a one-factor model with all items loading on this factor. In addition, we examined a five-factor model that reflected the five comparison facets. The five factors were allowed to correlate among each other. The models were estimated with the maximum likelihood estimator with robust standard errors. Comparative Fit Index (CFI) and Tucker–Lewis Index (TLI) values  $>0.95$  indicated good fit; values  $>0.90$  indicated acceptable fit. Root mean square error of approximation (RMSEA) and Standardized Root Mean Square Residuals (SRMR) values  $<.05$  indicated good fit; values  $<.08$  indicated acceptable fit (Browne & Cudeck, 1992; Hu & Bentler, 1999).

To explore other potential factor solutions in a more data-driven manner, we used exploratory factor analysis (EFA), accounting for the fact that our rationally divided scales may not align with the true factor structure, particularly regarding facets that have not been included in prior studies (i.e., dimensional, counterfactual). To discern the number of latent factors, we conducted parallel analysis following Horn (1965) and visually inspected the scree-plot. Following Fabrigar and Wegener (2011), we additionally relied on the means of the Velicer’s Minimum Average Partial (MAP) test, the Very Simple Structure (VSS), and the Kaiser criterion (eigenvalues above 1) and ran EFA with promax rotation (allowing factors to be correlated) to examine factor loadings.

To investigate the extent to which the comparison-based ASC facets are reflective of students general ASC (H2), we examined an a priori defined model including *general ASC* as a latent factor consisting of the five manifest items of the general-ASC scale. In addition, we defined five latent factors for the comparison-based ASC facets (criteria-based, temporal, social, dimensional, and counterfactual) based on their respective items. General ASC was treated as an overarching higher-order latent factor for which the five ASC facets served as indicators. We compared the strength of these indicators by comparing their factor loadings with their respective 95% confidence intervals. Model fit was estimated based on the same criteria as outlined for the CFA. Next, we scrutinized relationships of achievement emotions, psychological distress, and student burnout with general ASC (see H3) and the five comparison-based ASC

facets (see H4), by calculating Pearson correlation coefficients of these variables among each other along with 95% confidence intervals. Correlation coefficients were compared pairwise using *z* tests for dependent overlapping correlations (Hittner et al., 2003) implemented in *cocor* for R (Diedenhofen & Musch, 2015). Since strictly speaking, some of the analysed variables can be considered ordinal, we repeated the correlation analyses using non-parametric analyses. The respective results tables are openly available on the Open Science Framework (OSF) via <https://osf.io/76bgv/>.

Alpha was set at 0.05 (two-sided) for all tests. For an optimal balance between the risk of Type I and Type II errors while conducting multiple closely related correlational analyses addressing the same hypothesis (i.e., H3), we used the D/AP method (Sankoh et al., 1997) implemented in the Bonferroni tool of Simple Interactive Statistical Analysis (SISA; [www.quantitativeskills.com/sisa/calculations/bonfer.htm](http://www.quantitativeskills.com/sisa/calculations/bonfer.htm); e.g. Meyer et al., 2017). Thereby, we adjusted the critical *p*-values for the number of dependent variables while taking the average correlation among dependent variables into account.

The data, materials, and analysis code are openly available on the OSF: <https://osf.io/76bgv/>. Analyses were not preregistered. All analyses were conducted in R version 4.01 (R Core Team, 2021).

## Results

### Overview and descriptive statistics

Means and standard deviations for all variables are depicted in [Table 1](#). General ASC, as well as the criteria-based and temporal ASC facets tended to be slightly positive for most individuals, whereas social, dimensional and counterfactual ASC facets were close to zero on average. In terms of comparison frequency, criteria-based and social comparisons were endorsed most frequently. Dimensional and counterfactual were the least frequent comparison types, with 104 (29.9%) and 143 (41.1%) respondents indicating they never used this type of comparison, respectively (but the distributions did not critically violate normality assumptions; skewness  $<0.732$ , kurtosis  $>-.580$ ).

### Confirmatory Factor Analysis of ASC facets

The model fit of the one-factor model was poor according to all fit indices (CFI = .49; TLI = .45; SRMR = .15; RMSEA = .16). For the five-factor model, most indices indicated acceptable model fit (CFI = .90; TLI = .89; SRMR = .05; RMSEA = .07).

### Exploratory Factor Analysis of ASC facets

The different criteria we applied to determine factor solutions yielded inconclusive results. The scree plot suggested between two and four factors. VSS suggested two factors while the Kaiser-criterion and MAP pointed to four factors. The parallel analysis indicated five different factors. As no clearly superior factor solution emerged, [Table 2](#) depicts the factor clustering and the standardized factor

**Table 1. Descriptive statistics**

Scale	Subscale	M (SD)
ASC general (-3-3)		0.94 (0.89)
ASC facets (-3-3)	Criteria-based	1.44 (0.95)
	Temporal	0.89 (1.00)
	Social	0.21 (0.92)
	Dimensional	0.16 (0.92)
	Counterfactual	-0.48 (1.18)
Comparison Frequency (1-5)	Criteria-based	2.98 (1.01)
	Temporal	2.70 (0.96)
	Social	2.99 (1.09)
	Dimensional	2.21 (1.02)
	Counterfactual	2.09 (1.14)
Achievement emotions (1-5)	Anxiety	2.81 (0.83)
	Enjoyment	3.30 (0.67)
Psychological distress (DASS-21)		17.6 (13.1)
Student Burnout (MBI-S-SF)		3.12 (1.26)
Student Task values (1-5)	Interest	3.60 (0.72)
	Achievement value	4.03 (0.88)
	Career centrality	3.37 (0.74)

Note. DASS-21=Depression, Anxiety and Stress Scales 21; MBI-S-SF=Maslach Burnout Inventory, Students, Short form; M=Mean; SD=standard deviation.

loadings for 1) a two-factor solution, 2) a four-factor solution, and 3) a five-factor solution. In the two-factor solution, all items loaded on one factor apart from the six items for counterfactual comparison that loaded on a distinct factor. In the four-factor solution, criteria-based and social comparison items formed one factor, while the three other comparison types formed three distinct factors (temporal, dimensional, and counterfactual). In the five-factor solution, the theoretical distinction into the five comparison types was reflected in the data by distinct factors (criteria-based, temporal, social, dimensional, and counterfactual). In all factor solutions, the item factor loadings were good.

### Contributions to general ASC

For our a priori model to have acceptable fit, we allowed for covariances of errors between the following indicators: Item 4 (*Intelligence*) for all comparison types, Item 2 (*Learning new things*) for the criteria-based and social facets, and Item 5 (*Abilities*) for the criteria-based and social facets (see [Table 2](#) for item content). Afterwards, model fit was acceptable according to all fit indices (CFI=.91; TLI = .90; RMSEA=.065, SRMR=.060). As shown in [Figure 1](#), criteria-based and social ASC facets were the strongest indicators of *general ASC*, and stronger indicators than the other three comparison types, as indicated by non-overlapping confidence intervals. Furthermore, the dimensional ASC facet was a stronger indicator of *general ASC* than the temporal and counterfactual facets. Descriptively, the counterfactual ASC facet was the weakest indicator, but had overlapping confidence intervals with the temporal facet.

### Correlations among ASC facets and general ASC

To better understand the relationship among the ASC facets and to gauge their differential impact on general ASC, we continued with the five different comparison types (as reflected in the five-factor solution). [Table 3](#) presents Pearson correlation coefficients between general ASC and the five facets. All constructs had positive linear associations with each other. The strongest correlation was found between the general ASC and the criteria-based facet, which was slightly stronger than the correlation of the social facet,  $z=2.42$ ,  $p=.016$ . The social facet, in turn, correlated more strongly with general ASC than the dimensional facet,  $z=5.16$ ,  $p<.001$ , which correlated more strongly than the temporal facet,  $z=3.20$ ,  $p=.001$ . The temporal and counterfactual facets were the weakest predictors and did not differ statistically from one another,  $z=0.91$ ,  $p=.363$  (see [Table 3](#)).

### Correlations with affective outcomes

[Table 4](#) shows the correlations of General ASC (cf. H3) and the five ASC facets (cf. H4) with the various affective outcomes. Supporting H3, higher (i.e., more favourable) General ASC levels were associated negatively with AEQ-anxiety, positively with AEQ-enjoyment, and negatively with levels of psychological distress and student burnout.

For learning-related anxiety, the criteria-based and social ASC facets were the strongest negative predictors and did not differ from one another,  $z=-1.16$ ,  $p=.246$ . Both had larger correlations than the dimensional and temporal facets,  $z_s<=-3.92$ ,  $p_s<=.001$ , and the criteria-based facet also correlated more strongly than the counterfactual facet,

**Table 2. Standardized factor loadings for the different factor solutions**

Factor-solution	2 factors		4 factors				5 factors				
	1	2	1	2	3	4	1	2	3	4	5
Criteria1 (Giftedness)	.68	-	.77	-	-	-	.55	-	-	-	-
Criteria2 (Learn new things)	.67	-	.68	-	-	-	.59	-	-	-	-
Criteria3 (Coping)	.69	-	.49	-	-	-	.49	-	-	-	-
Criteria4 (Intelligence)	.67	-	.89	-	-	-	.70	-	-	-	-
Criteria5 (Abilities)	.70	-	.68	-	-	-	.61	-	-	-	-
Temporal1 (Giftedness)	.48	-	-	.81	-	-	-	.81	-	-	-
Temporal2 (Learn new things)	.44	-	-	.76	-	-	-	.76	-	-	-
Temporal3 (Coping)	.47	-	-	.84	-	-	-	.80	-	-	-
Temporal4 (Intelligence)	.32	-	-	.42	-	-	-	.45	-	-	-
Temporal5 (Tasks)	.49	-	-	.78	-	-	-	.79	-	-	-
Temporal6 (Abilities)	.51	-	-	.67	-	-	-	.69	-	-	-
Social1 (Giftedness)	.75	-	.79	-	-	-	-	-	.83	-	-
Social2 (Learn new things)	.70	-	.78	-	-	-	-	-	.67	-	-
Social3 (Coping)	.72	-	.68	-	-	-	-	-	.67	-	-
Social4 (Intelligence)	.55	-	.78	-	-	-	-	-	.76	-	-
Social5 (Abilities)	.67	-	.59	-	-	-	-	-	.69	-	-
Social6 (Tasks)	.67	-	.58	-	-	-	-	-	.63	-	-
Dimensional1 (Giftedness)	.61	-	-	-	.73	-	-	-	-	.71	-
Dimensional2 (Learn new things)	.63	-	-	-	.77	-	-	-	-	.80	-
Dimensional3 (Coping)	.61	-	-	-	.80	-	-	-	-	.84	-
Dimensional4 (Intelligence)	.62	-	-	-	.64	-	-	-	-	.61	-
Dimensional5 (Abilities)	.64	-	-	-	.75	-	-	-	-	.72	-
Dimensional6 (Tasks)	.64	-	-	-	.83	-	-	-	-	.85	-
Counterfact1 (Giftedness)	-	.69	-	-	-	.70	-	-	-	-	.71
Counterfact2 (Learn new things)	-	.83	-	-	-	.83	-	-	-	-	.83
Counterfact3 (Coping)	-	.86	-	-	-	.87	-	-	-	-	.87
Counterfact4 (Intelligence)	-	.85	-	-	-	.86	-	-	-	-	.85
Counterfact5 (Tasks)	-	.90	-	-	-	.91	-	-	-	-	.91
Counterfact6 (Abilities)	-	.87	-	-	-	.88	-	-	-	-	.88

Note. A complete representation of all factor loadings can be found via the following link to the Open Science Framework (OSF): <https://osf.io/76bgv/>

$z=-2.16, p=.031$ . Meanwhile, the counterfactual, dimensional, and temporal facets were not differentially associated with anxiety (all  $ps \geq .097$ ). For learning-related enjoyment, the dimensional, criteria-based, and social ASC facets were all positive predictors not differing from one another,  $zs \leq 1.77, ps \geq .077$ . However, the dimensional facet was descriptively the largest and the only predictor that was statistically larger than the temporal ASC facet,  $z=2.29, p=.022$ . Meanwhile, the counterfactual ASC facet did not correlate with enjoyment and was a weaker predictor than all other facets,  $zs \leq -2.90, ps \leq .004$ . Regarding psychological distress (DASS-21 scores), none of the ASC facets were differentially associated (all  $zs \geq -1.80, ps \geq .072$ ) except for dimensional ASC, which was the weakest predictor and differed statistically from both the counterfactual and the criteria-based facets ( $zs \leq -2.41, ps \leq .016$ ). Finally, for student burnout, none of the ASC facets were differentially associated (all  $zs \geq -1.80, ps \geq .072$ ), except for counterfactual ASC, being a weaker predictor than all other facets ( $zs \leq -2.34, ps \leq .019$ ).

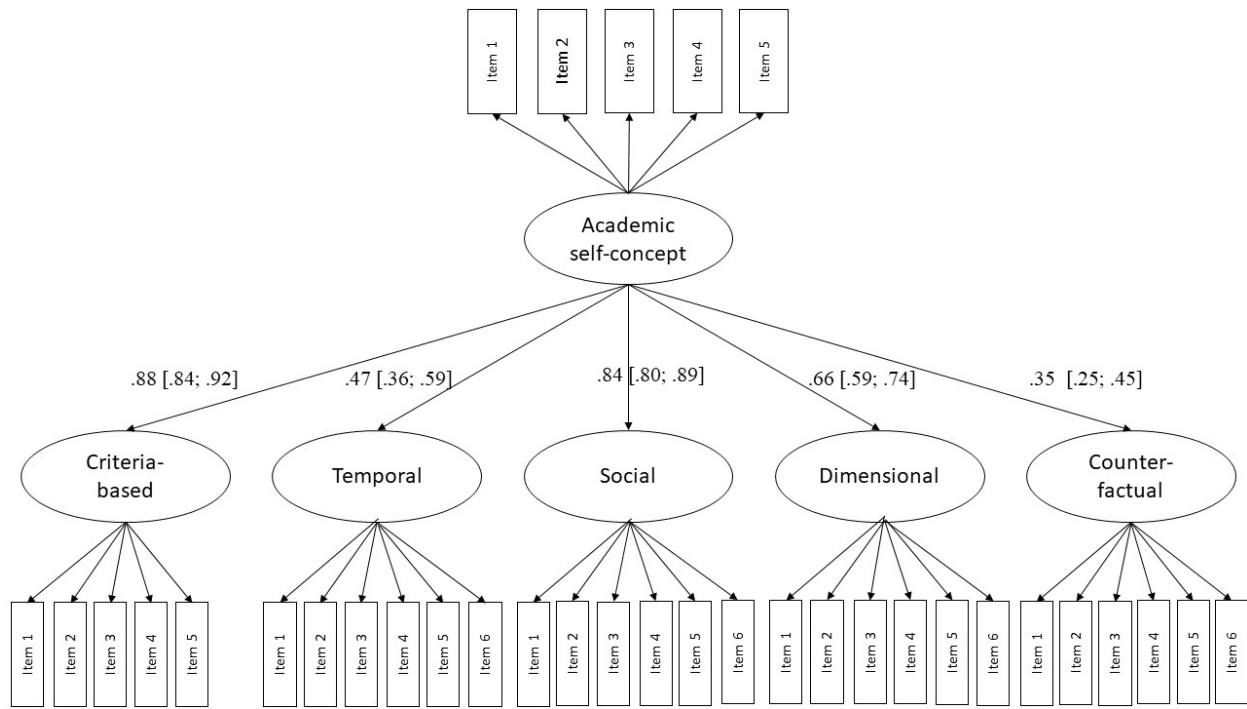
Also, the frequencies of all comparison types were mostly positively associated with anxiety, distress, and burnout, while frequency measures were statistically unrelated to learning-related enjoyment.

**Correlations with student task values and achievement**

Table 5 shows the correlations of our ASC measures with student task values and achievement. General ASC and all ASC facets were positively associated with subjective interest, achievement value, and achievement levels. Meanwhile, career centrality was unrelated to General ASC, while the dimensional and the temporal ASC facets were positively associated with career centrality.

Concerning differences between the ASC facets, subjective interest was similarly well predicted by the dimensional, criteria-based, and temporal facets,  $zs \leq 1.88, ps \geq .060$ . The counterfactual ASC facet was the weakest predictor and differed statistically from the criteria-based and dimensional facets,  $zs \geq 2.62, ps \leq .001$ . For achieve-

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**Figure 1. A priori defined model with general ASC as an overarching latent factor and the five comparison-based ASC facets as indicators, based on their respective items.**

**Table 3. Pearson Correlations among general ASC and comparison-based ASC facets along with 95% confidence intervals**

	1	2	3	4	5	6
1.General ASC	-	.76 [.71; .80]	.35 [.24; .44]	.70 [.64; .75]	.51 [.43; .58]	.29 [.19; .38]
2.Criterial		-	.44 [.35; .52]	.73 [.67; .77]	.54 [.46; .61]	.30 [.20; .39]
3.Temporal			-	.36 [.26; .45]	.43 [.34; .51]	.12 [.02; .23]*
4.Social				-	.57 [.50; .64]	.28 [.18; .37]
5.Dimensional					-	.18 [.08; .28]
6.Counterfactual						-

Note. All *ps* below  $.001$  unless stated otherwise.

\*  $p < .05$

ment value, none of the ASC facets was a differential predictor,  $z_s \leq 1.63$ ,  $ps \geq .103$ . For career centrality, the dimensional ASC facet was descriptively the strongest predictor, which did not differ statistically from the temporal facet,  $z=1.84$ ,  $p=.066$ , but from the social facet,  $z=3.95$ ,  $p<.001$ . Meanwhile, the associations of temporal and social facets with career centrality did not differ,  $z=1.51$ ,  $p=.130$ . Finally, for GPA, the criteria-based ASC facet was a stronger predictor than all other facets  $z_s \geq 2.97$ ,  $ps \leq .003$ . Social and dimensional facets did not differ from one another but were both stronger predictors of GPA than counterfactual and temporal ASC facets, all  $z_s \geq 2.25$ ,  $ps \leq .024$ .

Comparison frequencies were mostly unrelated to these outcomes, apart from dimensional comparison frequency,

which had small negative associations with interest, achievement value and achievement, as well as a small positive association with career centrality.

### Gender and age effects

To gauge the potential influence of sample demographics on our results, we explored differences between women ( $n=277$ ) and men ( $n=70$ ) on all independent and dependent variables using independent-samples *t*-tests, mostly yielding non-significant differences ( $ts < 1.61$ ,  $ps > .11$ ), with the following exceptions. Compared to men, women had (a) lower social ASC scores ( $t[100.7] = -2.19$ ,  $p=.031$ , 95% CI of difference:  $-0.54; -0.03$ ); (b) a higher frequency of criteria-based comparisons ( $t[105.5] = 2.12$ ,  $p=.037$ , 95% CI of



**Table 4. Pearson Correlations [95% CI] between ASC and comparison frequency with affective outcomes**

	AEQ-Anxiety	AEQ-Enjoyment	Psychological distress (DASS-21)	Student Burnout (MBI-S-SF)
General ASC	-.49 [-.57; -.41]***	.38 [.29; .47]***	-.28 [-.38; -.18]***	-.51 [-.58; -.43]***
Criteria	-.48 [-.55; -.39]***	.36 [.26; .44]***	-.29 [-.39; -.19]***	-.52 [-.59; -.44]***
Temporal	-.25 [-.34; -.15]***	.30 [.20; .39]***	-.22 [-.32; -.12]***	-.44 [-.52; -.35]***
Social	-.44 [-.52; -.35]***	.34 [.25; .43]**	-.22 [-.31; -.11]***	-.47 [-.55; -.39]***
Dimensional	-.26 [-.35; -.16]***	.42 [.32; .50]***	-.17 [-.27; -.07]**	-.48 [-.56; -.40]***
Counterfactual	-.36 [-.45; -.27]***	.10 [-.00; .21] <sup>ns</sup>	-.33 [-.42; -.23]***	-.29 [-.38; -.19]***
F. Criteria	.32 [.22; .41]***	.11 [.00; .21] <sup>ns</sup>	.21 [.10; .30]***	.17 [.07; .27]**
F. Temporal	.19 [.08; .29]**	.09 [-.02; .19] <sup>ns</sup>	.18 [.08; .28]**	.08 [-.03; .18] <sup>ns</sup>
F. Social	.34 [.24; .43]***	-.02 [-.13; .08] <sup>ns</sup>	.22 [.12; .32]***	.18 [.08; .28]**
F. Dimensional	.33 [.23; .42]***	-.04 [-.14; .07] <sup>ns</sup>	.26 [.16; .35]***	.24 [.14; .33]***
F. Counterfactual	.37 [.28; .46]***	.03 [-.07; .14] <sup>ns</sup>	.46 [.37; .54]***	.27 [.17; .36]***

Note. ASC = academic self-concept. F. = Frequency; AEQ = Achievement Emotions Questionnaire; DASS-21 = Depression, Anxiety and Stress Scales 21; MBI-S-SF = Maslach Burnout Inventory Students short form. Critical *p*-values were adjusted for multiple testing with 4 dependent variables and for the average correlation among dependent variables (*r* = .44). \*\*\* *p* < .0004 ( $\alpha$  = 0.001), \*\* *p* < .004 ( $\alpha$  = 0.01), \* *p* < .023 ( $\alpha$  = 0.05), ns = non-significant.

**Table 5. Pearson Correlations [95% CI] between ASC and comparison frequency with student task values and achievement**

	Interest	Achievement value	Career centrality	Achievement (GPA)
General ASC	.38 [.28; .46]***	.32 [.23; .42]***	.08 [-.03; .18] <sup>ns</sup>	.51 [.43; .59]***
Criteria	.32 [.22; .41]***	.26 [.16; .35]***	.09 [-.02; .19] <sup>ns</sup>	.54 [.38; .46]***
Temporal	.28 [.18; .37]***	.17 [.07; .27]**	.23 [.13; .33]***	.19 [.09; .29]**
Social	.27 [.17; .37]***	.23 [.13; .33]***	.14 [.03; .24]*	.44 [.35; .52]***
Dimensional	.38 [.28; .46]***	.24 [.13; .33]***	.33 [.24; .42]***	.43 [.24; .43]***
Counterfactual	.16 [.06; .26]**	.17 [.07; .27]**	-.05 [-.16; .05] <sup>ns</sup>	.29 [.19; .39]***
F. Criteria	.03 [-.07; .14] <sup>ns</sup>	.01 [-.09; .12] <sup>ns</sup>	.14 [.03; .24]*	-.09 [-.19; .02] <sup>ns</sup>
F. Temporal	.06 [-.05; .16] <sup>ns</sup>	-.07 [-.18; .03] <sup>ns</sup>	.18 [.08; .28]**	-.08 [-.18; .03] <sup>ns</sup>
F. Social	-.13 [-.23; -.02]*	.06 [-.04; .17] <sup>ns</sup>	.12 [.02; .22] <sup>ns</sup>	.13 [-.08; .02] <sup>ns</sup>
F. Dimensional	-.16 [-.26; -.06]**	-.16 [-.26; -.05]**	-.03 [-.13; .08] <sup>ns</sup>	-.19 [-.29; -.09]**
F. Counterfactual	-.03 [-.14; .07] <sup>ns</sup>	-.08 [-.18; .03] <sup>ns</sup>	.17 [.07; .27]**	-.17 [-.27; -.06]**

Note. ASC = academic self-concept. F. = Frequency; GPA = grade point average. Critical *p*-values were adjusted for multiple testing with 4 dependent variables and for the average correlation among dependent variables (*r* = .23). \*\*\* *p* < .0003 ( $\alpha$  = 0.001), \*\* *p* < .003 ( $\alpha$  = 0.01), \* *p* < .017 ( $\alpha$  = 0.05), ns = non-significant.

difference: 0.02; 0.55), (c) higher achievement value ( $t[105.0]=4.56, p<.001, 95\% \text{ CI of difference: } 0.30; 0.76$ ), (d) higher career centrality ( $t[102.0]=2.57, p=.012, 95\% \text{ CI of difference: } 0.06; 0.46$ ), and (e) a higher reported GPA ( $t[100.9]=2.23, p=.028, 95\% \text{ CI of difference: } 0.03; 0.45$ ). Next, we explored linear associations between age and all variables. Statistically significant Pearson correlation coefficients emerged only with: (a) the counterfactual ASC facet ( $r=.24, p<.001$ ), (b) the frequencies of dimensional comparisons ( $r=.16, p=.003$ ) and (c) counterfactual comparisons ( $r=.14, p=.007$ ), (d) achievement value ( $r=-.15, p=.004$ ), and (e) GPA scores ( $r=-.11, p=.035$ ).

### Discussion

In this article, we explored the role of different comparison-based ASC facets in the construal of general ASC among university students and investigated the correla-

tions of these facets with learning-related emotions and psychological distress. The main findings are as follows. First, factor analysis indicated that criteria-based, social, temporal, dimensional, and counterfactual self-evaluations can be regarded as distinct yet correlated comparison-based ASC facets. Second, the criteria-based and social ASC facets were the strongest predictors of general ASC, followed by the dimensional facet. The temporal and counterfactual comparison facets had the smallest association with general ASC. Third, individuals with more favourable ASCs reported higher learning-related enjoyment and lower anxiety, psychological distress, and student burnout. Fourth, the comparison-based ASC facets had mostly similar associations with affective outcomes, whereby the criteria-based and social facets had the largest negative correlations with learning-related anxiety.

Our findings support the view that ASC construal is fundamentally comparative, whereby comparisons against

multiple standards jointly contribute to a higher-order representation of one's own academic abilities (Shavelson et al., 1976). Specifically, the five-factor solution in line with our rationally defined ASC facets (i.e., criteria-based, temporal, social, dimensional, and counterfactual facets) was superior to a one-factor solution in CFA, and also emerged in our EFA, supporting H1 (but see discussion below). Concerning their contributions to general ASC, the criteria-based ASC facet was most dominant, closely followed by the social facet. The dimensional facet was in the third place, whereas the temporal and counterfactual facets shared the fourth place. Thus, our results replicate prior findings highlighting the importance of criteria-based comparisons in ASC construal (Dickhäuser et al., 2002), as well as an important, yet somewhat smaller role of temporal comparisons (Dickhäuser et al., 2002; Wolff & Möller, 2022), in line with H2. In addition, dimensional comparisons had a substantial impact on general ASC, which has previously been shown only for ASC subdomains (e.g., maths vs. languages). Thus, people appear to use other life domains as a reference also in higher-order self-concepts, like general ASC (e.g., *How good am I as a student vs. in sports?*). Finally, we show for the first time that counterfactual comparisons represent an independent ASC facet that informs general ASC to a small degree, even though this type of comparison was used relatively infrequently.

Our data also confirm prior findings linking more favourable general ASC levels to lower levels of psychopathology, such as anxiety symptoms (Brumariu et al., 2022). In line with H3, general ASC had large negative correlations with the learning-related anxiety and student burnout, a moderate positive association with learning-related enjoyment, and a small-to-medium negative correlation with DASS-21 scores. For learning-related anxiety, this was carried most strongly by the criteria-based and social facets, and least strongly by the counterfactual, temporal, and dimensional ASC facets. Indeed, unfavourable comparisons with peers or with course requirements may pose more salient threats for students than realizing that one used to be better in the past or performs worse than in other life domains. This pattern supports our tentative hypothesis that the ASC facets might have a differential impact on affective outcomes (H4) and replicates/extends prior studies with ASC facets (Dickhäuser et al., 2002), as well as studies linking clinical symptomatology to unfavourable social and criteria-based comparisons (McCarthy & Morina, 2020; Morina et al., 2022).

Meanwhile, all comparison-based ASC facets shared mostly similar correlations with learning-related enjoyment, DASS-21 scores, and student burnout. Still, some differential effects were present. For instance, the dimensional facet was among the strongest positive predictors of learning-related enjoyment, whereas it had the weakest associations with DASS-21 scores. Meanwhile, the counterfactual ASC facet was the strongest predictor of DASS-21 scores, but had the weakest (non-significant) association with enjoyment and student burnout. Thus, by and large, all five ASC facets largely share substantial contributions to student well-being and mental health, whereby criteria-

based and social comparisons stand out as particularly important correlates of learning-related anxiety.

Interestingly, our exploratory factor analysis also yielded a possible four-factor solution, in which the criteria-based and social ASC facets represent a single underlying construct. This solution appears to be at odds with prior factor analyses (Dickhäuser et al., 2002), and also with the expected pattern that criteria-based ASC facet correlated more strongly with achievement (i.e., self-reported GPA;  $r=.54$ ) than the social facet ( $r=.44$ ). However, strong interrelation between these facets ( $r=.73$ ) and highly similar correlations with all affective outcomes suggests vast conceptual overlap. Indeed, students likely rely on their peers to gauge what comprises an expected, ideal, and/or excellent performance – next to written course manuals and regulations. At the same time, criterial indicators typically serve as the basis for social comparisons.

Meanwhile, for the other three ASC facets, differential correlations with achievement and student task values indicate some divergence between constructs. For instance, career centrality (e.g., *I generally believe that my studies define the type of person that I am*) and intrinsic interest was particularly high among individuals with favourable *dimensional* ASC facets (i.e., individuals who are doing well academically compared to other life domains). Similarly, individuals whose ASC improved relative to the past tended to have higher values of career centrality. Taken together, our data lend support for the importance of studying multiple comparison standards in ASC construal and its affective consequences. Future studies need to determine potential merits of studying criteria-based and social facets separately, or whether they can pragmatically be interpreted as reflecting a single construct (cf. Morina & Schlechter, 2023).

## Limitations

The following limitations merit to be mentioned. First, due to our cross-sectional data, causality cannot be inferred. Relatedly, they cannot inform about the developmental course of ASC construal. Yet, it is plausible that specific comparison standards become more or less salient in different phases of competence acquisition. Also, critical phases like exam periods or events like success or failure may moderate engagement in specific types of comparison (e.g., Eckert et al., 2006). Hence, focused follow-up research with longitudinal designs is warranted. Second, the composition of our sample limits the generalizability to other student samples. In particular, our sample included many psychology students and predominantly women, and had a relatively homogenous age distribution. Since gender and age were weakly associated with some of our variables (e.g., self-reported GPA), future studies should address potentially moderating effects of these sample characteristics (cf. Wolff & Möller, 2022). Third, our findings on general ASC may not necessarily translate to self-concepts in other life domains, or even to ASC subdomains. Fourth, we assessed ASC facets in a fixed order and only after participants had reported general ASC. Hence, certain carryover effects are possible, such that some correlations among the ASC facets

could be inflated. Fifth, the interpretability of the counterfactual ASC facet is limited by the relative infrequency of this comparison type. Indeed, counterfactual comparisons may be more frequent in samples that have experienced abnormal and highly emotional life events (Hoppen et al., 2020). Hence, it may be fruitful to investigate this type of comparison in more selective samples. Finally, internal consistencies were lower than ideal for two of our scales measuring student task values, potentially threatening the reliability of some findings, in particular regarding interest ( $\alpha=.61$ ) and career centrality ( $\alpha=.68$ ).

## Conclusions

Our findings support a multi-standard comparative processing view of general ASC, whereby criteria-based and social comparisons appear to be dominant. The criteria-based and social ASC facets also appear most intimately linked with learning-related anxiety. However, all ASC facets (including dimensional, temporal, and counterfactual) share substantial and largely similar contributions to student well-being, distress, and burnout. Focused follow-up studies with longitudinal designs are highly warranted. Eventually, this line of research may inform debates about the role of certain comparisons in self-perception, learning outcomes, as well as student mental health, which may interact with individual differences in the perception of control (Pekrun, 2006), motives driving learning behaviours (e.g., performance goals; Senko et al., 2011) or self-eval-

uation motives (e.g., self-assessment versus self-enhancement; Gregg et al., 2011).

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## Contributions

TM, NM, and LS designed the study. TM and LS wrote the protocol. LS collected the data. PS undertook the statistical analyses. TM wrote the first draft. All authors contributed to and have approved the final manuscript.

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## Conflict of Interest Statement

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## Data Accessibility Statement

The data, materials, and analysis code are openly available on the Open Science Framework: <https://osf.io/76bgv/>. The analyses were not preregistered.

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## Supplementary Materials

### Peer Review History

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