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Mastery-Approach Goals: A Large-Scale Cross-Cultural Analysis of Antecedents and Consequences

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Abstract

Mastery-approach (MAP) goals, focusing on developing competence and acquiring task mastery, are posited to be the most optimal, beneficial type of achievement goal for academic and life outcomes. Although there is meta-analytic evidence supporting this finding, such evidence does not allow us to conclude that the extant MAP goal findings generalize across cultures. Meta-analyses have often suffered from over-representation of Western, educated, industrialized, rich, and democratic (WEIRD) samples, reliance on bivariate correlations, and lack the ability to directly control individual-level background variables. To address these limitations, this study used nationally representative data from 77 countries/regions (N = 595,444 adolescents) to examine the relations of MAP goals to four antecedents (workmastery, competitiveness, fear of failure, fixed mindset) and 16 consequences (task-specific motivational, achievement-related, and well-being outcomes), and tested the cross-cultural generalizability of these relations. Results showed that MAP goals were: (a) grounded primarily in positive but not negative achievement motives/beliefs; (b) most strongly predictive of well-being outcomes, followed by adaptive motivation; (c) positively but consistently weakly associated with achievement-related outcomes, particularly for academic performance (β = .069); (e) negatively and weakly associated with maladaptive outcomes; and (d) uniquely predictive of various consequences, controlling for the antecedents and covariates. Further, the MAP goal predictions were generalizable across countries/regions for 13 of 16 consequences. While directions of effect sizes were slightly mixed for academic performance and perceived reading and PISA test difficulty, the effect sizes were consistently small for most

countries/regions. This generalizability points to quite strong cross-cultural support for the observed patterns.

Keywords: achievement goals; mastery-approach goals; cross-cultural differences; achievement motivation; well-being

Achievement motivation represents the energization and direction of competence-relevant behavior, and is known to be an important determinant of academic and life success (Elliot & Church, 1997; Wigfield et al., 2021). Achievement goals are the standards that we strive to achieve, and these constructs have been central to studying achievement motivation for many decades. Achievement goals create a framework through which individuals interpret, experience, and select themselves into and out of achievement-related situations (i.e., situations where individuals believe that their performance will be evaluated; Dweck, 1986; Nicholls, 1984; Pintrich et al., 2003). The different types of achievement goals that individuals pursue are associated with differential patterns of affect, cognition, and behavior (Elliot & Hulleman, 2017).

Achievement goal theorists have traditionally differentiated achievement goals in terms of the definition of *competence* – either developing competence or mastering tasks (mastery) or demonstrating competence relative to others (performance; Ames, 1992; Dweck, 1986; Nicholls, 1984). In more recent conceptualizations, these definitions of competence have been crossed with approaching positive outcomes or avoiding negative ones (Elliot & McGregor, 2001). The present study focuses on approach-based mastery goals that focus on mastering a task or improving over time to develop competence (hereafter called mastery-approach [MAP] goals; Moller & Elliot, 2006). MAP goals are posited to be the most broadly beneficial form of achievement goals for student academic and life outcomes (Elliot, 2005; Linnenbrink, 2005; Senko et al., 2011).

MAP goals are grounded in such antecedents as achievement motives (e.g., workmastery, competitiveness, and fear of failure; Elliot & Church, 1997; Harackiewicz et al., 1997) and implicit theory of intelligence (i.e., growth/fixed mindset; Cury et al., 2006; Dweck, 1999; Dweck & Leggett, 1988; Elliot, 1999). Extant meta-analyses (e.g., Huang, 2011, 2012, 2016; Hulleman et al., 2010; Lochbaum et al., 2016; Rawsthorne & Elliot, 1999; Richardson et

al., 2012; Senko & Dawson, 2017; Van Yperen et al. 2014; Wirthwein et al., 2013) have demonstrated that MAP goals predict a positive, adaptive set of affective, cognitive, and behavioral processes and outcomes. These include task-specific motivational outcomes (e.g., self-efficacy, interest, value), achievement-related outcomes (e.g., performance, engagement, aspirations), adaptive well-being outcomes (e.g., life satisfaction, positive affect, resilience), deep learning strategies, and adaptive help-seeking and coping.

The meta-analyses mentioned above have contributed nicely to our understanding of the relations of MAP goals with various antecedents and consequences. However, these meta-analyses do not allow us to evaluate the cross-national generalizability of MAP goal findings. In particular, they rely heavily on studies conducted in WEIRD (Western, educated, industrialized, rich, and democratic) countries (Zusho & Clayton, 2011), focus on bivariate correlations (not the unique predictive utility of MAP goals, controlling for antecedents), and cannot directly control individual-level background variables (Marsh et al., 2020). Students from different cultures adopt different types of goals (e.g., Dekker & Fischer; 2008; Zusho et al. 2005), and a goal may or may not have the same implications across different cultural contexts (King & McInerney, 2014; Zusho and Clayton, 2011; see "Importance of Testing Cross-Cultural Generalizability" section below for further discussion). Therefore, it is crucial to seek an answer to the questions: "Are there universal motivational sources that lead to MAP goal adoption, and are there universal links between MAP goals and optimal forms of student academic and life outcomes?". Evaluating cross-cultural generalizability promises to advance our understanding of achievement goal theory. It has practical implications regarding the benefits of MAP goal pursuit in daily life and directions for educational intervention in a global context. The present study aims to overcome the aforementioned shortcomings of prior meta-analytic research by testing the generalizability of the relations of MAP goals with various

antecedents and consequences. We utilized nationally representative samples from 77 countries/regions with data from 595,444 15-year-old adolescents.

MAP Goals and Four Antecedents

This study focused on four antecedents of MAP goals: workmastery, competitiveness, fear of failure, and fixed mindset, which have been well-documented in the literature (Figure 1). Traditionally, goal theorists have conceptualized goals as midlevel constructs, structurally situated between dispositional motives and specific actions (e.g., Cattell, 1957; McClelland, 1951). The hierarchical model of achievement goals integrates two competence-relevant motives – the need for achievement and the need to avoid failure (i.e., fear of failure) – and achievement goals (Elliot & Church, 1997). In the model, achievement goals are viewed as both manifestations of motives and as predictors of achievement-relevant outcomes. The need for achievement includes two major components: workmastery (the desire to work hard and the preference for difficult, challenging tasks) and competitiveness (the enjoyment of interpersonal competition; Spence & Helmreich, 1983). Workmastery, in particular, is posited to have a positive link to MAP goal adoption (Elliot & McGregor, 2001; Harackiewicz et al., 1997). Meta-analyses have supported such a proposition. For example, Baranik et al. (2010) found that workmastery correlated positively with MAP goals (r = .49).

Baranik et al. (2010) found that while students high in competitiveness tended to endorse MAP goals (r = .12), this pattern was much weaker than that for workmastery. Indeed, competitiveness is theoretically assumed to be closer to performance-based goals than to MAP goals, as competition activates social comparison processes and shifts attention to normative standards of evaluation (Elliot & McGregor, 2001; Harackiewicz et al., 1997). However, researchers have argued that social comparison should not be restricted to competitive self-evaluation concerns; comparative standards can be used for self-improvement purposes when guided by mastery goals (Bandura, 1977; Butler, 1989). Experimental studies have found that

students use social comparison standards under induced MAP goal conditions (Bulter, 1989). Survey research (e.g., Régner et al., 2007) has further shown that MAP goals are related to social comparison orientation even after controlling for performance-based goals. Thus, we expect competitiveness to be slightly and positively associated with MAP goals.

We posit that MAP goals are unrelated to the avoidance motive, fear of failure (the dispositional tendency to avoid failure). This relation has been observed in previous empirical studies (Conroy & Elliot, 2004; Conroy et al., 2003; Zusho et al., 2005). Another important antecedent of MAP goals is an individual's implicit theory about the malleability of ability (Dweck & Leggett, 1988; Shih, 2021). We posit that people who believe that intelligence is relatively malleable (i.e., growth mindset) exhibit a more mastery-oriented pattern that includes adopting MAP goals; the reverse is true for those believing that intelligence is relatively fixed (i.e., fixed mindset; Dweck, 1986). A meta-analysis by Payne et al. (2007) revealed a positive but small correlation between MAP goals and growth mindset (r = .10). In the present study, we systematically evaluate how the four antecedents - restricted to the hierarchical model of achievement goals (Elliot & Church, 1997) and implicit theories of intelligence (Dweck, 1999; Elliot, 1999) - contribute to the adoption of MAP goals across different cultures. However, we note that many other antecedents, both dispositional/distal (e.g., Big-Five personality traits) and contextual/proximal (e.g., peer relationships), were not included in the PISA data collection and, therefore, not included in our study.

MAP Goals and Their Consequences

As mentioned above, MAP goals are linked to a host of desired processes and outcomes. In the present study, we build on the existing research base (Baranik et al., 2010; Kaplan & Maehr, 1999; Moller & Elliot, 2006; Payne et al., 2007) and focus on three different sets of consequences: Task-specific motivational outcomes, achievement-relevant outcomes, and well-being outcomes (see Figure 1). In terms of task-specific outcomes, we posit that MAP

goals direct attention to the achievement activity itself and increase appraisals of task controllability and self-efficacy. This, in turn, promotes task-specific motivational beliefs, such as perceived competence and the subjective value of the task (Harackiewicz et al., 1997; Pekrun et al., 2006). Meta-analyses have shown that MAP goals are associated with task-specific perceived competence (Huang, 2016; Lochbaum et al., 2016) and interest (Hulleman et al., 2010). While many studies have examined the relation of MAP goals with positive motivational outcomes, the relation between MAP goals and adverse motivational outcomes (e.g., perceived task difficulty) has rarely been investigated (Horvath et al., 2006).

In relation to achievement-relevant outcomes, MAP goals focus on the attainment of task-focused standards (meeting vs. not meeting a task requirement) and intrapersonal standards (i.e., progressing vs. not progressing over time), which we posit to promote adaptive achievement-relevant outcomes such as fully engaging in learning activities (Meece et al., 2006; Senko et al., 2011; Wolters, 2004) and long-term educational and occupational aspirations (Tuominen-Soini et al., 2008). Research has shown that MAP goals also negatively predict maladaptive achievement-relevant outcomes, such as dropout behavior (Lochbaum et al., 2016; Sommet & Elliot, 2016). While meta-analyses have found that MAP goals are positively associated with academic performance, the overall effect sizes were small, between .100 to .200 (e.g., r = 10 in Huang, 2012; r = 11 in Hulleman et al., 2010; r = 14 in Van Yperen et al. 2014; r = 13 in Wirthwein et al., 2013).

Lastly, in terms of well-being outcomes, MAP goals are posited to influence a wide range of actions, thoughts, and affects that are closely related to subjective well-being (Dweck, 1986; Elliot & Hulleman, 1997; Kaplan & Maehr, 1999). Dykman (1998) argued that individuals who pursue MAP goals are more resilient to failure, resistant to depression, optimistic, and feel more positive affect in learning activities. This is because such individuals are focused on growth, learning, and improvement. It is reasonable to assume that, in the long

term, such foci would influence students' well-being more generally, beyond the situational affect in a particular classroom (Kaplan & Maehr, 1999). Indeed, research shows that students who endorse MAP goals are more likely to feel satisfied with their life (Diseth et al., 2012; Diseth & Samdal, 2014), experience positive affect (King & McInerney, 2014; Tuominen-Soini et al., 2008), and be persistent and resilient in their life (Sideridis & Kaplan, 2011; Vitali et al., 2015). In addition to general subjective well-being, some researchers have narrowed their emphasis to subjective well-being in the school context. For example, Holzer et al. (2022) employed a large sample of Austrian adolescents and found that MAP goals were positively related to various school-related well-being variables, such as school connectedness, optimism and happiness at school, and engagement and perseverance in school tasks (see also Anderman & Anderman, 1999; Lazarides & Raufelder, 2017; Tuominen-Soini et al., 2012; Wolters, 2004). A growing number of studies have investigated links from MAP goals to both general and school-specific measures of subjective well-being. However, relatively few reviews have provided a comprehensive summary of the pattern of results across different countries. Previous achievement goal meta-analyses on student subjective well-being largely focused on task- or course-specific emotions, such as anxiety and positive and negative affect (Huang, 2011; Senko & Dawson, 2017). The present study seeks to fill this research gap by examining how MAP goals are related to both general and school-related well-being outcomes in a cross-cultural context.

Cross-Cultural Research on MAP Goals

Importance of Testing Cross-Cultural Generalizability

Cross-cultural comparisons allow researchers to test the external validity and generalizability of their measures, theories, and models (Kitayama & Cohen, 2010). To the extent that a strong theoretical model generalizes well to heterogeneous samples drawn from diverse countries, there is strong support for the external validity and robustness of the

interpretations based on the theory (Marsh et al., 2021). Testing the relations between MAP goals and their antecedents and consequences in a cross-cultural context is essential (Maehr, 2008). Previous research has shown that students from different cultures tend to adopt different types of goals. For instance, Dekker and Fischer (2008) analyzed data from students from 13 societies. They found that students from more socioeconomically developed countries (measured by the Human development index [HDI]) were more likely to adopt MAP goals. Dekker and Fischer (2008) explained that in developed countries, where basic survival needs are met, students are more free to choose and engage with mastery- and task-based goals. Students in such countries often consider mastery- and task-based foci as intrinsic goals in and of themselves; they feel free to tackle challenging tasks that may result in occasional failures, as these failures generally have smaller negative influences on their social status and material and social well-being than their counterparts from less developed countries. Thus, students from developed countries tend to develop more positive approaches to achievement situations, leading to high mastery goals. Relatedly, a quantitative review in competitive sport found that people from individualistic countries tended to endorse MAP goals more than those from collectivistic countries (Lochbaum et al., 2016).

In addition, Zusho et al. (2005) found mean-level differences in achievement goal adoption between Asian-American and Anglo-American college students. However, the pattern of relations between antecedents, goals, and consequences was similar for these two ethnic groups (see King et al., 2017 for similar findings based on nine societies). Nevertheless, the cross-cultural variability of MAP goal endorsement, as well as of associations between MAP goals and their antecedents and consequences, have not been examined systematically across a broad range of countries. We examine this issue in the present study.

Major Issues in Previous Cross-Cultural Research on MAP Goals

Previous large-scale cross-cultural research on MAP goals has relied on traditional meta-analytic approaches and cross-cultural comparisons in single studies. These meta-analyses, despite their many strengths, have important limitations. First, meta-analyses usually suffer from a reliance on samples from WEIRD countries (Henrich et al., 2010). For example, although Hulleman et al. (2010) found that the nationality of the sample was the most consistent moderator of achievement goal correlations with performance outcomes, only 15% of the studies in their meta-analysis were outside of the U.S., Canada, or Europe. In a subsequent meta-analysis on the same topic (i.e., achievement goals and performance), Huang's (2012) data only included 5%-8% of samples from outside the U.S./Canada or Europe. In a more recent meta-analysis on achievement goals and self-efficacy (Huang, 2016), these numbers remained approximately the same. As such, most achievement goal meta-analyses have considered country as a moderator, but have treated it as a dichotomous variable (the U.S. vs. other; Murayama & Elliot, 2012) or a trichotomous variable (the U.S. vs. European vs. other countries; e.g., Van Yperen et al., 2015). Although the low representation of non-WEIRD countries has been widely recognized for more than a decade, Nielsen et al. (2017) concluded that there had been little meaningful change in resolving the problem. In adolescence research, the implications are, perhaps, even more important, as there are substantial differences in school systems in different countries that make cross-cultural generalizability even more tenuous.

Second, according to achievement goal theory (Elliot, 1999), MAP goals are posited to uniquely predict their consequences, over and beyond what is explained by the antecedents of MAP goals. However, existing meta-analyses on achievement goals have focused mainly on bivariate correlations between goals and their consequences, which precludes testing the unique predictive ability of MAP goals above and beyond their antecedents. There are two

exceptions. Murayama and Elliot (2012) used meta-analytic structural equation modeling and tested how performance goals uniquely predicted performance outcomes controlling for their antecedent (i.e., competitiveness). In their study, however, MAP goals were not considered. The other exception is that Payne et al. (2007) examined the incremental validity of MAP goals in predicting job performance over and above cognitive ability and the Big Five traits. They found that MAP goals significantly and positively predicted job performance over and above these other variables. Nonetheless, the key antecedents, such as achievement motives and implicit theories, were not included in their analysis. Moreover, none of the previous meta-analyses on achievement goals have considered other individual-level background variables (e.g., family socioeconomic status, gender) that were assumed to simultaneously predict the consequences of achievement goals (Elliot, 1999). As such, the cross-cultural generalizability of theoretically-based associations of MAP goals has not been tested appropriately and requires further scrutiny (Elliot & Thrash, 2001).

Finally, meta-analyses across research areas and disciplines show that extant bodies of empirical work often suffer from publication bias and related problems (e.g., *p*-hacking) that produce interpretational ambiguity (Franco et al., 2014). There are numerous approaches to addressing these problems. However, all have strengths and weaknesses and do not yield definitive conclusions about a body of work when these problems are present (see Nelson et al., 2018 for more discussion). By employing large representative samples, the present study overcomes these problems. It enables the estimation of effect sizes of hypothesized associations for MAP goals that are cross-culturally valid and robust.

Scholars tend to conduct cross-cultural comparisons in single studies (e.g., Elliot et al., 2001; King et al., 2017; Litalien et al., 2017; Zusho et al., 2005) to scrutinize the cross-cultural generalizability of theories. However, these studies often suffer from many of the same limitations of extant meta-analyses, such as small sample sizes of countries, no nationally

representative samples, etc. These drawbacks make the test of cross-cultural generalizability tenuous at best. The PISA dataset provides nationally representative examples, validated measures, a consistent research design across countries, and rich individual-level data. This provides a potentially stronger basis for evaluating the cross-cultural generalizability of theoretical predictions than standard meta-analyses or traditional cross-cultural studies.

The Present Investigation

Achievement motivation is a ubiquitous feature of daily life. The achievement goal approach to achievement motivation is one of the most prominent theories of motivation in psychological research. MAP goals are consistently posited as the most optimal, beneficial type of achievement goal, and this has garnered considerable research attention over the past 35 years. The extant research has provided some empirical and meta-analytic support for these proposals by examining the associations between MAP goals and their antecedents and consequences. However, the cross-cultural generalizability of these theoretical associations remains unclear.

A robust empirical test of the cross-cultural generalizability of posited associations regarding MAP goals requires data with three critical features: (i) validated measures; (ii) a cross-national design with comprehensive global coverage and sufficient cultural variation; and (iii) representative samples of populations within each country. The data from PISA meet all three criteria. In particular, the 2018 cohort was the first PISA data collection to measure student MAP goals (no other achievement goals were assessed). Thus, the present study is unique. It provides a potentially more robust test of the cross-cultural generalizability of theoretical associations of MAP goals with various theoretically-proposed antecedents and consequences than previous meta-analyses and cross-cultural studies (see Figure 1 for the hypothesized model).

The present study is grounded in the hierarchical model of achievement goals (Elliot & Church, 1997) and uses a broad-to-specific approach to link MAP goals with their antecedents and consequences. We first investigate how broad dispositional antecedents (i.e., workmastery, competitiveness, fear of failure, and fixed mindset) predict domain-general MAP goals in school learning. The four antecedents have received extensive theoretical and empirical support (Burnette et al., 2013; Dweck, 1999; Elliot, 1999; Elliot & Hulleman, 2017). Next, we examine the associations between MAP goals and three sets of their consequences (i.e., task-specific [domain-specific] motivational, achievement-related, and well-being outcomes), controlling for the four proposed antecedents and individual-level background covariates. Following this logic, we explicitly make assumptions about the directionality of the paths in the hypothesized model (Figure 1). However, the correlational design of PISA data does not allow a stringent test of causal directionality among the antecedents, MAP goals, and their consequences. Indeed, some outcomes (e.g., performance, engagement) can be a precursor of MAP goals, a consequence of MAP goals, or reciprocally related to MAP goals (Holzer et al., 2022; Scherrer et al., 2020; Seaton et al., 2014; Senko & Harackiewicz, 2005). However, this study focuses on the strength of associations between MAP goals and three sets of outcome variables rather than causal directionality among these variables.

Our main research questions are as follows:

RQ 1: How are the antecedents (i.e., workmastery, competitiveness, fear of failure, and fixed mindset) associated with MAP goals?

RQ 2: How are MAP goals associated with task-specific motivational, achievement-related, and well-being outcomes?

RQ 3: How are MAP goals and their antecedents jointly associated with the outcome variables?

RQ 4: Is there a country-level mean difference in MAP goal adoption (RQ4a)? Do the hypothesized associations between MAP goals and their antecedents and consequences generalize across cultures (RQ4b)?

In RQ1, we hypothesize that: workmastery and competitiveness will be positively related to MAP goals (Baranik et al., 2010; Elliot & McGregor, 2001; Harackiewicz et al., 1997); fixed mindset will be negatively related to MAP goals (Dweck, 1986; Payne et al., 2007); and the relation between MAP goals and fear of failure will be weak or non-significant (e.g., Conroy & Elliot, 2004; Harackiewicz et al., 1997). The predictions for RQ 2 are shown in Figure 1.

For RQ3, we expect that MAP goals will make a significant, unique contribution to predicting the outcome variables over and above the antecedents (Elliot & Church, 1997; Elliot & McGregor, 2001; Harackiewicz et al., 1997). We leave RQ4 as an open research question to examine whether the hypothesized associations will generalize across the countries/regions. Given that students are exposed to substantially different cultural and educational contexts across countries/regions, analyzing the data in relation to this question provides a strong test of the generalizability of findings.

Methods

Participants

PISA is a large-scale international assessment measuring 15-year-old adolescents' mathematics, reading, and science performance. Besides the achievement tests, adolescents were administered a survey to measure various personal characteristics, beliefs, and experiences. PISA takes place every three years and employs a two-stage sampling approach to ensure that the samples are nationally representative for each participating country (OECD, 2019a). The current study used data from the most recent PISA cycle – PISA2018, in which MAP goals were first included in the PISA student questionnaire. A total of 612,004

adolescents from 80 countries/regions participated in the PISA2018 study. In our preliminary data analysis, we detected a measurement issue of MAP goals for Vietnam where a reversed order of response scale was employed[1] (see Supplement 1 for details). Given that MAP goals were the major focus of this study and a different order of response scales may confuse students, complicate the cross-cultural interpretation, and affect the commensurability of ratings across respondents (Böckenholt, 2017; Van Vaerenbergh & Thomas, 2013), we dropped Vietnam's data in this cross-cultural study. Macedonia and Lebanon were also excluded from this study because they did not collect students' data on MAP goals. As a result, 595,444 adolescents from 77 countries/regions were included in this study. In the research, we performed no manipulations and reported results for all variables that were analyzed.

Measures

MAP Goals

The MAP goal measure used in this study focused on the general academic domain rather than any specific school subject. It is grounded in the Achievement Goal Questionnaire-Revised (Elliot & Murayama, 2008) that focuses directly on goal-relevant content (i.e., "My goal is to learn as much as possible," "My goal is to completely master the material presented in my classes," and "My goal is to understand the content of my classes as thoroughly as possible"). All items were answered on a 1 (*not at all true for me*) to 5 (*extremely true for me*) scale.

Antecedents

The measure of antecedents included three achievement motives – workmastery, competitiveness, and fear of failure – and fixed mindset. Workmastery (four items, e.g., "Part of the enjoyment I get from doing things is when I improve on my past performance") and

[1] The response scale of the MAP goals for Vietnam was ordered from 1 (*extremely true for me*) to 5 (*not at all true for me*) scale, which was opposite to the PISA original response scale (i.e., from 1 [*not at all true for me*] to 5 [*extremely true for me*]). The reversed order of response scales only applied to the items of the MAP goals in Vietnam's data, and this issue only existed for Vietnam but not the other countries.

competitiveness (three items, e.g., "It is important for me to perform better than other people on a task") were derived from the Work and Family Orientation Scale (Helmreich & Spence, 1978), which was used to assess components of conscious achievement motivation. Fear of failure was measured by three items (e.g., "When I am failing, I worry about what others think of me"), derived from the Performance Failure Appraisal Inventory (Conroy et al., 2002). Fixed mindset was assessed by a single item (, i.e., "Your intelligence is something about you that you can't change very much"), derived from Dweck's (1999) Implicit Theories of Intelligence Questionnaire. The measures of the four antecedents were answered on a scale from 1 (*strongly disagree*) to 4 (*strongly agree*).

Task-Specific Motivational Outcomes

The task-specific motivational outcome variables included reading enjoyment, perceived reading competence, perceived reading difficulty, and perceived PISA test difficulty. We note that in each cycle of PISA data collection, PISA chooses one subject domain as a primary focus (i.e., reading in PISA2018), even though PISA assesses students' academic performance in reading, math, and science in every cycle. Thus, PISA2018 only included reading-related motivational outcomes, and a few other domain-general outcomes (e.g., educational and career aspirations, subjective well-being) (see further discussion in the "Strength, Limitations, and Directions for Future Research" section for details).

Reading enjoyment was assessed by five items (e.g., "Reading is one of my favorite hobbies"). This scale was created by the PISA research group and has been used in multiple cycles of PISA since 2000 (OECD, 2002). Three items were used to measure perceived reading competence (e.g., "I am a good reader") and perceived reading difficulty (e.g., "I have always had difficulty with reading"), respectively. These items were derived from the Reading Self-Concept Scale (Champan & Tunmer, 1995). For perceived PISA test difficulty, three items were used to assess the level of difficulty experienced by the students specifically in the PISA

reading test (e.g., “There were many words I could not understand”), developed by the PISA research group (OECD, 2019a). All of the task-specific motivation outcomes variables were answered on a scale from 1 (*strongly disagree*) to 4 (*strongly agree*) scale.

Achievement-Related Outcomes

Six achievement-related outcomes were included in the present study: PISA performance, education aspirations, career aspirations, lateness, truancy, and reading engagement.

The primary goal of PISA is to compare the skills and knowledge of 15-year-old students across countries in the core domain of mathematics, science, and reading. PISA aims to provide a broad content coverage of each of the domains through a large number of items. But at the same time, PISA tries to keep the test forms relatively short to minimize the testing burden on students. Thus, PISA organized items into different test forms linked to each other. Each student received a relatively small number of items in a two-hour testing period. The plausible-value methodology uses the latent regressions models. These incorporate the Item Response Theory scaling of the student’s cognitive data from multiple domains and the students’ background data specified as covariates (e.g., gender, academic/non-academic activities), to impute 10 proficiency values (plausible values, PVs) for each student instead of a single point estimate in each domain (Lechner et al., 2021). PVs can be thought of as a mechanism reflecting that a given student’s true achievement value is unknown. In this sense, the PVs reflect the distribution of true scores expected for a particular student. PISA recommends that these PVs are used to appropriately account for measurement errors in the relation between (sub)population proficiency distributions and characteristics in the background data (see Chapter 9 of PISA 2018 Technical Report [OECD, 2019b] for more details).

For each of the 10 sets of PVs (one set consisted of one PV for each subject domain), we averaged performance scores on the three subjects (i.e., math, reading, and science), as the three performance scores were highly correlated (r = .83 to .95). This produced 10 PVs for PISA performance (e.g., PV1 for PISA performance = (PV1math + PV1reading + PV1science) / 3). Then, each PV of PISA performance was assigned to one imputed dataset in the multiple imputation (see below). In the supplementary analyses, we also examined the relation between academic performance in different domains and MAP goals separately, and the pattern of results was highly similar across different subject domains (see "Supplemental Analysis" section for details).

Educational aspiration was a dichotomous variable assessing whether students expected to complete tertiary education (i.e., ISCED level 5A and/or 6; OECD, 2019c) or not (0 = not expected to complete tertiary education; 1 = expected to complete tertiary education). For career aspirations, students were asked, "What kind of job do you expect to have when you are about 30 years old?" We categorized students' answers into low-skilled, medium-skilled, and high-skilled, according to the one-digit ISCO-08 classification of occupations. Low-skilled jobs correspond to ISCO codes 9 (elementary occupations), medium-skilled jobs to codes 4 to 8 (e.g., clerical support workers and skilled agriculturists), and high-skilled jobs to codes 1 to 3 (e.g., professions and managers; OECD, 2019c).

Lateness and truancy measures assessed whether students engaged in tardiness or absenteeism during the two weeks before completing the questionnaire. Both variables were coded as dummy variables (0 = no lateness/truancy behavior; 1 = having lateness/truancy behavior).

Reading engagement was assessed with a question asking students how much time they usually read for enjoyment. Students chose one of five options: "I do not read for enjoyment,"

"30 minutes or less a day," "More than 30 minutes to less than 60 minutes a day," "1 to 2 hours a day," and "more than 2 hours a day".

Well-being Outcomes

We followed OECD (2013) in defining subjective well-being as "good mental states, including all of the various evaluations, positive and negative, that people make of their lives and the affective reactions of people to their experiences" (p. 10). Accordingly, subjective well-being was considered a multidimensional construct, including life evaluation (i.e., life satisfaction), affect (i.e., positive affect[2]), eudaemonia (i.e., meaning in life), and resilience (OECD, 2019a). Besides general well-being, we also considered school-specific well-being factors — a sense of belonging and attitudes towards school.

One item was used to measure students' overall life satisfaction ("Overall, how satisfied are you with your life as a whole these days.") on an 11-point scale ranging from 0 (not at all satisfied) to 10 (completely satisfied). This single-item measure of life satisfaction has been widely used in large-scale cross-cultural studies (e.g., the World Values Survey, Eurobarometer, the European Quality of Life Survey, the European Values Study), and in a wide spectrum of well-being research (Diener et al., 2018). Positive affect was assessed according to the frequency with which students' felt happy, joyful, and cheerful in their daily lives on a 1 (never) to 4 (always) scale, based on Watson et al. (1988)'s Positive and Negative Affect Schedule (PANAS). Three items were used to measure students' sense of meaning in life (e.g., "I have a clear sense of what gives meaning to my life"), derived from the Meaning in Life Questionnaire (Steger et al., 2006). Five items were used to measure resilience when individuals face setbacks (e.g., "My belief in myself gets me through hard times"), derived

[2] Note that PISA2018 also assessed students' negative feelings in their lives in terms of scared, miserable, afraid and sad. However, OECD (2019c) pointed out that there was low internal consistency in response to these negative affect items across PISA-participating countries/regions and suggested that it is not suitable for cross-cultural comparison research (see p. 176 for more detail). Hence, we decided not to include negative affect in this study.

from Wagnild's (2011) resilience scale. Items from both scales were to be rated on a scale from 1 (*strongly agree*) to 4 (*strongly disagree*).

With respect to school-related well-being variables, six items (e.g., "I feel like I belong at school") were used to measure sense of belonging, and three items (e.g., "Trying hard at school is important") were employed to assess attitudes toward school. These two scales were developed by the PISA research group and have been used in multiple cycles of PISA (OECD, 2002, 2014). Items from both scales were to be rated on a scale from 1 (*strongly agree*) to 4 (*strongly disagree*).

Covariates

Individual-Level Covariates

Three individual-level covariates were included in the analyses: Student gender, grade level, and family socioeconomic status (SES). Gender was coded as 0 (females) or 1 (male). PISA2018 constructed a variable – student school grade level – that they include in the PISA dataset. This variable defined students' academic year in K-12 educational programs. Given that the PISA only sampled 15-year-old students, the majority of the participants were from Grade 10 (55.2%) and Grade 9 (31.9%). But the means of school grade levels varied across different countries (ranging from 8.80 [Estonia] to 11.13 [Great Britain]). SES is based on a combination of parents' highest education, parents' highest occupation, and home possessions, which is also provided by the PISA dataset (see OECD, 2019b for details).

School-Level Covariates

Several school- and teacher-related factors were controlled at the school-level: school type, school resources, school climate, teacher qualification, student-teacher ratio. School type was a trichotomous variable (private independent, private government-dependent, and public. Two dummy variables were constructed to represent school type in the analysis: (1) private independent vs. others (0 = private government-dependent or public school; 1 = private

independent school) and (2) private government-dependent vs. others (0 = private independent or public school; 1 = private government-dependent school).

School resources were measured with two scales: staff shortage and shortage of educational material, both of which were reported by school principals in four-point Likert scales (“not at all”, “very little”, to some extent”, and “a lot”). Each four items were used to assess staff shortage (e.g., “inadequate or poorly qualified teaching staff”) and shortage of educational material (e.g., “inadequate or poor quality physical infrastructure [e.g., building, grounds, heating/cooling, lighting and acoustic systems]”), respectively.

PISA 2018 assessed school climate using the school principal’s perceptions of student and teacher behavior that might hinder instruction at school. We included two scales to measure school climate: student-related school climate and teacher-related school climate. The former focused on the safety domain of school climate, including students’ order and discipline and physical/social safety; The latter targeted teachers’ teaching and learning in the academic domain of school climate (Wang & Degol, 2016). Six and five items were employed to measure student-related school climate (e.g., “students intimidating or bullying other students”) and teacher-related school climate (e.g., “teachers not being well prepared for classes”), respectively. Both factors were reported by school principals on four-point Likert scales from 1 (not at all) to 4 (a lot).

Teacher qualification was measured by the proportion of fully certified teachers, which was obtained by dividing the No. of fully certified teachers by the total No. of teachers in schools. Student-teacher ratio was computed by diving the No. of enrolled students by the total No. of teachers.

National-Level Moderators

Previous studies found that country-level socioeconomic development and cultural characteristics might be associated with country-level MAP goal endorsement and might

moderate the pattern of relations between antecedents, goals, and consequences (e.g., Dekker & Fischer, 2008; Zusho et al., 2005). Therefore, the HDI from Global Development Reports (http://hdr.undp.org/en/data) was included as a predictor of MAP goals and a moderator variable for the hypothesized associations. HDI represents socioeconomic development at a national level, which is calculated by considering the quality of national living conditions, including health, financial status, life expectancy, and education (United Nations Development Programme, 2019).

We also included national-level measures that capture cultural characteristics based on Hofstede's cultural dimensions (Hofstede, 2001). These were power distance (i.e., the degree to which the organization and institution members with less power accept and expect that power is unequally distributed), individualism versus collectivism, uncertainty avoidance (i.e., the degree to which individuals in a society feel comfortable in uncertain or unstructured situations), masculinity versus femininity, and long-term versus short-term orientation. *Long-term orientation* refers to the degree of emphasis on virtues (especially perseverance and thrift) related to future rewards, while *short-term orientation* refers to the degree of emphasis on virtues (especially a respect for tradition, preservation of face, and fulfilling social obligations) related to the past and present. We retrieved the cultural value data from Hofstede's cultural database (https://geerthofstede.com/research-and-vsm/dimension-data-matrix/). Hofstede's (2001) cultural dimensions are widely used to represent national culture (see Taras et al., 2010 for a meta-analytical review). These cultural dimensions have also been extensively employed as moderators to examine the cross-cultural generalizability of psychological theories (e.g., Guo et al, 2022; Marsh et al., 2021; Seaton et al., 2009).

It is worth noting that national indices of HDI and culture characteristics were available for most, but not all, of PISA2018 participating countries/regions. For analyses involving national-level variables, we included as many PISA2018 participating countries/regions as

possible into the analysis if their national variables of interest were available (e.g., data on HDI were not available for Chinese Taipei, which was, therefore, excluded from analyses involving HDI). For mainland China, only four (B-S-J-Z, i.e., Beijing, Shanghai, Jiangsu, and Zhejiang) of 31 provinces participated in the PISA2018 survey. Given considerable economic, cultural, developmental, and educational differences between provinces within mainland China (e.g., Chua et al., 2019), we excluded China B-S-J-Z from the national-level analysis.

Measurement Equivalence

To conduct cross-cultural comparisons, a prerequisite is to guarantee that the focal scales measure the same constructs in different cultural contexts (Muis, 1993; van de Vijver & Tanzer, 2004). PISA2018 first adapted rigorous procedures in questionnaire development: (1) a review of the developed scales by representatives of countries/regions to obtain in-depth feedback; (2) pre-tests in English and French; (3) a translatability assessment of the questionnaire by linguistic experts through translating into several representative languages including Korean, a Slavic language, German, French, and Modern Standard Arabic; (4) adaptation negotiation and verification of the questionnaire by the national PISA centers in each society; (5) translation of the questionnaire into the local language(s) by each country/region; and (6) a final check of the translated questionnaire for each society by international contractors (see OECD, 2019b for details).

Furthermore, it is known from cross-cultural research that response biases, such as social desirability, extreme responding, and acquiescence, can distort cross-cultural comparability (Fischer, 2004; King & McInerney, 2014; Smith, 2004). Thus, assessing and ensuring measurement equivalence of constructs across cultures is critical prior to conducting cross-cultural comparisons (King & McInerney, 2014; van de Vijver & Tanzer, 2004). PISA2018 adopted an innovative item response theory (IRT) approach to ensure cross-cultural comparability through the invariance test of item parameters across participating countries

(OECD, 2019b). Specifically, for each scale in each country, the internal consistency was calculated; for each item and scale, analyses on the invariance of item parameters across countries and languages within a country were conducted (OECD, 2019b). In cases when a country administered the questions in two or more languages, a country-language group was defined for each language. As such, the measurement invariance was evaluated across groups that were based on country-by-language combinations. All scales measured by multiple items detailed above showed adequate to strong internal consistency (Cronbach's alphas ranged from .716 to .863, see Table S1). We used the weighted likelihood estimate (WLE) summary scores of these latent scales provided by the PISA2018 organizers in this study. These WLE scores have demonstrated validity and invariance across countries and languages and are adequate for cross-national comparison of the proposed relations and mean differences of MAP goals (see OECD, 2019b, for more details).

Data Analysis

Multilevel models were used in the analyses with the HLM statistical package (Version 7.0) to accommodate the nested structure of the data: students (L1) nested within schools (L2), and schools nested within countries (L3). We used hierarchical linear models (HLMs) for continuous outcome variables (e.g., PISA performance) and multilevel probability linear models (MPLMs) for dichotomous outcome variables (e.g., truancy and lateness).

Three-level (student, school, and country) multilevel models were the primary type of analysis performed. The fixed effects included MAP goals, the four antecedents, and the covariates. Random effects included school-level and country-level residual variances of MAP goals and the four antecedents used to evaluate cross-cultural generalizability. Further, two-level (student and school) country-specific models were also built for each country to examine cross-cultural generalizability (see the “Result” section for details).

In the analysis, cases were weighted using PISA's weighting procedure to ensure that statistical inference considers the sampling process's uncertainty (OECD, 2019b) in both two- and three-level modeling analysis. Specifically, in the two-level models, the final student weights (W_FSTUWT) were normalized using the house weighting procedure to make the sum of the weights equal to the number of observations for each country. In the three-level models, we took a two-step weighting procedure suggested by the PISA Data Analysis Manual (OECD, 2009). First, the weights were normalized by using the house weighting procedure to make the sum of the weights across the countries equal to the number of cases in the databases. Second, we adopted the senate weighting procedure to make the sum of the weights per country constant and equal to the total number of cases divided by the number of countries (please see the annotated syntax of the weight transformation for three-level modeling in the PISA Data Analysis Manual, p. 219, OECD, 2009).

We used multiple imputation to handle missing data on the focal variables based on the entire sample of PISA2018. In addition to the variables used in the present study (i.e., four antecedents, MAP goals, 16 outcome variables, and three individual-level covariates), other demographic background variables (e.g., index of immigration status) were included to better model the missing data mechanism in the multiple imputation process. Ten datasets were imputed, aligned with the availability of 10 plausible values for student PISA performance. Each plausible value of PISA performance, as noted above, was assigned to one imputed dataset. We conducted all analyses for each imputed dataset separately and then combined the results using Rubin's (1987) method. We standardized scores ($M = 0$, $SD = 1$) for all student and country-level variables across the entire sample to facilitate interpretation in relation to a standardized effect-size metric. However, dichotomous variables were scored 0 or 1 to facilitate interpretation in relation to a traditional effect-size metric. The present study is based on the analysis of secondary data published by OECD; the data are freely available online

(https://www.oecd.org/pisa/data//). All the analyses codes and supplementary materials are available at https://osf.io/vry7s/?view_only=a3cde8b3bafd4f8783cba3edc0529035.

Results

Antecedents of MAP Goals

First, we used the full sample to evaluate the correlation between the four antecedents and MAP goals (see Table S1 in supplemental materials for the full correlation matrix). Workmastery (r = .426, SE = .001), competitiveness (r = .236, SE = .001), fear of failure (r = .056, SE = .001), and fixed mindset (r = .009, SE = .001) were all positively related to MAP goals. Next, to examine joint predictive utility, we ran HLMs with four antecedents that simultaneously predicted MAP goals. Results showed that workmastery was a strong positive predictor (β = .373, SE = .007), followed by competitiveness (β = .079, SE = .007). The predicted effect of fear of failure was weak but still statistically significant due to the large sample size (β = .036, SE = .003). Fixed mindset was not a statistically significant predictor (β = -.005, SE = .006). The pattern of results remained highly similar after controlling individual-level covariates (i.e., student gender, grade level, and SES; see "Full Model" in Table 1). To summarize, the results were consistent with our hypotheses for workmastery, competitiveness, and fear of failure, but not with our hypothesis for fixed mindset.

Consequences of MAP Goals

Association Between MAP Goals and Task-Specific Motivational Outcomes

We applied a two-step approach to examine the associations between MAP goals and the outcome variables. First, we regressed each outcome variable onto MAP goals. Individual-level covariates were then added to the model as additional predictors. As shown in Table S2, MAP goals were positively associated with reading enjoyment (β = .196, SE = .007) and perceived reading competence (β = .235, SE = .008). The associations of MAP goals with perceived difficulty in reading and perceived difficulty of the PISA test were negative and

descriptively weaker (β = -.081, *SE* = .006; β = -.083, *SE* = .007, respectively). The effect sizes were reduced only slightly by controlling individual-level covariates (|Δ|< .03, see Table 2 & Figure 2).

Association Between MAP Goals and Achievement-Related Outcomes

The association between MAP goals and achievement-related outcomes without individual-level covariates was shown in Table S3. Among the continuous outcome variables, the relation between MAP goals and PISA performance was descriptively small (β = .069, *SE* = .008); MAP goals had positive and similar-sized associations with career aspirations (β = .116, *SE* = .006) and reading engagement (β = .150, *SE* = .007). Given that educational aspirations, truancy, and lateness were dichotomous variables, we used multilevel probability linear models to model their relations with MAP goals. Results showed that MAP goals positively predicted educational aspirations (β = .087, *SE* = .005), indicating that a 1 SD increase in MAP goals would be associated with a 8.7% increase in the probability of aspiring to complete university study. MAP goals were a weak negative predictor of truancy (β = -.065, *SE* = .003) and lateness (β = -.055, *SE* = .002), indicating that a 1 SD increase in MAP goals would be associated with a 6.5% and 5.5% decrease in the probability of being truant and late, respectively. When controlling the individual-level covariates, the pattern of results remained highly similar (|Δ| < .03; Table 3 & Figure 2).

Association Between MAP Goals and Well-Being Outcomes

As shown in Table S4, MAP goals were strongly and positively associated with the four domain-general well-being outcomes: Life satisfaction (β = .203, *SE* = .006), positive affect (β = .245, *SE* = .007), meaning in life (β = .311, *SE* = .006), and resilience (β = .376, *SE* = .009) . For school-specific well-being outcomes, MAP goals were positively associated with sense of belonging (β = .186, *SE* = .005) and attitudes toward school (β = .299, *SE* = .008).

Again, the pattern of results remained similar in size after controlling for student background covariates ($|\Delta| < .03$; Table 4 & Figure 2).

In summary, among the three sets of outcome variables, MAP goals were, descriptively, most strongly associated with well-being outcomes. MAP goals were positively associated with adaptive motivational outcomes and negatively associated with maladaptive motivational outcomes. The pattern of results was relatively weak for the associations between MAP goals and achievement-related outcomes. Overall, these findings were well-aligned with our expectations (RQ2, Figure 1).

Antecedents and MAP Goals as Joint Predictors of Consequences

We ran a series of additional models that included the four antecedent variables and MAP goals as joint predictors of outcomes, controlling for individual-level covariates (see Figure 3 and Tables S5-S7). When controlling for the four antecedents, the predictive effects of MAP goals on the 16 outcome variables remained statistically significant. There were only two major differences in the effect sizes of MAP goals ($|\Delta| > .10$) when comparing the models without and with controlling the four antecedents. The effect of MAP goals on meaning in life and resilience was reduced (from .311 and .376 to .204 and .228, respectively), by further controlling the antecedents. In terms of the predictive power of the antecedents, workmastery were uniquely, significantly associated with all 16 outcome variables; 15 of 16 relations were significant for competitiveness; and 14 of 16 for fear of failure and fixed mindset. These results indicated that MAP goals and the antecedents accounted for unique variance of the consequences.

Supplemental Analysis

Comparing Effect Sizes of MAP Goals and the Four Antecedents on Outcome Variables

We conducted supplemental analyses to compare the effect sizes of MAP goals and the four antecedents on the outcome variables using the Delta method in R (R Core Team, 2013;

see Tables S8-S10). MAP goals were stronger predictors of positive motivational outcomes for task-specific motivational outcomes (i.e., reading enjoyment, perceived reading competence) than were the antecedents. In contrast, workmastery, fear of failure, and fixed mindset were stronger predictors of negative motivational outcomes (i.e., perceived reading difficulty and perceived PISA test difficulty). Although the relations between MAP goals and achievement-related outcomes were relatively weak, MAP goals were stronger predictors of achievement-related outcomes (except for PISA performance) than the antecedents. With regard to well-being outcomes, MAP goals were stronger predictors of the six outcome variables relative to the four antecedents. However, there were some exceptions. Fear of failure was a stronger predictor than MAP goals for life satisfaction and sense of belonging, and workmastery was a stronger predictor than MAP goals for meaning in life, resilience, and attitudes toward school. We note that these differences favoring the antecedents were relatively small ($|\Delta| < .09$). Overall, our findings consistently showed MAP goals to be a stronger predictor across 16 outcome variables than the antecedents, with only a few exceptions.

Sensitivity Analysis: Controlling for School- and Teacher-Related Factors

Given that schools and teachers are prominent stakeholders influencing student learning outcomes (Rivkin et al., 2015; Sammons et al., 1995), we conducted supplemental analyses to examine whether the relations between MAP goals and consequences hold after further controlling for school- and teacher-related factors. Specifically, we included school type (Lubienski et al., 2018), school resources (Murillo & Román, 2011), school climate (Kutsyuruba et al., 2015), teacher qualification (Qu & Becker, 2003), and student-teacher ratio (Ajani & Akinyele, 2014) in the analysis. The relations between MAP goals and all 16 outcome factors were nearly the same after further controlling for the school- and teacher-related factors: changes in effect sizes of MAP goals ($|\Delta\beta|$) were all less than .001 (see Tables

S11-S13 in supplemental materials for details). Given the situation, school-level covariates were not considered in our further analysis.

The Relations of MAP Goals to Domain-Specific Academic Performance

In the supplementary analyses, we also separately examined the relations of academic performance in math, reading, and science with MAP goals (see Tables S14-S17). The pattern of results was highly similar across different subject domains. For example, controlling for individual-level covariates, the effects of MAP goals on math, reading, and science achievement were .055 (*SE* = .006), .054 (*SE* = .007), and .051 (*SE* = .007), respectively (Table S15).

Cross-Cultural Generalizability of MAP Goal Relations

Variability of Country-Level Means of MAP Goals

Before examining the cross-cultural generalizability of our findings, we evaluated whether there were substantial country-level mean differences in MAP goal endorsement. To do so, we employed a meta-analytic approach. We used both I^2 (Higgins et al., 2003) and Q statistics (Cochran, 1954) to assess the variability of country-level MAP goal endorsement. Results showed that the I^2 was equal to 99.6% (exceeded 25% cut-off value, Higgins et al., 2003) and the Q statistic was statistically significant (Q statistic = 18189.66, $df = 76$, $p < .001$). This indicates substantial variability of country mean-level differences in MAP goals (see Figure S3). Next, we examined whether such variability could be explained by country-level measures, controlling for individual-level covariates. We regressed MAP goals on HDI and five dimensions of cultural characteristics (i.e., power distance, individualism versus collectivism, masculinity versus femininity, uncertainty avoidance, and long-term versus short-term orientation), as well as individual-level covariates in a multilevel model. We found that both uncertainty avoidance and long-term orientation negatively predicted MAP goals (β = -.065, *SE* = .019; β = -.063, *SE* = .024, respectively; see Table S18). This indicates that

students in societies with a higher degree of uncertainty avoidance and long-term orientation tend to be less likely to adopt MAP goals[3].

Cross-National Generalizability of Associations Between MAP Goals and Their Antecedents and Consequences

Subsequently, we evaluated the cross-national generalizability of our findings based on a hypothesized model using four different approaches. The first three approaches were based on three-level (student, school, and country) multilevel models: (1) the random variance components of MAP goals; (2) the standard deviations of country-to-country variations of MAP goals; and (3) the cross-level interactions between country-level moderators and MAP goals. Finally, we ran two-level (student and school) multilevel models for each country and compared country-specific effects of MAP goals with the solution of the three-level models on outcome variables across countries.

Three-Level Modeling approach. First, the random effect estimates in the multilevel models represent country-to-country variation in the fixed effects. Residual variance components of less than .01 are considered trivially small, given that the square root of a variance component of .01 translates into an estimated *SD* = .1 (Marsh et al., 2020). When predicting all three sets of outcomes, the random variance components of MAP goals were small (<.01; see Tables 2-4).

[3] Although the WLE scores provided by PISA2018 have been proven to be comparable for cross-cultural research (OECD, 2019b), we conducted supplemental analyses using raw scores of MAP goals to further preclude the possibility that the relations of uncertainty avoidance and long-term orientation with country-level MAP goal adoption is simply due to cultural differences in extreme responding (Heine et al., 2002). In order to control for the modesty bias prevalent in East Asian cultures, we followed Mullis et al. (2016)'s suggestions and collapsed the two response categories together at the extremes (i.e., combining "Extremely true of me" and "Very true of me" as well as combining "Not at all true of me" and "Slightly true of me", and used "Moderately true of me" as the third category) to produce new 3-point Likert scales. The benefit of collapsing the two response categories differing in degree but not in direction is the dampening of potential cultural bias in response styles. We repeated our analyses using the new 3-point Likert scales and found that the effects of country-level measures on MAP goals were highly similar.

Second, as suggested by Marsh (2016), if the standard deviation of country-to-country variation is less than half that of a fixed-effect estimate in support of an a priori prediction, there is good support for the generalizability of that prediction. The rationale behind this is that the direction of the effect will not change even at relatively extreme values (i.e., an individual's MAP goals that are two SDs away from the mean). For example, consider the results for the relations between MAP goals and well-being-related outcomes. For these relations (controlling for individual-level covariates), the fixed-effect estimates were large (βs > .18), coupled with the relatively small standard deviation of the country-to-country variation (i.e., the square root of the corresponding random variance component, SDs < .09). There is support for the generalizability of the a priori predictions in terms of the variance of effect sizes. Following this guideline, all models with fixed effects of MAP goals larger than .07 met the criteria.

Third, we evaluated cross-level interactions between MAP goals and the country-level measures, such as socioeconomic development status (i.e., HDI) and the five cultural characteristics. If practically significant interaction effects were identified, it would suggest that there are some meaningful cross-national heterogeneities that might be explained by cultural differences. According to the rule of thumb (Marsh et al., 2020), a statistically significant interaction effect with coefficient larger than .05 can be considered practically significant, providing evidence against the generalizability of the associations. For the cross-level interactions between MAP goals and the country-level measures, all of the |βs | were below .05. Such moderating effects can be considered small, both in absolute terms and compared to the main effects of MAP goals (see Tables S19-S24).

Country-Specific Effects Based on the Two-Level Modeling Approach. We employed two-level modeling (students nested within schools) to compute the effects of MAP goals for each country/region separately. We based these on the models where we regressed the outcome variables on MAP goals and individual-level covariates (Tables S25-S27). In line

with the findings for country-to-country variation based on the random effects in the three-level modeling, the standard deviations of country-specific effects were all smaller than .100 (Marsh et al., 2020). In addition, we directly compared the fixed effects (in the three-level modeling) with the distribution of country-specific effects. We found that the absolute differences of both 25th and 75th percentiles of the country-specific effects to the fixed effects were very small across outcomes (Mean = .030 and .028), and the absolute differences of both 10th and 90th percentiles of the country-specific effects to the fixed effects only slightly increased (Mean = .054 and .057). In summary, our findings indicate small country-to-country variation for the predictive effects of MAP goals on 16 outcomes.

Furthermore, it is critical to evaluate the consistency of the directions of effect sizes, as positive or negative associations between MAP goals and the outcomes have substantially different practical implications for specific countries. The small country-to-country variation revealed in our statistical models demonstrated above does not mean that all country-specific effects are in the same direction. Graphically, the distribution plot for country-specific effects showed perfect consistency of directions of effect sizes for 13 out of 16 outcomes across countries/regions (see Figure 4). The relations of MAP goals with PISA performance, perceived reading difficulty, and perceived PISA test difficulty were distributed across zero, indicating a mixed pattern of results. However, the effect sizes for the majority of countries were in the same direction, and only a small proportion spread around zero. For instance, among 77 effect sizes for PISA performance, 53 were statistically significantly positive, 18 were non-significant, and 6 were statistically significantly negative. But most effect sizes (62 out of 77 = 81%) were weak (i.e., < |.100|), including all negative effect sizes (range from -.021 to -.055 for the negative effects). Similar patterns were found for perceived reading difficulty and perceived PISA test difficulty, albeit in the opposite direction (i.e., most of the effects were slightly negative and several were positive but weak).

In addition, we integrated boxplots into the distribution plot (Figure 4) to identify statistical outliers for each outcome. 29 out of 1,232 (77 country-specific effects × 16 outcomes = 1,232; 29/1,232 = 2.35%) country-specific effects were found as outliers because they were not covered by 1.5 interquartile range whiskers (Tukey, 1977; see Figure 4; outliers were also highlighted in Tables S22-24). However, among these outliers, there were only 3 out of 1,232 country-specific effects were inconsistent with the hypothesized direction (e.g., negative and weak associations between MAP goals and educational expectations for Ukraine [$\beta = -.075$] and France [$\beta = -.011$]). In other words, 99.8% of the 1,232 estimates (i.e., 1 – 3/1,232 = 98.8%) were in the predicted direction. These findings provide support for the consistency of MAP goal predictions.

In summary, at the country level, there is substantial variation in MAP goal endorsement. This variation is related to country-level long-term orientation and uncertainty avoidance, but not to HDI and other cultural characteristics (RQ4a). By evaluating the variance, direction, and statistical outliers of effect sizes across countries, we show that the pattern of results supports the cross-cultural generalizability of the MAP goal predictions for most of the outcomes. Although the directions of effects were mixed for PISA performance, perceived reading difficulty, and perceived PISA test difficulty, the effects are consistently small for most countries (RQ4b).

Discussion

Given the proposed importance of MAP goals, it is crucial to examine the links both to their theoretically anticipated antecedents and consequences, as well as the generalizability of these relations across different cultures with different demographic characteristics and values (Dekker & Fischer, 2008). The present study overcomes many disadvantages of meta-analyses and traditional cross-cultural studies in providing a cross-cultural evaluation of MAP goals and their relations with four antecedents and 16 consequences. Our findings are largely consistent

with our hypotheses; MAP goals are grounded primarily in positive, appetitive achievement motives and are associated with a variety of adaptative, task-specific motivational, achievement-related, and well-being outcomes. Importantly, all observed relations were generalizable across most or all of the 77 countries/regions.

Comparing Our Findings with Previous Empirical Evidence

MAP Goals and Their Antecedents

This study examined four antecedents of MAP goals, namely workmastery, competitiveness, fear of failure, and fixed mindset. For the two achievement motive variables, our findings indicated that students who were oriented towards workmastery were more likely to adopt MAP goals. While students high in competitiveness also tended to endorse MAP goals, this pattern was much weaker than that for workmastery. Competitiveness is theoretically assumed to be closer to performance-based goals than to MAP goals (Elliot & McGregor, 2001; Harackiewicz et al., 1997), but links between competition-relevant variables such as social comparison orientation and MAP goals have also been found (Régner et al., 2007). Our findings suggest that students endorsing MAP goals are more likely to use competition as a source of information for self-evaluative purposes.

In terms of fear of failure, in line with the hierarchical model of achievement goals (Conroy & Elliot, 2004; Conroy et al., 2003; Elliot & Church, 1997), our findings suggest that the link between this antecedent variable and MAP goals is weak ($\beta = .036$). We posited MAP goals to be a critical manifestation of students' implicit theories. However, we found that MAP goals were weakly correlated with a fixed mindset ($r = .009$, $SE = .001$). This weak association became statistically non-significant when controlling for other antecedents (i.e., workmastery, competitiveness, and fear of failure). Theoretically, validating their ability by pursuing performance goals is more important when people view ability as fixed. In contrast, when people view ability as something that can be improved, developing that ability by taking on

learning goals is more important (Dweck & Leggett, 1988; Dweck & Yeager, 2019). Hence, one possible reason for the weak correlation between fixed mindset and MAP goals is that MAP goals may be more strongly related to growth mindset than negatively related to fixed mindset. A fixed mindset may have a stronger positive link with performance-based goals than with MAP goals.

Unfortunately, incremental and entity beliefs are often conceptualized as opposite ends of a single continuum, and fixed mindset scales are widely used to measure growth mindset by reversing scores of the scales in empirical studies (Yeager et al., 2016, 2019; see also meta-analyses, Burnette et al., 2013; Sisk et al., 2018). Measuring implicit theories with a fixed, rather than growth, mindset measure has advantages regarding avoiding social desirability. However, it runs the risk of an acquiescence response bias, leading to an overestimation of an endorsement of a fixed mindset (Lüftenegger & Chen, 2017). More importantly, empirical studies found that the correlation between growth and fixed mindset was generally weak, resulting in two distinctive constructs (e.g., Dupeyrat & Mariné, 2005; Tempelaar et al., 2014). This casts a doubt on whether implicit theories should be simply treated as a single bipolar construct (see Lüftenegger & Chen, 2017 for further discussion).

Furthermore, PISA 2018 measured fixed mindset with a single item in the PISA2018 survey – the first time that PISA included an implicit theory measure. Rammstedt et al. (2021) provided preliminary evidence that both the most widely used three-item (Dweck et al., 1995) and single-item fixed mindset measures (i.e., the same one as the PISA used) had acceptable psychometric properties in terms of reliability, comparability, and validity for German adolescents. Nevertheless, the psychometric validity of the single-item fixed mindset scale for other countries is still unknown. Therefore, relations between implicit theories and MAP goals are needed further to investigate multiple-item measures of growth and fixed mindset together using large-scale, internationally representative data.

MAP Goals and Their Consequences

Previous meta-analyses on achievement goals and their consequences have primarily focused on bivariate correlations. The present study extended past research by evaluating the relations between MAP goals and various consequences, while controlling individual-level background variables and the antecedents of MAP goals. We also included several negative, maladaptive outcomes that have not been examined in previous meta-analyses, such as perceived difficulty in reading tasks, perceived PISA test difficulty, and school truancy and lateness. We found MAP goals to be positively associated with adaptive outcomes and negatively associated with maladaptive outcomes. We also observed that MAP goals have descriptively stronger associations with positive than with negative outcomes. Controlling for individual-level background variables only slightly reduced the strength of these associations.

Another strength of our study is that we included well-being outcomes that have been largely ignored in previous meta-analytic reviews. While students' subjective well-being has attracted some attention from goal theorists, the primary focus has been on academic task- or course-specific emotions, affect, and satisfaction (Huang, 2011; Linnenbrink, 2005; Senko & Dawson, 2017). Relatively few studies have focused on general subjective well-being (e.g., life satisfaction) and school-related well-being (e.g., sense of belonging) (but see Diseth & Samdal, 2014; Holzer et al., 2022). We found that MAP goals have a strong link to the well-being outcomes investigated in our study. This suggests that MAP goal adoption is not only associated with positive affect in learning tasks, but it is also linked with higher well-being more generally. Such strong links with well-being may be because students with MAP goals tend to be more able to use adaptive learning strategies to cope with their failure, maintain an optimistic outlook, and have higher levels of positive affect (Kaplan & Maehr, 1999).

Among the three sets of outcome variables, MAP goals were most weakly related to our study's achievement-related outcomes. Most notably, MAP goals were positively but weakly

associated with PISA performance (β = .069 and .056 for the models without and with individual controls, respectively, see Figure 2). This finding is consistent with previous meta-analyses that reported positive but small correlations between MAP goals and performance (e.g., Huang, 2011; Van Yperen et al., 2014; Wirthwein et al., 2013). Specifically, Hulleman et al. (2010) found a significant positive relation only for MAP goal scales that did not focus specifically on goal-relevant content (r = .11, e.g., an item such as "I like learning new things from physical education, even if I make mistakes" contains enjoyment- and error-relevant content more than goal-relevant content). In contrast, MAP goal scales that contained goal-relevant language were not significantly related to performance outcomes (r = .05). We used the MAP goal scale that was grounded in the Achievement Goal Questionnaire-Revised (Elliot & Murayama, 2008) that focuses directly on goal-relevant content (e.g., "My goal is to learn as much as possible"). Although the levels of statistical significance were different, the sizes of Hulleman et al.'s (2010) relations were similar to ours when the MAP goals were assessed as goals per se.

Unique Predictive Utility of MAP Goals Controlling for Their Antecedents

We found that MAP goals and their antecedents account for unique variance in the theoretically-relevant consequences that we investigated. This is in accordance with the hierarchical model of achievement goals (Elliot & Church, 1997), which posits that achievement goals emerge from various antecedents and that these goals then proximally predict outcomes. This does not preclude the antecedents from also predicting the outcomes, which is the pattern we observed. For example, workmastery was a slightly stronger predictor than MAP goals for resilience and attitudes toward school. Such a pattern suggests that other mid-level variables such as strategies, tactics, or foci (e.g., defensive pessimism, grit, promotion focus) might also be operative and worthy of investigation (Elliot, 2006).

Cross-Cultural Generalizability and Variability

Testing the cross-cultural generalizability of findings is important, as it promises to advance theory and suggests pragmatic directions for educational intervention in a global context. Typically, meta-analysts claim that they test generalizability and variability. However, the hypothetical population of studies to which meta-analytic findings generalize is typically ill-defined. This ill-definition is largely due to the ad hoc, biased nature of the sample of studies available in the literature. Specifically, the studies available to meta-analysts are heavily biased by an over-representation of WEIRD countries (i.e., sample bias). They tend to provide significant statistical support for their a priori formulated hypotheses, sometimes due (at least in part) to publication bias and related problems. However, well-designed cross-national studies, like PISA, focus on sampling to obtain representative samples within each country and a diverse range of countries. Traditional cross-cultural studies also suffer from many of the limitations of extant meta-analyses (Marsh et al., 2020). Hence, the present study provides a stronger, more robust evaluation of the cross-cultural generalizability and variability of the antecedents and consequences of MAP goals than past studies.

We found substantial variability in country-level MAP goal endorsement, and national culture of long-term orientation and uncertainty avoidance tended to be negatively associated with this variability. The results indicate that students from higher long-term-oriented and uncertainty-avoided societies tend to be less likely to adopt MAP goals. The negative association of long-term orientation and MAP goals might because long-term oriented societies, like East Asian countries/regions, value virtues toward future rewards (e.g., perseverance and thrift). Parents and teachers in such societies emphasize student academic success. Consequently, students in these countries/regions are pushed to study hard to get high grades at the expense of their learning motivation, such as MAP goal pursuit and task interest (Hu et al., 2018; Leung, 2002). A plausible explanation for the negative prediction of

uncertainty avoidance might be, in societies with higher uncertainty avoidance, "safety or security is likely to prevail over other needs" (Hofstede et al., 2010, p. 216), thus higher-level needs (e.g., cognitive needs) will be lower. Given the limited number of studies on this issue, our explanations are speculative and needs further empirical testing.

Surprisingly, other country-level variables, such as socioeconomic development (HDI) and individualism, suggested by previous studies (Dekker & Fischer, 2008; Lochbaum et al., 2016), were unrelated to MAP goal adoption at the country-level in our study. The reason might be that the prior studies focused on a small number of cultures that overrepresented WEIRD countries (e.g., only 13 societies in Dekker & Fischer's, 2008, study). As mentioned earlier, our utilization of PISA data avoids exclusive or primary reliance on WEIRD countries, thereby, presumably, yielding a more truly cross-cultural pattern of findings.

The universalist perspective to cross-cultural psychology emphasizes using multiple approaches to test results' replicability across diverse cultures (Zusho & Clayton, 2011). The present study examined the cross-cultural generalizability of the predictions of MAP goals from three perspectives: variation, direction, and statistical outliers of effect sizes across countries. Multiple statistical approaches showed a small country-to-country variation in effect sizes across all outcomes. For all but three of the outcomes, there was good consistency in the direction of effects. Specifically, several countries showed statistically significant negative relationships of MAP goals with PISA performance (6/77 countries/regions), positive relationships with perceived reading difficulty (5/77 countries/regions), and positive relationships with perceived PISA test difficulty (2/77 countries/regions). However, all these effect sizes were weak ($|\beta| < .055$). Overall, approximately 80% of the countries/regions had effect sizes less than |.100| for PISA performance, perceived reading difficulty, and perceived PISA test difficulty. In this sense, the results show reasonable consistency.

Across the different countries/regions, we found that MAP goals were consistently more closely associated with reading enjoyment, reading competence perceptions, and well-being outcomes than other consequences, particularly for maladaptive consequences (e.g., perceived difficulty, lateness, truancy). Traditionally, MAP goals are assumed to be optimal for facilitating adaptive motivation (Ames, 1992; Elliot & Church, 1997). Students adopting MAP goals focus on absolute or intrapersonal standards, believe that effort will lead to success and mastery, and are more able to use cognitive, metacognitive, and self-regulatory strategies. Thus, they tend to have high levels of perceived competence and intrinsic motivation (Ames, 1992; Middleton & Midgley, 1997; Payne et al., 2007; Pintrich, 2000; Wolter, 2004). Focusing on intrapersonal improvement, strong effort belief, and frequent use of learning strategies also help students cope with setbacks and keep positive attitudes toward school, which in turn leads to high levels of well-being in general life (Kaplan & Maehr, 1999). In contrast, MAP goals are negatively related to maladaptive behaviors, such as self-handicapping behaviors (e.g., procrastination), maladaptive coping, use of expedient help-seeking, and avoiding help-seeking. In turn, these lead to undesirable behaviors; however, these relations were much weaker than the relations between MAP goals and adaptive motivation and behaviors (e.g., Linnenbrink, 2005; Lochbaum, 2016b; Walter, 2005). Thus, our findings are consistent with the theoretical processes underlying the relations between MAP goals and their consequences.

In summary, our findings showed that the pattern of the MAP goal predictions for most of the outcomes was generalizable across WEIRD and non-WEIRD countries/regions. Furthermore, while the pattern for PISA performance, perceived reading difficulty, and perceived PISA test difficulty was mixed in terms of the directions of effects, the MAP goal predictions for these three outcomes were consistently weak for most countries/regions. This generalizability points to quite strong cross-cultural support for the observed patterns. It

suggests that MAP goals might represent a universally optimal form of student learning and motivational regulation for most countries/regions.

As discussed above, the cross-cultural approach with PISA data has many advantages over traditional meta-analyses in generalizability, such as diverse nationally representative samples, consistent measurement items, and the elimination of publication biases. Indeed, the PISA approach to generalizability may provide better tests of cross-cultural generalizability than typical meta-analyses that are limited by a potentially idiosyncratic set of studies mainly from WEIRD countries (see Marsh et al., 2020 for further discussion). The overwhelmingly positive relations between MAP goals and various adaptive outcomes revealed in this study suggest that intervening on MAP goal adoption can be beneficial for students. However, compared to other empirical work on achievement goals, intervention work has received much less attention in education contexts (Elliot & Hulleman, 2017). Several previous studies showed significant intervention effects on MAP goal adoption (e.g., Muis et al., 2013; O'Keefe et al., 2013; Ranellucci et al., 2017; Smeding et al., 2013). However, no existing meta-analyses provide a cross-cultural summary of the scientific evidence for achievement-goal interventions due to the relatively small number of published intervention studies (Elliot & Hulleman, 2017). Our study supports cross-cultural generalizability of empirical relations between MAP goals and their consequences. However, it does not imply that the process of MAP goal adoption would be generalizable across cultures. We also found significant heterogeneity in the levels of MAP goal adoption across cultures. The pursuit of MAP goals is more context-dependent than that of performance-based goals (Bong, 2001, 2004; Wirthwein et al., 2020). Therefore, our findings call for an urgent need to conduct MAP goal intervention studies in different learning contexts. These can then be synthesized to provide clear recommendations on how to conduct an effective MAP goal intervention across cultures.

Strength, Limitations, and Directions for Future Research

We have highlighted many strengths of the PISA data, such as the evasion of sample and publication biases, and the inclusion of individual-level controls. Another important strength of our cross-national approach to generalizability based on PISA data is the consistency of procedures and materials used to collect the data in each country (compared to meta-analyses based on diverse, ad hoc measures of MAP goals). Indeed, researchers have used many different measures to assess MAP goals. Some of these measures have emphasized the standpoint of competence (i.e., developing one's ability), others have emphasized the standard of competence (i.e., mastering a task or improving over time), and still others have emphasized both (see Elliot & Hulleman, 2017, for details). Even for prominent achievement goal measures, such as the Achievement Goal Questionnaire-Revised (Elliot & Murayama, 2008) and the Patterns of Adaptive Learning Survey (Midgley et al., 2000), the items are often adapted or revised to fit the context to which they are used (Senko & Dawson, 2017). Previous meta-analyses report that this use of different measures is a significant moderator of the relation between MAP goals and their consequences (Hulleman et al., 2010). However, each focal measure in such research was used only in a small subset of studies (Senko & Dawson, 2017). As a result, the generalizability of the pattern of results, even within each measure, remains unknown. The present study provided strong support for the generalizability of our findings based on the MAP goal measure from the Achievement Goal Questionnaire-Revised. Nevertheless, this consistency can also be viewed as a potential weakness with regard to generalizability. From this perspective, there is still a need to test the generalizability of the results presented herein with different measures of the MAP goal construct.

Another important limitation is that we focused exclusively on MAP goals in the present study, as it was the only achievement goal assessed in the PISA survey. Previous work has conceptualized achievement goals in terms of a 2 x 2 framework (Elliot, 1999; Pintrich,

2000) by incorporating both the definition of competence (mastery vs. performance) and the valence of competence (i.e., the approach-avoidance distinction). This raises the question of whether the explained variance in the outcome variables observed in our study is due to MAP goals per se or to the shared variance between MAP goals and other achievement goal constructs. Meta-analyses have shown that the correlations between MAP goals and other goal constructs are relatively modest (*r*s < .3, e.g., Huang, 2012; Hulleman et al., 2010; Payne et al., 2007), suggesting a relatively small amount of shared variance. Theoretically, the correlation of MAP goals with other goal constructs, such as performance-approach goals, should be relatively small given the considerable conceptual difference between the two definitions of competence used in the goals (Heyman & Dweck, 1992). Thus, we believe that our results will hold when considered simultaneously with other achievement goals, but further research is needed to test this prediction. Furthermore, although this study provides strong support for the cross-cultural generalizability of relations between MAP goals and various outcomes, we speculate that such a pattern might be weaker when examining performance-based goals. Theoretically, performance goals are rooted in social comparison, which is more relevant to societal and educational contexts. Dekker and Fischer (2008) found that societal context is more related to performance goal adoption than to MAP goal adoption. For example, in highly embedded societies, individuals are concerned with gaining social approval by showing competence and ability (Dekker & Fischer, 2008). King and his colleagues showed that in extremely competitive learning environments (e.g., Hong Kong) where performance-approach goals are more the norm, performance-approach goals play a salient role in linking to adaptive outcomes, such as self-reliance and positive self-concept (King et al., 2017). These results are in conflict with the traditional mastery goal perspective and previous findings based on Western countries (Midgley et al., 2000). Therefore, it is worthwhile to explore whether

performance goals function differently in school learning across different societal and educational contexts in future research.

An additional limitation is the cross-sectional nature of our study design. Given this, we were unable to empirically establish whether the associations between MAP goals and their antecedents and consequences represent causal links. Although each of the outcome variables examined in our research can be plausibly portrayed as consequences of MAP goals, MAP goals are dynamic and responsive to ongoing experience; as such, their relations with these outcome variables are undoubtedly reciprocal over time (e.g., King & McInerney, 2016; Scherrer et al., 2020; Seaton et al., 2014; Senko & Harackiewicz, 2005; Van Yperen & Renkema, 2008). For example, the link between MAP goals and perceived competence has been shown to be bidirectional; pursuing MAP goals promotes students' self-perception of mathematics ability, and high perceived mathematics ability reinforces the continued pursuit of MAP goals (Seaton et al., 2014). Hence, our findings must be interpreted with these issues in mind. Longitudinal, large scale, cross-national studies are, at present, aspirational rather than realized; fulfilling this aspiration in the future would yield incredibly valuable theoretical and applied information.

Another limitation is that all participants were from a single age group (i.e., 15-year-old students). Previous research indicates that the development of MAP goals and their associations with their antecedents and consequences might differ across ages (e.g., Paulick et al., 2013; Scherrer et al., 2020; Spinath & Steinmayr, 2012; also see Scherrer & Preckel, 2019 for a meta-analytic review), potentially limiting the generalizability of our findings to other developmental periods. However, 15 is a particularly important age, as students from many countries are approaching the end of mandatory education and need to make critical decisions regarding further education, training, and work. Nevertheless, additional research is needed to investigate whether our findings replicate in samples with different age groups.

An additional limitation is the measurement specificity of MAP goals and consequences. The 2018 cycle was the first PISA data collection to assess student MAP goals, and PISA included only domain-general MAP goals in school learning. We linked domain-general MAP goals to 11 domain-general (e.g., truancy) and 5 domain-specific (e.g., reading motivational beliefs) consequences. However, previous research showed that MAP goals were distinct across subject domains; between-domain relations of MAP goals with motivational beliefs were weaker than corresponding within-domain relations (Bong, 2001, 2004). Nevertheless, it is reasonable to use domain-general MAP goals to examine their relations with general well-being and school-related undesirable behaviors and well-being (e.g., Diet & Samdal, 2014; Holder et al., 2022; Tuominen-Soini et al., 2012). However, exploring the within-domain relations between MAP goals and motivational beliefs might be more informative.

PISA2018's primary focus was reading. Hence, they surveyed motivational outcomes in reading but not in math and science. Nevertheless, PISA2018 assessed adolescents' academic performance across the three domains. This provides an opportunity to test how generalizable the relations between domain-general MAP goals and academic performance are across domains. Our supplemental analysis showed that the relations between MAP goals and each subject domain were highly similar (see Tables S14-S17). However, cross-national studies could further strengthen our findings, including domain-specific MAP goals and motivational outcomes in different subject domains. Considering domain-specific MAP goals and their consequences in future studies may reveal different patterns of associations and additional insights into the role of MAP goals in shaping student learning and motivational regulation across cultures.

Finally, according to the hierarchical model of achievement motivation (Elliot & Church, 2001), this study missed an important antecedent of MAP goals, which is broad

competence expectancies. There is evidence showing that competence expectancies affect achievement goal adoption, controlling for motive disposition variables (Elliot & Church, 1997a; Payne et al., 2007). Therefore, the inclusion of competence expectancies along with motive dispositions would be helpful in painting the picture of antecedents and their relationship to MAP goals.

Conclusion

Our study contributes to the extant body of achievement goal research by taking a cross-cultural approach to testing the generalizability of the associations between MAP goals and their antecedents and consequences. One important conclusion of this study is that MAP goals uniquely contribute to the prediction of various consequences, above and beyond the variance explained by the antecedents of MAP goals, as well as by individual- and school-level covariates. The positive and robust associations between MAP goals and positive, adaptive consequences across most countries/regions documented in this study suggest that increasing students' MAP goals may facilitate their learning processes, adaptive behavior, and well-being regardless of where students live and study.

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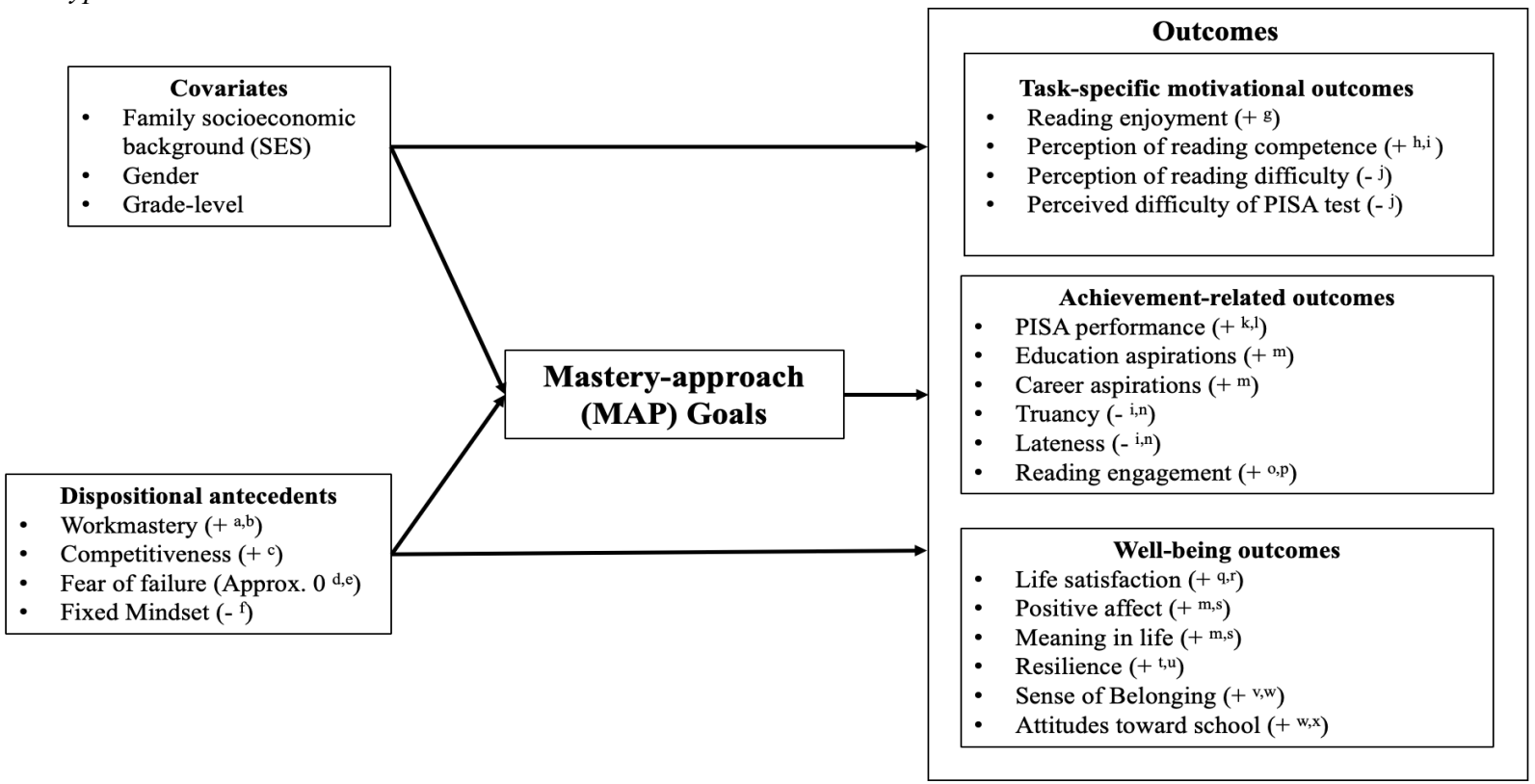
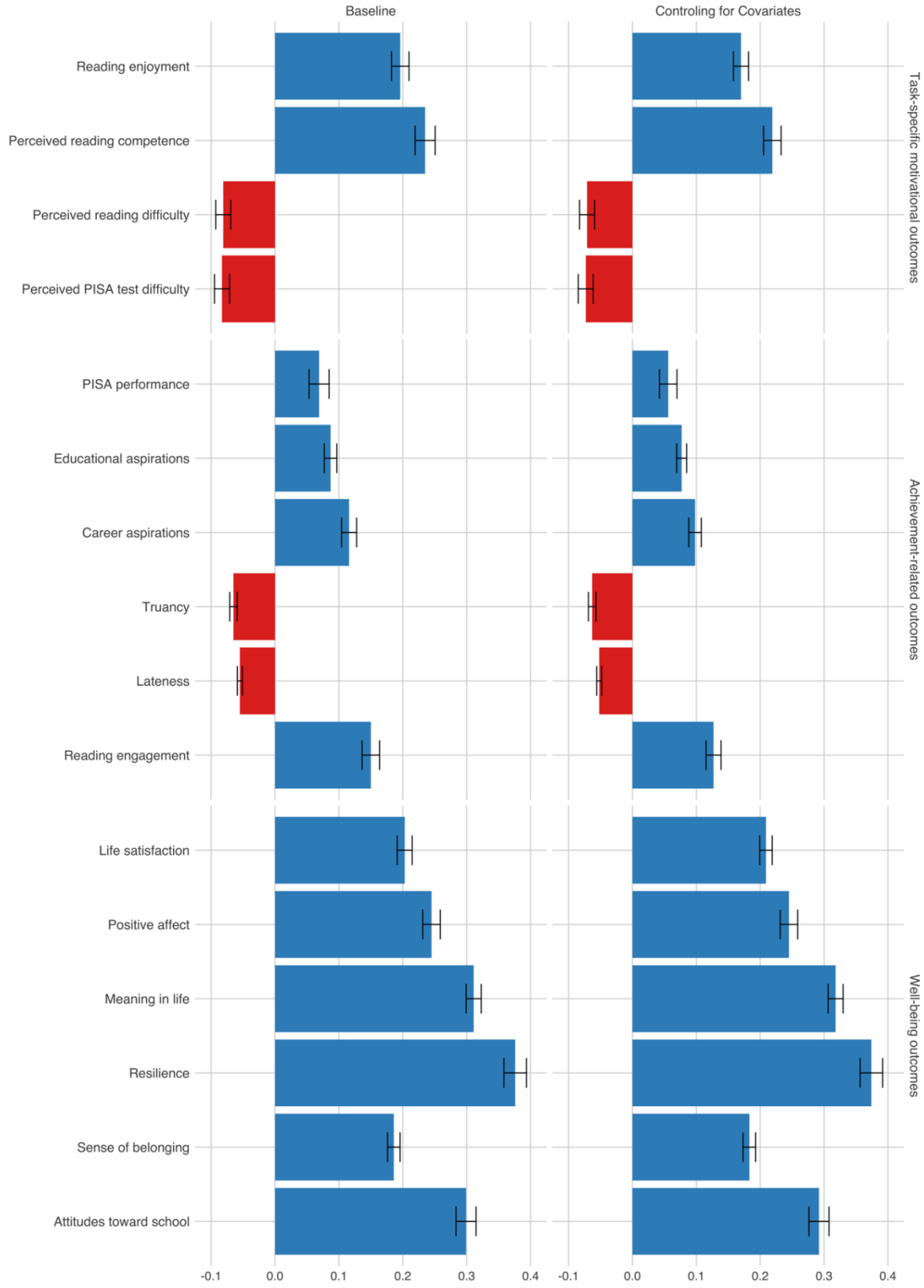
Figure 1
The Hypothesized Model



Notes. Subscripts indicate the direction of the a priori predictions in relation to the antecedents and consequences of MAP goals based on previous empirical and meta-analytic evidence; [a] Harackiewicz et al., 1997; [b] Elliot & McGregor, 2001; [c] Conroy & Elliot, 2004; [d] Zusho et al., 2005; [f] Burnette et al., 2013; [g] Hulleman et al., 2010; [h] Huang, 2016; [i] Lochbaum et al., 2016; [j] Horvath et al., 2006; [k] Huang, 2012; [l] Wirthwein et al., 2013; [m] Tuominen-Soini et al., 2008; [n] Sommet & Elliot, 2016; [o] Meece et al., 2006; [p] Senko et al., 2013; [q] Diseth et al., 2012; [r] Diseth & Samdal, 2014; [s] King & McInerney, 2014; [t] Sideridis & Kaplan, 2011; [u] Vitali et al., 2015; [v] Tuominen-Soini et al., 2012; [w] Holzer et al., 2022;[x] Anderman & Anderman, 1999.

Figure 2

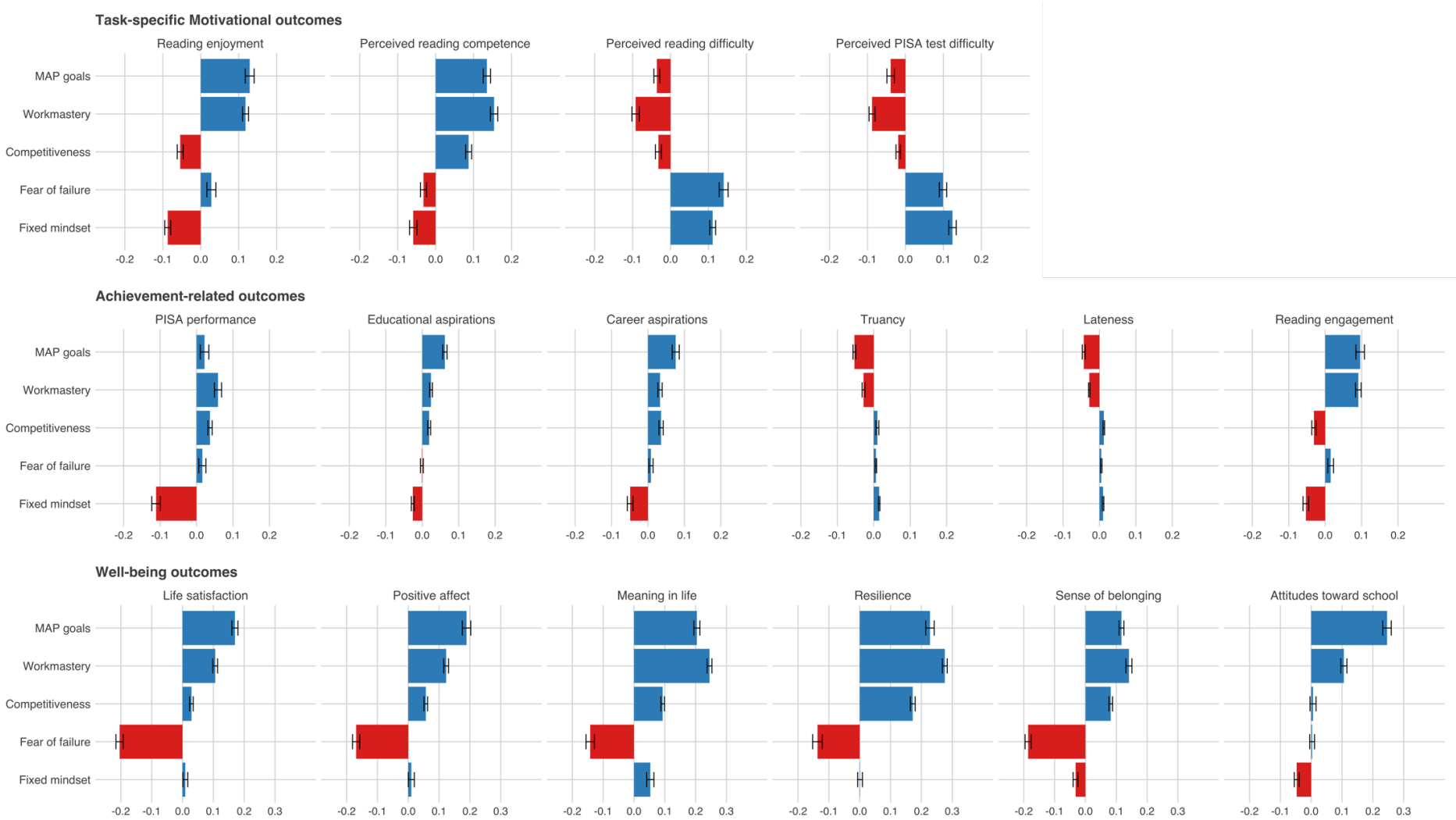
Associations between MAP Goals and Three Sets of Outcome Variables



Notes. The bars present the fixed effects of MAP goals on three sets of outcome variables with 95% confidence intervals (see Tables 2-4 & S2-S4).

Figure 3

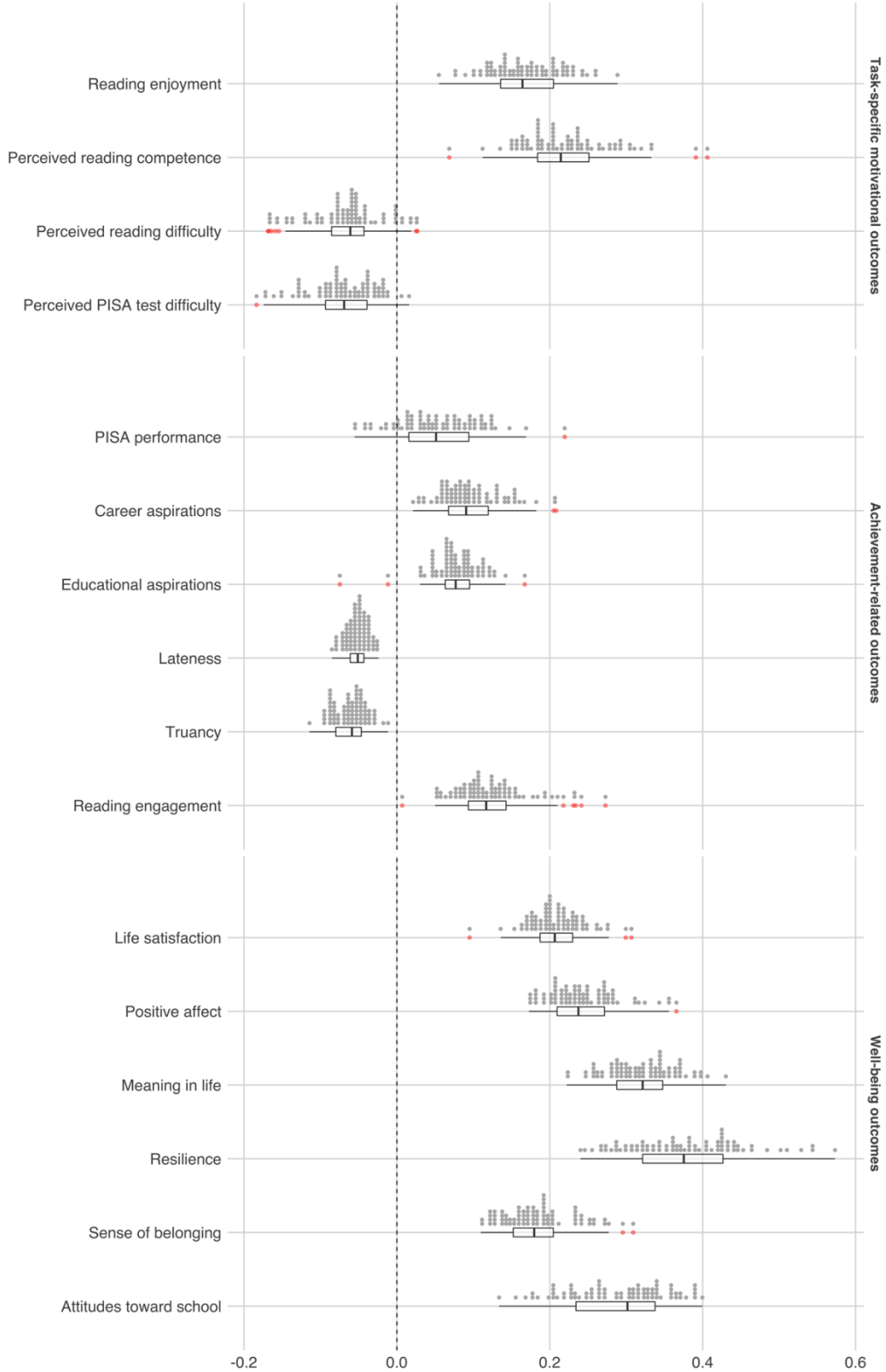
Joint Predictive Effects of The Four Antecedents and MAP Goals on Three Sets of Outcome Variables



Notes. The bars present the fixed effects of the four antecedents and MAP goals on three sets of outcome variables with 95% confidence intervals, controlling individual-level covariates (see Table S5-S7).

Figure 4

Country-Specific Effects of MAP Goals on 16 Outcome Variables



Notes. The dots represent the distribution of effect sizes from each country. Bolded dots present the median of 77 country-specific effect sizes on each outcome variable with 50% and 95% confidence intervals. The country-specific effects were estimated, controlling for individual-level covariates.

Table 1.

Antecedents of MAP Goals

	Null Model		Baseline Model		Control Model		Full Model	
	Estimate	SE			Estimate	SE	Estimate	SE
Fixed effect								
Intercept	-.035	.030	-.019	.023	-.028	.032	-.018	.024
Workmastery			.373***	.007			.365***	.007
Competitiveness			.079***	.007			.085***	.006
Fear of failure			.036***	.003			.026***	.003
Mindset			-.005	.006			.000	.006
Male					-.167***	.012	-.114***	.010
Grade					.034**	.010	-.002	.008
SES					.081***	.007	.041***	.004
Random effect								
School-level								
Workmastery			.008	.092			.008	.091
Competitiveness			.005	.071			.005	.071
Fear of failure			.004	.066			.004	.066
Mindset			.004	.064			.004	.064
Country-level								
Workmastery			.003	.052			.003	.053
Competitiveness			.003	.054			.003	.051
Fear of failure			.001	.025			.001	.023
Mindset			.002	.046			.002	.046
Variance								
Student	.909	.954	.726	.852	.898	.948	.721	.849
School	.027	.165	.015	.123	.026	.162	.016	.126
Country	.057	.238	.038	.194	.064	.253	.040	.200

Note. * $p < .05$; ** $p < .01$; *** $p < .001$.

Table 2.

The Relation between MAP Goals and Task-Specific Motivational Outcomes

	Reading enjoyment		Perceived reading competence		Perceived reading difficulty		Perceived PISA test difficulty	
	Estimate	SE	Estimate	SE	Estimate	SE	Estimate	SE
Fixed effect								
Intercept	-.015	.034	-.009	.027	-.032	.023	-.026	.028
MAP goals	.170***	.006	.219***	.007	-.071***	.006	-.073***	.006
Male	-.483***	.016	-.117***	.011	.040**	.012	-.021*	.009
Grade	.024***	.005	.065***	.007	-.059***	.007	-.103***	.009
SES	.103***	.008	.166***	.008	-.126***	.006	-.170***	.007
Random effect								
School-level								
MAP goals	.004	.066	.006	.079	.009	.094	.006	.078
Country-level								
MAP goals	.002	.046	.003	.056	.002	.046	.002	.046
Variance								
Student	.763	.874	.829	.910	.911	.955	.837	.915
School	.027	.163	.016	.127	.015	.122	.031	.175
Country	.085	.292	.042	.205	.038	.194	.053	.230

Note. * $p < .05$; ** $p < .01$; *** $p < .001$.

Table 3.

The Relation between MAP Goals and Achievement-Related Outcomes

	PISA performance		Education aspirations		Career aspirations		Truancy		Lateness		Reading engagement	
	Estimate	SE	Estimate	SE	Estimate	SE	Estimate	SE	Estimate	SE	Estimate	SE
Fixed effect												
Intercept	-.002	.061	.529***	.019	-.035	.020	.421***	.020	.488***	.011	.025	.038
MAP goals	.056***	.007	.077***	.004	.098***	.005	-.063***	.003	-.052***	.002	.127***	.006
Male	-.011	.009	-.080***	.006	-.189***	.012	.018***	.004	.054***	.003	-.415***	.017
Grade	.298***	.015	.081***	.006	.112***	.008	-.020***	.005	-.031***	.004	.006	.005
SES	.155***	.010	.103***	.005	.143***	.009	-.013***	.002	-.005*	.002	.095***	.005
Random effect												
School-level												
MAP goals	.002	.042	.001	.022	.003	.056	.000	.021	.000	.013	.002	.049
Country-level												
MAP goals	.003	.054	.001	.034	.002	.041	.000	.022	.000	.013	.003	.051
Variance												
Student	.440	.664	.186	.432	.894	.946	.202	.449	.228	.477	.835	.914
School	.179	.423	.016	.125	.057	.238	.007	.086	.008	.089	.018	.133
Country	.247	.497	.020	.140	.029	.169	.030	.172	.009	.092	.089	.299

Note. * $p < .05$; ** $p < .01$; *** $p < .001$.

Table 4.

The Relation between MAP Goals and Well-Being Variables

	Life satisfaction		Positive affect		Meaning in life		Resilience		Sense of belonging		Attitudes toward school	
	Estimate	SE	Estimate	SE	Estimate	SE	Estimate	SE	Estimate	SE	Estimate	SE
Fixed effect												
Intercept	.019	.023	-.010	.021	-.010	.020	-.021	.021	-.027	.023	-.027	.024
MAP goals	.209***	.005	.245***	.007	.318***	.006	.374***	.009	.183***	.005	.292***	.008
Male	.202***	.012	.034**	.012	.145***	.010	.097***	.011	.055***	.012	-.124***	.006
Grade	-.016*	.007	.010	.005	-.028***	.008	.036***	.006	.055***	.006	.040***	.009
SES	.043***	.005	.030***	.004	.006	.004	.093***	.004	.079***	.004	.022***	.004
Random effect												
School-level												
MAP goals	.006	.076	.005	.072	.006	.074	.013	.113	.007	.083	.006	.074
Country-level												
MAP goals	.001	.035	.002	.045	.002	.045	.005	.073	.002	.044	.004	.063
Variance												
Student	.884	.940	.889	.943	.832	.912	.784	.885	.860	.927	.842	.918
School	.015	.123	.011	.104	.012	.108	.007	.085	.017	.129	.011	.106
Country	.039	.197	.030	.172	.026	.161	.028	.166	.033	.181	.032	.179

Note. * $p < .05$; ** $p < .01$; *** $p < .001$.