BABEȘ-BOLYAI UNIVERSITY
FACULTY OF PSYCHOLOGY AND EDUCATIONAL SCIENCES
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PH.D. THESIS SUMMARY

THE ROLE OF FIXED INTELLIGENCE MINDSET AND SELF-ESTEEM IN STUDENTS' AFFECTIVE RESPONSES TO ACADEMIC ADVERSITIES

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Notes.

(1) This is to certify by Éva Gál that:

(a) The thesis includes the original research work of Éva Gál towards the Ph.D.;

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(3) All the Tables and Figures are numbered within the corresponding chapter or subchapter of the thesis.

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Date:	Signature:
07.02.2022	ÉVA GÁL

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CHAPTER I. THEORETICAL BACKGROUND

Academic life is abundant in challenges, difficulties and failures, however the reactions they trigger are highly dissimilar. When facing academic adversities, some students respond with persistence and hard work, and they strive to overcome these situations by investing more effort in the learning process. In contrast, others display differing reactions, they easily become discouraged by these experiences and tend to cease investing effort, give up and try to escape from the situation. These contrasting reactions seem to represent more stable individual difference and researchers tried to explain the mechanisms which operate behind them.

Carol Dweck (1999) observed that one of the key differences between students who respond well to challenges and difficulties and those who cope less efficiently with these situations is the way they view the nature of intelligence. While some students viewed their intelligence and cognitive abilities as malleable, improvable constructs and demonstrated greater persistence, others believed that they were born with a limited amount of intelligence, which cannot be changed and tended to withdraw from the situation. These beliefs or core assumptions are known as implicit theories or mindsets (Dweck, 2008) and are considered to shape the way individuals interpret and respond to achievement-related situations (Dweck et al., 1995).

According to Dweck (1999) believing that intelligence cannot be improved (i.e., holding an entity theory of intelligence or fixed intelligence mindset) creates the impression that failures or difficulties are the representations of one's irreversible lack of ability (Yeager & Dweck, 2012). In this framework, exerting greater effort when encountering difficulties or failures becomes pointless (Dweck & Yeager, 2019), since if achievement reflects one's fixed level of abilities or intelligence, then persistence will not aid to overcome difficulties. However, when viewing intelligence as a changeable, improvable construct (i.e., incremental theory of intelligence or growth mindset), failures are not so conclusive events, since through the investment of additional effort, remedial actions and improvement are possible (Dweck, 2008).

Research has also demonstrated that the failure-reaction of individuals adhering to fixed or growth mindsets differ not only on behavioral but on emotional levels as well. For instance, individuals holding fixed intelligence mindset tend to experience shame and loss of interest when encountering failure (Smiley et al., 2016), while those who endorse growth intelligence mindset retain positive mood and an optimistic view of the future (Forsythe & Johnson, 2017).

Moreover, other studies provide indirect support for the role of intelligence mindset in students' differing affective responses to failures. Studies have documented that fixed intelligence mindset is associated with self-esteem loss following failure (Niiya et al., 2004) and greater self-esteem decline over time (Robins & Pals, 2002). In turn, it is well-established that low self-esteem is linked to negative mental health outcomes (Orth et al., 2012).

Although, numerous studies have documented the association between intelligence mindset and affective states (e.g., differing failure reactions), only a handful of them focused explicitly on investigating this association; their majority examining it only tangentially and their conclusions are constrained. First of all, previous results regarding the association between intelligence mindset and affective states are highly inconsistent, thus it is unclear whether these findings are spurious or denote genuine relationships. Besides, there is a lack of knowledge in terms possible mechanisms, through which intelligence mindset might exert its impact on emotions. Moreover, since almost all studies were based on cross-sectional data, the way intelligence mindset operates in students' daily life and in the long-run is uncharted. Furthermore, previous studies mainly used cross-sectional methods which did not allow to draw causal conclusions. However, establishing causality and gaining more granular understanding about mindsets' role in the affective responses to difficulties and failure is crucial.

Given, the above presented limitation and unclarities, the present research project proposed to address these gaps in the literature. As a first step it synthetized available research on the association between intelligence mindset and affective states (Study 1) in order to establish the soundness of this relationship. Furthermore, in order to attain a more chiseled picture of this relationship we also proposed to explore the way mindset operates in shaping students' daily emotional experiences (Study 2) and to test potential mediating mechanisms (i.e., irrational beliefs, self-esteem) through which mindset influences emotions (Study 3a, 3b). Since, Study 2 and 3 unequivocally evidenced the crucial role of self-esteem in mediating the relationship between intelligence mindset and affective states, further inquiries focused on the in-depth analysis of this mediating effect. Thus, the cross-cultural invariability of the mediational model (Study 4) and the long-term association between intelligence mindset and self-esteem (Study 5) was also explored. Finally, an experimental method (Study 6) was used to test whether priming unconditional self-acceptance, a construct diametrically opposed to self-esteem (i.e., global self-evaluation), reduces negative affect and self-esteem loss after experiencing difficulties on a cognitive task.

CHAPTER II. RESEARCH OBJECTIVES AND GENERAL METHODOLOGY

Given the scarcity of research on the relationship between intelligence mindset and affective states and the inconsistency of previous results, the current research aimed to synthetize and to disentangle the nature of this relationship. As outlined in Chapter 1, intelligence mindset exerts its greatest impact during academic adversities (e.g., failures, challenges, difficulties), thus we aimed to explore the way fixed intelligence mindset operate in determining students' affective responses within these contexts.

Since most studies treat intelligence mindset as a unitary construct, where growth and fixed mindsets are situated at the opposite ends of the same continuum (Martin et al., 2017), during the present thesis, in order to strive for parsimony in analysis and interpretation, we opted to conceptualize intelligence mindset in the same manner. Thus, throughout the subsequent studies intelligence mindset would be represented as fixed intelligence mindset.

The **first objective** of the present thesis was to explore in more depth the nature of the relationship between fixed intelligence mindset and affective states. Specifically, we aimed to synthetize previous results to establish the presence of a link between these two constructs. Thereafter, we aimed to gain a more granular understanding of this relationship by investigating the way mindset operates in students' daily experiences during a challenging period.

As a **second objective**, we aimed to answer whether intelligence mindset influence emotions directly or other factors also play a role in mediating mindsets' effect. We tested several potential mediators in different contexts (i.e., during the exam period or recalled failure experiences). In order to further substantiate the obtained mediational model, we tested its cross-cultural stability as well.

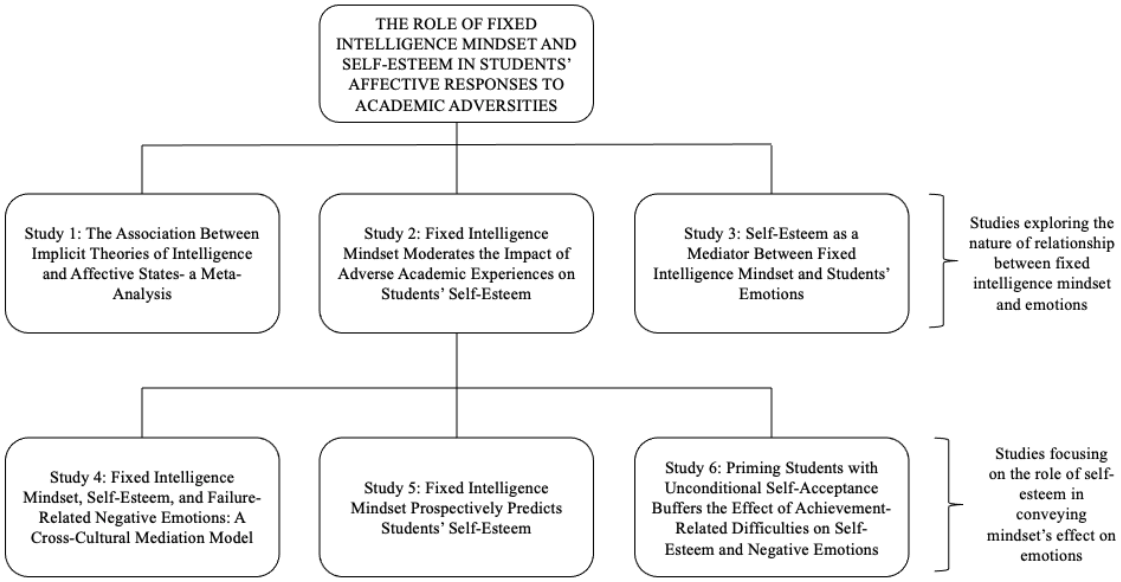
Since self-esteem proved to mediate intelligence mindset's effect on emotions, the **third objective** of the present thesis focused on investigating the relationship between fixed intelligence mindset self-esteem. Firstly, in a longitudinal study we aimed to test whether holding fixed intelligence beliefs leads to lower levels of self-esteem or having low self-esteem predisposes individuals to endorse fixed intelligence mindset. Secondly, we also tested experimentally whether priming students with unconditional self-acceptance, a construct diametrically opposed to global self-evaluation (i.e., self-esteem), reduces difficulty-related self-esteem loss and alleviates the affective consequences (i.e., increase in negative and decrease in positive emotions) of difficulties.

From a **theoretical** point of view the present thesis extends our knowledge regarding the influence intelligence mindset exerts on students' affective responses to academic adversities. Although, research on intelligence mindset mainly focuses on performance and related behaviors, the present research highlights that intelligence mindset have considerable implication in students' affective experiences as well, thus conferring a greater understanding regarding intelligence mindset's role in students' academic experiences.

The present research, although indirectly, might have **practical** implications as well. Unfolding and documenting intelligence mindsets' role on the way academic adversities impact students' emotional experiences, might offer new insights to further improve the efficiency of existing mindset interventions or to help students to cope better with adversities.

Figure 1

The Structure of The Current Thesis



CHAPTER III. ORIGINAL RESEARCH

Study 1. The Association Between Intelligence Mindset and Affective States- a Meta-Analysis[1]

1.1 Theoretical Background

According to Dweck (1999) „people's beliefs about themselves (self-theories) can create different psychological worlds, leading them to think, feel and act differently in identical situations" (Dweck, 2000, p.17). These distinct interpretations and responses are well illustrated by the following quotes from students who were interviewed by Robins and Pals (2002). While one of them in the face of academic setbacks „ feel upset, ashamed at my failure, angry that I couldn't have done better, and even a little depressed." (p.313), others approach similar situations very differently „ I feel I can do much better in school. It is still hard for me to accept the fact that I have a C on my transcript, but I look at my grades and I am inspired to do well... And, despite my grades, I feel like I have learned a lot." (p.313). Dweck's social cognitive theory of achievement motivation and personality (Dweck & Leggett, 1988) can offer a possible explanation for these distinct reactional patterns.

According to Dweck, one can view intelligence as a fixed (entity theory/fixed mindset) or as a malleable (incremental theory/growth mindset) construct (Dweck, 2008; Yeager & Dweck, 2012). Personal attributes, by an individual with fixed mindset, are perceived as relatively stable and unchangeable, while someone with a growth mindset perceives them as malleable qualities, which are open to influence and through effort they can be changed (Howell & Buro, 2009).

Competence acquires different meaning for individuals with growth and fixed mindset, while for one of them it is something people simply have and demonstrate right away, a fixed ability that needs to be proved, for others competence is something that develops over time through effort (Molden & Dweck, 2006). Accordingly, for individuals with fixed mindset every achievement situation represents an evaluation, when they have to validate their intelligence, contrary to growth mindset, where challanges are perceived as opportunities for learning (Dweck, 2008). According to Dweck's model core beliefs create specific reaction patterns regarding success and failure (Blackwell et al., 2007). While students with fixed mindset interpret failures as the manifestation of their lack of ability (Snyder et al., 2014), students with growth mindset attribute their failures to the effort they have invested, and they are more likely to exert effort to improve the skills they lack (Hong et al., 1999).

The attribution of success and failure determines the behavioral and affective reactions individuals display in response to these events (Aditimo, 2015). Attributing failure to stable factors (e.g., global, fixed ability) leads to maladaptive reactions, while attributing it to instable or controllable factors (e.g., lack of effort) leads to adaptive responses. Thus, effort attribution protects from negative emotions and de-motivation (Hong et al., 1999), while attributing failure

[1] This study has been published.

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to an innate, unchangeable ability makes individuals more vulnerable to negative emotions and maladaptive responses (Robins & Pals, 2002).

In the face of failure those with fixed mindset display the cognitive, affective and behavioural components of a helpless response (Robins & Pals, 2002), they start to doubt and denigrate their abilities and intelligence. Since failure reflects their entire intelligence it becomes a measure of self worth (Dweck, 1999), failure defines them, thus, they frequently engage in maladaptive self-attibutions (eg. I am failing because I am totaly stupid; Robins & Pals, 2002). They react with intensive negative emotions to failure, adopt a pessimistic view of the future, and frequently arises the urge to escape from the situation or disengage from the activity (Dweck, 1999). Zhao et al. (1997) compared the failure responses of individuals with depression to those with fixed mindset; the two groups obtained similar results on the used measures. Baer et al. (2005) using an online diary method followed college students' moods and coping behavior for two months. Fixed mindset students reported higher levels of depression which was caused by extensive rumination over setbacks and problems. As the level of depression increased, those with fixed mindset tended to neglect their pesonal and academic chores. However, students with growth mindset showed different responses to the elevated levels of depression, they tried to invest more energy into their academic work, they became more determined. Studies also show that a growth mindset intervention is effective in reducing state anxiety (DaFonseca et al., 2008) and negative reactions to social exclusion (Yeager et al., 2014).

Numerous research have investigated the association between intelligence mindset and academic achievement and related factors (Blackwell et al., 2007; Haimowitz et al., 2011; Hong et al., 1999; Howel & Buro, 2009), and their clear majority came to the same conclusion, namely that fixed mindset results in maladaptive consequences, while growth mindset in positive ones. Mindset's association with emotions is less extensively studied, and the research results are mixed. While some studies found medium to strong correlations between growth mindset and positive emotions (*r* between .39 and .53; Chan, 2012; Shih, 2011), other results indicated only weak associations (*r* = .10; King, 2012). Generally, fixed mindset was negatively associated with positive affective states with weak to medium correlations (*r* between -.02 and -.31; Chan, 2012; King, 2012), but it correlated positively with negative emotions, with correlations ranging between .15 and .47 (Cury et al, 2006; Da Fonseca et al., 2009). A recent meta- analysis conducted by Schleider et al. (2015) revealed that in the case of individuals with fixed mindset mental health problems are more pronounced. The authors proposed that fixed mindset could be a potential cognitive vulnerability factor, while growth mindset may be protective regarding mental health problems.

1.2 Method

1.2.1 Literature Search

For finding the relevant literature we conducted an initial search using PsycInfo, PsycArticles, ScienceDirect and ProQuest Dissertations and Theses. Search terms included the following keywords: implicit theories or mindset or growth mindset or fixed mindset or incremental theory or entity theory or intelligence belief and positive affect or negative affect or emotion or feeling. The starting point of our search was constituted by Dweck and Leggett's (1988) seminal work and it ended in May, 2016. Since in 2020 a new meta-analysis (Burnette et al., 2020) on the association between mindset and different indicators of psychological distress have appeared, which included a subgroup analysis on intelligence mindset as well, the idea of an updated search was discarded.

1.2.2 Selection of Studies

The initial electronic search yielded 806 articles, meanwhile the examination of the relevant articles' refrences yielded with an additional 54 articles. After removing the duplicates the total number of the identified articles was 820 out of which only 209 articles were connected directly to this specific reasearch topic, although they contained one or some of our search terms. The eligible articles were retrieved in full-text and then further analyzed to determine if they meet the following inclusion criteria: (1) studies investigating the association between implicit theories of intelligence, respectively growth and fixed mindset, and affective states (studies assessing implicit theories of emotion, personality, athletic ability and other consructs were excluded from the analysis); (2) studies which did not manipulate experimentally or prime a certain kind of mindset or did not investigate the effectiveness of a mindset intervention on affective outcomes; (3) the study sample represented the general population; (4) and the study provides sufficient information to compute an effect size.

Mindsets should be investigated in a domain specific fashion (Ilhan & Cetin, 2013), since differences in implicit theories occur even across academic domains (Shively & Ryan, 2013). But taken into consideration that all the included studies were conducted on student samples and considering the strong association between intelligence mindset and mindset of math ability ($r = .59$, $p < .001$; Shively & Ryan, 2013) we still included in the analysis two studies which assessed implicit theories of mathematical ability. After the selection procedure (illustrated by **Fig. 1.1**) 13 articles were included in the analysis.

1.2.3 Study Coding

The following study characteristics were coded: identification data (author, year of publication), sample size, mean age of the participants, gender distribution (the percentage of male participants), type of measured implicit theory of intelligence (incremental or entity), measurements of affective states, type of measurement, participants' academic level, country where the study was conducted, and data needed for computing an effect size (all the included studies reported the correlational coefficient between implicit theories of intelligence and different affective states).

All the information across the studies were obtained through self-reporting measures. For the assessment of the intelligence all the used scales were derived from Dweck's (1999) Theories of Intelligence Scale (TIS), thus representing the same construct. The majority of the used affective measures assessed affective states in general context, while there were three scales which focused on affective states in the academmic context. Due to their great variation, we did not considered it useful to include the different affective variables separately in the analysis (also taking into account the small number of studies), therefore the affective measures were categorized as positive or negative affective states; positive affective states including enjoyment, happiness, pride, hope and general positive affect, while negative affective states includes helplessness, depressive symptoms, worry, anger, shame, boredom and general negative affect.

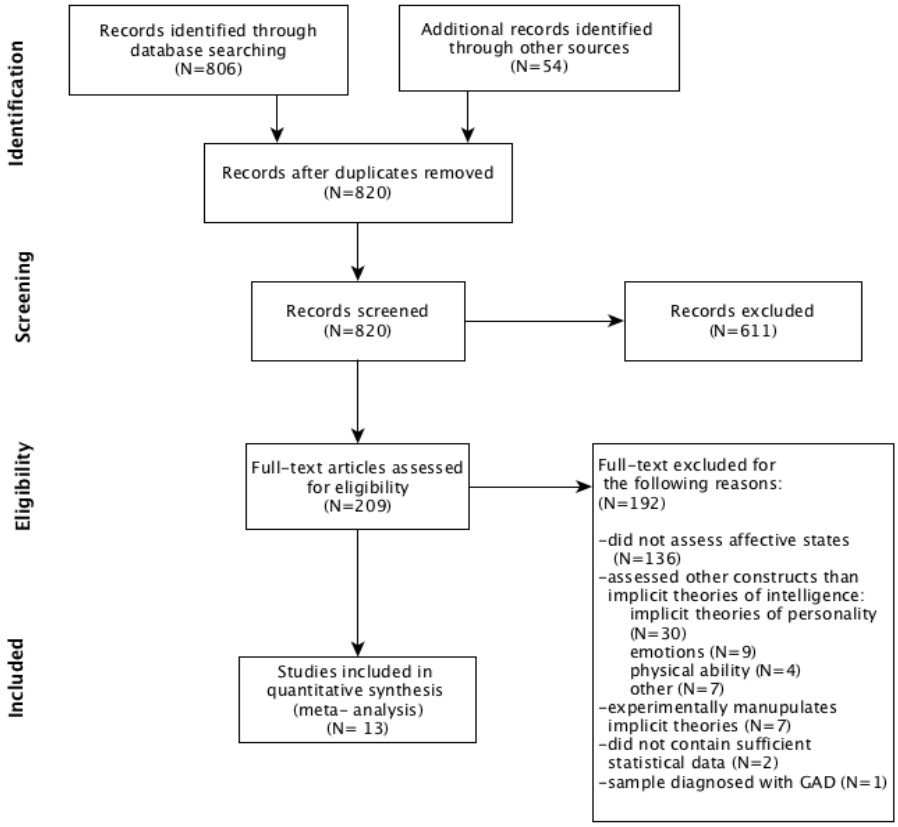
1.2.4 Procedure

To calculate the mean effect size we used correlation coefficients (r), which were directly reported in all the included studies and which can serve as effect size estimates (Borenstein et al., 2009). According to Cohen's guidelines for interpreting effect sizes from r, a value of 0.1 indicates low, a value of 0.3 medium, while 0.5 indicates large effect sizes (DeCoster, 2004). Since individual studies were the unit of analysis, each study contributed with a single effect size in the main analysis; thus, when studies included multiple indicators

of affective outcomes or mindsets, an aggregated effect was calculated, however, during subgroup analysis, we assumed independence among these studies.

Primarly we were intrested in estimating the overall association between intelligence mindset and affective states, regardless of the type of mindset and the valence of affective states. In accordance with theoretical assumptions, the correlational coefficients reported in the studies showed differential relationships with affective states: while growth mindset correlated positively with positive affective states and negatively with negative affective states, fixed mindset showed positive associations with negative affective states, and negative associations with positive affective states. In order to be able to estimate a mean effect size, we reverse coded the correlational coefficients (Hunter & Schmidt, 2004) between growth mindset and negative emotions and between fixed mindset and positive emotions, otherwise their correlations pointing to opposite directions would have neutralized each other.

Figure 1.1
The PRISMA Diagram



As a second step we attempted to deepen our understanding regarding this association and estimated a separate effect sizes for each mindset type combined with the positive or negative valence of affective states. For this analysis we used the non-reversly coded correlational coefficients.

For calculating effect sizes we used the Comprehensive Meta–Analysis software (version 2). Since we expected substantial heterogeneity among studies, we used a random effects model in all analyses. The random effects model does not assume that there is a true effect, but it allows for the true effect to vary across studies (Borenstein et al., 2009). According to DeCoster (2004) the random effects model is more realistic, especially if the inference the

researcher aims to make is a generalized conclusion about the research domain, beyond the studies included in the meta-analysis.

To test the heterogeneity of the effect sizes we calculated the Q and I^2 statistics. Q-statistics test if heterogeneity is statistically significant, with the null hypothesis that all studies share a common effect size. I^2 statistic determines in what proportion the observed variation in effect sizes is real (Borenstein et al., 2009). I^2 can be expressed in percentages, according to Higgins et al. (2011) a value of 25% represents low, 50% represent moderate, while 75% indicates high heterogeneity.

Based on Weiss (2010) we considered an effect size as outlier when its value was higher with more than three standard deviations than the population mean. During our analysis we did not find any outliers, thus all the data were included in the analysis. We examined the presence of publication bias by visually inspecting the funnel plot, in which the distribution of the studies would be asymmetrical in the case of publication bias. We also used Rosenthal's fail-safe N approach, which shows how many missing studies would be needed in order for the *p* value to become non-significant (Borenstein et al., 2009). Besides, we also employed Duval and Tweedie's (2000) trim-and-fill procedure, which by correcting for the publication bias yields with an adjusted effect size.

1.3 Results

1.3.1 Study Characteristics

For estimating the combined effect we obtained 13 effect sizes from the 13 included studies. The studies included 6.359 middle-, highschool and college students, with mean ages between 12.69 – 20.18 years. Across the studies the gender distibution seems equal, the mean percent of boys is 44.9%. Among the studies there was a great variance regarding the measured affective outcomes. The sample of the studies does not represent mostly westernized countries, more than one third of the studies was conducted in Asian countries.

1.3.2 Mean Effect Size Analysis

Growth and fixed mindsets' combined effect size was calculated using the reversly coded correlational coefficients. The ovearll effect size of their association was small to medium, $r = .21$, $p < .001$ (95% CI: .16 - .26). The heterogeneity was high $Q_{(12)} = 43, 09$, $p < .001$. The value of the I^2 statistics shows that 72% percent of the observed variance is due to real differences in effect sizes.

1.3.3 Subgroup Analyses

To refine the relational patterns between the examined variables we calculated separate effect sizes to the different types of mindsets and affective states. The effect size for the association between fixed mindset and negative affective (k= 6) states was close to medium, $r = .28$, $p < .001$ (95% CI: .16- .39) with high heterogeneity $Q_{(5)} = 63, 24$, $p < .001$; $I^2 = 92.09$. The effect size for the association between fixed mindset and positive affective states (k= 5) was low, $r = -.16$, $p < .001$ (95% CI: .08- .23) with high heterogeneity $Q_{(4)} = 25, 96$, $p < .001$; $I^2 = 84.59$. The mean effect size for growth mindset and positive affective states was medium, $r = .34$, $p < .001$ (95% CI: .21- .46) with high heterogeneity $Q_{(3)} = 40, 44$, $p < .001$; $I^2 = 92.52$. The mean effect size for growth mindset and negative affective states was small to medium, $r = -.17$, $p < .001$ (95% CI: .10- .24) with non-significant heterogeneity $Q_{(5)} = 7.74$, $p = .17$; $I^2 = 35.44$.

1.3.4 Moderator Analysis

We conducted moderation analysis, in order to investigate wheter our candidate moderators are able to explain the high heterogeneity. None of our moderators (i.e., academic level, academic vs general context) proved to be significant. Altough, the academic level, approached the required significance level, suggesting that there might be a tendency for stonger effects on lower academic levels, but this assumption needs further investigation.

1.3.5 Publication Bias

According to Rosenthal's fail- safe N procedure 772 studies would be needed in order for the *p* value to become nonsigificant. The trim-and-fill procedure showed no missing studies, and Egger's regression intercept was not significant ($p = .36$, two tailed), suggesting that smaller studies were not overrepresented. For the subgroup analyses, the value of the fail-safe N was higher than 5K+10, the trim-and-fill procedure did not show any missing studies, although the funnel plots were not symmetrical. Contarary, in one case (the association between growth mindset and positive affective states) the Egger's regression intercept ($p < .05$, two tailed) was significant, suggesting that smaller studies were overrepresented. In sum, we can conclude that we found no severe indicators for the presence of publication bias.

1.4 Discussion

The present meta-analysis investigated the assocition between intelligence mindset and affective states. Although the theoretical link between these two constucts are clear, only a limited number of studies addressed this issue, yielding mixed results. We obtained small to medium effect sizes for the overall association, but these effects were further refined by subgroup analyses. Between fixed mindset and negative affective states, and growth mindset and positive affective states we found positive associations with medium effect sizes, while between fixed mindset and positive emotions, and growth mindset and negative emotions the associations were negative with low effect sizes. Our results correspond to the theoretical assumptions, that individuals with fixed intelligence mindset experience more negative and less positive emotions, while those with growth mindset more positive and less negative emotions (Dweck, 1999; Blackwell et al., 2007; King et al., 2012; Teunissen & Bok, 2013). The obtained effect sizes are similar of those found by Schleider et al. (2015) ($r =. 25$, $p < .001$), who investigated the relationship between fixed mindset and youth mental health. In their analysis, several types of mindset were included (e.g., intelligence, peer relationship, personality) but mindset type did not moderate the association, which led them to the conclusion that it is the entity belief, rather than its domain or content, what conveys the risk for mental health. Burnette et al. (2013) conducted a meta-analysis on the association between growth mindset and the six self-regulatory procesess identified by the SOMA model and found that growth mindset is associated negatively with helpless responses and negative emotions ($r = -.23$, $p < .001$), while positively with mastery oriented respones.

Our result gain more importance in the light of those results which provide evidence for the effectiveness of growth mindset interventions. Miu and Yeager (2014) found that a growth mindset intervention, focusing on the implicit theories of personality, reduced the incidence of depressive symptoms nearly by 40%, 9 months after the intervention. While fixed mindset participants in the control group showed great increase in depressive symptoms during the school year. Individuals with fixed mindset experience less anxiety, when are exposed to a malleable prime (Burns & Lisbell, 2007), while priming a growth mindset of athletic coordination results in a significant increase in motivation and self-efficacy (Kasimatis et al., 1996). Negative affects are usually associated with poorer psychosocial functioning and health (Luong et al., 2016) and lower levels of psychological well-being (Marlies et al., 2015), thus

acknowledging the connection between intelligence mindset and affective states, could draw attention to this relatively new area of intervention to increase students' well-being or prevent the negative consequences of a fixed mindset.

In our data we observed high heterogeneity, thus we tested for potential moderators (i.e., academic level, context of affecitve states), but none of them was significant. Although academic level was close to the established .05 significance level suggesting a possible tendency for stronger association on lower academic levels, these assumptions need further substantiation.

Athough our meta-analysis seems unaffected by publication bias, it faces several limitations. First of all the number of the included studies was relatively small examining cross-sectional student samples, thus narrowing our conclusions to student populations. The cross-sectional nature of the studies does not allow us to establish causality between the investigated variables. Although, most researchers refer to mindsets as the antecedents of emotions and psychopathology symptoms, the results obtained by Schleider et al. (2015) question this view. They examined the longitudinal association between psychopathology and implicit theories of thought, emotion and behavior, and found that baseline theories did not predict increase in psychopathology, but baseline psychopathology predicted increased entiy theory at the end of the school year.

Study 2. Fixed Intelligence Mindset Moderates the Impact of Adverse Academic Experiences on Students' Self-Esteem[2]

2.1 Theoretical Background

Experiencing setbacks, difficulties or failures is an inevitable part of academic life; however, the impact of these experiences on students varies considerably. While some student bounce back fairly easily and try to overcome and learn from these experiences, others might feel helpless and suffer more negative consequences (Aditimo, 2015) such as decreases in self-esteem (Crocker & Wolfe, 2001), motivation, and persistence (Dweck, 2013). For many students, college is a challenging period and coping successfully with these challenges is crucial for their academic success and mental health. Thus, investigating the factors which might influence their reaction to academic adversities is essential.

Dweck's (2013) social-cognitive model of achievement motivation provides an explanation regarding the psychological resources that enable students to efficiently manage failures or sustained challenges. According to Dweck's model, students' beliefs or mindsets about the malleable vs. stable nature of learning-related abilities (e.g., intelligence) influence the meaning and reactions to adverse academic situations. Individuals who believe that their intelligence cannot be improved (i.e., fixed mindset) attribute failures to their low levels of intelligence, while discounting the role of effort. Hence, failure not only represents their performance, but it is seen as evidence of their inadequacy or lack of intelligence (Dweck & Yeager, 2019). Making trait attributions when facing failures might lead to decreased state self-esteem and increased levels of negative emotions (Weiner, 1985). In contrast, individuals who believe that their intelligence can be improved (i.e., growth mindset) are more likely to attribute poor performance to lack of effort and perceive difficulties as challenges or opportunities to learn (Dweck, 1999). These interpretational frameworks created by intelligence mindsets might explain why some students recover quite easily after setbacks, while for others failure is a discouraging and overwhelming experience which represents a threat to their self-worth.

Although the link between fixed intelligence mindset and self-esteem is theoretically meaningful, relatively few studies have explicitly investigated the association between these constructs. Previous studies have consistently reported that fixed intelligence mindset is related to lower levels of self-esteem (Lee et al., 2017) and greater self-esteem decline over time (Robins & Pals, 2002). According to Dweck (2013), fixed mindset transforms every achievement situation into an evaluation. Individuals with fixed mindset perceive their failures and successes as the reflections of their innate abilities. Therefore, they tend to be preoccupied with proving their abilities, so their self-esteem becomes highly contingent on external validation (Molden & Dweck, 2008). Thus, failure is a debilitating experience for them (Robins & Pals, 2002). This is well-illustrated by Zhao et al. (1997) who found that after an intellectual

[2] This study has been published.

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The authors contributed to article as follows: Gál, É: study conceptualization, research design, data collection, analysis and interpretation, writing the manuscript; Tóth-Király, I: data analysis and interpretation, review and editing; Szamosközi, I.: study conceptualization, review and editing, supervision; Orosz, G: study conceptualization and research design, review and editing, supervision.

failure self-doubt regarding one's worth was common among individuals with fixed intelligence mindset.

Dweck's theory (1991) also emphasizes that emotional reactions to task demands derive from students' belief system. Since competence acquires different meaning for individuals with fixed or growth mindset, the meaning they attach to achievement situations also differs dramatically. And the way adverse situations are interpreted determines the individual's emotional reactions. For example, attributing academic hardship to stable internal factors leads to intensive negative emotions, discouragement (Chan, 2012; Robins & Pals, 2002; Shih, 2011), pessimism about the future and rumination (Baer et al., 2005).There are a growing number of studies supporting that fixed mindset is related to students' mental health outcomes, such as generalized and social anxiety, depression, and negative emotions (King et al., 2012; Schleider et al., 2015). Moreover, in a longitudinal study, fixed mindset was also predictive of adolescent's depressive symptoms measured three weeks after baseline (DaFonseca et al., 2009).

Academic adversities are not equally taxing to all students, and considering the differential interpretational frameworks associated with fixed and growth intelligence mindsets (Dweck & Yeager, 2019) it is reasonable to assume that mindsets might also play a role in determining the magnitude of academic adversities' impact. Previous studies have documented that fixed intelligence mindset is generally associated with lower levels of self-esteem (Lee et al., 2018), but only two experimental studies examined the changes in students' self-esteem associated with their intelligence mindset (Robins & Pals, 2002; Zhao et al., 1997). Similarly, only a few cross-sectional studies have examined the relationship between emotions and mindsets (DaFonseca et al., 2009; King et al., 2012); results suggesting that fixed intelligence mindset is associated with higher levels of negative emotions. Thus, the present study aimed to explore whether intelligence mindset might differentiate the impact academic adversities exert on students' self-esteem and emotions.

Moreover, studies investigating the role of intelligence mindset in students' reactions to academic failures and difficulties put relatively little emphasis on the way daily classroom challenges and setbacks can shape the affective landscape of students over a shorter period of time. Although previous studies supported the association between fixed mindset and negative emotional reactions to academic failures and challenges (Chan, 2012; DaFonseca et al., 2009), little is known about the way these beliefs operate in students' day-to-day educational experiences. It was hypothesized that fixed intelligence mindset would moderate the impact of daily academic difficulties on students' self-esteem, positive and negative emotions. Students who endorse fixed intelligence beliefs would be more reactive to daily academic difficulties, and they would report lower levels of daily self-esteem and positive emotions and higher levels of daily negative emotions.

2.2 Materials and Methods

2.2.1 Participants

A total of 95 college students provided daily reports through five consecutive days during the exam period. Participation in the study was voluntary; however, three vouchers were offered through random drawing for those who provided daily reports each day. To be included in the study, participants had to provide five days of data. Initially, 141 students enrolled, from which 17 did not provide daily reports at all, 29 were excluded because they have provided daily responses less than five times. The mean age of the final sample was 20.08 years (SD = 2.44), with 14% males and 86% females.

2.2.2 Procedure

Data collection took place during the first week of the second semester's exam period in the 2017-2018 academic year (January). The recruitment took place one week before the beginning of the exam period. Participation had two modalities: students could choose to receive each evening an email with an online questionnaire, or they could send their daily reports through an application called Paco, which is a free, open-source tool for building and conducting personal science experiments. Upon enrollment, participants were informed about the aim of the study and informed consent was obtained. Next, they completed a background questionnaire with demographic questions and a measure of intelligence mindset. Daily reports were collected through five consecutive days. Since the exam period is highly stressful, we did not want to overburden participants, so we opted to collect data once a day and scheduled it at eight o'clock in the evening. Surveys closed four hours after had been sent in order to avoid next day completion.

2.2.3 Measures

Intelligence Mindset (measured one week before daily assessments). Intelligence mindset was assessed using the Hungarian version of the Implicit Theories of Intelligence Scale (Orosz et al., 2017). The scale showed good internal reliability (Cronbach's $\alpha = 0.86$).

Preparing for an Exam (daily measure). In order to assess academic difficulties, first, we asked participants whether or not they were preparing for an exam during the day ("Have you been preparing for an exam today?"). Their responses were coded 0 if they have not and 1 if they have been preparing.

Difficulty while Studying (daily measure). If participants indicated that they have been preparing for exams during the day, we asked them "*What amount of difficulties have you met during studying?*", and they provided their responses on a 5-point Likert scale (1 = none; 5 = very high). For those participants who responded that they have not been preparing for an exam, this question was not presented, but all other measures were considered.

Exam vs. No Exam Day (daily measure). Since taking an exam could have considerable influence on students' self-esteem and emotions, we asked participants if they took an exam on a particular day. Their responses were coded 0 if they did not have an exam and 1 if they had an exam.

Self-Esteem (daily measure). Taking into consideration that the data collection occurred during the exam period and that the attrition rates are generally high in ESM studies, in order to counter this threat and not to overburden participants, only the six highest loading items from the Hungarian version of the Rosenberg Self-Esteem Scale (Rosenberg, 1965; Sallay, et al., 2014) were used. In order to assess the reliability of the daily diary measures, the generalizability theory framework was used (Cranford et al., 2006). Variance components were estimated for each scale and were used to compute the generalizability coefficients. The R_{1F} value of 0.93 suggests that the abbreviated six-item self-esteem scale's ability to differentiate between persons is good, while an R_c value of 0.79 indicates that the scale measured individual differences in change over time reliably.

Positive and Negative Emotions (daily measure). Daily emotions were assessed using Pekrun et al.'s (2011) list of academic emotions. Participants were asked to indicate on a 5-point scale (1 = not at all; 5 = very much) the extent to which they have experienced specific negative and positive emotions during the day. For the negative emotions scale, the R_{1F} value is 0.81, while the R_c is 0.76, suggesting moderate to good reliability. The reliability of the positive emotions scale was poor to moderate with 0.60 R_{1F} and 0.69 R_c values.

2.2.4 Statistical Analysis

To test our hypothesis hierarchical linear mixed modeling (HLM) was used. Since the current study is based on repeated assessments, HLM is especially suited, since HLM takes

into account the non-independence among the repeated measurements (Heck et al., 2014), it allows estimates which are weighted according to the number of daily reports and it handles missing data well (Bryk & Raudenbush, 1992).

The present data had a two-level structure, daily observations being nested within individuals. As recommended by Bolger and Laurenceau (2013), Level 1 variables were person-mean centered, while Level 2 variables were grand-mean centered. The mean of the experienced difficulties (referring to it later as mean academic difficulties) was also included to prevent the confounding of levels. The close relationship between self-esteem and emotions is well-documented (Crocker & Wolfe, 2001), so we included daily self-esteem (person-mean centered) as a predictor of daily emotions. According to Bolger and Laurenceau (2013) when modeling within-person causal processes, elapsed time should be included in the model in order to rule out time as a source of confounding; for example, it is possible that with each day passing, students' fatigue increases, which might be related to their emotional experiences. By a similar rationale, exam vs. no exam day was also included in the model as a covariate, since exams and the perceived success on the exams might also have an impact on students' self-esteem and emotions.

All main analyses were carried out using SPSS version 22 (IBM Corp., Armonk, New York). Since our main research question refers to the differential effect of academic difficulties on students' self-esteem and emotions, in the statistical analysis, only those days were included when students were preparing for an exam and have reported the amount of difficulty they have met during studying (out of the 475 data points collected, 332 were used for the analyses).

Within-person (Level 1) variables included the repeated measures of daily academic difficulties, self-esteem, positive and negative emotions, time, and whether students had an exam on a particular day. Between-person (Level 2) variables included fixed intelligence mindset and mean academic difficulties. Level 1 and 2 fixed and random effects were estimated using restricted maximum likelihood estimation. Following the recommendation of Bolger and Laurenceau (2013) autoregressive covariance structure was used for the repeated statement of the model and unstructured covariance structure for the random statement.

2.3 Results

Given that nearly one third of the initially enrolled participants were excluded from the study due to failure to provide daily reports at least five times, as a first step, we explored whether participants included in the study differed from those who were excluded. No differences were found regarding their intelligence mindset (t [141] = 1.16, p = .24), age (t [140] = 1.68, p = .56) or gender (χ^2 [1] = .27, p = .37). Similarly, there were no differences among those who participated through the application or email in terms of their intelligence mindset (t [95] = -1.07, p = .43), age (t [95] = 1.77, p = .08), and gender (χ^2 [1] = .06, p =.79).

An initial step was estimating a null model to determine if there was a significant variation in daily assessments. Intraclass correlation (ICC) was used as an indicator of the variability estimates (Bryk & Raudenbush, 1992). For daily self-esteem, ICC suggested that 61% of the overall variability lied between individuals, and only 39% was within-person variation. For negative affect, 37% was between-person, and 63% was within-person variation. Only one third (34%) of the total variation of positive affect was between-person, while 66% represented within-person variation. These results indicated that the development of a multilevel model was appropriate since intercepts varied significantly across individuals.

2.3.1 Predicting Daily Self-Esteem Level

According to the results, higher levels of perceived difficulties in a given day was related to lower levels of self-esteem on that day (b = -1.01, t = -4.63, p < .001, β = -.11), and higher average level of experienced academic difficulties during the five days was also

significantly associated with lower levels of self-esteem (b = -1.94, t = -2.91, p < .01, β = -.24). Results suggested that with every increase of one SD in daily or mean academic difficulties, students' self-esteem dropped by 0.10 - 0.24 SDs.

The daily academic difficulties-self-esteem slope significantly varied across participants (s^2 = 1.02, Wald Z = 25.38, p < .001), suggesting that there was a variation in the effect of academic difficulties across participants. Results suggested that students' intelligence mindset partly explained this variation since fixed intelligence mindset moderated the impact daily academic difficulties had on daily self-esteem (b = -.14, t = -2.18, p = .03, β = -.05). Furthermore, this moderating effect was present at the between-subject level as well; fixed intelligence mindset moderated the effect of mean academic difficulties on self-esteem (b = -.53, t = -2.67, p < .01, β = -.21).

In order to probe these interactions simple slope analyses were carried out. Results suggested that at the within-subject level, the effect of daily academic difficulties on daily self-esteem differed when intelligence mindset was centered 1 SD below the mean (b = -.07, t = -1.788, p = .06, β =- .04) , at the mean (b = -.17, t = -3.142, p = <.01, β = -.06) and 1 SD above the mean (b = -.21, t = -6.51, p <.001; β = -.13). These results suggest that when daily academic difficulties were held constant at each persons' mean, with every increase of 1 SD in fixed intelligence mindset, students' self-esteem decreased by an additional 0.05 standard deviation. Furthermore, the daily academic difficulties × fixed intelligence mindset interaction explained 12% of daily difficulties' total slope variance. At the between-subject level a similar pattern emerged: fixed intelligence mindset centered at 1 SD below the mean (b = -.14, t = -2.88, p =.005, β = -.24), at the mean b = -.19, t = -3.96, p <.001, β = -.32), and 1 SD above the mean (b = -.22, t = -4.83, p <.001, β = -.38). At the between-subject level, one standard deviation increase in students' fixed intelligence beliefs was associated with an additional 0.05-0.10 SD decrease in self-esteem, when academic difficulties were held constant at the grand mean.

To illustrate the differential effect daily academic difficulty exerts on students' self-esteem, we estimated and plotted person-specific slopes and intercepts for each individual and also the average effect across individuals. For illustrating the average effect, intelligence mindset was centered at 1 SD above and below the grand mean (**Figure 2.1a** and **2.1b**).

2.3.2 Predicting Daily Positive Emotions

Daily (b = -.32, t = -1.88, p = .05, β =-.07) and mean academic difficulties (b = -1.10, t = -3.51, p <.01, β = -.24) had a significant negative effect on daily positive emotions. Contrary to our hypothesis, fixed intelligence mindset was unrelated to positive emotions (b = -.39, t = -1.32, p = .18, β = -.11), and it did not moderate neither the effect of daily (b = -.00, t = -0.11, p = .91, β = -.00) nor the effect of mean academic difficulties (b = .09, t = 1.00, p = .31, β = .06) on positive emotions. Time had a small, but significant negative effect (b = -.21; t = -2.27, p = .02, β = -.08), suggesting that with each day passing, participants experienced fewer positive emotions. Higher levels of daily self-esteem (b = .27, t = 5.34, p < .001, β = -.23) predicted increases in positive emotions. Furthermore, results suggested that on days when students were taking an exam, they felt fewer positive emotions (b = -1.53, t = -5.58, p = <.001, β = -.46).

2.3.3 Predicting Daily Negative Emotions

Similarly to positive emotions, fixed intelligence mindset was unrelated to negative emotions (b = -.21, t = -0.33, p = .73, β = -.14) and it did not moderate neither the effect of daily (b = .10, t = 1.09, p = .27, β = .03) nor the effect of mean academic difficulties (b = .16, t = -0.83, p = .40, β = -.06). In contrast, higher daily self-esteem (b = -.71, t = -7.77, p <.001, β = -.32) was related to lower levels of negative emotions. In addition, on days when students

took an exam, they reported lower levels of negative emotions (b = -.99, t = -2.06, p = .04, β = -.15).

Figure 2.1a.
Daily academic difficulties predicting daily self-esteem when fixed intelligence mindset is centered at - 1 SD below the mean

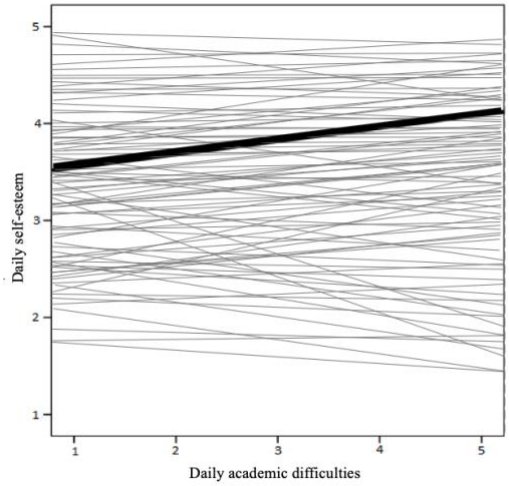
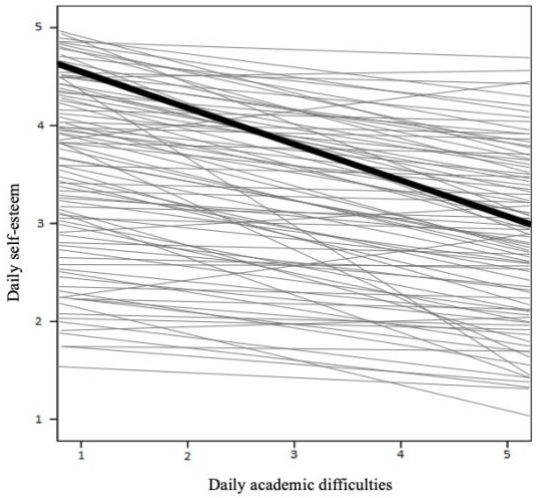


Figure 2.1b.
Daily academic difficulties predicting daily self-esteem when fixed intelligence mindset is centered at + 1 SD below the mean



2.4 Discussion

The results of the present study suggest that fixed intelligence mindset amplifies the effect of academic difficulties and failures on students' self-esteem. We found that fixed intelligence mindset moderated the impact of academic difficulties on students' self-esteem. However, we found no evidence indicating that fixed intelligence mindset would moderate the effect of daily academic difficulties on students' emotions. Regarding the impact of academic difficulties, results suggest that these experiences are associated with lower levels of self-esteem and positive emotions and higher levels of negative emotions. Similarly, several studies support that academic failure has a significant impact on self-esteem (Crocker & Wolfe, 2001) and that perceiving the study material to be more difficult is associated with higher levels of negative emotions (Zaharia et al., 2015).

In accordance with previous results (Lee et al., 2017), fixed mindset was negatively related to self-esteem; students who endorsed stronger fixed intelligence beliefs, generally, had lower levels of daily self-esteem. Results also suggest that fixed mindset moderates the effect of academic difficulties on students' self-esteem. The self-esteem of students' who believed more strongly in the unchangeable nature of their intelligence, was affected in a greater degree by academic difficulties. Results suggested that on days when students encountered higher levels of academic difficulties than their average level of daily difficulties, those with stronger fixed intelligence mindset reported lower levels of daily self-esteem than those who endorsed more growth-oriented intelligence beliefs.

When academic difficulties were held constant (at the person and grand mean), with each one standard deviation increase in students' fixed intelligence beliefs, their self-esteem decreased with an additional 0.05-0.10 standard deviation. Furthermore, the academic difficulties-mindset interaction explains about 12% of the variance in academic difficulties' effect on self-esteem.

From a theoretical point of view, the presence of intelligence mindsets' moderating effect is reasonable, considering that from a fixed mindset perspective, one's intelligence is

contingent on accomplishments and performance is a testimony for high or low intelligence (Hong et al., 1999). Moreover, Snyder et al. (2014) also found that the messages regarding students' abilities interacts with success and failure experiences. After receiving a fixed mindset message, participants tended to engage in behavioral self-handicapping, which is a strategy adopted to protect one's self-esteem (Urdan & Migdley, 2001).

The present results suggest that fixed intelligence mindset plays an important role in students' self-esteem and it might constitute an intervening point to help students maintain a healthy, stable sense of self-worth. Previous studies have shown that mindsets can be changed by interventions (Yeager et al., 2019). Teaching students to view failures from the perspective of growth mindset (in which setback is not a testimony of incompetence, but part of the learning process) might protect their self-esteem to be overly responsive to failures or difficulties.

Previous studies supported that fixed mindset is directly associated with negative emotions, higher emotional distress (Rosenberg et al., 2016) and mental health problems (Schleider et al., 2015). However, our results contradict the existence of a direct relationship between fixed intelligence mindset and emotions. Fixed intelligence mindset showed no association with daily emotions, and it did not moderate the effect of academic difficulties on affective states. In contrast, mean and daily self-esteem was the best predictor of daily emotions. Students who had higher mean self-esteem during the assessment period, and had more favorable daily self-evaluations, tended to experience more positive and fewer negative emotions. These results are supported by the vast literature documenting the impact of self-esteem on emotions (Crocker & Wolfe, 2001).

Although the present study broadens our understanding regarding the role of intelligence mindset in students' emotions and self-esteem when facing academic adversities, it has several limitations. First of all, a great majority of participants (48%) have been preparing for exams only three days out of five, thus providing only three data points. Thus, the lack of extensive repeated assessments might make the results of this study unreliable especially at the within-person level. Hence future studies should collect data for a longer period of time.

Moreover, data was collected once a day, and it might be possible that answering the daily questions did not coincide with experiencing the difficulties in question, which might alter students' responses, especially if these difficulties were successfully resolved before completing the daily reports. Attrition rate was high, and the sample consisted primarily of female college students, which might raise questions about internal validity and the generalizability of the results. Furthermore, the reliability of the scales measuring positive and negative emotions was only moderate, meaning that their ability to differentiate between persons and to measure individual differences in change was restrained. Another limitation is that actual academic achievement was not measured. It might be possible that poorer academic achievement is related to higher levels of perceived academic difficulties..

Study 3 Self-Esteem as a Mediator Between Fixed Intelligence Mindset and Students' Emotions

Study 3a. Self-Downing Mediates the Association Between Fixed Intelligence Mindset and Different Indicators of Students' Mental Health in Exam Periods[3]

3.1 Theoretical Background

The exam period is one of the most taxing periods of the academic year with concerns about success being the primary source of hardship (Aselton, 2012). According to Neuderth et al. (2009), exam nerves significantly impair the functioning of 15-20% of students. However, academic challenges and adversities experienced during the exam period influence students' mental health differently, leading to highly disparate affective responses. One might ask, what determines the type and intensity of students' emotional reactions and which are the factors that predispose to poorer mental health outcomes during the exam period? According to Dweck's (1995) social cognitive theory of achievement motivations, academic challenges and adversities (Schleider et al., 2015) might act as environmental "triggers" predisposing students to interpret academic difficulties from a fixed mindset perspective (i.e., "What this situation tells about my intelligence?"; Dweck, 2013), consequently leading to more helpless reactions (e.g., symptoms of anxiety and depression; see Baer et al., 2005; King et al., 2012). Although a clear link has been established between intelligence mindset and different mental health outcomes (for a review see Schleider et al., 2015), little is known about the nature of this relationship. Does endorsing fixed intelligence mindset lead directly to poorer mental health outcomes, or is mindset's effect mediated by other factors?

Another construct that might be implicated in students' mental health is irrational beliefs. From the perspective of Rational Emotive Behavior Therapy (REBT), interpreting adverse situations through the lenses of irrational beliefs — beliefs which are illogical, non-constructive and have no empirical support — (e.g., "Failing this exam is awful, it is the worst thing that could have happened.") leads to dysfunctional emotions (e.g., depression, anxiety, anger, distress; see David et al., 2010).

Although Dweck and Ellis offer different explanations as to why individuals react differently in the same situation (i.e., holding a fixed intelligence mindset or irrational beliefs), one might wonder if these theories could complement each other in explaining why certain students experience more pronounced mental health problems during the exam period. The literature suggests that there is an overlap in the emotional reactions associated with fixed intelligence mindset and irrational beliefs, which suggests a potential link between these two constructs. Studies from the mindset literature demonstrated that individuals with fixed mindset tend to display maladaptive emotional reactions when facing difficulties and failures (Robins

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[3] This study has been published.

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& Pals, 2002; Schleider et al., 2015; Tuckwiller & Durdick, 2018), while the REBT literature evidenced the crucial role of irrational beliefs in eliciting those same negative emotional reactions (Cuijpers et al., 2013).

Individuals with fixed intelligence mindset frequently report intensive negative emotions (e.g., anxiety, depression, shame") when confronting failure (Robins & Pals, 2002). Shame, anger, and depression are dysfunctional emotions which, according to REBT theory, are triggered by irrational beliefs (David & Cramer, 2010), like demandingness, low frustration tolerance, awfulizing and self-downing (e.g., "I must succeed on the exam under any circumstances, and I could not stand failing, that would be the worst thing that could happen to me."). Moreover, fixed intelligence mindset has also been linked to students' symptoms of depression and anxiety (Tuckwiller & Durdick, 2018), and the role of irrational beliefs in the onset and maintenance of these psychological disorders is well-established (Ellis et al., 2010). Irrational beliefs were also found to be related to anxiety and distress in school (DiLorenzo et al., 2011), and were found to mediate the effect of life stress on depressive symptoms (Deal & Williams, 1988).

Given the importance of demonstrating one's abilities and intelligence through performance, it is likely that individuals with fixed intelligence mindset are more prone to interpret or evaluate achievement-related situations in an irrational manner. According to REBT theory, interpreting situations irrationally provokes emotional disturbance. Taking together mindset and REBT theories, it is plausible that individuals with fixed intelligence mindset might hold absolutistic demands to attain success (i.e., validating intelligence), or avoid failure (i.e., revealing inadequacies). In the salience of failure, individuals with fixed intelligence mindset frequently report high levels of negative emotions (Robins & Pals, 2002).

For example, feeling ashamed about failure could be triggered by rating one's self or worth globally (i.e., self-downing) based on one's performance (e.g., "If I fail, that would mean that I am stupid."), and catastrophizing (e.g., "Failure would be the worst thing that could happen.") could also play a role in precipitating anxiety symptoms when failure is impending. Individuals with fixed intelligence mindset are characterized by an interpretational framework that stresses the necessity to validate their intelligence and the repercussions to one's self if they fail to do so. Thus, it is reasonable to assume that fixed intelligence mindset might incline individuals to interpret achievement situations in a more irrational manner, which in turn would trigger more intensive negative emotional reactions.

To examine the role of intelligence mindset and irrational beliefs on students' mental health-related outcomes, we adopted a context-specific approach and measured irrational beliefs related to exam performance. We also considered it important to control the effect of prior academic performance (i.e., grade point average; GPA) when investigating the proposed mediational model, since there is a close association between academic achievement and students' mental health (Murphy et al., 2015), and evidence in the literature also indicates that fixed intelligence mindset exerts greater influence among low-achieving students (Hwang et al., 2020).

We expected that fixed intelligence mindset will be positively related to students' negative emotions, depressive symptoms, and exam-related irrational beliefs, but negatively to positive emotions experienced during the exam period. Furthermore, it was also hypothesized that exam-related irrational beliefs would be positively associated with symptoms of depression and negative emotions, while negatively with positive emotions and that the effect of fixed mindset on emotions and depressive symptoms would be mediated by exam-related irrational beliefs.

Although REBT theory posits that irrational beliefs are the antecedents of psychological disturbance, according to a recent review, conclusions about their etiopathogenetic nature are limited (Visla et al., 2016). Furthermore, since high negative

affectivity and low positive affectivity is a common component of depression (American Psychiatric Association, 2013), it is also arguable whether the relationship between these mental health outcomes are bi- or unidirectional. Given these theoretical considerations and the cross-sectional nature of the present study, we tested several alternative models, where the position or the relationship between the assessed mental health outcomes were modified.

3.2 Materials and Methods

3.2.1 Participants

Overall, 323 individuals agreed to participate in the study; however, 13 individuals were excluded due to non-completion of the measures (seven individuals did not complete any of the measures, while six of them did not complete the fixed intelligence mindset measure). The final study sample consisted of 310 college students (245 females, 65 males), aged between 18 and 33 years (M_{age} = 22.15, SD_{age} = 2.57).

3.2.2 Measures

Intelligence Mindset. Participants' intelligence mindset was assessed using the fixed mindset subscale of the Hungarian version of the Implicit Theories of Intelligence Scale (Orosz et al., 2017). The scale showed good internal consistency (Cronbach's α = .84).

Exam-Related Irrational Beliefs. A context-specific approach was adopted to assess exam-related irrational beliefs. The four performance-related irrational beliefs subscales of the Attitudes and Beliefs Scale-2 (ABS2; DiGiuseppe et al., 1988) were translated to Hungarian using the protocol of Beaton et al. (2000). Since these subscales refer to performance in general, items were rephrased in order to reflect irrational beliefs related to exam performance All subscales showed good internal consistencies (Cronbach's α_{DEM} = .79, α_{LFT} = .83, α_{SD} = .86, α_{AWF} = .80).

Symptoms of Depression. The Hungarian version of the 9-item Beck Depression Inventory was used (BDI-II; Rózsa et al., 2001). Since BDI-II was not used as a diagnostic tool but as an indicator of distress, total scores were not further interpreted according to the established cut-off values. The scale showed good internal consistency (Cronbach's α = .85).

Positive and Negative Emotions. To assess participants' positive and negative emotions, we used Pekrun et al.'s (2011) list of academic emotion. Participants were asked to indicate the extent to which they have experienced specific negative and positive emotions during the current exam period. The internal consistency of the positive (Cronbach's α = .71) and negative (Cronbach's α = .75) subscales was acceptable.

GPA. GPA was assessed through self-reports; students were asked to provide their average GPA from the previous semester.

3.3.3 Statistical Analysis

Statistical analyses were conducted using Mplus 8 (Muthén & Muthén, 2017) and the weighted least squares mean- and variance-adjusted (WLSMV) estimator was used which, compared to maximum-likelihood-based estimation methods, has been found to be superior for Likert-type ordered-categorical items, particularly when the response categories follow asymmetric thresholds (for a review, see Finney & DiStefano, 2013).

A preliminary measurement model was first estimated (Model 0), using confirmatory factor analysis (CFA) to confirm the factor structure and psychometric adequacy of the measures used in this study. In this model, each item loaded on their corresponding latent factors, and latent factors were allowed to correlate among each other. Main analyses involved the estimation of fully latent path models. Model-based composite reliability indices (ω; McDonald, 1970) were also calculated to assess the reliability of the factors. GPA was also included in this preliminary measurement model to examine its associations with the other

variables. Several theoretically plausible alternative path models were estimated and compared. The adequacy of the models was examined with the following goodness-of-fit indices and their respective cut-off values (Marsh et al., 2005): comparative fit index (CFI; ≥ .95 for good, ≥ .90 for acceptable fit), Tucker- Lewis index (TLI; ≥ .95 for good, ≥ .90 for acceptable fit), and the root-mean-square-error of approximation (RMSEA; ≤ .06 for good, ≤ .08 for acceptable fit).

In line with typical model selection guidelines (Marsh, 2007), the final path model was selected based on the inspection of model fit, parameter estimates (e.g., regression coefficients, standard errors) and the interpretability and theoretical conformity of the results. In the final predictive model, to test potential mediating mechanisms, 95% bias-corrected bootstrapped confidence intervals were also computed in Mplus. Based on Preacher and Hayes (2008), 5000 bootstrap replication samples were requested, and the mediation was considered statistically significant if the confidence intervals excluded zero.

3.4 Results

3.4.1 Preliminary Analyses

The preliminary measurement model incorporating all variables had good model fit (see Model 0a in **Table 3.1**). However, taking a look at the latent correlations they revealed that mindset was not associated with demandingness, catastrophizing, and GPA. Contrary to our expectation, GPA was only related to positive emotions, but not to any of the other variables. For these reasons, we decided to remove these three variables from further analyses.

The revised measurement model showed equally good fit to the data (see Model 0b in **Table 3.1**). In general, results indicated well-defined and reliable factors for fixed intelligence mindset (λ = .526 to .859; ω = .856), self-downing (λ = .782 to .906; ω = .888), low frustration tolerance (λ = .794 to .921; ω = .877), depressive symptoms (λ = .466 to .863; ω = .913), as well as positive (λ = .574 to .705; ω = .789) and negative affective states (λ = .596 to .763; ω = .744). Latent correlations showed that fixed intelligence mindset positively correlated with self-downing, low frustration tolerance, depressive symptoms and negative emotions but negatively with positive emotions. Both self-downing and low frustration tolerance positively correlated with depression and negative emotions but negatively with positive emotions. Although, the very high correlation between self-downing and low frustration tolerance might be concerning at first, this association is perfectly reasonable as both are constituents of irrational beliefs and previous studies have also reported similarly strong correlations between these variables (Suso-Ribera et al., 2016).

Table 3.1

Goodness-of-Fit Indices for The Estimated Models

Model	χ^2 (df)	CFI	TLI	RMSEA [90% CI]
Model 0a: Preliminary measurement model	877.342* (525)	.959	.953	.047 [.041, .052]
Model 0b: Revised preliminary measurement model	595.412* (335)	.962	.957	.050 [.044, .057]
Model 1: Mindset → SD/LFT → Depression, PA, NA	595.413* (335)	.962	.957	.050 [.044, .057]
Model 2: SD/LFT → Depression/PA/NA → Mindset	595.412* (335)	.962	.957	.050 [.044, .057]
Model 3: Mindset → Depression → SD/LFT → PA/NA	595.413* (335)	.962	.957	.050 [.044, .057]
Model 4: Mindset → SD/LFT → Depression → PA/NA	595.413* (335)	.962	.957	.050 [.044, .057]
Model 5: Depression → SD/LFT → PA/NA → Mindset	595.412* (335)	.962	.957	.050 [.044, .057]

Note. *$p < .05$; χ^2: robust chi-square test of exact fit; df: degrees of freedom; CFI: comparative fit index; TLI: Tucker–Lewis index; RMSEA: root mean square error of approximation; 90% CI: 90% confidence interval of the RMSEA; SD: self-downing; LFT: low frustration tolerance; PA: positive affect; NA: negative affect.

3.4.2 Alternative Models

Given that from a theoretical perspective different path models were plausible, we estimated five alternative models which are described above. Goodness-of-fit indices associated with these models are reported in **Table 3.1** and revealed that all models fitted the data equally well which is not surprising as they are based on the same measurement model. Here, inspection of parameter estimates could be highly informative. Both Models 2 and 5 yielded invalid estimates (e.g., standardized regression coefficients greater than one) and theoretically unreasonable regression coefficients, thus these models were rejected. Model 3 had little theoretical underpinning and when depressive symptoms were placed before irrational beliefs (Model 3) or before negative and positive emotions (Model 4), irrational beliefs were no longer related to affective states, which suggests that irrational beliefs might be primarily linked to negative and positive affect through depressive symptoms. The mediating role of depressive symptoms is also supported by theory, allowing us to discard Model 1. Overall, based on these available theoretical and statistical information, Model 4 (Mindset → SD, LFT → Depression → PA, NA) was retained as the final path model.

3.4.3 Retained Model and Mediational Analysis

The final retained model showed that fixed intelligence mindset positively predicted both self-downing ($\beta = .616$, $p < .001$) and low frustration tolerance ($\beta = .314$, $p < .001$). Self-downing positively predicted depressive symptoms ($\beta = .592$, $p < .001$) but it showed no statistically significant associations with negative or positive emotions ($p > .165$). Contrary to our expectations, low frustration tolerance did not predict depressive symptoms, negative or positive emotions ($p > .507$). In fact, negative ($\beta = .617$, $p < .001$) and positive ($\beta = -.569$, $p < .001$) affect were only predicted by depressive symptoms.

Serial mediation analysis yielded a significant indirect path between fixed intelligence mindset and positive (indirect $\beta = -.208$, 95% CI = -.553 to -.007) and negative emotions (indirect $\beta = .225$, CI = .004 to .549), both paths involving self-downing and depressive symptoms in each chain. Finally, the proportion of explained variance was 38% for self-downing, 9.9% for low frustration tolerance, 29.1% for depression, 75.2% for negative and only 31.6% for positive emotions.

3.5 Discussion

There is ample evidence in the literature documenting the association between students' fixed intelligence mindset and their poorer mental-health outcomes (Lee et al., 2018; Robins & Pals, 2002; Schleider et al., 2015). Still, our understanding regarding the direct or indirect nature of this relationship is limited. Therefore, the present study aimed to investigate irrational beliefs related to exam performance as potential mediators between fixed intelligence mindset and different mental-health-related outcomes.

In line with previous findings (David et al., 2010), our results indicated that higher levels of exam-related irrational beliefs were associated with higher levels of depressive symptoms and negative emotions, and lower levels of positive emotions. In turn, fixed intelligence mindset showed weak to moderate associations with depressive symptoms and negative emotions, while its relationship with positive emotions was only weak. Contrary to our hypothesis, it seems that fixed intelligence mindset is associated distinctively with exam-related irrational beliefs. While it was not associated with demandingness and awfulizing, it was positively related to low frustration tolerance and self-downing.

Alternative model testing indicated that a serial mediational model fitted the data best, where self-downing and depressive symptoms mediated the effect of fixed intelligence mindset on positive and negative affect. Low frustration tolerance was unrelated to all the mental health outcomes. Results indicated that depressive symptoms were predictors of positive and negative affective states and they also mediated the effect of fixed mindset and self-downing on affect.

These findings could be explained by the fact that depression is a broader construct encompassing the presence of depressive mood and diminished interest and pleasure, symptoms which are consistent with increased negative and decreased positive affect (APA, 2013).

The role of self-downing in the mental health of students with fixed intelligence mindset is not totally unexpected since the presence of negative global self-evaluation (i.e., which in REBT terms translates into self-downing) in their maladaptive failure-reactions is frequently discussed. Dweck's theory (2013) posits that individuals with fixed mindset are preoccupied with proving their abilities, thus, their self-esteem becomes highly contingent on external validation (e.g., "I am a good student if I perform well.").

The lack of findings regarding fixed mindset's association with low frustration tolerance, awfulizing and demandingness and their mediating role might be explained by one of the premises of Dweck's theory which holds that fixed intelligence mindset exerts its greatest influence when a threat to one's self-worth is imminent (Dweck, 2013). Fixed intelligence mindset turns every achievement situation into an evaluation when a judgment about one's intelligence is made. If success is easily attainable, one's self-worth is preserved, since high achievement is proof of high intelligence or competence. In contrast, failure could reveal one's inadequacies or lack of ability presenting a threat to one's self or worth. Thus, it is reasonable to assume that, when reflecting on one's exam performance, those with fixed intelligence mindset would be more likely to evaluate their performance in terms of its repercussions or consequences regarding their selves.

Even though the present study offers valuable insights regarding the relationship between fixed intelligence mindset and students' mental health, it is not without its limitations. First of all, exam-related irrational beliefs and emotions were not assessed right before taking an exam, which might challenge the accuracy of their measurement; thus, future studies should measure exam-related irrational beliefs in the presence of their activating event. Since our results rely on cross-sectional data from which causality cannot be inferred, future studies should manipulate mindsets or irrational beliefs in order to test whether endorsing growth intelligence mindset would reduce students' self-downing tendencies or fostering unconditional self-acceptance (the rational counterpart of self-downing) would benefit students' mental health.

Results of a recent meta-analysis called into question the universal effectiveness of mindset interventions in improving academic achievement, suggesting that only high-risk and academically disadvantaged students might benefit from them (Sisk et al., 2018). The present results might broaden our perspective regarding the content of mindset interventions since it is possible that besides focusing on changing the beliefs about the malleability of intelligence, incorporating elements related to unconditional self-acceptance or self-compassion might improve the effectiveness of growth mindset interventions. Moreover, these self-worth related elements might enhance not only students' mental health, but it might decrease the self-handicapping, and procrastinating behavior of individuals with fixed intelligence since the function of these behaviors is the protection of the self and its worth (Covington, 1992).

Study 3b. A Serial Mediation Analysis Testing Fixed Intelligence Mindset, Self-Downing and Self-Esteem as Predictors of Students' Negative Emotions After Failure[4]

3.6 Theoretical Background

According to Dweck's (1999) social cognitive theory of achievement motivation, students' implicit theories about the changeability of their intelligence influence the way they interpret and react to academic situations, especially when failures or difficulties are imminent. Correspondingly, there is ample evidence in the literature linking intelligence mindset to affective states, however, little is known about the mechanism through which fixed intelligence mindset exerts its influence. Study 2 of the present thesis evidenced that fixed intelligence mindset moderates the impact of daily difficulties only on students' self-esteem, while Study 3 revealed the mediating role of self-downing between fixed intelligence mindset and students' mental health. Thus, the present study proposed to integrate our previous results and tested a combined model, where self-downing and self-esteem were proposed as potential mediators of the mindset – affective states relationship.

Self-esteem represents one's overall sense of personal worth and value and it involves a broad range of evaluations, appraisals and beliefs about the self (Fennel, 1998). Self-downing is an irrational belief which appears when individuals are overly critical to themselves and make global, negative evaluations about themselves. Literature suggest that self-downing precipitates low self-esteem (Ellis et al., 2010) and the close link between self-esteem, self-downing and negative affective states is well-documented in the literature (Crocker & Wolfe, 2001; Ellis et al., 2010).

Since for individuals with fixed intelligence beliefs, performance is not simply an indicator of actual performance, but it becomes a measure of self-worth (Robins & Pals, 2002), it is plausible that when encountering academic failure these students would be more prone to engage in self-downing (i.e., "I failed, so I am absolutely incompetent."), which in turn would lead to lower levels of self-esteem and finally to more negative emotions associated with the failure situation. Correspondingly, fixed intelligence mindset is generally associated with lower self-esteem (Lee et al., 2017) and greater self-esteem decline over time (Robins & Pals, 2002).

The aim of the present study was to investigate self-downing and self-esteem as potential mediators between fixed intelligence mindset and negative emotions. It was hypothesized that the fixed intelligence mindset – negative emotions association would be mediated by self-downing and self-esteem in a causal chain, meaning that fixed intelligence mindset would predict higher self-downing tendencies, which would lead to lower self-esteem, which in turn, would be associated with higher levels of negative emotions.

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[4] This study has been presented and published.

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The authors contributed to article as follows: Gál, É: conceptualization and study design, data collection, analysis and interpretation, writing of the manuscript; Szamosközi, I: study conceptualization and design, review & editing, supervision.

3.7 Materials and Methods

3.7.1 Participants

276 college students (173 females, 102 males, 1 other) participated in the study. Participants were aged between 18 and 42 years (M_{age}= 21.06, SD_{age}= 4.17). Participants had diverse majors, the most represented being psychology (14%), biology (11%), computer science (9%), education (5%) and political sciences (4%).

3.7.2 Measures

Intelligence Mindset. The fixed mindset subscale of the Hungarian version of the Implicit Theories of Intelligence Scale was used to assess students' intelligence mindset (Orosz et al., 2017). The scale showed good reliability with a Cronbach's alpha value of .89.

Self-Downing. Self-downing was assessed by the self-downing subscale of the Attitudes and Beliefs Scale- II (DiGiuseppe et al., 1988). Only the performance related items of this subscale were used (e.g., "I would be a worthless person if I performed poorly."), since the effect of intelligence mindset is mainly manifested in performance situations (Dweck, 1999). Participants rated their agreement on a 5-point scale, higher scores indicating greater self-downing tendencies. The scale showed good internal consistency (Cronbach's $\alpha = .84$).

Self-Esteem. Self-esteem was assessed using the Hungarian version of the Rosenberg Self-Esteem Scale (Sallay et al., 2014; see Appendix G). The scale showed good internal consistency (Cronbach's $\alpha = .89$).

Negative Emotions. To measure negative emotions Pekrun et al.'s (Pekrun et al., 2011) list of negative academic emotions was used in the same manner as in Study 2. The scale showed good internal consistency (Cronbach's $\alpha = .84$).

3.7.3 Statistical Analysis

Statistical analyses were conducted using SPSS 22 and Mplus 6. Latent factors structural equation modeling (SEM) with robust maximum likelihood estimation (MLR) was performed to examine the proposed serial mediational model. Fully latent variables were used that are corrected for measurement error. 95% bias-corrected confidence intervals were calculated using the maximum likelihood estimator (bootstrapping is not available is MLR) with 5000 replication sample, which yields more precise confidence intervals especially in the case of small to moderate samples. To examine the adequacy of the model the same goodness-of-fit indices were used as in Study 3a.

3.8 Results

Preliminary analyses indicated that fixed intelligence mindset is positively related to self-downing ($r = .24$, $p < .001$) and negative emotions ($r = .18$, $p < .001$), while stronger fixed intelligence beliefs are related to lower levels of self-esteem ($r = -.33$, $p < .001$). Self-downing is associated with lower self-esteem ($r = -.50$, $p < .001$) and higher negative emotions ($r = .36$, $p < .001$), while higher levels of self-esteem are associated with fewer negative emotions ($r = -.71$, $p < .001$).

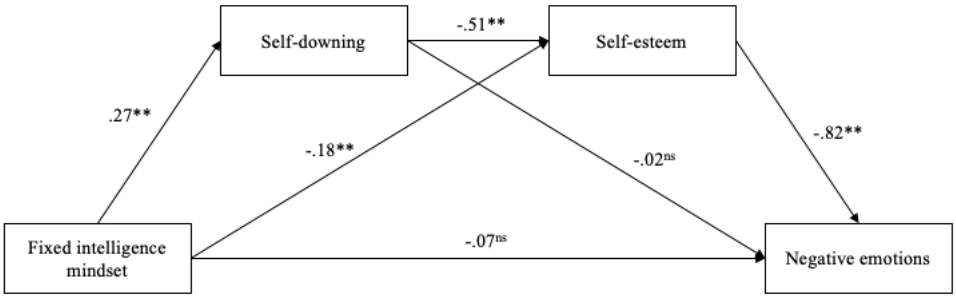
The serial mediational model (i.e., self-downing and self-esteem as mediators; see **Figure 3.1**) showed good fit to the data ($\chi^2 = 378.04$, $df = 201$, CFI = .95, TLI = .94, RMSEA = .05 [95% CI .04, .06], SRMR = .05). Fixed intelligence mindset positively predicted self-downing ($\beta = .27$, $p < .001$, [95% CI .20, .60]) and it showed a weak negative association with self-esteem ($\beta = -.18$, $p = .01$, [95% CI -.18, .01]). Self-downing showed a moderate negative association with self-esteem ($\beta = -.51$, $p < .001$, [95% CI -.33, -.15]), which, in turn, had a strong negative association with negative emotions ($\beta = -.82$, $p < .001$, [95% CI -1.42, -.74]).

Self-downing (β = -.02, p = .77, [95% CI -.09, .11]) and fixed intelligence mindset (β = -.07, p = .20, [95% CI -.13, .04]) were not significantly related to negative emotions.

As predicted, there was a significant indirect path from fixed intelligence mindset to negative emotions through both self-downing and self-esteem (β = .11, p < .001, [95% CI .06, .19]). Furthermore, the indirect path from fixed intelligence mindset to negative emotions through self-esteem was also significant (β = .14, p = .009, [95% CI .05, .29]). However, there was no significant direct path from fixed intelligence mindset to negative emotions (β = -.07, p = .18, [95% CI -.15, .06]), and there was no significant indirect path from fixed mindset to negative emotions through self-downing (β = -.00, p =.77, [95% CI -.04, .04]). The proportion of explained variance was 7% for self-downing, 35% for self-esteem and 62% for negative emotions.

Figure 3.1

Serial Mediational Model Including Self-Downing and Self-Esteem as Mediators



Note. All variables presented in ellipses are latent variables. For the sake of simplicity measured variables are not depicted in this figure. One-headed arrows represent standardized regression weights; * p < .05, ** p < .001.

3.9 Discussion

Although there was ample evidence in the literature linking fixed intelligence mindset to negative affective states, little was known about the nature of this relationship. Previous results also stressed the role of self-evaluations in the failure reactions of students with fixed intelligence mindset, however the role of self-evaluations in the emotional experiences associated with fixed intelligence mindset was unexplored. Result of the present supported the study's hypothesis indicating that the effect of fixed intelligence mindset on negative emotions is mediated by self-downing and self-esteem in a causal chain; however, results also suggested the presence of one additional indirect path through self-esteem alone.

The present study extends our understanding of how self-evaluations convey the effect of fixed intelligence mindset on negative affective states. Believing that one cannot change one's intelligence implies that performance mirrors one's intelligence or abilities, thus, achievement has direct implications in the self-evaluative process. Meaning that, when performance is poorer than one's expectations, individuals with fixed mindset tend to evaluate this situation as evidence of their inadequacy or worthlessness, thus, engaging in self-downing. Then these self-downing evaluative cognitions are translated into low self-esteem which is strongly related to negative affective states and poorer mental health (Crocker & Wolfe, 2001; Ellis et al., 2010). It is worth noting that, the direct path between fixed intelligence mindset and negative emotions was not significant, suggesting that self-downing and self-esteem might be the primary mechanism through which mindset's effect is conveyed on negative emotions. However, these results could not be generalized to other affective outcomes like depression or

anxiety, which were also related to fixed intelligence mindset (King et al., 2012; Schleider et al., 2015). Thus, future studies should investigate the validity of this mediational model including more diverse affective outcomes.

Acknowledging the role of self-downing tendencies and self-esteem in the affective failure reactions of students with fixed intelligence mindset opens new directions for intervention. Previous mindset interventions almost exclusively focused on teaching students how to interpret situations from a growth mindset perspective, to view abilities as being malleable and performance as being the result of effort and much more emphasis was put on students' behavioral reactions (e.g., persistence, strategy use, hard work). However, addressing self-downing and self-esteem directly, might confer additional benefits to these interventions. Teaching students to accept themselves unconditionally, regardless of their performance (i.e., the opposite of self-downing) and to refrain from global self-evaluation (i.e., the opposite of self-esteem, which is a global evaluation of one's worth) might help them to cope better with failures and difficulties both at the emotional and behavioral level. If the negative evaluation of one's performance (e.g., I performed badly.) does not spill over to the evaluation of the self (e.g., I am bad.) students might not be preoccupied with restoring self-esteem or trying to contend with the emotional consequences of low self-esteem, thus, they might have more resources to cope better and to persist in these academically challenging situations.

The primary limitation of this work is its cross-sectional nature, which does not allow to draw causal inferences, thus, future studies should investigate this mediational model in an ecologically more valid context. Furthermore, the present study investigated a fairly simplistic model, thus in order to develop a more extensive understanding about the relationship between fixed intelligence mindset and negative emotions, future research should consider adding other factors to this model. For example, it might be possible that the effect of fixed intelligence mindset on self-downing and self-esteem is dependent on how contingent students' self-worth is on academic achievement (i.e., the more contingent one's self-worth is on academic performance, the greater the effect of fixed mindset is on self-esteem and affective states) or the effect is fixed intelligence mindset might also be influenced by perceived competence.

The present study furthered our understanding of the mechanism through which fixed intelligence mindset influences students' negative emotions. Result suggest that self-downing and self-esteem mediate mindsets effect in a causal chain, meaning that fixed intelligence mindset might predispose students to engage in self-downing, which translates into low self-esteem, which in turn, lead to higher levels of negative emotions. These findings are in line with previous results demonstrating the impact of fixed intelligence mindset on students' self-worth and they also offer possible avenues to advance and complement currently available growth mindset interventions.

Study 4. Fixed Intelligence Mindset, Self-Esteem, and Failure-Related Negative Emotions: A Cross-Cultural Mediation Model

4.1 Theoretical Background

According to Dweck (1999) for students believing that smartness is a personal attribute that cannot be changed, academic failure is an overwhelming experience which gives rise to intense negative emotions. Correspondingly, previous studies have demonstrated a consistent link between students' intelligence mindset and affective states; fixed intelligence mindset being positively associated with negative emotions in cross-sectional (Chan, 2012; King et al., 2012) and longitudinal studies as well (Da Fonseca et al., 2008). Studies 2 and 3 of this thesis evidenced the crucial role of self-esteem and global self-evaluation in mediating fixed intelligence mindset's effect on affective outcomes, however, the cross-cultural validity of this effect is unexplored.

Cross-cultural studies have demonstrated that both the level (Heine et al., 1999) and the impact of self-esteem on mental health varies across cultures, and it is more influential in individualistic cultures (Diener & Diener, 1995). Since individualist cultures view the self as autonomous and separate from others (i.e., independent self-construal) and their members are encouraged to demonstrate their uniqueness through self-enhancement strategies, self-esteem and positive self-regard becomes more central. In individualistic cultures there is a huge emphasis on internal abilities and on realizing one's goals, while, in more collectivistic cultures the self is viewed as connected with others and the maintenance of interpersonal relationships is more accentuated which often manifests in self-effacement (Markus & Kitayama, 1991).

Dweck (1999) posits that the more individualistic the culture, the more probable is that individuals will cultivate fixed intelligence mindset, since in individualistic cultures demonstrating one's uniqueness and maintaining positive self-regard is fundamental. Although indirectly, research supports this view by demonstrating that in collectivistic cultures there is a focus on the process, and effort is highly valued; features which are consistent with a malleable view of intelligence. Moreover, previous research indicated that there are intercultural differences in effort beliefs (Li, 2012), in the value of hard work (Sebestyén et al., 2017) or achievement goals (Stephens et al., 2010), constructs that are closely linked to mindset.

However, as far as we are aware, no cross-cultural comparison was conducted to test whether the associations between fixed mindset, self-esteem, and negative emotions are comparable across cultures. Thus, the present study proposed to investigate the intercultural comparability (i.e., Hungary and the United States) of the proposed mediational model. While the United States has one of the most individualistic cultures, Hungary has a dual character where, although individualism is more dominant, Western and Eastern features are equally present (Holicza, 2016). Given these cultural differences among Hungary and the US and the culture-specific role of self-esteem and possibly of intelligence mindset, it is worthwhile to explore possible cross-cultural similarities or differences.

Given the implications fixed intelligence mindset has in students' self-esteem (Conigrave et al., 2019; Niiya et al., 2004; Robins & Pals, 2002) and affective states (Burnette et al., 2013; Gál & Szamosközi, 2016) and acknowledging the close relationship between self-esteem and affective states (Orth et al., 2012), the present study proposed to investigate self-esteem as a potential mediator between fixed intelligence mindset and negative emotions. Furthermore, the present study also aimed to test the validity of the proposed mediational model across cultures. It was hypothesized that fixed intelligence mindset would be positively associated with negative emotions. Higher levels of fixed intelligence mindset were also expected to be associated with lower levels of self-esteem, which in turn would lead to higher

levels of negative emotions. The analysis regarding the intercultural invariance of the mediational model was conducted in an exploratory manner, with no specific hypothesis formulated.

4.2 Materials and Methods

4.2.1 Participants

The present study was based on two college student samples from two different countries. Sample 1 consisted of 194 Hungarian college students (126 women) aged between 18 and 30 years ($M_{Sample1}$ = 22.50, $SD_{Sample\ 1}$ = 2.94). Sample 2 consisted of 204 US college students (146 women), aged between 18 and 30 years ($M_{Sample\ 2}$ = 21.57, $SD_{Sample\ 2}$ = 2.28).

4.2.2 Measures

Intelligence Mindset. Participants' intelligence mindset was assessed by the English and Hungarian versions of fixed mindset subscale of the Implicit Theories of Intelligence Scale (Dweck et al., 1995; Orosz et al., 2017). Scale score reliability was good (α_{US} = .91; α_{HU} = .90) in the present study.

Self-Esteem. Self-esteem was measured using a 9-item version of the Rosenberg Self-Esteem Scale (Rosenberg, 1965; Sallay et al., 2014). Scale score reliability in the present study was adequate. The scale showed good internal consistency (α_{US} = .89; α_{HU} = .87)

Negative Emotions. Negative emotions were assessed using Pekrun et al.'s (2011) list of negative academic emotions arising during learning and related activities. Participants were asked to recall their latest academic setback and indicated the extent to which they have experienced specific negative emotions during this event. Scale score reliability was adequate (α_{US} = .83; α_{HU} = .84).

4.2.3 Procedure

Participants were recruited through advertisements in online groups frequented by the students of one of the major universities in Hungary and Georgia, United States. Participants were informed about the aim of the study, and informed consent was obtained. Participation consisted of completing a set of online questionnaires. After completing the demographic questions and the intelligence mindset scale, participants were instructed to recall as vividly as they could the last time, they have experienced academic failure. Subsequently, based on these recalled experiences, they completed the self-esteem and affective measures.

4.2.4 Statistical Analysis

Statistical analyses were conducted using Mplus 8 (Muthén & Muthén, 1998) and the robust maximum-likelihood (MLR) estimator was used which provides fit statistics and standard errors that are robust to the non-normality of the data. Preliminary measurement models were estimated to verify the psychometric properties of the scales using a confirmatory factor analytic (CFA) model whereby scale items loaded on their corresponding latent factors, and the factors were allowed to correlate with one another. Relying on fully latent variables provides a way to explicitly take measurement errors into account (Finkel, 1995), thus leading to more accurate parameter estimates. A priori correlated uniquenesses were included between a subset of items belonging to the self-esteem factor to account for their negative-wording effect (Marsh et al., 2010).

Before investigating the associations between the variables of interest, we verified the equivalence and the comparability of the constructs across the two samples via tests of measurement invariance. These tests were conducted in a typical sequence with the gradual addition of equality constraints on various parameters (Millsap, 2011): configural invariance (same factor structure), weak invariance (equal factor loadings), strong invariance (equal intercepts), strict invariance (equal uniquenesses), as well as the invariance of correlated

uniquenesses, the latent variance-covariance matrix, and the latent means. Although only weak invariance is needed to test associations between latent variables across groups (Millsap, 2011), pursuing additional tests of invariance has important statistical advantages such as having a more parsimonious model and obtaining more stable and trustworthy estimates.

The most invariant measurement model was used to test the proposed predictive model in three steps. First, a partial mediation model was estimated in which fixed mindset predicted self-esteem and emotions while self-esteem also predicted negative emotions. In the second step, the direct path between fixed mindset and negative emotions was removed. In the third step, the equilibrium of the predictive paths was tested by constraining the regressive paths to equality across the two samples (Tóth-Király et al., 2020). In the final predictive model, in order to assess the mediation hypothesis, 95% bias-corrected bootstrapped confidence intervals were also computed in Mplus with the maximum likelihood estimator as bootstrapping is not available with MLR (Tóth-Király et al., 2019). Based on Preacher and Hayes (2008), 5000 bootstrap replication samples were requested. To evaluate the adequacy of the model, the same goodness-of-fit indices were used as in Study 3. For purposes of model comparisons, relative changes (Δ) in the fit indices were compared; a change of at least .010 for CFI and TLI and a change of at least .015 for the RMSEA were taken to suggest meaningful differences (Cheung & Rensvold, 2002). Finally, we calculated model-based composite reliability indices (ω; McDonald, 1970).

4.3 Results

Model fit information for the measurement models are reported in **Table 4.1**, and they showed that all models achieved an adequate level of fit. Tests of measurement invariance provided support for the configural and weak invariance of these preliminary measurement models. However, strong invariance was not achieved (ΔCFI = -.022, ΔTLI = -.019, ΔRMSEA = +.007), thus we tested a partial strong invariant model in which two self-esteem intercepts were freed up. This partial strong model demonstrated adequate model fit changes (ΔCFI and ΔTLI ≤ .010; ΔRMSEA ≤ .015).

Subsequent tests of measurement invariance revealed support for the complete invariance of this measurement model up to the level of latent mean invariance which was retained for interpretation and further analyses. In general, our results revealed well-defined and reliable factors for fixed mindset (λ = .779 to .902; ω = .908), self-esteem (λ = -.568 to .783; ω = .872), and negative emotions (λ = .641 to .795; ω = .840). Latent correlations reflected our a priori expectations: self-esteem negatively correlated with fixed mindset (r = -.331, SE = .058, p < .001) and negative emotions (r = -.725, SE = .043, p < .001), while fixed mindset positively correlated with negative emotions (r = .229, SE = .059, p < .001).

The model fit results from the predictive models are reported in the bottom section of **Table 4.1**, and they show that the partial and full mediation models have virtually identical fit indices. Coupled with the fact that fixed mindset did not statistically significantly predict negative emotions, we decided to retain the partial mediation model. Adding equality constraints to this predictive model resulted in negligible differences in model fit, suggesting that these predictive paths can be considered equal in the two samples. The examination of the parameter estimates from this model showed that fixed mindset negatively predicted self-esteem (β = -.330, SE = .057, p < .001), while self-esteem also negatively predicted negative emotions (β = -.725, SE = .044, p < .001). Mediation analyses revealed that the indirect path between fixed mindset and negative emotions was statistically significant as the confidence intervals for the indirect effect excluded the value of zero (indirect β = .239, CI = .157 to .326, p < .001). Finally, the proportion of explained variance was 10.9% for self-esteem and 52.5% for negative emotions.

Table 4.1

Invariance Testing of the Measurement and Structural Models across Countries

Model	χ^2 (df)	CFI	TLI	RMSEA	90% CI	$\Delta\chi^2$ (df)	ΔCFI	ΔTLI	ΔRMSEA
Measurement models									
US sample	244.155* (129)	.928	.915	.066	.053, .079	—	—	—	—
Hungarian sample	217.321* (129)	.937	.925	.059	.045, .073	—	—	—	—
Measurement invariance									
Configural	460.823* (258)	.932	.920	.063	.053, .072	—	—	—	—
Weak	477.053* (273)	.932	.924	.061	.052, .070	15.422 (15)	.000	+.004	-.002
Strong	554.171* (288)	.911	.905	.068	.060, .077	79.408* (15)	-.022	-.019	+.007
Partial strong	517.391* (286)	.923	.917	.064	.055, .072	41.053* (13)	-.009	-.007	+.003
Strict	541.974* (304)	.920	.920	.063	.054, .071	27.212 (18)	-.003	+.003	-.001
Correlated uniquenesses	543.268* (307)	.921	.921	.062	.054, .071	2.070 (3)	+.001	+.001	-.001
Latent variance-covariance matrix	555.135* (313)	.919	.921	.062	.054, .071	11.866 (6)	-.002	.000	.000
Latent means	560.947* (316)	.918	.921	.062	.054, .071	5.867 (3)	-.001	.000	.000
Predictive model									
Partial mediation free relations	559.279* (313)	.918	.920	.063	.054, .071	—	—	—	—
Full mediation free relations	559.143* (315)	.918	.921	.062	.054, .071	.083 (2)	.000	.000	.000
Full mediation equilibrium	560.883* (317)	.918	.921	.062	.054, .071	1.622 (2)	.000	.000	.000

Note. *$p < .05$; χ^2: robust chi-square test of exact fit; df: degrees of freedom; CFI: comparative fit index; TLI: Tucker–Lewis index; RMSEA: root mean square error of approximation; 90% CI: 90% confidence interval of the RMSEA; $\Delta\chi^2$ = robust (Satorra–Bentler) chi-square difference test (calculated from loglikelihood for greater precision); Δ: change in fit information relative to the previous model.

4.4 Discussion

The results of the present study are in line with those of previous ones, indicating that higher levels of fixed intelligence mindset are related to lower levels of self-esteem (Conigrave et al., 2019) and higher levels of negative emotions (Gál & Szamosközi, 2016). In turn, higher self-esteem is associated with lower levels of negative affective states (Baumeister et al., 2003). The present results also add to previous research by demonstrating that self-esteem mediates the effect of fixed intelligence mindset on negative emotions, suggesting that the belief in the unchangeable nature of intelligence primarily affects one's self-esteem, which in turn would lead to more negative affective outcomes. Although studies on intelligence mindset and on the association between intelligence mindset and affective states have been conducted in different cultures, to the best of our knowledge, no cross-cultural investigation has been carried out that explicitly compared different cultures. Results of the invariance testing indicated that the examined mediational model is consistent across different cultural settings with the strength of the associations between the examined variables being equal across the US and Hungarian samples.

Although cross-cultural research generally agrees that self-esteem might not equally determine positive and negative outcomes in all cultures (Farruggia et al., 2004), feeling good about oneself being more critical in western individualistic cultures (e.g., US), the present study

revealed that self-esteem exerts comparable effects on students' negative emotions across the US and Hungarian samples. The comparable role of self-esteem in determining students' failure-related emotions could be explained by the fact that, although Hungary, compared to the US, has a less individualistic culture, it combines Western and Eastern features alike (Falkné Bánó, 2014). Thus, it is possible that in this context achievement not only represents a way to demonstrate one's uniqueness, but also a way to meet social norms. Thus, feeling good or bad about oneself after experiencing failure, although for different reasons (i.e., demonstrating uniqueness and individual ability vs. meeting familial or societal standards), equally determines individuals' emotional reactions.

Previous studies have documented that failures and difficulties are emotionally taxing experiences for individuals holding fixed intelligence mindset, and these individuals tend to exhibit helpless reactions (Dweck & Yeager, 2019). If future studies would experimentally reinforce (e.g., manipulating mindsets, self-esteem during failure experiences) our results, that would point out two possibilities for intervention: changing one's intelligence mindset and teaching unconditional self-acceptance to students. Given the role of self-esteem in conveying fixed mindset's effect on affective states, we might speculate that teaching students to unconditionally accept themselves (i.e., the opposite of making one's worth contingent on satisfying some standards) might make academic adversities to be less emotionally overwhelming experiences

Although the present study offers new and meaningful insights regarding the relational pattern between fixed intelligence mindset, self-esteem, and affective states, it has several limitations that need to be mentioned. First of all, the size of the two samples was relatively small, and they mainly consisted of female college students, thus limiting the generalizability of the results. Moreover, results are based on self-reported data, which are susceptible to social desirability bias. The affective and self-esteem measures were completed based on recollections of past failures; thus, it is unknown whether our measurements properly reflect emotions emerging during real-life failure experiences. Future studies should investigate this mediational model in experimental settings as well. Furthermore, in the present study, academically contingent self-worth was not assessed, thus, it might be possible that the strength between fixed intelligence mindset and failure-related self-esteem might differ according to how heavily one's self-worth is staked on academic performance.

Study 5. Fixed Intelligence Mindset Prospectively Predicts Students' Self-Esteem[5]

5.1 Theoretical Background

Whilst previous studies have reported a consistent link between fixed intelligence mindset and lower levels of self-esteem (Diseth et al., 2014; King, 2012; Lee et al., 2017; see Conigrave et al., 2019 for a meta-analysis), the association between these two constructs has been predominantly investigated in cross-sectional studies (Diseth et al., 2014) and according to our knowledge only one study utilized a longitudinal design (Robins & Pals, 2002). However, this study employed an aggregated data analysis, hence, essentially it examined this relationship concurrently, rather than longitudinally. Robins and Pals (2002) found that average mindset across the four years of college showed small negative correlation with self-esteem change during this time, indicating that the self-esteem of students endorsing fixed mindset showed a downward trajectory during college. Although, the above presented results suggest a possible temporal trend in self-esteem which is associated with fixed intelligence mindset, this analysis did not take into account the possible concurrent changes in fixed intelligence mindset and its implications in self-esteem change. Furthermore, the correlation between mindset and self-esteem change confers no substantial evidence regarding the temporal dynamics between these variables, since it is equally possible that those with unstable self-esteem are more likely to endorse fixed intelligence mindset or vice versa, those endorsing fixed intelligence beliefs are more likely to have unstable self-esteem.

Nevertheless, an important question remains whether holding fixed intelligence beliefs lead to lower levels of self-esteem or having low self-esteem predisposes individuals to endorse fixed intelligence mindset? We might speculate that those who have low self-esteem might be more likely to endorse fixed intelligence mindset as part of their negative self-views. However, it is equally possible that interpreting achievement situations through the lenses of fixed intelligence mindset, where performance is attributed to one's innate abilities, contributes to lower self-esteem. Thus, the present study aimed to expand and replicate previous work by examining how college students' fixed intelligence mindset and self-esteem relates to each other across a two-year period. When examining the association between fixed intelligence mindset and self-esteem, we included academic self-efficacy as a control variable, which, according to Bandura (1997) influences self-esteem in those domains on which individuals base their self-worth. Furthermore, individuals with fixed mindset might have lower self-efficacy, since they believe that they cannot improve their abilities and performance through effort or by employing more effective strategies (King, 2016).

A cross-lagged design was used to explore the longitudinal relationship between the study variables, which is ideal to test prospective effects, since both the predictor and outcome variables are measured in the same time and the prior level of the outcome is statistically controlled, thus reducing bias due to the concurrent relations between the constructs (Cole & Maxwell, 2003). This design also allows to investigate the temporal stability of the study variables. Although, Dweck (1999) initially suggested that mindsets are stable predispositions,

[5] This study has been published.

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The authors contributed to article as follows: Gál, É: conceptualization and study design, data collection, analysis and interpretation, writing of the manuscript; Szamosközi, I.: conceptualization and study design, review and editing, supervision.

studies yielded mixed evidence, some reporting low stability among adolescents (Pomerantz & Saxon, 2001), others supporting its stability among young adults (Robins & Pals, 2002).

Although from a theoretical angle (i.e., the self-esteem of individuals with fixed intelligence mindset are highly influenced by their achievement, which makes self-esteem more vulnerable; Dweck, 1999) and based on previous research (Robins & Pals, 2002) it is plausible that fixed intelligence mindset might predict lower self-esteem over time, the present study has adopted an exploratory approach, meaning that there were no specific hypotheses formulated regarding the reciprocal or unidirectional nature of the association between the variables. Thus, the prospective effect of intelligence mindset on self- esteem and the prospective effect of self-esteem on intelligence mindset would be tested as well. Furthermore, the present study also controlled the effect of academic self-efficacy which has been consistently linked to both self-esteem and intelligence mindset.

5.2 Materials and Methods

5.2.1 Participants

184 college students were invited to participate in the follow-up survey of a larger study. In total 103 participants have responded and completed the second survey (response rate of 55.9%). Respondents and non-respondents did not differ in terms of their initial intelligence mindset ($t [181] = -0.35$, $p = .72$), self-esteem ($t [179] = -0.27$, $p = .78$) or self-efficacy ($t [181] = -0.45$, $p = .65$). The final sample ($N = 103$) predominantly included female college students ($N_{female} = 91$), aged (at Time 1) between 18 and 36 years ($Mean_{age} = 20.30$, $SD_{age} = 2.70$).

5.2.2 Procedure

Participants from Study 2 were invited by email to complete a follow-up survey 2 years after they have registered in the study. The first data collection (Time 1) took place in January 2018, while follow-up data (Time 2) was collected in December, 2019. Responses from the ESM study's onboarding questionnaires were used as Time 1 assessment. Responses were matched by participants' individual ID.

5.2.3 Measures

Intelligence Mindset. Intelligence mindset was assessed using the Hungarian version of the Implicit Theories of Intelligence Scale (Orosz et al., 2017). The scale showed good internal reliability with a Cronbach's α of .86 at Time 1 and .92 at Time 2.

Self-Esteem. To measure self-esteem the Hungarian version of the Rosenberg Self-Esteem Scale was used (Sallay et al., 2014). The scale showed good internal reliability with a Cronbach's α of 0.89 at Time 1 and .84 at Time 2.

Academic Self-Efficacy. Participants' academic self-efficacy was measured with the self-efficacy subscale of the Patterns of Adaptive Learning Scale (Midgley et al., 2000). The scale showed good internal reliability with a Cronbach's α of 0.87 both at Time 1 and Time 2.

5.2.4 Statistical Analysis

To test our hypothesis a series of preliminary analyses were conducted to explore the association between the study variables within and across times. To investigate the temporal stability of the outcomes paired sample t-tests were carried out. Hierarchical regression analysis with grand mean centered variables was used to explore temporal relationships between fixed intelligence mindset and self-esteem. In this model Time 1 fixed intelligence mindset predicted Time 2 self-esteem when initial self-esteem and self-efficacy were taken into account. This analysis quantifies change in terms of residual gain scores, which expresses the deviation of the observed values of the dependent variable at Time 2 from those of expected based on its Time 1 value (Olweus & Alsaker, 1994). Although the inverse of this temporal relationship (where initial self-esteem predicts later fixed intelligence mindset) was also planned to be tested, due

to the lack of correlation between Time 1 self- esteem and Time 2 fixed intelligence mindset, this analysis was not carried out.

5.3 Results

Normality statistics suggested that the data approached normal distribution, however, in the case of Time 2 self-efficacy scores were slightly positively skewed and are more heavily tailed. When comparing Time 1 and 2 means a slight increase in self-esteem ($t [101] = -4.85$, $p < .001$) and self-efficacy ($t [103] = -2.92$, $p = .004$) could be observed. In contrast, fixed intelligence mindset remained stable over time ($t [103] = -1.099$, $p = .274$). For the within-time correlations, it can be seen that self-efficacy was more strongly associated with self-esteem ($r = 0.54$, $p < .01$), while fixed intelligence mindset showed only small within-time correlations with self-esteem ($r = -0.20$, $p < .05$). In the case of the cross-lagged correlations, Time 1 fixed intelligence mindset was negatively related to Time 2 self-esteem ($r = -0.33$, $p < .01$), however, Time 1 self-esteem showed no significant association with Time 2 fixed intelligence mindset ($r = 0.12$, $p = .68$). Initial self-efficacy correlated moderately with Time 2 self-esteem ($r = 0.44$, $p < .01$), and Time 1 self-esteem was also positively associated with Time 2 self-efficacy ($r = 0.31$, $p < .01$).

Hierarchical regression analysis was conducted to predict self-esteem at Time 2 when Time 1 self-esteem was controlled. Initial self-esteem was strongly related to Time 2 self-esteem ($b = .63$, SE = 0.06, $p < .001$), while initial fixed intelligence mindset predicted lower self-esteem levels two years later ($b = -.33$, SE = 0.11, $p = .004$). Initial academic self-efficacy did not predict subsequent self-esteem ($b = .03$, SE = 0.09, $p = .70$). The final model explained 65% of the variance in Time 2 self-esteem.

5.4 Discussion

The present study examined the association between college students' intelligence mindset and self-esteem across time, when controlling for their academic self-efficacy. Synchronous correlations indicated a small-to-weak association between fixed intelligence mindset and self-esteem and results of the cross-lagged hierarchical regression analysis suggested that this relationship was unidirectional. Time 1 fixed intelligence mindset predicted self-esteem measured two years later when the effect of initial self-esteem was taken into account. A one standard deviation increase in fixed intelligence mindset at Time 1 led to a 0.18 standard deviation decrease in self-esteem at Time 2. In contrast, initial self-esteem had no significant effect on fixed intelligence mindset at Time 2.

These results are in line with a previous study which found that the self-esteem of students with fixed intelligence mindset shows a downward trajectory during college (Robins & Pals, 2002) and they also support Dweck's early assumption that the self-esteem of individuals with fixed intelligence mindset might be more vulnerable (Dweck, 1999). Even though the present study demonstrated that fixed intelligence mindset predicts self-esteem over time, it needs to be acknowledged that the effect of fixed intelligence mindset is only weak (Cohen, 1992). However, the meaningfulness of an effect should also be judged in the context of the existing literature (King, 2016). Previous studies found that conscientiousness, openness to experience and emotional stability exert small-to-medium effects on later self-esteem (Erol & Orth, 2011). In contrast, self-compassion conceptualized as an adaptive alternative to self-esteem did not predict self-esteem over time (Donald et al., 2017). In the light of these effects, the results of the present study seem to be meaningful, especially considering that there are effective interventions for changing intelligence mindset (Yeager et al., 2019).

Similarly to previous results (King, 2016; Robins & Pals, 2002), fixed intelligence mindset did not change significantly across the two years. These results also underscore Dweck's (1999) view that mindsets constitute a relatively stable individual characteristic.

According to Robins and Pals (2002) the competitiveness of the college environment fosters the maintenance of fixed intelligence beliefs. The authors argue that individuals with fixed intelligence mindset would approach the college environment as a context in which they have to demonstrate their abilities relative to their peers, which reinforces their pre-existing beliefs.

In contrast to the temporal stability of fixed intelligence mindset, self-esteem and self-efficacy showed slight increases. Self-esteem change over time is frequently reported in studies (Hair & Graziano, 2003) and it has been demonstrated that the development of self-esteem across the lifespan follows a quadratic trajectory with increases during young and middle adulthood (Orth et al., 2012). Regarding self-efficacy, synchronous and cross-lagged correlations indicated a medium to strong association with self-esteem, however, initial self-efficacy failed to predict self-esteem over time. These two constructs operate in an interconnected system of self-constructs, but it is possible that concurrent evaluations of one's self-efficacy impact self-esteem more strongly, than past evaluations of their ability to achieve the desired outcomes.

Although the present study offers new insights regarding the prospective effects of fixed intelligence mindset on self-esteem, it has several limitations. First of all, the study sample was relatively small and it mainly consisted of female participants, which reduces the generalizability of the conclusions. It is also possible that the high non-responsiveness at Time 2 led to a biased sample, so results should be interpreted with caution. Moreover, since the present results are based on correlational data, causality cannot be established with certainty, thus experimental research is needed to further substantiate conclusions.

Furthermore, certain variables which might have influenced the long-term association between fixed intelligence mindset and self-esteem were not included. Academic achievement exerts a marked influence on students' self-esteem (Ross & Broh, 2000) and it has also been linked to intelligence mindset (Blackwell et al., 2007). It is plausible that changes in achievement coincides with changes in self-esteem, thus, future studies should incorporate academic achievement to account for its effect. A similarly relevant variable is contingent self-worth. Dweck (1999) suggest that the self-worth of individuals endorsing fixed intelligence mindset becomes contingent on external validation, thus it is reasonable to assume that the effect of fixed intelligence mindset on self-esteem would be greater among those students who base their self-worth on academic achievement.

Study 6. Priming Students with Unconditional Self-Acceptance Buffers the Effect of Achievement-Related Difficulties on Self-Esteem and Negative Emotions irrespective of their intelligence mindset

6.1 Theoretical Background

According to Dweck (2013), students with fixed and growth mindset does not differ considerably when their daily academic life is free from hassles, however marked differences emerge in situations where success is uncertain. Failures, difficulties, criticism or challenges act as environmental triggers, which predispose students to interpret these situations from a fixed or growth mindset perspective. In this interpretational framework, failures and difficulties represent a threat to one's self-worth as they might reveal one's shortcomings or inadequacies (Dweck, 2008). Thus, individuals with fixed mindset become preoccupied with self-presentational concerns (e.g., "What this situation tells about my intelligence?") and are motivated to validate their abilities (Haimowitz et al., 2011). Given academic adversity's repercussions on the self, these situations exert a significant influence not only on one's self-evaluative processes (e.g., self-esteem), but they are equally taxing from an affective point of view as well (King, 2012).

It is widely accepted that low self-esteem is implicated in a wide range of mental health problems (Mann et al., 2004), while high self-esteem has widespread benefits for individuals (Crocker & Park, 2004). However, studies also suggest that the actual benefits of high self-esteem are modest at best and high self-esteem might have its negative consequences as well (e.g., violence; Baumeister et al., 1996).

Ellis (2010) argues that the pursuit of self-esteem is futile, since the benefits of high self-esteem are temporal because all human beings are fallible and no one is spared from failures or rejection. Furthermore, self-esteem implies a global rating of one's worth or essence which is an "unscientific overgeneralization" (p. 73), since it rates the entire self, based on specific instances of success or failure and it disregards the complexity and changeability of human beings. Moreover, negative global self-ratings are associated with self-defeating thoughts, anxiety, depression, shame or guilt (Ellis, 2010). Since self-ratings are inherently flawed and they lead to emotional disturbance, Ellis (2010) advocates that, individuals should unconditionally accept themselves irrespective of their achievement and actions. Instead, he advises individuals to rate their specific actions or performances, but not their self. It is presumed that USA would lead to more functional emotional and behavioral outcomes since the sense of self-worth is not threatened (Ellis & Harper, 1997). Nonetheless, accepting oneself unconditionally does not mean that when negative experiences occur one would not experience negative emotions, rather their negative emotional reactions would be less devastating (Ellis & Harper, 1997).

Research seems to confirm that USA is negatively correlated with anxiety, depression (Chamberlain & Haaga, 2001), while it is positively correlated with general psychological well-being (MacInnes, 2006). Experimental studies also confer evidence for the adaptive functions of USA. For instance, USA moderated the effect of ego-threat on different indicators of mental health; those with higher USA reported lower levels of anxiety, depression and negative affective states after receiving negative feedback from a jury on a public speaking task (Popov et al., 2015) and reported smaller mood decline associated with emotionally provocative scenarios (Chamberlain & Haaga, 2001).

Considering the benefits of USA (e.g., its buffering role in ego-threatening situations; Popov et al., 2015) and given the self-denigration tendency of individuals with fixed intelligence mindset (Dweck, 2008) and the vulnerability of their self-esteem to ego-threats

(Burnette et al., 2013), it is reasonable to assume that fostering USA might help them to perceive these situations as less menacing and to experience less disturbing emotional and cognitive consequences. As Dweck (1999) has stated fixed mindset transforms failure from an action (e.g., "I failed.") to an identity (e.g., "I am failure.), thus recognizing how logically unsound this overgeneralization is and that every person is a complex human being, might incline them to accept themselves as fallible human beings and to refrain from evaluating themselves globally and negatively when they fail to meet their goals. It was hypothesized that those who were primed with USA, after experiencing difficulty on a cognitive task, would report smaller decrease in self-esteem and positive emotions and smaller increase in negative emotions, than those in the control condition. Moreover, the present study also aimed to explore if the USA prime offers comparable benefits to both growth and fixed mindset students. Since individuals endorsing fixed intelligence mindset tend to engage in global negative self-evaluation and self-denigration, it is possible that they benefit more from the USA prime.

6.2 Materials and Methods

6.2.1 Participants

Overall, 312 participants enrolled in the study, however only 202 were randomized to the experimental (N = 111) and control (N = 91) conditions. Participants were randomized automatically by the survey platform, after they have completed the baseline survey, thus those who left the study before randomization were excluded. The final sample (N = 202) consisted of 156 female and 45 male college students, aged between 18 and 32 years (M_{age} = 23.09, SD_{age} = 3.31).

6.2.2 Procedure

Those interested in participating in the study were directed to the baseline survey and demographic questions. Upon entering the cognitive tasks section of the survey participants were automatically randomized by the survey platform into the experimental (N = 111) and control conditions (N = 91). The cognitive tasks consisted of 9 tasks requiring logical, analytical and abstract reasoning. The first two tasks were logical reasoning tasks (after reading a brief passage, students had to choose the correct conclusion). Participants in the control condition were presented with two tasks from a GRE prep-book (Bobrow, 2000). Following previous practices (Niiya et al., 2004), the USA prime was embedded in the logical reasoning tasks and students in the experimental condition, beside a GRE task, were presented a short passage arguing against the tendency to evaluate ourselves globally. The content of the USA prime was compiled based on the writings of Albert Ellis (2010). Since accepting oneself unconditionally under any circumstances is hard to adopt (Ellis & Dryden, 2007), the prime focused more on refraining from global self-evaluations and why global self-ratings are erroneous. The text of the prime outlines Ellis' view that self-esteem, rating oneself globally as a worthy person, is dependent on external contingencies (e.g., achieving success or winning other's approval) which is basically an unscientific overgeneralization, thus one should refrain from evaluating oneself globally and instead should evaluate one's performance, traits or deeds.

After solving the logical tasks, a difficulty experience was induced. Participants were given 7 tasks from the Raven Progressive Matrices, out of which 4 were modified in order to be unsolvable; furthermore, a two-minute time limit was posed for solving each task. After the cognitive tasks, participants completed the follow-up questionnaires (i.e., self-esteem, positive and negative emotions). At the end, participants were debriefed regarding the true aim of the study and that the abstract reasoning tasks were modified.

6.2.3 Measures

Intelligence Mindset. Intelligence mindset was assessed using the Hungarian version of the Implicit theories of Intelligence Scale (Orosz et al., 2017). Following previous practices (Nijja et al., 2010) mindset groups were formed based on median split (median = 16). Those who scored at or below the median were classified as growth mindset students (N = 126), while those who scored above the median as fixed mindset students (N = 76). The scale showed good internal reliability (Cronbach's $\alpha = 0.94$).

Self-Esteem. Self-esteem was measured twice, before and after the difficulty experience, using the Hungarian version of the Rosenberg Self-Esteem Scale (Sallay et al., 2014). The scale showed good internal reliability ($\alpha_{pre} = 0.88$, $\alpha_{post} = 0.90$).

Positive and Negative Emotions. Positive and negative emotions were measured before and after the difficulty experience and were assessed using Pekrun et al.'s (2011) list of academic emotions. Both the positive ($\alpha_{pre} = 0.70$; $\alpha_{post} = 0.73$) and negative ($\alpha_{pre} = 0.76$; $\alpha_{post} = 0.76$) scales showed acceptable reliability at pre- and post-test as well.

Unconditional Self-Acceptance. To serve as manipulation check the tendency to engage in unconditional self-acceptance was assessed by three items based on the Unconditional Self-Acceptance Scale (Chamberlain & Haaga, 2001) and Ellis' (2010) work. Participants were asked to rate on a 5-point scale (1 = totally untrue; 5 = completely true) how much the following statements described their attitude during the cognitive tasks: "I tried not to evaluate myself as being smart, dumb, good, or dumb."; "I was accepting towards myself."; "I was aware that my worth does not depend on my performance.". We chose to use only three items in order to avoid raising attention to their content and to keep up appearances regarding the fictitious aim of the study. The scale showed acceptable internal reliability both ($\alpha = 0.68$).

Task Difficulty. In order to explore if the tasks were indeed perceived as difficult, after solving the tasks, participants rated the difficulty of the tasks (i.e., "How difficult have been the assignments?"). Participants rated the difficulty of the tasks on a 4-point scale (1 = not difficult at all; 4 = extremely difficult).

6.2.4 Statistical Analysis

All statistical analyses were conducted with SPSS, version 22. The experiment had a 2 × 2 × 2 mixed factorial design with type of INTELLIGENCE MINDSET (fixed mindset vs. growth mindset) and CONDITION (prime vs. control condition) as between subject factors and TIME (pre- vs. post-test) as a within-subjects factor. Thus, to test the hypothesis, that the USA prime would reduce self-esteem loss and negative emotions experienced after confronting difficulties, a series of 2 × 2 × 2 mixed analyses of variance (ANOVA) were conducted, where mindset group, condition type and time were independent variables, and scores on the self-esteem and affective scales were the dependent variables. The effectiveness of the USA prime was evaluated using independent sample t-test. Although, initially task difficulty was planned to be used as a control variable, due to its nonsignificant association with the investigated outcomes, it was not included in the analyses.

6.3 Results

Normality of the data was examined by the skewness and kurtosis values which ranged between 0.931 and -0.87; these values are within the values recommended by Field (2009). Results also indicated that at baseline the prime and control groups did not differ in terms of self-esteem $t(200) = -0.582$, $p = .561$, positive $t(192) = -0.693$, $p = .489$ and negative emotions $t(163) = 1.368$, $p = .173$.

6.3.1 Manipulation Check

Results of independent t-test indicated that there were significant differences among the two groups regarding their tendency to engage in USA during the cognitive tasks, $t(197) = 4.126$, $p < .001$; the prime group reported higher levels of USA ($M = 19.314$, $SD = 2.$), than participants in the control condition (489$M = 10.836$, $SD = 2.663$). This result showed that the USA priming had its intended effect. Participants rated the tasks as being highly difficult, group means varying between 3.40 and 3.67; 4 being the maximum score for the difficulty rating. These results suggest, that the experimental set-up was effective, since participants perceived the cognitive tasks as difficult. Furthermore, the prime and control groups $t(196) = 0.301$, $p = .764$, and the fixed and growth mindset groups $t(147) = 0.297$, $p = .767$, perceived the tasks as equally difficult.

6.3.2 Self-Esteem

A three-way mixed ANOVA with condition, mindset group and time as independent variables and self-esteem as dependent variable was carried out. The assumption of homogeneity of variances was met. Results indicated that time $F(1, 195) = 22.220$, $p < .001$, $\eta^2_p = .115$, power = 0.999 had a significant main effect on self-esteem, while the main effect of condition was not significant $F(1, 195) = 0.023$, $p = .879$, $\eta^2_p = .000$, power = 0.053. Significant main effects were found for mindset group as well $F(1, 195) = 12.942$, $p < .001$, $\eta^2_p = .062$, power = 0.947. Pairwise comparisons reveled that those endorsing fixed intelligence mindset generally reported lower levels of self-esteem ($p < .001$). The interaction between time and condition was also significant $F(1, 195) = 19.615$, $p < .001$, $\eta^2_p = .091$, power = 0.993. Pairwise comparisons indicated that compared to the control condition, those in the prime condition reported higher levels of self-esteem after the cognitive tasks ($p < .001$), irrespective of their intelligence mindset. Furthermore, the nonsignificant interaction between condition and mindset group $F(1, 195) = 2.474$, $p = .117$, $\eta^2_p = .013$, power = 0.347 and between time and mindset group $F(1, 195) = 0.279$, $p = .598$, $\eta^2_p = .001$, power = 0.008 indicated that the effect of the prime and of the difficulty experience did not differ across the two mindset groups. Similarly, the three-way interaction between mindset group, condition and time was also nonsignificant $F(1, 195) = 0.004$, $p = .948$, $\eta^2_p = .000$, power = 0.050.

6.3.3 Positive Emotions

A three-way mixed ANOVA with condition, mindset group and time as independent variables and positive emotions as dependent variable was carried out. The assumption of homogeneity of variances was met. Results indicated that time $F(1, 169) = 93.576$, $p < .001$, $\eta^2_p = .356$, power = 1.00, and mindset group $F(1, 169) = 5.092$, $p < .001$, $\eta^2_p = .029$, power = 0.612 had a significant main effect on positive emotions. In contrast, the main effect of condition was not significant $F(1, 169) = 0.080$, $p = .879$, $\eta^2_p = .000$, power = 0.059. Pairwise comparisons showed that participants in the growth mindset group reported higher levels of positive emotions at the baseline ($M = 13.609$, $SD = 2.974$), than those in the fixed mindset group ($M = 12.676$, $SD = 2.960$), $p = .027$, however these differences were not present at the second assessment $p = .056$.

Results yielded nonsignificant interactions for time and condition $F(1, 169) = 2.317$ $p < .001$, $\eta^2_p = .014$, power = 0.328, time and mindset group $F(1, 169) = 0.004$ $p = .925$, $\eta^2_p = .005$, power = 0.050, and condition and mindset group $F(1, 169) = 0.118$ $p = .732$, $\eta^2_p = .001$, power = 0.063. Similarly, the three-way interaction between mindset group, condition and time was also nonsignificant $F(1, 169) = 0.001$, $p = .974$, $\eta^2_p = .000$, power = 0.050. These results suggested that after experiencing difficulty, positive emotions decreased and this decrease did not differ across conditions or mindset groups.

6.3.4 Negative Emotions

A three-way mixed ANOVA with condition, mindset group and time as independent variables and negative emotions as dependent variable was carried out. The assumption of homogeneity of variances was met. Results indicated that while time $F(1, 158) = 0.244$, $p = .622$, $\eta^2_p = .002$, power = 0.078, and condition $F(1, 158) = 0.000$, $p = .991$, $\eta^2_p = .000$, power = 0.050 did not have a significant main effect on negative emotions, the main effect of mindset group $F(1, 158) = 9.140$, $p = .003$, $\eta^2_p = .055$, power = 0.852 was significant. Means and standard deviations indicated that at both assessments those endorsing fixed intelligence mindset generally reported higher levels of negative emotions.

Results yielded significant interactions for time and condition $F(1, 158) = 16.730$ $p < .001$, $\eta^2_p = .096$, power = 0.982. These results suggested that after experiencing difficulties those in the prime condition reported lower levels of negative emotions than those in the control conditions. The nonsignificant interaction between condition and mindset $F(1, 158) = 0.458$ $p = .499$, $\eta^2_p = .003$, power = 0.103 and between time and mindset $F(1, 158) = 0.796$ $p = .374$, $\eta^2_p = .005$, power = 0.144 indicated that the effect of the prime did not differ across the mindset groups and that both fixed and growth mindset students experienced comparable increase in negative emotions after the difficulty experience. Similarly, the three-way interaction between mindset group, condition and time was also nonsignificant $F(1, 158) = 2.248$, $p = .136$, $\eta^2_p = .014$, power = 0.320.

6.4 Discussion

Building on previous research demonstrating that the self-esteem of individuals endorsing fixed intelligence mindset is more responsive to academic failures and difficulties (Gál et al., 2020) and that they also display more intensive emotional reactions during these situations (Robins & Pals, 2002), the present study proposed to investigate if priming students with USA, a construct diametrically opposed to global self-evaluation (i.e., self-esteem; Ellis, 2010) and strongly linked to positive mental health outcomes (Bernard, 2014), is effective in mitigating the effect of difficulties on students' self-esteem and affective states.

Results partially confirmed our hypothesis that priming USA is effective in mitigating difficulties' effect on students' self-esteem and affective states. Compared to the control condition, participants in the prime condition reported smaller decreases in self-esteem and smaller increases in negative emotions after experiencing difficulties on the cognitive tasks. Dweck emphasized that fixed intelligence mindset "transforms failure from an action to an identity" (Dweck, 2008, pp.33), which encompasses a tendency to make global self-evaluations and internal attributions (e.g., "I failed because I am stupid."), processes which indirectly intensify the emotional impact of failures. In contrast, USA stresses the improperness of any global self-evaluation and emphasizes self-acceptance regardless of external factors (e.g., performance, acceptance of others). When adopting USA, the evaluations of negative events like failures or difficulties does not overspill from specific events to the entire self, thus, one's self-worth does not become threatened or contingent on external events as it is in the case of students with fixed intelligence mindset. If failures are not interpreted as indicators of one's competence or abilities, but as separate events and one recognizes the complexity of the self and its inherent value, failures and difficulties would not have so overwhelming consequences as those frequently reported by individuals endorsing fixed intelligence mindset (e.g., self-denigration and intensive negative affective states). Previous studies have also indicated that refraining from negative global self-ratings was associated with more stable self-esteem (Hall et al., 2009) and positive mental health outcomes (Jibeen, 2017).

In contrast to our expectations, the USA prime had no effect on positive emotions, participants in both groups reported equal decreases in positive affect. The discrepancy in the

effect of the USA prime on positive and negative emotions could be explained by theories in rational-emotive behavior therapy (REBT). In the REBT literature USA is conceptualized as a rational belief and rational beliefs are not considered to alter the valence (i.e., positive vs. negative emotions) of the emotional reaction to negative events, but they lead to a quantitatively (high or low levels of emotions) and qualitatively (functional vs. dysfunctional negative emotions) different negative emotional reaction (David et al., 2004). Thus, interpreting negative events through the lens of USA is not necessarily expected to eliminate the presence of negative emotions or to boost positive emotions, but to decrease the level of dysfunctional negative emotions (e.g., anxiety, depression, anger), thus leading to more functional ones (e.g., concern, sadness, annoyance; Dryden & DiGiuseppe, 2003). In the present study we measured dysfunctional negative emotions and as suggested by REBT, the USA prime led to a decrease in these difficulty-related dysfunctional emotional reactions. Similarly to the present results, Popov et al. (2016) did not find evidence for an interaction effect between USA and feedback type in the case of functional positive and functional negative emotions, but the interaction was significant for anxiety and depression, which are considered to be dysfunctional negative emotions.

Results also indicated, that the effect of the USA prime was not influenced by students' mindset, both groups benefited equally from it, however fundamental differences emerged between groups regarding their level of self-esteem and negative emotions. Students in the fixed mindset group reported higher levels of negative emotions and lower levels of self-esteem at both assessments compared to students with fixed intelligence mindset. These results are in line with previous studies indicating that students endorsing fixed intelligence mindset differ from those with growth mindset not only in terms of achievement, strategy use, or achievement goals, but their self-esteem is generally lower and more responsive to academic difficulties and failures (Gál et al., 2020; Robins & Pals, 2002) and that they tend to experience higher levels of negative emotions (King et al., 2012), rumination (Baer et al., 2005), depression and anxiety (Schleider et al., 2015).

Although, the present study offers new possibilities for helping students to cope better emotionally with academic difficulties, it has several limitations that needs to be mentioned. First of all, the small number of participants in each group might challenge the reliability of the results, moreover due to unequal gender distribution the generalizability of the conclusions is also constrained. Since USA was primed in an experimental context, the ecological validity of its effect is limited, thus more research is needed to explore the effectiveness of USA interventions in buffering academic adversities' effect. Furthermore, the instrument measuring positive and negative emotions showed only acceptable internal consistency, which also disputes the reliability of the assessments. The present study did not include variables like the importance of good performance, perceived performance and performance contingent self-esteem, which all could influence reactions to difficulties, thus future studies should try to control their effect.

CHAPTER IV. GENERAL CONCLUSIONS AND IMPLICATIONS

This thesis sought to disentangle the nature of the relationship between fixed intelligence mindset and affective states, given that there is a scarcity of research on this topic and previous research results are highly inconsistent. There is a lack of research regarding the direct, indirect or causal nature of the relationship between fixed intelligence mindset and affective states. Furthermore, it is unknown how intelligence mindset operates when influencing students' emotional responses to setbacks. Thus, research providing greater understanding of this relationship is warranted.

In order to fill these gaps in the literature six studies were conducted. Since it is well-established that intelligence mindset exerts its greatest impact during academic adversities (Burnette et al., 2013), thus we aimed to explore the way fixed intelligence mindset operate in determining students' affective responses within these contexts.

Study 1 synthetized previous results on the association between fixed intelligence mindset and affective states, and results indicated the presence of a modest association between the two constructs. Study 2 adopted a more granular approach and explored how fixed intelligence mindset influence the way daily academic difficulties impact students' emotions and self-esteem. We found that fixed intelligence mindset moderated the impact of daily academic difficulties on students' self-esteem, however fixed intelligence mindset was unrelated to daily emotions. Study 3a, which was conducted parallel to Study 2, aimed to explore potential mechanisms (i.e., irrational beliefs) through which intelligence mindset influence different indicators of students' mental health during the exam period. Among the different exam related beliefs only self-downing proved to be a significant mediator. In order to synthetize the results of Study 2 and 3a, in Study 3b a serial mediational model was tested, where two significant mediation paths emerged: one where the effect of fixed intelligence mindset was mediated both by self-downing and self-esteem in a causal chain and another path which involved only self-esteem. Since self-esteem consistently proved to be a crucial factor in conveying mindsets' effect on emotions, and given that self-downing essentially refers to global self-evaluation which also lies at the core of self-esteem, subsequent studies focused on examining the relationship between fixed intelligence mindset and self-esteem. Study 4 tested the cross-cultural validity of the fixed mindset – self-esteem – emotions mediational model. Subsequently, the relationship between fixed intelligence mindset and self-esteem (i.e., the mediator variable) was also explored longitudinally; results indicating that fixed intelligence mindset predicts self-esteem across a two-year period (Study 5). Finally, a priming experiment was conducted when participants were primed with unconditional self-acceptance (a construct diametrically opposed to self-esteem and global self-evaluation), which proved to be effective in alleviating the effect of difficulties on students' emotions and self-esteem irrespective of their mindsets (Study 6).

Theoretical and Methodological Advances

The findings of the present research project have several theoretical implications. First of all, Study 1 using a meta-analytic approach evidenced a small to moderate association between intelligence mindset and affective states. Moreover, result also indicated that while fixed intelligence mindset is associated with negative emotions, growth mindset is linked more strongly to positive emotions. These results are consistent with theoretical expectation (Dweck, 1999), while the obtained effect sizes are similar to those of other meta-analyses on various types of mindsets and mental-health (Schleider et al., 2015).

Since a clear link between intelligence mindset and affective states was established, Study 2 sought to gain a more detailed understanding of this relationship. Although there are

several indications in the literature regarding the differential behavioral reactions of fixed and growth mindset individuals in the face of difficulties and failures (Bempchat et al., 1991; Doron et al., 2009; Dweck & Yeager, 2019; Forsythe & Johnson, 2017), their emotional reactions have not been explicitly studied. Thus, we followed participants through five consecutive days during the exam period and examined whether fixed intelligence mindset influence the impact of daily difficulties on students' emotions and self-esteem. According to the results, daily difficulties explained a large amount of the variance in daily positive and negative emotions and self-esteem, highlighting the importance of the meaning students attach to these situations. Furthermore, on days when students encountered higher levels of difficulties while preparing for exams, they generally reported lower levels of self-esteem and positive emotions and higher levels of negative emotions. However, the impact of daily difficulties on self-esteem varied across students, when encountering higher levels of daily difficulties, students with stronger fixed intelligence mindset reported lower levels of daily self-esteem, than those who believed in the changeability of their intelligence. The present results are in line with mindset theory, which stresses that students with fixed intelligence mindset tend to make internal attributions (e.g., "I failed because I am stupid."; Hong et al., 1999) and perceive failures as evidence of their incompetence (Dweck, 2008). However, contrary to our expectations fixed intelligence mindset was unrelated to daily positive and negative emotions and it did not moderate the effect of daily difficulties on these outcomes. Although, self-esteem showed a strong association with both positive and negative daily emotions.

Study 3a was conducted parallel with Study 2 and by bridging mindset and rational emotive behavior theories, it aimed to test irrational beliefs as potential mediators between fixed intelligence mindset and different indicators of students' mental health during the exam period. There is evidence in the literature that students with fixed intelligence mindset tend to respond with self-blame, self-denigration (Dweck, 1999), and intensive negative emotional reactions (Robins & Pals, 2002) to failures and difficulties. However, Yeager and Dweck (2020) emphasized that mindsets does not influence behavioral and emotional reactions directly, but through shaping the way individuals interpret achievement situations. Similarly, rational emotive behavior therapy (REBT) postulates that emotional reactions are not triggered by the events themselves, but by the way we evaluate them (David, 2017). REBT proposed that when negative situations are interpreted through the lens of irrational beliefs dysfunctional negative emotions arise (Ellis et al., 2010). Taking into consideration the overlap between the failure reactions of individuals with fixed intelligence mindset, and the maladaptive behaviors and emotions usually associated with irrational beliefs, we hypothesized that fixed intelligence mindset might predispose individuals to interpret failure situation in a more irrational manner. Thus, we tested whether exam-related irrational beliefs would mediate the impact of fixed intelligence mindset on students' negative emotions and depressive symptoms. Results indicated that fixed intelligence mindset is linked only to low frustration tolerance and self-downing, however only self-downing proved to be a significant mediator. Self-downing fully mediated mindsets' effect on depressive symptoms, while partially on negative emotions. These results confer valuable insights into the nature of the mindset – emotion relationship. Study 3b through synthetizing our previous results further refined our understanding of the mediational pathway between fixed intelligence mindset and emotions. We conducted a serial mediation analysis and results revealed two significant mediational pathways, one involving self-downing and self-esteem in a causal chain, the other involving only self-esteem as mediator.

During the previous studies self-esteem emerged as a crucial factor in conveying fixed intelligence mindsets' effect on emotions. Although, self-downing has also proved to mediate mindsets' effect, our subsequent studies focused more closely on the role of self-esteem. This decision was based on previous results (e.g., when taking into account self-downing mindset

was still directly related to self-esteem and the mindset – self-esteem – emotions mediational path was significant in Study 3b; self-esteem fully mediates mindsets' effect on negative emotions, while self-downing mediates it only partially) and theoretical considerations as well (self-esteem and self-downing both entail a tendency to evaluate oneself globally, thus they are analogous to each other).

Study 4 proposed to test the validity of the previously evidenced mediational model across cultures. In accordance with our expectations self-esteem fully mediated the fixed mindset – negative emotion relationship. Furthermore, invariance testing indicated that the mediational model is consistent across the US and Hungarian samples and the strength of the associations between the examined variables was also comparable across cultures. Although the impact of mindset on students' emotions have been examined in different cultural contexts, according to our knowledge no cross-cultural comparisons have been carried out yet. Thus, our study is one of the first, which investigated the cross-cultural comparability of intelligence mindsets' effect on emotions.

The second part of the thesis focused on exploring in more detail the relationship between fixed intelligence mindset and self-esteem. Previous studies have demonstrated that fixed intelligence mindset is associated with lower levels of self-esteem (Conigrave et al., 2019), however little is known about the direction of this relationship. Does fixed intelligence mindset lead to lower levels of self-esteem or the opposite is true, having lower levels of self-esteem predisposes individuals to view their intelligence as incapable of improvement. Study 5 using a longitudinal design assessed students' mindset and self-esteem twice during a two-year period. Cross-lagged hierarchical regression analysis indicated that initial fixed intelligence mindset predicted lower levels of self-esteem measured two years later, when the effect of initial self-esteem and self-efficacy was taken into account. However, initial self-esteem did not predict later intelligence mindset. These results offer significant insights into the mindset – self-esteem relationship, suggesting that fixed intelligence mindset might also make individuals self-esteem more vulnerable (Dweck, 1999).

Previous results indicated that those with fixed intelligence mindset experience higher levels of negative emotions and greater drops in their self-esteem in failure situations. Moreover, self-esteem seemed to mediate the effect of fixed intelligence mindset on emotions. However, these results are based on correlational data. Thus, in Study 6 we experimentally tested whether an unconditional self-acceptance prime would reduce self-esteem loss and would mitigate the affective consequences of a difficulty experience. Participants in the prime condition, compared to those in the control condition, reported smaller decreases in their self-esteem and smaller increases in their negative affect after encountering difficulties on the cognitive tasks. Results indicated that the effect of the USA prime was not influenced by students' mindset, both groups benefited equally from the prime. However, basic differences emerged in their general self-esteem level, since students with fixed intelligence mindset reported higher levels of negative emotions and lower levels of self-esteem at both assessments. According to mindset theory, individuals endorsing fixed or growth intelligence mindset does not differ when success is easily attainable, however they display distinct reactional patterns in the salience of failures (Dweck, 2008). However, our results indicated that the two mindset groups reported equal drops in their self-esteem and increases in negative emotions, suggesting that differences in negative emotions and self-esteem represent individual differences along these constructs, rather than differential reactional patterns. Nonetheless, it might also be possible, that the induced difficulty experience did not represent a real threat to participants' self-worth, which could explain the lack of findings regarding the magnitude of self-esteem loss among the two mindset groups, thus future studies should explore these issues in real world settings.

In conclusion the present study evidenced that intelligence mindset is not directly related to emotions, but it is in a close relationship with different self-evaluative processes, especially self-esteem, which also mediates mindset's effect on different affective outcomes. Furthermore, our studies have also evidenced that mindsets' association with self-esteem seems to be unidirectional, since mindset prospectively predicted self-esteem but this effect was not present in the case of self-esteem. The results of the priming experiment indicated that students with fixed and growth mindset responded similarly to difficulties experienced on a cognitive task, however fundamental differences emerged among the two groups in terms of their self-esteem level. Moreover, results also revealed that unconditional self-acceptance can mitigate the effect of difficulties in terms of negative emotions and self-esteem among fixed and growth mindset individuals alike.

Practical Implications

Although indirectly, our result might have several practical implications as well. Our findings demonstrated that fixed intelligence mindset influence the magnitude of academic difficulties' effect on self-esteem, which in turn was related to higher levels of negative mental health related outcomes. Moreover, results also revealed that USA might alleviate the negative consequences of difficulties on students' self-esteem and negative emotions. These results jointly point toward two targets for interventions aiming to help students cope more efficiently with academic failures.

First of all, studies have also demonstrated that teaching students the concept of growth intelligence mindset confer various benefits in terms of perseverance, motivation and performance. However, our results indicated that viewing failures and difficulties from the perspective of growth mindset might also protect students' self-esteem to be overly affected by external events.

Secondly, helping students to refrain from global self-evaluations and to engage in unconditional self-acceptance, might also protect them from the negative consequences of failures. Furthermore, adopting unconditional self-acceptance would not only benefit students' emotional experiences, but since they won't feel the need to validate their abilities and to protect their self-worth, they would have more mental resources to efficiently cope with these situations (e.g., take remedial actions, keep investing effort, asking for help). A vast amount of literature has demonstrated the importance of self-esteem in adaptive functioning (Prichard et al., 2013), thus incorporating growth mindset and USA elements in interventions aiming to enhance students' mental health and academic success might offer considerable benefits.

Limitations and Future Directions

Besides its theoretical contributions, the present research project has several limitations as well. The specific limitations of the individual studies are reviewed at the discussion of each study; thus, this section will focus on the general limitations of the present thesis.

First of all, the reliability of the conclusion of several studies are constrained due to the small number of participants and the presence of unequal gender distribution rises issues about generalizability. Moreover, due to high non-responsiveness it might be possible that the samples of Study 2 and 5 might be biased (e.g., participants with specific characteristics remained in the study).

Secondly, another limitation regards to the timing of the assessments. For instance, in Study 3, exam related irrational beliefs were not measured right before the exams and in Study 2 emotional reactions to academic difficulties were not assessed when students were in the difficulty situation, but at the end of the day. These might question whether the constructs assessed reflect the real-life experiences of participants or whether their responses are

influenced by subsequent reappraisals and interpretation. Furthermore, some of the study results might be affected by memory bias, since in two studies failure related emotions and self-esteem were assessed based on recollections.

Along the same lines, Limeri et al. (2020) drew attention to the fact that when assessing intelligence mindset, intelligence itself is never defined, thus responses to the items are subjected to the way individual define intelligence. The authors have evidenced that conceptualizing intelligence as knowledge is associated with higher agreement with the growth mindset items, however, defining intelligence as ability showed associations with both the growth and fixed mindset items. Since in neither of our studies provided a definition for intelligence, our intelligence mindset measures are subjected to measurement error.

Thirdly, the majority of the present studies are based on correlational data, which did not allow for causal conclusion, thus future studies should try to validate the present findings in an experimental context as well. For example, future studies should test the causal relationship between mindset and self-esteem by changing mindsets. Or it would be worthwhile to explore if growth mindset interventions reduce self-esteem vulnerability among students or whether adding unconditional self-acceptance element to growth mindset interventions would confer additional benefits to these interventions.

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