Key antecedents of maximal levels of aspiration and minimal boundary goals: a structural equation modeling analysis

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Abstract
Research findings indicate that two types of goals, which focus on the lowest (highest) levels of achievement possible in a learning setting, are strong predictors of how well students attain in school. Unfortunately, little is known about how these two goals, termed minimal boundary goals (MBG) and maximal levels of aspiration (MLA) relate to psychological constructs that are theorized to be antecedents of goals. To fill this knowledge gap, this research collected data from 463 secondary-school students and tested a model linking these goals to achievement motives and theory of intelligence. Results revealed that *not* believing that intelligence is fixed and devoting effort to studying was associated with a strong endorsement of MLA. At the same time, making low/no efforts to study, being afraid of failure, and believing that intelligence is fixed were strong predictors of MBG. These findings advance current knowledge and have important implications for teaching and learning.

Keywords Levels of aspiration · Boundary goals · Theory of intelligence · Motive to avoid failure · Need for achievement

Motivation research has provided evidence that goals focusing on specific (as opposed to general) levels of performance students target in school settings (e.g., getting an 'A' in a course) are strong predictors of individual differences in students' achievement. In particular, a corpus of findings showed that two specific goals, encompassing students' aims to attain (i) minimal passing grades, titled minimal boundary goals (MBG) and (ii) maximal available grades, denoted as maximal levels of aspiration (MLA), respectively, predicted both individual differences in secondary-school student achievement and change in attainment (Hodis et al., 2011, 2015; McClure et al., 2011; Meyer et al., 2009; Walkey et al., 2013). Case in point, findings from Hodis et al. (2015) indicate that these two goals significantly predicted achievement over and above demographic variables (e.g., SES, gender, ethnicity), performance and mastery goals, self-efficacy, and student engagement in outside-school activities (e.g., sports, Facebook). In the same vein, results reported by Hodis et al. (2011) indicated that maximal levels of aspiration—denoted by these authors as 'doing my best'—and minimal boundary goals called 'doing just enough'—significantly predicted changes in students' achievement in the final part of their secondary school studies.

These consistent findings could have important implications for reducing underachievement in secondary school. However, as the antecedents of MBG and MLA have yet to be explored, it is currently unknown why some secondary-school students are strongly motivated to attain the highest levels of achievement available in a subject/course (i.e., strongly endorse MLA), whereas others want just to pass (i.e., have high levels of MBG). To close this salient knowledge gap, this study investigated three potential predictors of these constructs, namely theory of intelligence and two achievement motives (i.e., fear of failure and need for achievement). These three constructs are overviewed below, after the theoretical conceptualization of MBG and MLA is presented.

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Review of the Literature

Past studies have provided evidence that taking into consideration MBG and MLA significantly boosts the ability to predict individual differences in student attainment (e.g., Hodis et al., 2011, 2015). In contrast, other results indicate that achievement goals (e.g., mastery and performance goals) are weak or insignificant predictors of achievement (Huang, 2012; Hulleman et al., 2010; Richardson et al., 2012). Following, we first overview key conceptual aspects of MBG and MLA; then we examine the similarities and differences between them and cognate constructs. Subsequently, we highlight theoretical arguments and empirical findings suggesting that theory of intelligence together with two achievement motives (i.e., the motive to avoid failure and the motive to approach success) might be significant predictors of these two goals. We conclude this section by delineating the hypotheses we tested in this study.

Conceptualization of minimal boundary goals and maximal levels of aspiration

Consistent with prior research, we conceptualized MBG and MLA in relation to the National Certificate of Educational Achievement (NCEA) framework, developed in the context of New Zealand's educational system (Hodis et al., 2015). Specifically, MBG and MLA are criterion-referenced (Brophy, 2005) and revolve around absolute standards of competence, namely attaining the minimal passing (respectively highest) grades in the NCEA system (Hodis et al., 2015). To extrapolate to a typical university course, a student who strongly endorses maximal levels of aspiration would aim to attain assignment scores in the A + range. In contrast, a student who strongly emphasizes minimal boundary goals, would want to attain passing scores on her/his assignments. Notably, in the context of New Zealand's NCEA, even successful attainment of MBG in secondary school is not optimal as achieving at low levels could lead to limited opportunities for scholarship and admission to selective university programs. In addition, adoption of MBGs sets student on a school trajectory that creates risks for graduating from high school; see, for example, findings reported by Hodis et al. (2011). Following, to highlight additional key aspects of MBG and MLA, we compare these goals with other goal-related constructs.

Similarities and differences between minimal boundary goals and maximal levels of aspiration and cognate constructs

Boundary goals

Boundary goals pertain to "the minimum performance level that one must attain to subjectively experience success" (Corker & Donnellan, 2012, p. 138). In light of this definition, it follows that both MBG and boundary goals revolve around minimal performance levels. Despite this similarity, the two constructs differ in two important ways. First, the standard of performance that is germane to each type of goal is not necessarily identical. Specifically, MBG gauges the extent to which students aim to attain the minimal passing grade (e.g., "I will work for the number of credits I need at each level, no more"). In contrast, measurement of boundary goals will either (i) enable students to state the specific minimal level of performance they subjectively associate with success in the given course (e.g., "What's the lowest grade in this course that would be acceptable to you?"; Corker & Donnellan, 2012, p. 142), or (ii) ask them to rate their endorsement of different levels of achievement (e.g., earning a 'B-' grade).

A second key difference between MBG and boundary goals is that the latter but not necessarily the former involves the subjective experience of success. Specifically, a student who has competing priorities (e.g., school, work, and family commitments) and wants to graduate without delays, may make an instrumental decision to aim for MBG. Consequently, a subjective experience of success is not a prerequisite for strong endorsement of MBG. In contrast, the experience of success is a core part of the definition of boundary goals (Corker & Donnellan, 2012).

Levels of aspirations

Levels of aspiration "represent the performance standard that individuals are striving to achieve" (Corker & Donnellan, 2012, p. 138). MLA and levels of aspiration overlap to some extent as both constructs center on a standard of performance students aim to achieve. Nevertheless, the standards used as reference points in the two constructs are not necessarily identical. For MLA, the standards are both fixed and provided by the assessment system (e.g., "I aim to get Excellence or at least Merit when I do NCEA"). In contrast, for levels of aspiration, the reference standards could involve any level of performance a student aspires to achieve (e.g., "What grade are you aiming for in this course?"; Corker & Donnellan, 2012, p. 142). On a practical level, when the strength of MLA is gauged, all

respondents have the same referent for their aspirations. In contrast, when the magnitude of the levels of aspiration is measured, either specific levels of performance students aspire to are recorded, or students report to what extent they strive to achieve certain pre-specified levels of attainment (e.g., to get a 'B' grade).

Empirical findings suggest that the differences highlighted above between MBG and boundary goals and between MLA and levels of aspiration have non-trivial implications. Specifically, Hodis and colleagues (2011, 2015) found that both MBG and MLA significantly predicted (changes in) achievement in school. In contrast, Corker and Donnellan (2012) reported that boundary goals but not levels of aspiration predicted students' performance.

Achievement goals

Some contemporary models of achievement goals (e.g., Elliot & Murayama, 2008; Elliot et al., 2011) posit that students' achievement goals reflect their competence-related aims (as opposed to their purposes or reasons for engaging in an achievement activity); for an alternative viewpoint, interested readers could consult, for example, work by Midgley et al. (1998) and Midgley et al. (2000). Recent overviews of achievement goals, discussing Elliot's and alternative theoretical frameworks can be found in Chung et al. (2020), Senko (2019), Senko and Tropiano (2016), Sommet and Elliot (2017), and Urdan and Kaplan (2020).

When students construe competence pertaining to an achievement-related task or activity with regard to an absolute, task-related, or intrapersonal standard/referent (e.g., they aim to perform better at the final exam than they did at the mid-term test), this focus supports the adoption of mastery goals (Elliot & Murayama, 2008). Contrary to this, when students construe competence with regard to a normative standard (e.g., they aim to perform better than their peers), this focus promotes setting performance goals (Elliot & Dweck, 2005; Elliot & Murayama, 2008). Crossing these two ways of defining competence with the valence dimension (i.e., avoiding something undesirable vs. approaching something desirable) differentiates four achievement goals: performance avoidance (PAV), mastery avoidance (MAV), performance approach (PAP), and mastery approach (MAP); information on the similarities/differences between MAP and MLA are provided in a subsequent section.

Of note, minimal boundary goals and maximal levels of aspiration are conceptualized with regard to standards that are both absolute and criterion referenced. Hence, these goals involve neither intra- nor inter-personal standards/referents. In contrast, PAV, MAV, PAP, and MAP involve, at least to some extent, intra- or inter-personal referents (Elliot & Murayama, 2008; Senko & Hulleman, 2013). These conceptual differences between MBG/MBA and achievement

goals have important consequences. For example, Hodis et al. (2015) investigated 10 indicators of student achievement and found that MLA, MBG, or both significantly predicted seven of these achievement indicators. In contrast, the set of achievement goals examined by Hodis and colleagues (i.e., MAP, PAP, and PAV) significantly predicted a single indicator of achievement.

Work avoidance

In the research literature, work avoidance is defined as wanting to reduce/minimize effort in school, avoiding learning-related challenges, and doing the bare minimum (Jagacinski et al., 2020; Nicholls et al., 1989; Seifert & O'Keefe, 2001). The definition of work avoidance indicates one pivotal difference between work avoidance and minimal boundary goals (MBG): When students adopt a work avoidance goal, their focus is squarely on avoiding (or minimizing) school-related effort, whereas when they endorse MBG, they aim to achieve objectively defined minimal standards of performance. A second important difference between work avoidance and MBG is illustrated by their divergent relationships with fear of failure. Specifically, the conceptualization of work avoidance indicates that students who have high levels on this construct are generally disengaged and unconcerned with performing well in school (Jagacinski et al., 2020; King, 2014; King & McInerney, 2014). Consistent with this proposition, Jagacinski et al. (2020) reported a very small (and non-significant) correlation between work avoidance and a measure of fear of failure. In contrast, aiming to achieve at the lowest passing level in a learning setting, which characterizes students who endorse MBG, might indicate a low level of ambition but is not necessarily a sign of disengagement or lack of concern with school performance. In line with this rationale, in this study, we found a strong positive correlation between MBG and fear of failure (i.e., $r = 0.67$). A third significant difference between work avoidance and MBG stems from the fact that "work avoidant individuals are not deriving feelings of competence in their academic (or work) settings" (Jagacinski et al., 2020, p. 223). This is not necessarily true with regard to MBG, because consistent success in achieving one's (admittedly unambitious) goals might strengthen students' confidence in their ability to undertake schoolwork. This is in pointed contrast to the fact that work avoidance leads to distancing from school-related tasks and minimizing their importance (Jagacinski et al., 2020).

Mastery approach goals

Mastery approach goals and maximal levels of aspiration (MLA) are similar in that they both support the pursuit of excellence. However, excellence is differently defined

for the two goals. For students who set mastery goals, the quest for excellence (or mastery) is driven by own interests and curiosity (see Elliot & Church, 1997 and references therein for extensive support for this proposition). As a consequence, mastery goals are defined vis-à-vis internal and (often) relatively flexible personal criteria/standards (Senko, 2019). In contrast, for MLA, excellence is assessed vis-à-vis external outcomes defined as the highest levels of achievement available in a given learning setting/system. This difference (between the standards for assessing excellence in mastery goals and MLA) is mirrored by a difference in these goals' relations with achievement in school. Specifically, "the interest-based studying" (Senko, 2019, p. 3) characterizing mastery goals has been found to have a negative or nil association with student achievement; see Senko (2019) for an extensive assessment of the association between mastery goals and achievement. This is in stark contrast with consistent findings indicating a positive association between MLA and achievement (e.g., Hodis et al., 2011, 2015). These aspects suggest that despite some similarities, mastery goals and MLA illustrate different routes for self-regulation in learning settings. The route facilitate by mastery goals involves being motivated to engage in tasks/activities because these are either immediately rewarding (e.g., interesting) or help one improve one's past performance, or valued skills/abilities. The second route, which is connected to MLA, supports engagement with tasks that might not be interesting or enable one to improve on past performances but facilitate the attainment of long-term goals (e.g., achieving "Merit"/"Excellence" in a learning domain.

Potential predictors of minimal boundary goals and maximal levels of aspiration

The motivation literature provides some indications that implicit self-theories and achievement motives (i.e., the motive to avoid failure and the need for achievement) relate to the goals students adopt in achievement situations (Dweck, 1999; Elliot et al., 2011; Hagtvet & Benson, 1997; Hodis, 2018, 2020; Spence & Helmreich, 1983; more details follow). Thus, it is plausible that theory of intelligence, need for achievement, and the motive to avoid failure could account for meaningful individual differences in the strength of minimal boundary goals and maximal levels of aspiration.

Theory of intelligence

Implicit theories comprise people's views on whether key traits or personal qualities are changeable or fixed (Dweck, 1999; Yeager & Dweck, 2012). These theories create meaning systems that guide how individuals regard themselves and interpret their circumstances (Yeager & Dweck, 2012); hence, they are strongly associated with the goals people set

and pursue (Miu & Yeager, 2015; Yeager & Dweck, 2012; Yu & McLellan, 2020). This research investigated theories of intelligence because they are influential factors of student engagement and success (Yeager & Dweck, 2012) that may significantly relate to MBG and MLA.

Conceptually, when people have an entity theory of intelligence, they believe that their intelligence is unchangeable and uncontrollable; the opposite is true for an incremental view (Dweck & Leggett, 1988; Yeager & Dweck, 2012). Research findings suggest that endorsing an incremental theory of intelligence has important benefits (e.g., being resilient when experiencing failure). Conversely, holding an entity theory of intelligence has significant drawbacks (e.g., helpless reactions when facing/contemplating failure; Miu & Yeager, 2015; Yeager & Dweck, 2012). In this research, we examined only entity theory because the two views on intelligence generally have strong (negative) associations; in turn, highly corelated predictors could create multicollinearity problems when estimating prediction models.

People's views (theories) of own intelligence play key roles in how they set goals. That is, these theories create "a framework in which certain goals become more important than others" (Dweck & Grant, 2008, pp. 407–408; for a similar point of view, see Dweck, 1986). Specifically, students who embrace an entity theory of intelligence set primarily performance goals centered on attaining positive evaluations of their intelligence. In contrast, when students hold an incremental theory of intelligence, this orients them toward setting mastery goals (Dweck, 1986; Dweck & Leggett, 1988). Empirical findings have provided evidence supporting this theorizing. For example, Robins and Pals (2002) found that entity (vs. incremental) theories of intelligence differentially predicted university students' performance and learning (mastery) goals. Consistent findings were reported by Cury et al. (2006).

Achievement motives

Spence and Helmreich (1983) drew from the work of earlier motivation theorists (e.g., Murray, McClelland, and Atkinson) to conceptualize motives as general tendencies that are rooted in people's prior experiences. Importantly, motives have both "activating and affective properties and directive or goal-oriented properties" (p. 31). This conceptualization of motives is reflected in contemporary theorizing of achievement motives. Specifically, achievement motives are "affectively-based dispositions that energize achievement activity" (Thrash & Elliot, 2001, p. 15) by highlighting, for example, either the failure-related shame or the success-driven pride. Educational and psychological research has examined two salient achievement motives, namely fear of failure and need for achievement. These dispositions focus people's attention on aspects (e.g., cues,

information) that pertain to negative (fear of failure) or positive outcomes (need for achievement) (Dickhäuser, et al., 2016; Dinger et al., 2013; Elliot, 2006; Thrash & Hurst, 2008).

Need for achievement Minimal boundary goals and maximal levels of aspiration are defined in relation to the New Zealand's NCEA framework, are criterion referenced, and involve absolute standards of competence (Hodis et al., 2015). Hence, it is unlikely that facets of need for achievement that focus on striving to (i) outperform others (i.e., competitiveness) or (ii) surpass one's prior performance (i.e., mastery orientation; Spence & Helmreich, 1983) would play important roles in predicting individual differences in MBG and MLA. Hence, this research focused only on the work orientation facet of the need for achievement. This facet captures the desire to work hard and complete assignments/tasks (Fairchild et al., 2005; Pastor et al., 2007; Spence & Helmreich, 1983). Following, we overview key characteristics of the work orientation.

Research reported that university students' work orientation was unrelated to their scores on the Scholastic Aptitude Test (SAT) and to how much they valued goal attainment (Spence & Helmreich, 1983). Hence, the work orientation involves key aspects that energize goal pursuits yet do not overlap with scholastic aptitude or reward sensitivity. In addition, research that collated the work orientation with mastery orientation, found that (for university students) this 'workmastery' factor had positive correlations with mastery goals and course grades (Harackiewicz et al., 2002, 2008), interest, class enjoyment, semester GPA, and subsequent GPA (Harackiewicz et al., 2002).

The motive to avoid failure This motive encapsulates a person's inclination to anticipate negative affect when the outcome(s) of task-engagement is/are uncertain or when the individuals thinks that failure is likely (Hagtvet & Benson, 1997). Research suggests that this motive is significantly associated with several achievement goals (i.e., $r = -0.16$ with MAP; $r = 0.27$ with MAV; $r = 0.29$ with PAP) (Pastor et al., 2007; similar results were reported by Elliot & McGregor, 2001, study 2).

The consequences of having strong achievement motives depend on both the nature of the motives (e.g., being more motivated by fear of failure than by need of achievement) and on how people self-regulate during goal pursuits (Thrash & Hurst, 2008). Given the important role of theories of intelligence for self-regulation in school settings (Dweck, 1999; Yeager & Dweck, 2012), conjoint consideration of individuals' achievement motives and theory of intelligence may help predict variability in minimal boundary goals and maximal levels of aspiration.

Hypotheses investigated

Grounded on the review of the literature presented earlier, we hypothesize that entity theory of intelligence is a positive predictor of minimal boundary goals and a negative predictor of maximal levels of aspiration. Having a fixed (vs. incremental) mindset influences the meaning students attribute to effort in learning settings (Yu & McLellan, 2020). Specifically, endorsing a fixed mindset leads to perceiving effort as an indicator of low ability, and, especially in the presence of negative feedback, to avoiding challenges and forgoing opportunities to engage in activities that facilitate strengthening skills/abilities; see Dweck (2016) and Yu and McLellan (2020) for more information. These aspects suggest that entity theory of intelligence could be a negative predictor of the work orientation because when students think their intelligence is largely unmovable, they are unwilling to devote effort to tasks they perceive as being too challenging (Dweck, 2016; Yeager & Dweck, 2012). As we could not find empirical research to directly speak to this matter, we regard this aspect as exploratory. To our knowledge, the existing literature has not investigated whether theory of intelligence influences the motive to avoid failure or vice versa. This is why, in the model we tested, (see Fig. 1), these two predictors of minimal boundary goals and maximal levels of aspiration are represented as correlated constructs. Given the drawbacks associated with both fear of failure and an entity theory of intelligence, we hypothesize that this correlation is positive. We also hypothesize that the motive to avoid failure is a positive predictor of minimal boundary
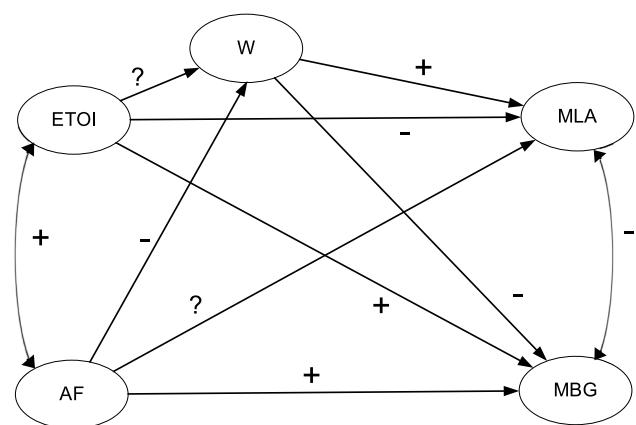
Fig. 1 Proposed model. ETOI = Entity theory of intelligence; AF = Motive to avoid failure; W = Work orientation; MLA = Maximal levels of aspiration; MBG = Minimal boundary goals; The '+' signs denote positive relationships; The '– ' signs denote negative relationships; The '?' sign denotes a relationship whose direction and strength cannot be hypothesized precisely

goals. It is unclear whether the association between the motive to avoid failure and maximal levels of aspiration is significant.

Our hypothesis that the motive to avoid failure predicts the work orientation has been informed by major motivation theories. Specifically, Higgins' (1997, 2012) regulatory focus theory suggests that the motivational consequences of failure are likely to be stronger than those of success. When students' motive to avoid failure in school settings is strong, the negative affect derived from anticipated failure is likely to inhibit the extent to which they are ready to work hard (especially with regard to tasks they perceive as challenging). This hypothesis is consistent with both people's desire to "avoid pain" (Higgins, 2012) and the tenets of expectancy-value theory suggesting that task engagement is supported by positive expectancies of success regarding the given task (Eccles & Wigfield, 2020; Wigfield & Eccles, 2000). In addition, the hypothesis is also in line with Atkinson's (1964, 1966) theorizing that the motive to avoid failure reduces people's motivation to engage in achievement-related tasks/activities; see also Hagtvet and Benson (1997). Finally, we hypothesize that need for achievement (represented here by the work orientation) is a positive predictor of maximal levels of aspiration and a negative predictor of minimal boundary goals.

The hypotheses (H0) and research questions (RQs) investigated in this research are summarized in Fig. 1 and listed below. To foreshadow them, we note that based on our review of the literature we felt confident to propose hypotheses about two of the three predictors of the two goals, namely W and ETOI (see H0-1 to H0-4 below). For the third predictor, AF, we were able to hypothesize its relationship with MBG (H0-5) and W (H0-6) but we did not feel confident about its association with MLA (after controlling for W and ETOI); hence, we examined this aspect by means of the first research question (i.e., RQ1). Similarly, the literature did not provide clear information about the relationship between ETOI and W and, thus, we investigated this aspect by means of RQ2. Finally, because mediation effects are generally small, it is difficult to predict whether they are statistically significant. Hence, in this study, we examined mediation effects by means of RQ3-RQ6.

H0-1: Controlling for entity theory of intelligence (ETOI) and the motive to avoid failure (AF), the work orientation (W) is a significant positive predictor of MLA.

H0-2: Controlling for ETOI and AF, W is a significant negative predictor of MBG.

H0-3: Controlling for W and AF, ETOI is a significant negative predictor of MLA.

H0-4: Controlling for W and AF, ETOI is a significant positive predictor of MBG.

H0-5: Controlling for W and ETOI, AF is a significant positive predictor of MBG.

H0-6: AF is a significant negative predictor of W.

RQ1: Is AF a significant predictor of MLA after controlling for W and ETOI?

RQ2: Is ETOI a significant predictor of W?

RQ3: Does W significantly mediate the association between ETOI and MLA?

RQ4: Does W significantly mediate the association between ETOI and MBG?

RQ5: Does W significantly mediate the association between AF and MLA?

RQ6: Does W significantly mediate the association between AF and MBG?

Methods

Sample

This research received approval from the Human Ethics committee of the institution of the first author. Participants in this study were recruited from three secondary schools in New Zealand. These schools, which were randomly selected, were located in urban areas (two in main urban areas; the third in a secondary urban area), in low-, mid-, and high-SES neighbourhoods, respectively. One of the schools was a small school (i.e., total enrolment < 200 students) and the others were mid-size schools (i.e., total enrolments between 450 and 600 students).

Paper questionnaires were used to collect the data; the questionnaires were administered by the schools to students who provided informed consent to participate ($N = 463$). About twice as many girls than boys responded to the questionnaire (i.e., 272 vs. 141); 50 students did not provide data on this demographic question. In terms of ethnicity, 4,1% of students reported being Asian, 7.8% Pacific, 21.4% Maori, and 44.7% European; 22.0% of respondents either were of another ethnicity or did not answer this question. Similar percentages of participating students were registered in years 10 (29.8%), 11 (27.7%), and 12 (31.3%); 11.2% of participants were year 13 students or did not provide data on this demographic variable. In New Zealand, secondary school comprises years 9–13; year 13 is the last year of secondary school. Notably, NZ students can leave secondary school before they reach year 13. However, this generally does not happen until students are older than 16 years.

Measures

Need for achievement

To measure need for achievement, we used the 'Work' scale (6 items) from Spence and Helmreich (1983). As the original scale focuses on work settings, we made small adjustments to some items to make them appropriate for school-related

environments. For example, the first item of this scale (i.e., "It is important for me to do my work as well as I can even if it isn't popular with my co-workers") was changed to: "It is important for me to do my *school* work as well as I can even if it isn't popular with my *school* mates". Similarly, the third item ("There is satisfaction in a job well done") was changed to read: "There is satisfaction in *school* work well done". These slight changes did not modify the meaning or length of the items. Findings from prior research suggest that this scale appropriately measures its target construct (e.g., Adams et al., 1985; Fairchild et al., 2005; Spence & Helmreich, 1983). The reliability of the need for achievement scores in this research was Cronbach's alpha = 0.82; see Table 1.

The motive to avoid failure

We used three items from Hagtvet and Benson (1997) to gauge the motive to avoid failure: "Just thinking about working on new, somewhat difficult tasks makes me feel uneasy"; "I dislike work that I am not sure I can manage"; and "I dislike doing things which seem somewhat difficult". As the target population in our study consisted of high-school students, we considered that the remaining three items of the scale could be harder to understand/relate to and did not use them. Prior research has provided consistent support for the reliability/validity of this measure (e.g., Elliot & McGregor, 2001; Fairchild et al., 2005; Hagtvet & Benson, 1997; Johnston & Finney, 2010; Pastor et al., 2007). In our research, the reliability of this factor was 0.69.

Entity theory of intelligence

We employed four items from Dweck (1999) to measure this construct (e.g., "Your intelligence is something about you that you can't change very much"). Several studies have found that the scores associated with this scale are reliable and valid (e.g., Blackwell et al., 2007; Yeager et al., 2016). In our study, reliability was 0.83.

Table 1 Maximum likelihood estimates for correlations among the constructs

Construct	MLA	MBG	ETOI	AF	W
MLA	1.00				
MBG	− .57	1.00			
ETOI	− .24	.66	1.00		
AF	− .29	.67	.61	1.00	
W	.80	− .32	− .17	− .35	1.00
Reliability	.83	.74	.83	.69	.82

For all correlations, $p < .01$

MLA Maximal level of aspiration, *MBG* Minimal boundary goals, *ETOI* Entity theory of intelligence, *AF* Motive to avoid failure, *W* Work orientation

Minimal boundary goals and maximal levels of aspiration

These goals were measured with three items each, which were adapted from Meyer et al., (2009; e.g., "Once I have my 80 credits, I'll be satisfied", for MBG; "I will strive for Merit or Excellence even when I don't need this to achieve my goals", for MLA). The scales used to measure MBG and MLA provided reliable and valid scores in prior research (e.g., Hodis et al., 2015; McClure et al., 2011; Walkey et al., 2013). In this research, the Cronbach's alpha value for MBG was 0.74 and that for MLA was 0.83. All the items were rated on a 1 (Strongly Disagree)—7 (Strongly Agree) Likert scale.

Analytic strategy

Structural equation modeling (SEM; Raykov & Marcoulides, 2006) was used to examine whether the model summarizing the hypotheses under investigation fitted the empirical data. All analyses were conducted in Mplus (version 8.2; Muthen & Muthen, 2010). The estimation was conducted by means of FIML (Arbuckle, 1996), which enables using all data (both complete and incomplete) and is not sensitive to medium violations of multivariate normality (Fan & Wang, 1998). Consistent with Hu and Bentler (1999), model fit was assessed by using information provided by the root-mean-square-error-of approximation (RMSEA) (Steiger, 1990), the Tucker-Lewis index (TLI) (Tucker & Lewis, 1973), and the comparative fit index (CFI) (Bentler, 1990). Values of 0.05 and lower for RMSEA and 0.95 and higher for both TLI and CFI and TLI are indicative of an excellent fit between the model and the data.

Results

In our research, six participants who did not provide data on any of the constructs were not included in the analysis; this led to an effective sample size of $N = 457$. Of this sample, 82.49% of participants (i.e., $n = 377$) provided data on all variables investigated. An examination of the covariance coverage of the proportion of the data present reveals that all values were above 0.90. Taken together, these aspects indicate that only a very small proportion of data was missing in this research.

The variables examined in this research had no problems with multivariate normality (MVN). Specifically, skew values for the items ranged from -1.35 to 0.98; kurtosis ranged between -1.27 and 1.40; these values are below the cutoffs of 2.00 (for skew) and 7.00 (for kurtosis) that indicate problematic violations of MVN (Curran et al., 1996). The model examined did not encounter estimation problems or inadmissible solutions. The correlations among the constructs

examined in this research and their internal consistency levels are reported in Table 1.

The model fit very well the data: Chi-square (142, $N = 457) = 301.116$; $p < 0.001$; RMSEA = 0.050; 90% CI for RMSEA [0.042, 0.057]; TLI = 0.941; CFI = 0.951. The key parameters of this model (summarized in Fig. 2) are discussed next. The total, direct, and indirect effects associated with this model are reported in Table 2.

Entity theory of intelligence (ETOI) had a significant direct effect on minimal boundary goals (MBG; see Table 2). Specifically, having high levels of ETOI was associated with strong endorsement of MBG; see Keith (2015) for a discussion of the magnitude of standardized coefficients in regression/structural models. In addition, ETOI had a negative direct effect on maximal levels of aspiration (MLA). In other words, the stronger an individual's ETOI, the weaker her endorsement of MLA.

The need for achievement, represented in this study by the work orientation (W), had significant direct relationships with both MLA (positive) and MBG (negative). The motive

to avoid failure (AF) had significant direct and indirect effects (the latter mediated by W) on MBG but only an indirect effect (via W) on MLA. More specifically, the higher a student's level of AF, the stronger she endorsed minimal boundary goals. In contrast, high levels of AF were related to smaller levels of W and, thus, to weaker endorsement of maximal levels of aspiration.

The set of predictors accounted for about 57% of variability in minimal boundary goals, 66% in maximal levels of aspiration, and 12% in the work orientation. Thus, although the model tested is parsimonious, it predicted large and practically significant percentages of variability in both goals. For MBG, ETOI and AF had comparable standardized slopes, which were somewhat stronger than that of W. For MLA, however, the standardized coefficient of W surpassed in magnitude that of ETOI.

Discussion

Minimal boundary goals and maximal levels of aspiration have been found to consistently predict student achievement in models that controlled for key antecedents of attainment (e.g., Hodis et al., 2011, 2015). However, because currently little is known about the relationships between these goals and factors that are known antecedents of achievement goals, this information has yet to translate into effective educational interventions that reduce underachievement. Our study started to bridge this significant gap.

Findings from this research indicate that students who did not adopt an entity view of intelligence and invested effort in their learning emphasized maximal levels of aspiration. These results suggest that setting ambitious goals in achievement settings is rooted in being willing to expend effort in one's learning pursuits and taking pride in one's schoolwork (Spence & Helmreich, 1983). Setting and pursuing ambitious goals is generally adaptive in learning settings, unless the goal is blocked or when its attainment is no longer beneficial (Sahdra et al., 2022). In contrast, students
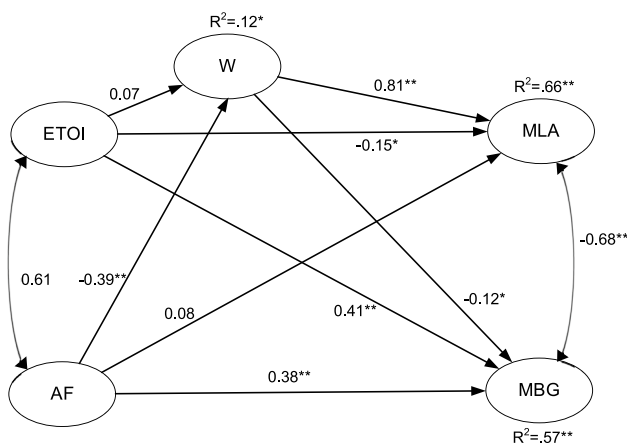
Fig. 2 Standardized parameter estimates. ETOI = Entity theory of intelligence; AF = Motive to avoid failure; W = Work orientation; MLA = Maximal levels of aspiration; MBG = Minimal boundary goals; **, $p < .01$; *, $p < .05$

Table 2 Summary of standardized total, direct, and indirect effects

Name	Total effect			Direct effect			Indirect effect		
	Est	LB	UB	Est	LB	UB	Est	LB	UB
ETOI→MLA	−0.095	−0.258	0.071	**−0.153**	−0.305	−0.008	0.058	−0.088	0.214
ETOI→MBG	**0.404**	0.239	0.552	**0.413**	0.249	0.559	−0.009	−0.045	0.010
AF→MLA	**−0.234**	−0.410	−0.049	0.080	−0.089	0.263	**−0.314**	−0.503	−0.142
AF→MBG	**0.425**	0.259	0.588	**0.379**	0.203	0.551	**0.046**	0.007	0.106

For all values in bold, $p < .05$

Est. Estimate, *LB* lower bound of the 95% bias-corrected bootstrapped confidence interval based on 5000 bootstraps, *UB* upper bound of the 95% bias-corrected bootstrapped confidence interval based on 5000 bootstraps, *MLA* Maximal levels of aspiration, *MBG* Minimal boundary goals, *ETOI* Entity theory of intelligence, *AF* Motive to avoid failure

who had a strong entity view of intelligence, were afraid to fail in academic contexts, and invested little effort in studying, endorsed strongly minimal boundary goals. Notably, although the model investigated in this study was parsimonious, it accounted for very large percentages of variability in both goals.

Given that "it is in the face of challenge that self-theories matter most" (Dweck & Grant, 2008, p. 406), the strong positive relationship we identified between an entity theory of intelligence and the endorsement of minimal boundary goals is likely to be further strengthened when these goals pertain to tasks/courses that students perceived as challenging. Thus, when enrolled in difficult courses, students who are convinced that their intelligence is fixed are likely to set lower achievement targets (e.g., to aim to achieve only the lowest passing grade). In the same vein, the negative relationship between entity theory of intelligence and setting maximal levels of aspiration is likely to be stronger when accompanied by corresponding perceptions of task/course difficulty. Additionally, considering that "self-theories and goals together set up a framework in which people interpret and respond to setbacks" (Dweck & Grant, 2008, p. 408), the reported relationships between entity theory of intelligence (on the one hand) and MLA and MBG (on the other), are likely to be further strengthened in situations/settings where students receive feedback that their performance in a course/assignment places them at risk of failure.

Our findings concern goal orientations that are specific to the New Zealand educational context. Nonetheless, as we discus below, they are relevant to secondary-school student populations from other educational contexts (e.g., cultures) as well. In addition, the findings have implications for research and theorizing focusing on the goals students set in learning environment (e.g., achievement goals).

Endorsing maximal levels of aspiration is consistent with having high standards and making efforts to attain them, going above and beyond minimal requirements, and striving to exceed expectations. In turn, these aspects characterize conscientiousness, in general, and industriousness, in particular; the latter is a facet of conscientiousness (Constantini & Perugini, 2016; Spielman et al., 2022). Conscientiousness is a multi-faceted personality trait characterized by strong tendencies to engage in actions that advance pursuits of important goals, rein in impulsive behaviors, and prioritize/plan tasks (Constantini & Perugini, 2016; Spielman et al., 2022). Industriousness encompasses tendencies to be ambitious, aspire to excellence, work diligently to get things done, and persist when encountering difficulties. Thus, students who strongly endorse maximal levels of aspiration, much like students who have high levels of conscientiousness (industriousness), strive for high levels of achievement because they are satisfied only with high (or relatively difficult) accomplishments (Bates et al., 2023). In contrast,

adopting minimal boundary goals—which is associated with aiming for mediocre achievements—is consistent with having low levels of conscientiousness (industriousness).

As we noted earlier, research indicates that maximal levels of aspiration (minimal boundary goals) are strong positive (negative) predictors of achievement (Hodis et al., 2011, 2015; McClure et al., 2011; Meyer et al., 2009; Walkey et al., 2013). In a similar vein, conscientiousness has been found to be one of the strongest and most reliable predictors of achievement in educational settings (for a recent review, see Spielman et al., 2022; see also Jach et al., 2023 for an overview of some key benefits of considering personality in educational research). Taken together, these findings provide further support for our hypothesis that maximal levels of aspiration and minimal boundary goals are rooted in high and low levels of conscientiousness (industriousness), respectively. If this hypothesis is tenable, the results from the present research suggest that striving for the highest levels of achievement in any learning setting, which is consistent with having strong conscientiousness (industriousness), is more likely when students believe their intelligence/abilities can improve, regard instances of failure as inherent parts of learning, and are willing to devote diligent effort to their schoolwork. In addition, our findings also indicate that adoption of goals that are typical for students having low conscientiousness (i.e., endorsement of minimal boundary goals) is more likely when students construe their intelligence/abilities as immovable, fear failure, and do not see diligence and hard work as paying off. In turn, these findings provide guidance for teachers on how to develop/strengthen students' ambitious and diligent goal pursuit in learning settings. For example, teachers could model how they (i) set ambitious goals in their own teaching, (ii) work hard to achieve them, and (iii) productively deal with setbacks and failures during the pursuit of these goals. In addition, it might be helpful if teachers share with students how some of their (i.e., teachers') knowledge and abilities have developed during the conscientious pursuit of their lofty goals.

Our findings indicate that theory of intelligence, the motive to avoid failure, and the work orientation are strong predictors of the goals we investigated. In addition, we hypothesized that adoption of these goals reflects high and low levels of conscientiousness, respectively. The implications of these aspects (i.e., the findings and the hypothesis) are twofold. First, in line with an important theoretical proposition highlighting the intertwined nature of motivation and personality (i.e., Dweck, 2017), it might be profitable to consider the extent to which students' goal setting and pursuit in learning environments is related to their personality, in general, and to their conscientiousness, in particular; for an earlier empirical work that is relevant to this discussion, see Corker et al. (2012). Second, in a recent research, Bates et al. (2023) mapped several critical aspects characterizing goal

setting of conscientiousness individuals (e.g., attentional focus, specificity of action plans, strategic orientation toward task, high standards for evaluating own performance). Training a similar lens onto the goals that students set in learning contexts could facilitate access to critical new information, which, in turn, may lead to theoretical advancements/refinements pertaining to the conceptualization and roles of these goals. For example, this approach may be able to shed some fresh light onto when the pursuit of mastery goals is both rewarding and associated with high levels of school attainment (e.g., when students are driven by a strong interest in a topic/domain and adopt maximal levels of aspiration in their learning).

Future research

Future studies could examine whether more adaptive patterns of endorsing minimal boundary goals and maximal levels of aspiration emerge when predictors investigated in this research are targeted in intervention studies. Specifically, future research could assess whether an intervention that enhances students' work orientation leads to stronger endorsement of the aim to attain the highest levels of achievement. For example, recent research found non-trivial positive associations between need for achievement and an orientation toward attaining gains, fulfilling aspirations, and striving to achieve one's ideals (i.e., a promotion orientation; Higgins, 1997, 2012; Hodis, 2018, 2020). Notably, promotion is strongly linked to key facets of conscientiousness (Constantini & Perugini, 2016), can be readily primed (e.g., Cesario et al., 2004; Koenig et al., 2009), and is influenced by contextual features of the environment (Hattie et al., 2020). Considering these aspects, future research could investigate whether learning settings that support students' efforts to attain their ideal goals and aspirations (i.e., that support a promotion focus) are associated with higher work orientations and, consequently, with stronger endorsement of maximal levels of aspiration than settings that do not.

With regard to minimal boundary goals, future research could compare and contrast the effectiveness of three types of interventions: (a) One that attempts to reduce the strength of students' entity views of intelligence, which are known to be malleable (Yeager & Dweck, 2012); (b) Another that focuses on reducing their fear of failure; (c) An intervention that targets simultaneously both entity views and the motive to avoid failure. Another direction for future research could use the conceptual foundation of goal complexes (i.e., combinations between aims and reasons; Hodis et al., 2016; Senko & Tropiano, 2016; Sommet & Elliot, 2017) to examine whether students' reasons for learning/studying (e.g., autonomous reasons, such as to strengthen their knowledge vs. controlled reasons, such as to keep their parents happy;

Ryan & Deci, 2017) relate to their endorsement of minimal boundary goals and/or maximal levels of aspiration. Our study uncovered a weak and non-significant association between students' entity beliefs about their intelligence and their work orientation. Future research is needed to clarify whether this result generalizes. When exploring this aspect, future work could also include alternative models for this association. An example of such a model could include these orientations as correlated predictors of the goals students adopt in achievement settings; we thank an anonymous reviewer for this suggestion.

Limitations

This research has significantly advanced knowledge of key antecedents of maximal levels of aspiration and minimal boundary goals. Nonetheless, it also has some limitations. First, although the model used to predict these goals accounted for significant variability in minimal boundary goals and maximal levels of aspiration, consideration of additional factors may further enhance the precision of these predictions. Second, no causal inferences are warranted from the findings of this research. Hence, we cannot conclude, for example, that high levels of the motive to avoid failure *cause* strong endorsement of minimal boundary goals. Similarly, our results cannot speak about the direction of the association between the motive to avoid failure and an entity theory of intelligence. Third, this research collected data from students located in a specific country/culture. Hence, we need future research, which is conducted in other countries/cultures, to understand the extent to which findings reported here generalize. Finally, the self-report and cross-sectional nature of the data available for this research are other limitations that need to be considered.

Implications for practice

Research has provided consistent evidence that maximal levels of aspiration (minimal boundary goals) are strong positive (negative) predictors of student achievement and changes therein (Hodis et al., 2011, 2015; McClure et al., 2011; Meyer et al., 2009; Walkey et al., 2013). This evidence suggests that, in school settings, in most situations, it might be helpful to support students to strive for maximal levels of aspiration rather than emphasize minimal boundary goals. As we noted above, our findings do not afford causal conclusions. Therefore, our suggestions in this section would need to be regarded with caution until they are supported by experimental results.

Considering the strong direct/indirect associations between the motive to avoid failure and minimal boundary

goals/maximal levels of aspiration, one potentially productive way to promote optimal patterns of endorsing these goals is to clearly delineate and communicate criteria for success to students (Hattie & Donoghue, 2016). For example, whenever appropriate, teachers/lecturers could provide marking criteria for assignments that clearly specify the type and level of performance needed to demonstrate a certain level of achievement (e.g., creating detailed marking criteria for performance that is in the "A" range; detailed criteria for performance that is in the "B" range, etc.). In addition, to further reduce fear of failure and mitigate its deleterious consequences for learning/attainment, teachers could make available, in a step-by-step manner, progressively detailed scaffolding; this strategy would be particularly needed for tasks students construe as difficult. In addition, teachers could also help students decouple (relative) lack of success at learning tasks from evaluations of personal ability, (self-) criticism, and negative affect. For example, feedback from teachers could underline areas in which students did well, as well as highlight (both via feedback and by means of modeling in class activities) that success at learning tasks is supported by strong attentional focus on the task and employment of effective learning strategies; both of these desiderata can be learned and should be modelled in class. Finally, encouraging/supporting students to devote sustained effort to their learning and creating an environment where working hard and striving to do a good job are constantly modelled by teachers and peers are likely to foster the endorsement of maximal levels of aspiration and to limit the adoption of minimal boundary goals.

Conclusion

This study found that individual differences in minimal boundary goals and maximal levels of aspiration are strongly predicted by entity theory of intelligence, the motive to avoid failure, and the need for achievement. As MLA and MBG are key predictors of student achievement, these results fill in important gaps in current knowledge.

Appendix

See Tables 3, 4, 5, and 6.

Table 3 Item level descriptive statistics

Item	Mean	Variance	Skew	Kurtosis
MLA1	5.59	2.14	−0.95	0.24
MLA2	5.77	2.34	−1.16	0.59
MLA3	5.88	1.95	−1.35	1.40
MBG1	2.59	3.74	0.98	−0.29
MBG2	2.96	3.68	0.65	−0.78
MBG3	4.23	4.45	−0.21	−1.27
W1	5.45	1.93	−0.66	−0.25
W2	5.42	1.69	−0.58	−0.23
W3	5.46	1.89	−0.82	0.31
W4	5.16	1.90	−0.54	−0.02
W5	5.17	1.93	−0.42	−0.35
W6	4.98	1.95	−0.32	−0.36
AF1	4.10	2.25	−0.05	−0.53
AF2	3.99	3.23	0.02	−0.85
AF3	4.05	2.57	0.14	−0.69
ETOI1	3.43	3.12	0.27	−0.81
ETOI2	3.91	3.16	−0.09	−0.93
ETOI3	3.38	3.77	0.40	−1.00
ETOI4	3.95	3.02	−0.03	−0.83

For each construct, the number represents the number of the indicator of the given construct; for example, MLA2 is the second indicator of MLA

MLA Maximal level of aspiration, *MBG* Minimal boundary goals, *ETOI* Entity theory of intelligence, *AF* Motive to avoid failure, *W* Work orientation

Table 4 Unstandardized and standardized values for the path coefficients for the MLA outcome

Predictor	Path coefficient	Standard error	*p* value
W—unstandardized	1.30	0.21	< .01
W—standardized	0.81	0.05	< .01
AF—unstandardized	0.14	0.16	.40
AF—standardized	0.08	0.09	.37
ETOI—unstandardized	−0.26	0.14	.07
ETOI—standardized	−0.15	0.08	.04

MLA Maximal level of aspiration, *ETOI* Entity theory of intelligence, *AF* Motive to avoid failure, *W* Work orientation

Table 5 Unstandardized and standardized values for the path coefficients for the MBG outcome

Predictor	Path coefficient	Standard error	*p* value
W—unstandardized	−0.17	0.09	.05
W—standardized	−0.12	0.06	.04
AF—unstandardized	0.58	0.16	<.01
AF—standardized	0.38	0.09	<.01
ETOI—unstandardized	0.63	0.13	<.01
ETOI—standardized	0.41	0.08	<.01

MBG Minimal boundary goals, *ETOI* Entity theory of intelligence, *AF* Motive to avoid failure, *W* Work orientation

Table 6 Unstandardized and standardized values for the path coefficients for the W outcome

Predictor	Path coefficient	Standard error	*p* value
AF—unstandardized	−0.42	0.12	<.01
AF—standardized	−0.39	0.10	<.01
ETOI—unstandardized	0.08	0.10	.45
ETOI—standardized	0.07	0.09	.44

ETOI Entity theory of intelligence, *AF* Motive to avoid failure, *W* Work orientation

Declarations

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