Student Motivation and Associated Outcomes: A Meta-Analysis from Self-Determination Theory

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Abstract

Student outcomes are influenced by different types of motivation that stem from external incentives, ego-involvement, personal value, and intrinsic interest. These types of motivation as described in self-determination theory each co-occur to different degrees and should lead to different consequences. These associations with outcomes are in part due to unique characteristics and in part to the degree of autonomy each entails. In the current meta-analysis, we examine these different types of motivation in 344 samples (223,209 participants) as they relate to 26 performance, well-being, goal orientation, and persistence-related student outcomes. Findings highlight that intrinsic motivation is related to student success and well-being, whereas personal value (identified regulation) is particularly highly related to persistence. Ego-involved motives (introjected regulation) were positively related to persistence and performance goals, but also positively related with indicators of ill-being. Motivation driven by a desire to obtain rewards or avoid punishment (external regulation) was not associated to performance or persistence but was associated with decreased well-being. Finally, amotivation was related to poor outcomes. Relative weights analysis further estimates the degree to which motivation types uniquely predict outcomes, highlighting that identified regulation and intrinsic motivation are likely key factors for school adjustment.

Keywords: Motivation; Self-determination; Education; Student; Meta-analysis.

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Within self-determination theory (SDT; Ryan & Deci, 2017), multiple types of motivation are specified that each have unique characteristic phenomenology and dynamics. These types of motivation can also be predictably ordered on a continuum of self-determination (see Figure 1; Ryan & Deci, 2017, 2020; Howard, Gagné, & Bureau, 2017), varying from most self-determined (i.e., intrinsic motivation), to partially self-determined (e.g., introjection), and finally to an absence of self-determination (i.e., amotivation). Given that types of motivation share a certain degree of self-determination, questions have been raised concerning the value of measuring different types of motivation (i.e., a multidimensional approach) as opposed to a single-dimensional approach which measures the general degree of experienced self-determination (Chemolli & Gagné, 2014; Howard et al., 2017). Through meta-analytic procedures, we aim to quantify the relative importance of different types of motivation in order to examine how much each motive uniquely adds to our understanding of student functioning.

While SDT specifies one of the more complex and nuanced perspectives of motivation, each type of motivation can also be aligned with other contemporary theories of motivation and achievement. For example, SDT research began with a focus on intrinsic motivation, defined as a psychological desire to enact behaviors for the pleasure, satisfaction, or excitement associated with enacting the behavior itself (Ryan & Deci, 2019). Yet, intrinsic motivation has also been a focus of other theories, including Krapp's (2002) interest theory and Csikzentmihalyi's theory of flow (Csikszentmihalyi, Abuhamdeh, & Nakamura, 2014). Intrinsic motivation has also been a central construct within Gottfried and colleagues' developmental research on academic motivation (e.g., Gottfried, Marcoulides, Gottfried, & Oliver, 2009) and Harter's (2012) social developmental perspective on motivation and identity.

In contrast to intrinsic motivation, extrinsic motivation describes the psychological state evident when individuals are driven to achieve outcomes separable from the satisfactions inherent in the behavior itself (Ryan & Connell, 1989). However, the behavior will have different consequences for the individual depending on the type of contingency regulating it. This leads to the specification of three commonly studied subtypes of extrinsic motivation: identified, introjected, and external regulations. Identified regulation is a state that drives individuals to enact behaviors based on perceived personal valued and meaningful, whether or not these behaviors are inherently enjoyable. As such, within SDT, identified regulation is considered a relatively self-determined form of motivation and is predicted to foster positive learning attitudes and outcomes. Similarly, within expectancy-value theories (e.g., Wigfield, Rosenzweig, & Eccles, 2017) such personal valuing of behavior is a positive motivating force in student achievement.

Another internally driven, yet extrinsically focused form of motivation is described within SDT as introjected regulation. This represents a state driven by internal, self-esteem related dynamics such as guilt and shame avoidance as well as pride-seeking (Ryan & Deci, 2017). Introjected regulation is characterized by ego-involvement (Ryan, 1982) because the goal

is to gain and maintain approval from the self and others. A number of theories have considered introjection and ego-involvement in academic settings, for example, achievement goal theories (Duda, 1989; Nichols, 1984), stability of self-esteem perspectives (Paradise & Kernis, 2002) and theories focused on contingent self-esteem (e.g., Crocker, 2008). Research further suggests that introjection often results from the application of contingent regard by parents and teachers for academic outcomes (Roth, Assor, Niemiec, Ryan, & Deci, 2009). Finally, introjection has been directly related to the concept of self-infiltration with Personality Systems Interaction Theory (Kuhl, Quirin, & Koole, 2015; Ryan, 2018).

External regulation is the psychological state enacted when individuals seek out externally controlled rewards and/or avoiding externally administered punishments. Although SDT suggests that external regulation can drive short-term behavior, it also portrays external regulation as a low-quality form of motivation that is often undermining of more self-determined motives (e.g., Deci, Koestner, & Ryan, 1999). Nonetheless, there are approaches that embrace external evaluations and incentives to promote learning such as high-stakes testing policies in which external contingencies are expected to foster improved student achievement (Koretz, 2017; Levitt, List, Neckermann, & Sadoff, 2016; Ryan & Weinstein, 2009).

In addition to these intrinsic and extrinsic motivations, the category of amotivation refers to a state in which neither intrinsic nor extrinsic factors energize action (Ryan & Deci, 2020). Students experiencing amotivation either do not see the connection between their behavior and the expected result and/or feel incapable of doing the work. As such, they are expected to demonstrate little to no effort or persistence in school activities (Pelletier, Dion, Tuson, & Green-Demers, 1999). Amotivation is thus associated with theories concerning low expectancy and/or value (Wigfield et al., 2017), low self-efficacy (Schunk & DiBenedetto, 2016) and learned helplessness (Abramson, Seligman, & Teasdale, 1978).

Although these five types of motivation are the most commonly applied in SDT research, another type of extrinsic motivation, integrated regulation, is sometimes studied. Integrated regulation is a form of extrinsic motivation that is highly self-determined. When driven by integrated regulation, individuals assimilate the enactment of a behavior into their sense of self such that the behavior becomes a fully congruent element of their identity. However, it is commonly acknowledged that school students are too young to have integrated academic demands into their identity (Deci, Ryan, & Guay, 2013), which explains difficulties in empirically distinguishing integrated regulation from identified regulation in the educational context (Howard et al., 2017). As such, it is not often measured in academic motivation scales.

Evaluating Both the Self-Determination and Specificity of Motives

The idea that motivation types are predictably ordered according to their degree of self-determination raises an interesting and often overlooked issue concerning the specific effects of different types of motivation along this continuum. That is, are motivation types truly distinct if they can be described by their position on a single-dimensional continuum of self-determination? If each type of motivation lies on a continuum, it would imply that motivation could be understood by a unidimensional model, thereby questioning the necessity of a multidimensional

approach. This issue has been the focus of several empirical studies in recent years with some disputing the continuum structure of self-determination (Chemolli & Gagné, 2014), others indicating a highly consistent and predictable ordering (Howard et al., 2017), while yet other studies providing a nuanced interpretation incorporating both sides of this issue (Howard, Gagné, Morin, & Forest, 2018; Litalien et al., 2017).

A meta-analysis examining the correlations among SDT regulation types found that, regardless of the domain or scale used, each type of regulation is predictably ordered, thus supporting the continuum structure of motivation (Howard et al., 2017). However, this previous meta-analysis did not test whether motivation types related differently to outcome variables and was limited solely to relations among motivation types. To examine this issue of multidimensionality, understanding the associations between motivation types and students' outcomes is required. If motivation types relate to outcomes in a linear fashion determined by their place on the continuum of self-determination, this would indicate the central importance of self-determination in understanding motivation. For example, it is generally assumed that the more self-determined (or autonomous) a motivation type is, the more positively it will relate to adaptive outcomes, and negatively to maladaptive ones. In contrast, less self-determined (or controlled) motivation types will relate positively to maladaptive outcomes, but negatively to adaptive ones. However, because SDT also specifies that each motivation type is defined by unique characteristics (i.e. enjoyment, meaningfulness, ego-involvement, external pressures), and will therefore have specific consequences, it is important to determine the patterns, magnitudes, and reliability of their univariate relations with learners' goals, academic outcomes, and well-being.

Past research has occasionally highlighted the importance of unique motivation characteristics in association with outcomes. For example, whereas some research suggests that intrinsic motivation, being the most highly self-determined type of motivation, will predict more desirable results (Guay & Bureau, 2018; Guay, Denault, & Renauld, 2017; Taylor et al., 2014), a number of instances have been noted in which identified regulation appears more influential (Burton, Lydon, D'alessandro, & Koestner, 2006; Gagné et al., 2015; Losier & Koestner, 1999). Losier and Koestner (1999) found that voting behavior was more likely to be motivated by identified regulation, reflecting a sense of the importance of the action, rather than by any intrinsic enjoyment derived from the behavior. Results thus indicated that these types of motivation do indeed capture distinctly different reasons for behaving. Many school tasks also share this property of being important but not always enjoyable. While these studies provide a proof of concept, it remains unclear when or for which education-relevant outcomes identified regulation will demonstrate similar, or even stronger prediction than intrinsic motivation.

The exact roles of introjected and external regulations are also of interest in order to clarify how these two controlled motives are differentially associated with outcomes (Gagné et al., 2015; Ng et al., 2012). For example, in a meta-analysis of health-related behaviors, introjection was found to be associated with some adaptive outcomes, some negative ones, and showed some nonsignificant relations (Ng et al., 2012). As such, this previous meta-analysis

demonstrated that introjection has varying effects but was not broad enough to identify a consistent pattern of when and for which variables these effects should be expected. In the academic domain, introjection may similarly play different roles depending on whether the outcome concerns, for example, persistence, well-being, or the embracing of performance goals.

When considering external regulation, it is also unclear in which occasions it is an effective motivator and when it does more harm than good. In contrast with introjection, which theoretically represents partial internalization and should thus have mixed effects, external regulation is considered a less positive influence. Typical relations to educational outcomes range from nonsignificant relations with positive outcomes to small deleterious effects (Guay & Bureau, 2018; Litalien, Guay, & Morin, 2015). Evidence from other domains of research, such as workplaces, indicate that external motivating factors may yield positive relations with outcomes such as quantity of work completed. For example, a meta-analysis by Cerasoli, Nicklin, and Ford (2014) compared the effects of intrinsic motivation and extrinsic incentives (used as a proxy for extrinsic motivation) in predicting the quantity and quality of workplace performance, finding that extrinsic incentives positively predicted work quantity but not quality, whereas intrinsic motivation predicted both quality and quantity. However, the scope of their meta-analysis was restricted to these two broad categories of motivation and did not examine the contribution of each regulation type specified by SDT which is relevant for a detailed understanding of human motives. Likewise, a broad range of important outcomes fell outside the scope of their study, leaving questions about the effects of motivation on well-being, for example, unexamined. These questions are relevant to education considering the high levels of both external and introjected motivation in school contexts (Ratelle, Guay, Vallerand, Larose, & Senécal, 2007).

Such issues concerning the relations between specific motivation types and outcomes are particularly important given the correlated nature of the motivation types and their frequent use by SDT researchers in aggregated forms, such as contrasts between autonomous and controlled types of motivation and/or relative autonomy summary scores (Howard et al., 2020; Sheldon, Osin, Gordeeva, Suchkov, & Sychev, 2017). The issue of multicollinearity is noteworthy as it can result in spurious effects and the incorrect partitioning of explained variance, thereby obscuring the true effects associated with regulation types in multiple regression. While many studies tend to either ignore this multicollinearity or bypass it through composite variables in which motivation types are combined, solutions to multicollinearity are available. Relative weight analysis can be utilized to account for correlated predictors and is a particularly powerful method when applied in conjunction with meta-analytically derived correlations. As such, this analytic approach is well suited to testing the individual contributions of each motivation type in multivariate models and will more clearly identify trends and patterns which are unlikely to be noticed in individual studies or studies employing summary scores.

Assessing Multiple Outcomes Associated with Academic Motives

Outcomes in the current study are presented under five categories; academic achievement, persistence (e.g., effort, continuance intention, dropout intention), well-being (e.g., anxiety, positive and negative affect), goal orientations (e.g., performance approach/avoidance

and mastery approach/avoidance), and self-evaluation (e.g., self-esteem, self-efficacy, self-image). Academic achievement is usually operationalized as grade point average and is measured both objectively and by self-report. Variables within the persistence category reflect a student's intentions to participate in behaviors and include the variables of effort, continuance intention, intention to exercise, participation in physical activity, engagement, absenteeism, and intention to dropout. The well-being category includes the variables of anxiety, depression, boredom, negative affect, positive affect, general life satisfaction, vitality, enjoyment, and social-emotional functioning. Social-emotional functioning is defined in this study as an ability of students to navigate interpersonal interactions is a positive and fulfilling manner. The goal orientation category includes variables describing achievement goals (Elliot, 2013). Where mastery goals focus on developing competence and mastery of school activities, performance goals focus on how students are judged to have performed, especially in relation to others (Scherrer, Preckel, Schmidt, & Elliot, 2020). For example, mastery approach describes a mindset of engaging in a behavior with the intention of mastering the behavior, whereas mastery avoidance describes avoiding self-perceptions of incompetence, often resulting in individuals choosing easier tasks over more difficult ones. A performance approach orientation describes students who aim to demonstrate high performance relative to others, whereas performance avoidance describes a desire not to fail in a given behavior in front of others (Elliot & Hulleman, 2017; Scherrer et al., 2020). The self-evaluation category includes self-efficacy (belief in one's ability to accomplish a goal), self-esteem (respect or positive regard one has for themselves), anxiety concerning physical self-image, as well as positive impressions of physical self-image. The categories of self-evaluation and goal orientations can be considered either antecedents or outcomes of motivation (e.g., Hein & Hagger, 2007; Ciani, Sheldon, Hilpert, & Easter, 2011). For this reason, we refer to these variables as covariates rather than outcomes, but for analytic consistency treat them as outcomes.

Last, a number of moderators were examined, including publication status, age, gender, scale used, nationality, and context (classroom education vs. physical education). Self-determination theory specifies that its representation of motivation is universal (Chirkov, 2009; Ryan & Deci, 2020), and therefore should not vary substantially across contextual or individual difference variables. As such, we test the degree to which this claim of universality holds true for relations between motivation types and outcomes in the education context. We specifically test whether these relations vary as a function of the country in which data were collected to explore broad cultural differences. We also test more specifically for any differences in how motivation is experienced by students according to age and gender. In each case, these exploratory analyses are not expected to find substantial differences.

Methods

Inclusion Criteria

Inclusion in the current study was limited to samples meeting three criteria. First, samples must have presented primary data collected using a validated motivation scale based upon the SDT conceptualization of motivation. These scales are the Self-Regulation Questionnaire (SRQ),

Perceived Locus of Causality Scale (PLOC), Academic Self-Regulation Questionnaire (ASRQ), Academic Motivation Scale (AMS), Échelle de Motivation en Éducation (EME), Situational Motivation Scale (SIMS), Behavioral Regulation in Exercise Questionnaire (BREQ, BREQ-2, BREQ-2r), Behavioral Regulation in Sport Questionnaire (BRSQ), or Exercise Motivation Scale (EMS). Studies that made slight adaptations to these scales (e.g., alterations to the premise statement to reflect a specific context) were included. Second, samples must have presented data collected from students in an educational context, ranging from primary school to university education. Third, studies must have reported at least one correlation between a motivation type and an outcome. Studies published in languages other than English were included when relevant data was accessible.

Literature Search

Our literature search relied on three primary methods and is depicted in Figure 2. Firstly, forward searches were conducted beginning at scale validation articles. The list of all possible validated SDT-based motivation scales upon which to conduct this search was compiled and approved by the authors prior to searches. This forward search consisted of collecting all articles that cited a scale validation paper in either Google Scholar or Web of Science (n = 10,448). This process was conducted by the first, second and fourth authors, as well as a trained research assistant. All articles were independently examined at this stage by either the first or fourth authors with duplicates being removed. Studies not reporting primary data from student samples or associations with outcomes were also removed at this stage. Secondly, a search of major databases (EBSCO & PsycINFO) was conducted by the first author using search terms "self-determination" and "student" and again combining the search terms "student" and individual scale names. All available dissertations, conference presentations, and grey literature were included. Additionally, the Proquest Dissertation and Thesis Global database was searched with the keywords "self-determination" and "student." All articles appearing in database search results were assessed, compared against previously collected samples, and included if meting the inclusion criteria and not duplicates. Of the 329 remaining articles, 55 did not provide all necessary information. Corresponding authors of these articles were contacted via e-mail (n = 49), requesting the full correlation tables associated with published studies as well as any additional unpublished data (including conference presentations and dissertations; response rate = 43%), resulting in 14 additional samples. Finally, a request for unpublished data was posted on multiple mailing lists (SDT, American Educational Research Association, Society of Personality and Social Psychology, and Society for the Study of Motivation), resulting in an additional 17 samples.

The final database consisted of 344 samples (276 published, 68 unpublished), including a total of 3,959 correlation coefficients from 223,209 participants (samples ranging from 21 – 26,607 participants, mean = 649). Of the samples, 232 were classroom-based, whereas 112 were from physical education-based. The mean age across samples was 16.19 years old and the average proportion of males in each sample was 45.94%.

Coding

A coding spreadsheet was developed by the first author and approved by remaining authors. Information pertaining to motivation variables (type of motivation, scale used, and reliability) was coded, as was information relating to associated outcomes (scale used and reliability). Demographic information relating to the sample was also coded including domain in which the data were collected, country, language, year level at school (or categorical label when exact year level was unavailable), mean age, percentage of males in the sample, and publication status. All coding was shared between the fourth and first authors. The first author additionally double coded approximately 10% of articles independently to establish inter-coder agreement (Cohen's $\kappa = .94$; McHugh, 2012). All divergent coding decisions were discussed between the first and fourth authors and resolved through reexamination of the data.

Outcomes

All outcomes included in the collected studies were coded. In two instances, outcomes measuring highly related constructs were combined when agreed upon by the authors (i.e., positive affect/happiness; anxiety/stress) in order to meet minimum required number of samples for analysis. Variables that were not measured more than three times and could not be combined with related constructs were not examined further (see Table S2). Additionally, variables that were considered of low interest for education, specifically, body mass index and physical performance were relegated to the supplementary materials (Table S3). Most variables were measured through self-report and many outcomes included data from multiple different scales. Student academic achievement was the only outcome commonly measured through both self-report and objective measures. Given that previous research has demonstrated that this distinction is likely to be important (Kuncel, Credé, & Thomas, 2005) and because many samples were available, self- and objective-report academic achievement were analyzed separately. As such, the final analyses included a total of 26 outcome variables.

Meta-Analytic Procedures

All meta-analytic calculations were conducted using the R software, specifically using the robumeta package (Fisher & Tipton, 2015). Random effects models were used throughout as the assumption of fixed effects models (i.e., attributing residual variance in outcomes to artifacts rather than theoretically plausible moderators) is unlikely to be tenable (Borenstein, Hedges, & Rothstein, 2007; Hunter & Schmidt, 2000). Correlations were initially corrected for scale reliability before final meta-analytic correlations (ρ) and associated 95% confidence intervals were calculated through inverse-variance weighting procedures. When scale reliability data was not available, mean reliability scores were calculated for each measure and imputed. Non-independent data was handled with robust variance estimator procedures (Hedges, Tipton, & Johnson, 2010). This analytic method integrates dependent effects into a single, non-biased estimate in order to avoid inflation of sample size and effect precision. When studies included multiple time points, only time 1 correlations were included in order to avoid effects of experimental manipulations and duplication of data. Outliers were examined through cumulative analyses and one-study-removed analyses (Borenstein, Hedges, Higgins, & Rothstein, 2011). Results from these tests did not find any substantial outliers and, as such, no studies were

excluded from analyses based on this test. Specifically, the removal of a sample never significantly changed the estimated association with outcomes, which was indicated by highly similar point estimate and confidence intervals as well as by effects remaining within the confidence intervals of the estimated true effect.

The degree of heterogeneity present in meta-analytic estimates was examined through the Tau squared (T^2) and I^2 statistics. Specifically, whereas the T statistic is the estimated standard deviation of the population level effect size, T^2 is the population variance, which indicates the amount of heterogeneity in the target association. The I^2 statistic estimates the proportion of this variance which can be attributed to true heterogeneity caused by moderating factors, as opposed to artifacts such as sampling error and chance (Higgins, Thompson, Deeks, & Altman, 2003; Higgins & Thompson, 2002). I^2 scores greater than 75% indicate substantial heterogeneity which could be explained by moderating factors, whereas 50% is considered moderate heterogeneity, and 25% low heterogeneity (Higgins et al., 2003).

To compare the effect sizes between regulation types, we relied on the confidence interval method proposed by Cumming and Finch (2005). Effect sizes with confidence intervals that show >50% overlap indicates approximate equivalence between effects. Alternately, when confidence intervals do not overlap at all, this is interpreted as a statistically significant difference in effect equal to a probability of approximately .01. When confidence intervals overlap but less than 50%, this indicates effects are statistically different at a probability of .05.

A number of tests were conducted to establish the moderating influence of age, gender, publication status, scale, and context. Specifically, meta-regressions were conducted on the continuous variables of age and gender (respectively operationalized as mean age and percentage of males in the sample). Meta-regressions indicate how much of the unexplained heterogeneity (I^2) can be explained by the potential moderator. More specifically, meta-regression examines the proportion of between-study variance in an effect, in this case an estimated correlation, which can be explained by the moderating variable, in this case age or proportion of males in the sample and is represented by the R^2 analogue statistic. Additionally, the regression coefficient describes the degree to which the estimated effect size will change in relation to a one-point increase in the potential moderator variable. The statistical significance associated with this effect is also provided. Furthermore, the effect of publication status was investigated in several ways including trim and fill procedures (Duval & Tweedie, 2000), Egger's test of the intercept (Egger, Smith, Schneider, & Minder, 1997), and subgroup analysis. The trim and fill method utilizes funnel plots to examine symmetry of observed effects in order to identify potential missing studies, and thereby potential for publication bias. Results present the number of studies estimated to be missing, the direction of missing studies (left or right of the mean), and the corrected correlation if such studies were in fact conducted and included. Although adjusted correlations from this analysis are not reliable replacement estimates, they nonetheless serve to demonstrate if systematic exclusion of literature is present and in which direction these effects are likely to be, and in doing so act as a type of sensitivity analysis (Duval & Tweedie, 2000).

Egger's test is a regression-based test of symmetry in which results significantly different from zero indicate potential publication bias.

Finally, subgroup analysis was also applied to further examine publication bias in which correlations were estimated for published and unpublished samples separately. Subgroup analyses were also conducted based upon the motivation scale used (AMS vs. SRQ; Vallerand et al., 1992; Ryan & Connell, 1989), which context the study took place (classroom education vs. physical education), and the country in which samples were collected.

Additionally, relative weights analysis (RWA) was applied to meta-analytically derived correlations in order to test the differential prediction capabilities of motivation types for each outcome. RWA is designed to estimate the unique contribution predictors make towards the prediction of an outcome once accounting for the correlated nature of predictors (Tonidandel & LeBreton, 2011). In other words, when predictors are correlated, the amount of explained variance in an outcome can be misattributed between predictors and lead to false conclusions regarding the influence or importance of predictors. RWA adjusts for this issue of multicollinearity and produces an estimated R^2 for each predictor as well as a rescaled relative weight describing the proportion of total variance uniquely explained in the outcome by each predictor. RWA was conducted in the R software package (Tonidandel, & LeBreton, 2015).

Results

Correlations between types of motivation are presented in Table 1. Results conformed to the expected pattern with larger correlations recorded between theoretically neighboring types of motivation. The correlations between intrinsic motivation, integrated regulation, and identified regulation were notably high (ρ = .85 to .90).

Motivation and Adaptive / Maladaptive Outcomes

To gain a broad understanding of results, outcomes were first divided into two composite variables representing adaptive or maladaptive educational outcomes as displayed in Table 2, and correlations between these two composites and motivation types were calculated (graphically represented in Figure 3, Table S1 of the supplementary materials). When examining adaptive outcomes, a general pattern can be observed as amotivation is the strongest negative correlate, and relationships with motivation types become increasingly more positively as the degree of self-determination increases, until reaching a moderately strong positive relationship with intrinsic motivation. Specifically, amotivation was significantly associated with adaptive outcomes (ρ = -.24), though external regulation was unrelated (ρ = -.01). Introjected regulation (ρ = .17), identified regulation (ρ = .38), and intrinsic motivation (ρ = .41) were all positively associated. Integrated regulation was also positively associated with adaptive outcomes (ρ = .23; See Table S1), although this result was not significant, likely due to the very limited number of samples including the motivation type (k = 6).

The reverse pattern of association is also observable for maladaptive outcomes which displayed a moderately positive association with amotivation and decreased to a negative association with intrinsic motivation. Specifically, amotivation was positively and significantly associated with maladaptive outcomes at a corrected correlation of .28, along with external

regulation (ρ = .18) and introjected regulation (ρ = .19). Identified regulation, on the other hand, demonstrated a nonsignificant association with maladaptive outcomes (ρ = -.04) whereas intrinsic motivation was found to relate negatively and significantly (ρ = -.13). Insufficient samples were available to meaningfully estimate a correlation between integrated regulation and maladaptive outcomes.

It is worth noting that introjected regulation was positively related to both adaptive and maladaptive outcomes. Though these correlations are somewhat modest in magnitude, this clearly indicates the theorized double-sided nature of introjected regulation. It is also interesting to highlight that identified regulation and intrinsic motivation display highly similar associations, with each relating positively to adaptive outcomes (ρ = .38 & .41 respectively). However, when examining maladaptive outcomes, intrinsic motivation was significantly related (ρ -.13) whereas identified regulation was not (ρ = -.04). This result is noteworthy as intrinsic motivation is the only motivation type to significantly and negatively relate to globally defined maladaptive outcomes.

Motivation and Specific Outcomes

In examination of specific outcomes and beginning with student academic achievement, it can be seen in Table 3 (and Figure 4) that regardless of grades being self-reported or objectively reported, amotivation is associated in a negative manner. External and introjected regulations also display results similar across both reporting methods, with non-significant results. While identified regulation and intrinsic motivation were both positively and significantly related to academic achievement, the differences between these two types of motivation were not significant. Interestingly, unlike with the previous types of motivation, results with identified and intrinsic motivation differed between self-report and objective report. Specifically, the effect size is substantially higher for self-report (identified ρ = .29, intrinsic ρ = .32) compared to an objective report (identified ρ = .11, intrinsic ρ = .13). This indicates that while both identified regulation and intrinsic motivation positively and equally related to academic achievement, self-reports of academic achievement may inflate this relationship over more objective measures.

When examining variables relating to student persistence (Table 4, Figures 5 & 6), several common themes emerged. Firstly, amotivation was once again negatively associated whether the outcome was defined as continuation intention, intention to exert effort, intention to exercise, or engagement. Likewise, external regulation related non-significantly to each of these variables. Introjected regulation displayed diverse results, with significant positive correlations with effort (ρ = .25, k = 16), engagement (ρ = .26, k = 23) and intention to exercise (ρ = .25, k = 12). However, its relationship with continuation intention and dropout intention were nonsignificant (ρ = .02 & -.03 respectively, k = 9 & 7). Together, these results seem to indicate that introjection has a mixed relationship with future intentions to persist in education-based activities. Interestingly, when comparing identified regulation and intrinsic motivation in relation to persistence-based outcomes, results showed that effect sizes were larger for identified regulation than intrinsic motivation, although notably, overlapping confidence intervals indicate

this difference may not be significant (Cumming & Finch, 2005). This same difference in absolute effect sizes favoring identified regulation was also noted for dropout intention, though with negative correlations. This indicates that while both identified and intrinsic motives are positively and significantly associated with student persistence, it is reasonable to expect identified regulation may often be the strongest correlate. Objectively reported absenteeism was unrelated to any motivation types, perhaps signaling the diverse causes of being absent from school.

Results associated with well-being outcomes are displayed in Table 5 (Figures 7 & 8). Beginning with amotivation, results demonstrated significant negative associations with indicators of positive well-being (i.e., positive affect, vitality, enjoyment, and social emotional functioning) and significant positive associations with maladaptive well-being indicators (i.e., anxiety, depression, boredom, and negative affect). The only non-significant relationship was that with general (life) satisfaction. External regulation often did not relate to well-being outcomes significantly, but it was positively and significantly associated with anxiety ($\rho = .12$, $k = 20$), and negative affect ($\rho = .22$, $k = 20$), and negatively with vitality ($\rho = -.18$, $k = 10$). Across the range of well-being indicators, introjected regulation was positively and significantly associated with positive affect ($\rho = .13$, $k = 18$), enjoyment ($\rho = .26$, $k = 9$), negative affect ($\rho = .16$, $k = 12$), and anxiety ($\rho = .13$, $k = 17$), while remaining unrelated to all remaining outcomes. Somewhat unexpectedly, identified regulation was unrelated to most negative indicators of well-being (i.e. depression, negative affect), with anxiety presenting the only exception ($\rho = -.12$, $k = 16$). In contrast, identified regulation was positively and strongly related to positive indicators. Intrinsic motivation, on the other hand, was negatively and significantly associated with anxiety and negative affect and unrelated to depression, but positively associated with all positive indicators of well-being. As such, it appears intrinsic motivation is a stronger correlate of well-being, particularly regarding indicators of negative well-being, than identified regulation.

When examining results pertaining to goal orientation (See Table 6, Figure 9), it was found that in relation to mastery-approach orientation, amotivation was negatively related ($\rho = -.22$, $k = 14$) and external regulation unrelated. Introjection displayed a moderate positive correlation ($\rho = .33$, $k = 18$), whereas identified and intrinsic motivations returned strong positive relationships ($\rho = .65$ & $.64$ respectively, $k = 16$ for both). Mastery avoidance was unrelated to amotivation, and positively related to all remaining types of motivation ($\rho_{range} = .30$ to $.40$). Likewise, performance approach was unrelated to amotivation but positively related to each other type of motivation with introjected regulation being the strongest correlate ($\rho = .46$, $k = 17$). Finally, performance avoidance was positively related to all motivation types, including amotivation, with introjected regulation again recording the strongest correlation ($\rho = .43$, $k = 19$). In summary of these results, it appears intrinsic motivation and identified regulation were the strongest associates of mastery-approach goals, whereas both approach and avoidance performance goals, which are focused on comparisons with others, were particularly associated with introjection.

Data were available and analyzed for several self-evaluation covariates including students' self-esteem, self-efficacy, and self-physical image evaluation (both positive and negative; Table 7, Figure 10). First, self-efficacy related negatively and significantly to amotivation (ρ = -.37, k = 13), non-significantly to external (ρ = -.02, k = 16) and positively and significantly to introjected regulations (ρ = .18, k = 13), identified regulation (ρ = .43, k = 15) and intrinsic motivation (ρ = .41, k = 11). Self-esteem, likewise, related negatively and significantly to amotivation (ρ = -.38, k = 3), non-significantly with external regulation (ρ = .10, k = 5) and positively and significantly with introjected (ρ = .23, k = 5) identified (ρ = .44, k = 5) and intrinsic motivations (ρ = .34, k = 5). Interestingly, when examining positive and negative physical image perceptions, amotivation was uniformly maladaptive (i.e., associated with increased physical image anxiety and reduced positive physical image perception), external and introjected regulations were both unrelated to positive physical image perception but significantly positively related to physical image anxiety (ρ = .26, ρ = .22, respectively). Identified and intrinsic motivations were both positively and significantly related to positive physical image (ρ = .32, ρ = .36, respectively) whereas only intrinsic motivation was related significantly to physical image anxiety (ρ = -.18, k = 5).

Relative Weights Analysis

Relative weights analysis was conducted to estimate the unique contribution each type of motivation made towards outcomes once accounting for the correlated nature of motivation (Table 8). Beginning with student academic achievement, for self-report data, both intrinsic and identified types of motivation contributed substantial unique predictive capability (39% and 21% respectively), while amotivation also accounted for 27% of the explained variance. Furthermore, it was estimated that introjected and external regulations contributed very little unique information (2% and 9% respectively). However, for data employing objective measures of academic achievement, it appears that avoiding amotivation was the most important consideration as its detrimental effect can account for 38% of variance, followed by intrinsic motivation (25%) and identified regulation (20%).

When examining other outcomes, it appears that intrinsic motivation was, on average, the single strongest predictor, capable of accounting for 30% of variance in outcomes. Identified regulation also played an important role on average (28%) with amotivation uniquely contributing 17% of predictive capability towards outcomes. External (12%) and introjected (11%) regulations played less central roles in prediction, on average. It should be noted, however, that results of this analysis pertain to direct effects of motivation on outcomes and do not account for interaction effects. As such, while introjected and external regulation do not appear to be strong unique predictors of most outcomes, they may still play more complex interactive roles.

Interestingly, two patterns consistently emerged from these analyses. First, it appears that factors relating to well-being including depression, negative affect, and psychological well-being were primarily associated with intrinsic motivation (RW_{mean} = 38%), and somewhat less so with identified regulation (RW_{mean} = 27%) and amotivation (RW_{mean} = 17%). For these well-being

outcomes, external and introjected regulations appeared to be uninfluential as simultaneous predictors. This pattern of intrinsic motivation playing the strongest role also applied to the outcomes of mastery avoidance goals (38%) and physical image anxiety (30%).

A second pattern also emerged relating to the persistence-based outcomes of effort, intention to exercise, and continuance intention. For these outcomes, identified regulation was estimated to uniquely contribute the most to prediction, accounting for an average of 34% of variance, which was more than intrinsic motivation (RW_{mean} = 26%) or any of the remaining motivation types. These results provide evidence for the importance of identified regulation in uniquely predicting outcomes relating to persistence and intention.

When examining performance goals, introjected regulation was the strongest predictor of both performance approach and avoidance goals (30% & 41% respectively). Additionally, whereas self-efficacy appeared most strongly predicted by identified regulation (34%), self-esteem was predicted more strongly (and negatively) by amotivation (39%). External regulation was not found to be the key predictor of any measured outcome.

Moderation Analyses

Turning to moderation analyses, we conducted trim and fill procedures as well as Egger's regression test to investigate publication bias through examination of the possibility of missing studies. Given the known tendency of trim and fill tests to return false positives (Sterne, Gavaghan, & Egger, 2000), we interpreted results from both tests, as well as the degree to which possible missing studies would influence the effect size in order to identify publication bias. Results generally demonstrated that the amount of suspected missing data was small and that for most variables, publication bias was not present (see Table S4 for details and minor exceptions) A single notable exception to this was seen in the association between intent to exercise and external regulation which, when based upon collected data was estimated to be .03, although once accounting for potentially missing studies was estimated to be negatively related (ρ = -.11). Relationships between these variables should therefore be interpreted with some caution. Subgroup analysis comparing published and unpublished results did not find any additional differences (See Table S5).

When examining the influence of participants' age on the relationships between regulation types and outcomes through meta-regression (see Table S4), many analyses returned nonsignificant results (74 out of 100 results). However, a subtle yet statistically significant pattern emerged when examining introjection. Specifically, meta-regression results regarding well-being variables indicated that as students grow older, the positive relationship between introjection and adaptive well-being outcomes decreased and the positive relationship between introjection and maladaptive outcomes increased. Results also showed corresponding small but significant effects for positive affect and general satisfaction such that introjection became less strongly positively related to these variables as mean age of samples increased. Alternatively, the positive relationship between introjection and negative affect demonstrated the inverse result with this relationship becoming stronger as participant age increased. This effect was also noticed for dropout intention (relationship increasing for older students), while the relation

between introjection and self-reported academic achievement became weaker with age. A final trend to be noted regards amotivation. Associations between amotivation and both self-efficacy (negative) and negative affect (positive) decreased as student age increased. Alternatively, correlations between amotivation and social-emotional functioning, positive affect, engagement and physical activity all increased as student age increased, indicating that for these outcomes, amotivation became less detrimental as students' age increased.

When examining the moderating effects of gender, two trends appeared noteworthy. First, the correlation between self-reported academic achievement and both identified and intrinsic motivation increased as the proportion of males in a sample increased. Interestingly, no differences were present when examining objectively recorded academic achievement. Second, a pattern emerged in which engagement, vitality, and social-emotional functioning all displayed lower correlations with amotivation as the proportion of males increased, indicating that amotivation may have a less detrimental effect on males on these outcomes. These results are reported in Table S4 of the online supplementary materials.

Finally, subgroup analyses were conducted to examine the moderating influence of the scale used (Tables S6 & S7), the type of academic context (classroom vs. physical education; Table S8), and the country in which samples were collected (Table S9). Results do not show any clear pattern of difference, with 95% confidence intervals around point estimates overlapping in most comparisons. Differences were noticed in that introjected regulation, identified regulation, and intrinsic motivation all related more strongly and positively to engagement in the Eastern samples. These results indicate that cultural influences may moderate the relationships between motivation and some specific outcomes in a minor way. However, in general, the associations between motivation and outcomes appear robust across cultural contexts. Nonetheless, the relatively small number of samples collected in non-western countries suggests caution in interpreting these findings.

Discussion

In this meta-analysis, we examined the relations between various types of motivation as defined within SDT and an array of outcomes in education, including indicators of academic performance, persistence, well-being, goal orientations, and self-evaluative appraisals. In line with theoretical expectations, adaptive outcomes were generally associated with more self-determined forms of motivation, and less self-determined motives were generally associated with more maladaptive indicators. In addition, several nuanced findings reflecting the specific characteristics of these motivation types were demonstrated, as were moderating influences based on student age. The theoretical implications as well as implications for teaching and institutional practices are detailed below.

A central finding is that identified regulation appears to hold some unique and meaningful characteristics pertinent to motivation beyond any of the other motivation types, as evidenced by both correlations and RWA results (see Table 8). These results are interesting because identified regulation is a self-determined form of extrinsic motivation that relates to several outcomes more strongly (or as strongly) than intrinsic motivation. Although this pattern

has been noted previously in some specific instances (e.g., Burton et al., 2006; Losier & Koestner, 1999), we found that this pattern was particularly important regarding a range of persistence related outcomes (see Table 8). This result can be aligned with theory considering that intrinsic motivation is dependent on emotive states such as curiosity and enjoyment (Reeve, 1993), whereas identified regulation is likely to be more relevant to both interesting and uninteresting tasks, thus adding an essential component in persistence-based outcomes. In addition to providing relatively strong evidence for this under-documented effect, these results also have substantial implications for SDT as they indicate that identified regulation contributes some amount of unique information towards explaining student outcomes, above other motivation types or general self-determination.

Results also indicate that ego-involving motives, described as introjected regulation in SDT, play a very interesting dual role. Introjection positively relates to education-focused behaviors including effort, engagement, and physical exercise, but will likely coincide with notable negative side effects including anxiety and negative affect. These findings are thus consistent with SDT's view that introjection represents a partial internalization of values, and as such can drive behaviors through internalized pressures and ego-involvement to some extent (Ryan & Connell, 1989; Ryan & Deci, 2017). An especially important and novel contribution of our analysis was showing the strong relations of introjected motives with performance goals, both approach and avoidance. This is perhaps not surprising given that performance goals are focused on social comparisons, which may be associated with both self and other approval dynamics. Another set of findings unique to this meta-analysis was that the associations between introjected regulation and many outcomes were moderated by age. Specifically, results indicated that as students become older, the relation between introjection and adaptive outcomes decreases, whereas the relation between introjection and maladaptive outcomes increases. It appears that introjection plays an increasingly negative role as students mature. This result implies that moving beyond introjected regulations (or internalizing them; Deci, Eghrari, Patrick, & Leone, 1994) might be considered an important developmental challenge for students. Though beyond the scope of this study, this result may well generalize to other domains such as sport, work, parent-child relationships, and health-care settings.

Our results also demonstrate that external regulation associates with outcomes in a very interesting and somewhat unexpected way, which had not been outlined so clearly before. Specifically, external regulation related to a range of maladaptive results (including higher anxiety as well as reduced social-emotional functioning, physical well-being, and vitality), but appeared unrelated to adaptive outcomes. In fact, across the 26 outcomes included in the current study, in only one case (performance approach goals), did external regulation demonstrate positive and significant associations with what may be considered an adaptive outcome. This is contrary to past research examining the effects of incentives, usually monetary, on student performance and persistence have argued for positive, or at least mixed, outcomes (e.g., Angrist & Lavy, 2009; Fryer, 2011; Niu, 2016). In fact, current results indicate that motivating students via such external means, insofar as that engenders external regulation, may risk reduced student

well-being. This is highly notable as much of the past research on incentives, often stemming from economic and management domains of research, does not include measures of well-being, typically prioritizing student achievement (Angrist & Lavy, 2009; Fryer, 2011). As such, detrimental effects associated with external regulation are not well documented outside of self-determination theory.

Finally, because most general outcome categories (i.e., achievement, persistence, well-being) are not exclusive to the education domain, one can expect that the current results are transferable to domains beyond education such as workplaces, health-related behavior and interpersonal relationships, to name a few. Recent meta-analytic research in different domains, although not exactingly paralleling our methods, does in fact reveal findings that are generally consistent with those of the present study, holding promise for such generalizability (e.g., Ntoumanis et al., 2020; Slemp, Kern, Patrick, & Ryan, 2018; Vasconcellos et al., 2019).

Implications for SDT

When considering theoretical implications for SDT, it is important to note that theory-consistent results demonstrate the characteristics and importance of specific types of motives, including for example, the strong connections between introjection and performance goals, and between academic persistence and identified regulation. Such results largely support a multidimensional perspective of motivation and indicate that any single factor is not likely to capture all construct-relevant information inherent within SDT (Howard et al., 2020; Sheldon et al., 2017). However, it must also be noted that more autonomous types of motivation were generally associated with more desirable outcomes in a predictable and linear manner, indicating the relatively strong influence from general self-determination. This conclusion aligns with previous studies examining the structure of motivation in SDT through bifactor modeling (Howard et al., 2018; Litalien et al., 2017). Once a general factor of self-determination was extracted in these studies, each regulation factor contributed varying amounts in subsequent prediction analyses with intrinsic and identified factors found to play substantially greater roles than external and introjected factors in predicting many variables (Howard et al., 2018; Litalien et al., 2017).

These findings also have implications for the commonly applied dichotomy of autonomous/controlled motivations (Howard et al., 2020). Given our results indicate that introjected and external regulations do not associate similarly with outcomes, and can even associate in different directions, combining these motivations into a controlled motivation factor carries risks and will be insensitive to these noted differences. Likewise, an autonomous motivation factor will be insensitive to the unique associations between identified regulation and persistence, as well as the more beneficial effects of intrinsic motivation on wellbeing. For these reasons, the present results also indicate that a simple, unidimensional conceptualization of motivation is unlikely to explain the most important educational outcomes in a satisfying way. Results from both previous studies and the current meta-analysis indicate that while the degree of self-determination is highly important, different motivation types within the SDT taxonomy also relate to different outcomes beyond their level of self-determination.

Practical Implications for Classrooms

These results have substantial implications for classrooms, especially for how teachers, parents, and administrators attempt to activate or incentivize student participation in their education through learning practices, engagement, and testing. While past research has established the importance of autonomy support in facilitating motivation, the current results demonstrate more clearly and precisely the importance of motivation, thereby completing the motivational process from teacher and parent behaviors to student outcomes.

For example, it is known that implementation guidelines for fostering optimal student motivation, that is a combination of both intrinsic motivation (i.e., enjoyment) and identified regulation (i.e., meaningfulness), should be centered around teachers' and parents' autonomy-supportive practices. These require consideration of the student as a person, meaning that their feelings and preferences should be acknowledged (through empathetic interactions and provision of choices meaningful to them) and that they are entitled to rationales explaining why school tasks suggested to them are meaningful. It also implies minimizing the use of controlling language and behavior. These positive interpersonal gestures have demonstrated in meta-analytic investigation the ability to increase meaningfulness and intrinsic motivation among students and to lead to adaptive academic outcomes (Vasquez, Patall, Fong, Corrigan, & Pine, 2016) and are supported by the demonstrated effectiveness of interventions designed to increase autonomy-supportive teaching practices (Cheon, Reeve, & Moon, 2012; Cheon & Reeve, 2015; Su & Reeve, 2011). Combining current findings with this past research, parents and educators now have access to precise estimates detailing the motivational pathway from autonomy supportive practices, to student experienced motivational states, and associations with a wide array of education focused outcomes. The present results also highlight more clearly the potential costs of using external incentives and punishments (e.g., parents offering monetary rewards or teachers punishing bad behavior), as these controlling environmental effects are likely to foster external regulation which in turn relate negatively with student wellbeing while not associating with persistence or performance. Additionally, overbearing or conditionally regarding teaching and parenting practices are likely to increase student ego-involvement and introjected regulation (Joussemet, Landry, & Koestner, 2008). Current results highlight the double-edged nature of conditional regard as it relates positively with effort and engagement, but also to negative well-being costs, and ultimately remains unrelated to academic achievement.

Current results may also have implication concerning how education systems are designed more broadly. Specifically, Ryan and Weinstein (2009) have argued that high stakes testing, with its focus on achieving suitable scores on standardized tests and the incentives and punishments schools incur as a result, will foster an education environment of control. School faculty will feel externally pressured to meet and exceed specific criteria, potentially encouraging controlling teaching practices, and subsequently stifling the more autonomous forms of motivation of students (Pelletier & Sharp, 2009). Current results highlight the flaw inherent within such a system in that carrot and stick approaches, insofar as they tend to foster external regulation, are unlikely to correlate with performance though will correlate with

negative student well-being indicators. In other words, the pursuit of a narrowly defined criteria of success in the form of test scores now appears potentially harmful to students' long-term development and educational success. The absence of positive motivational contributions from high-stakes testing is particularly worrisome given their worldwide pervasiveness (e.g., SAT in the US, NAPLAN in Australia, Baccalaureat in countries following the French system).

Limitations & Direction for Future Research

A first limitation worth noting is that heterogeneity could not be removed from point estimates, even after moderation analyses. While current estimates successfully distinguish between motivation types and their associations with outcomes, this remaining heterogeneity indicates that point estimates may be further moderated by factors not included in this study and, therefore, that effect sizes may still vary due to contextual, environmental, and individual differences. The contextual influence of class subject, particularly non-academic subjects such as music and art, could be notable. Future meta-analytic studies focusing on more specific contexts and fewer outcomes would be well suited to mapping out these moderating influences. Secondly, it must also be noted that data in the current study were cross-sectional and correlational, precluding strong conclusions about causality. While this reflects the current literature, it also limits our ability to infer meaning from current results and highlights the need for more rigorous methodologies designed to test causality, potentially using time separation, repeated measures, and experience sampling methodologies.

Another potential limitation is that very few samples in the current meta-analysis included data for integrated regulation. This is because it is not often measured in the education domain, likely due to theorizing that students are too young to internalize motives to this degree. However, results that did include this motivation type showed that integrated regulation was potentially important in reducing maladaptive student outcomes. This indicates the potential for more research including this motivation type in education contexts as it may play a role not otherwise accounted for by intrinsic or identified motives. Likewise, the range of outcomes, while representative of the current literature, do not cover the full range of important education outcomes. Specifically, greater attention could be paid to maladaptive student outcomes such as disruptive and anti-social student behaviors as these are highly relevant to teachers and parents. Likewise, growth scores would likely be a more nuanced indicator of student achievement then GPA, and as such could be included in future studies.

Another direction for future research could include examination of potential interactions between motivation types in predicting educational outcomes (Deci, Koestner, & Ryan, 1999, 2001). Although our results indicated that external and introjected regulations play relatively minor roles directly predicting most outcomes in RWA, it may be the case that they are more important predictors of others, or through interaction with other motives. The application of person-centered analyses such as latent profile analysis and latent transition analysis to the study of motivation is ideally suited to testing these complex interactions (e.g. Wang, Morin, Ryan, & Liu, 2016). A final direction for future research would be a comparison of SDT against other commonly applied theories of motivation in order to establish the relative importance of various

theories. Such an approach could be essential to the integration of theories and even the development of novel and more holistic theories of student motivation.

Conclusion

Through a comprehensive synthesis of research within the educational psychology literature on types of motivation specified within SDT, the current results demonstrated the importance of student self-determination in education contexts. In general, and as expected, more autonomous types of motivation were associated with more desirable outcome. Furthermore, results demonstrate the added importance of identified regulation in fostering persistence and future intentions, as well as the detrimental effects on well-being likely to accrue from external incentives and pressures insofar as they engender external regulation. The role of shame, pride, and guilt (i.e., introjected regulation) is demonstrated as they show positive associations with both adaptive and maladaptive education outcomes. The particularly damaging effect of amotivation for students in general is also underscored. Taken together, these results provide compelling evidence for the importance of fostering high quality student motivation, and of the relative costs and benefits of specific types of academic motivation.

Data and Supplementary Materials:

The full dataset and all associated supplementary materials are made available through Open Science Framework. All files can be found with the following link: https://osf.io/ykfz5/?view_only=35f834deee2d459f8eb39c97d8ff3601

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* All references providing data are listed in the supplementary material.

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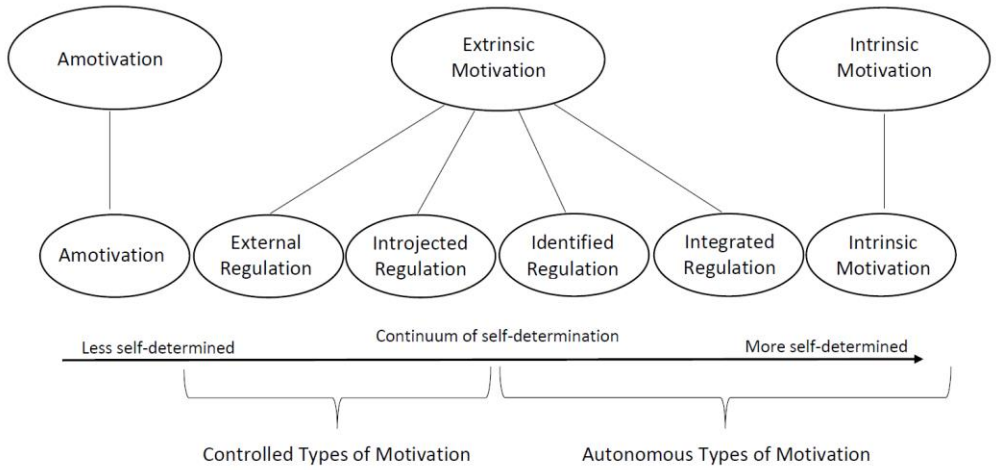

Figure 1

Representation of Motivation in Self-Determination Theory. Adapted from "Testing a Continuum Structure of Self-Determined Motivation: A Meta-Analysis," by J.L. Howard., M. Gagné., & J.S. Bureau, 2017, *Psychological Bulletin*, *143*(12), p. 1347. Copyright 2017 by American Psychological Association

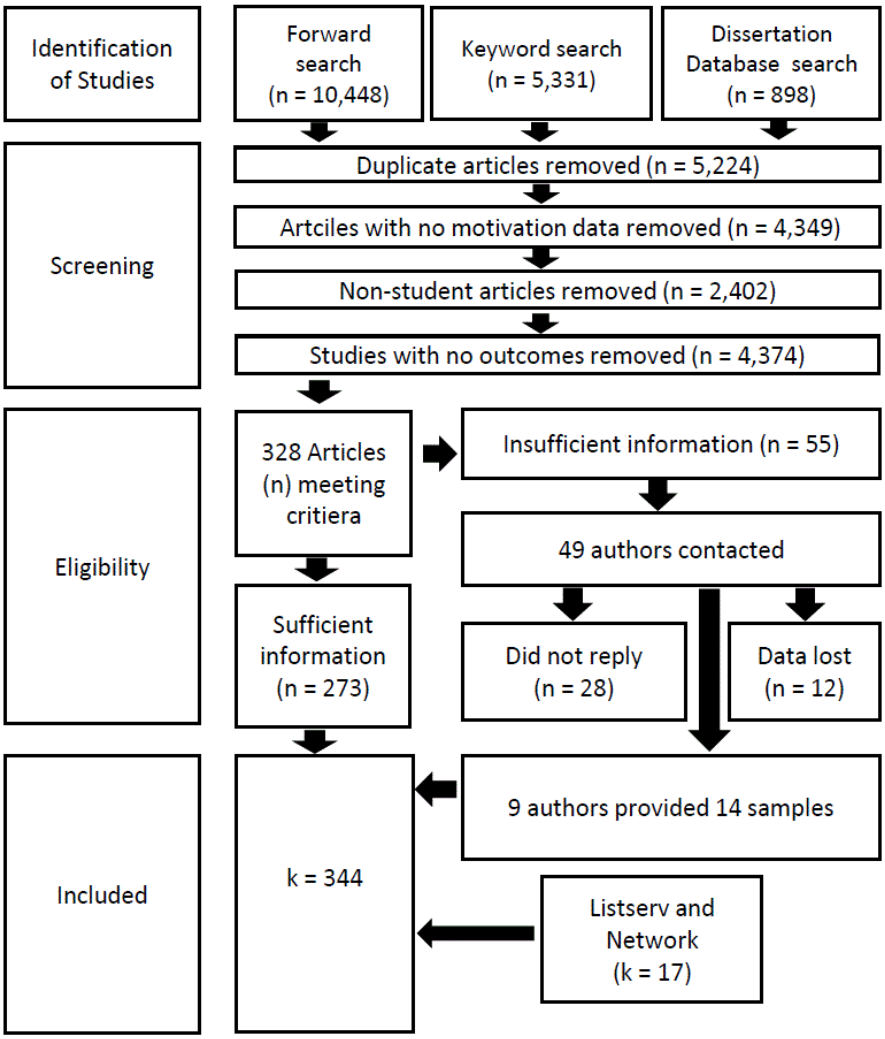

Figure 2

Flow Chart of Literature Search and Exclusion Procedures

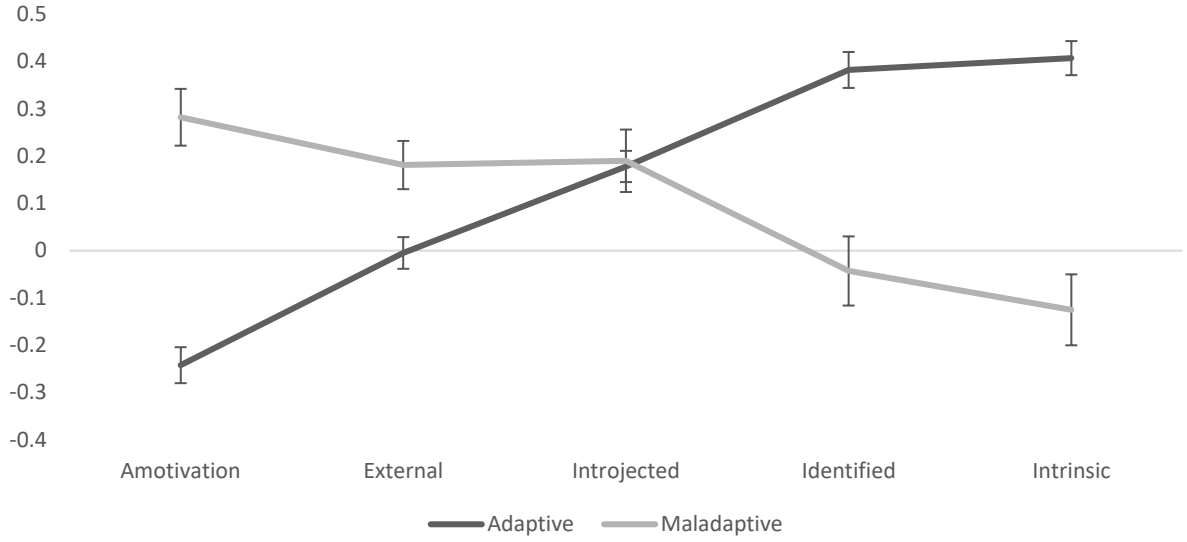

Figure 3
Graphical Representation of the Average Relationship between Motivation Factors and Adaptive and Maladaptive Outcomes with 95% Confidence Intervals

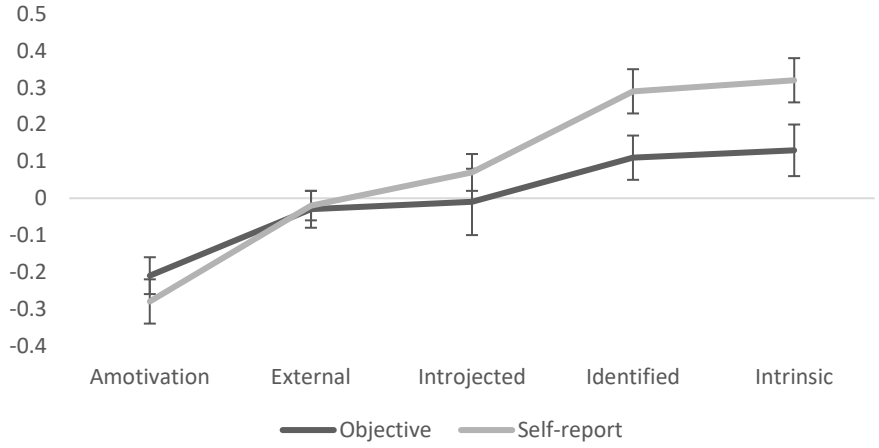

Figure 4
Graphical Representation of Correlations between Motivation and Grade Point Average with 95% Confidence Intervals

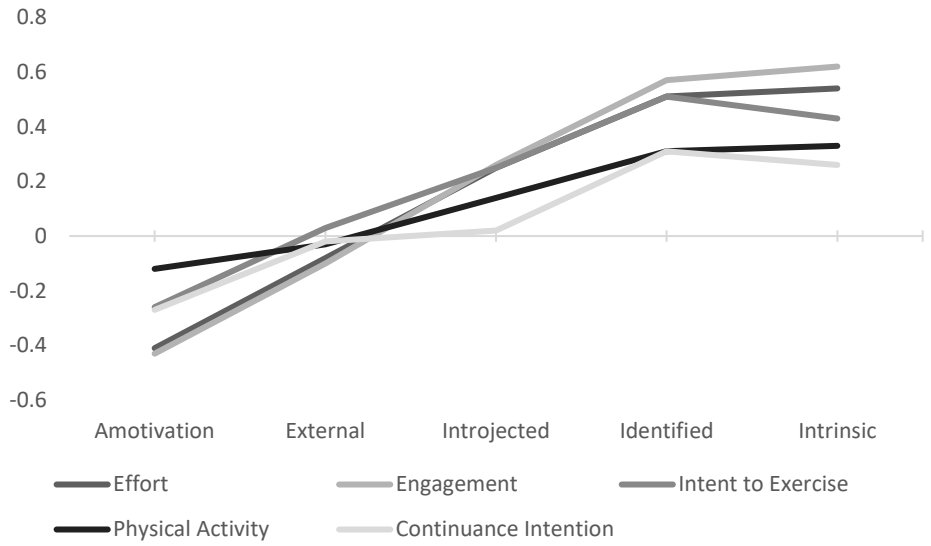

Figure 5
Graphical Representation of Correlations between Motivation and Adaptive Persistence Outcomes

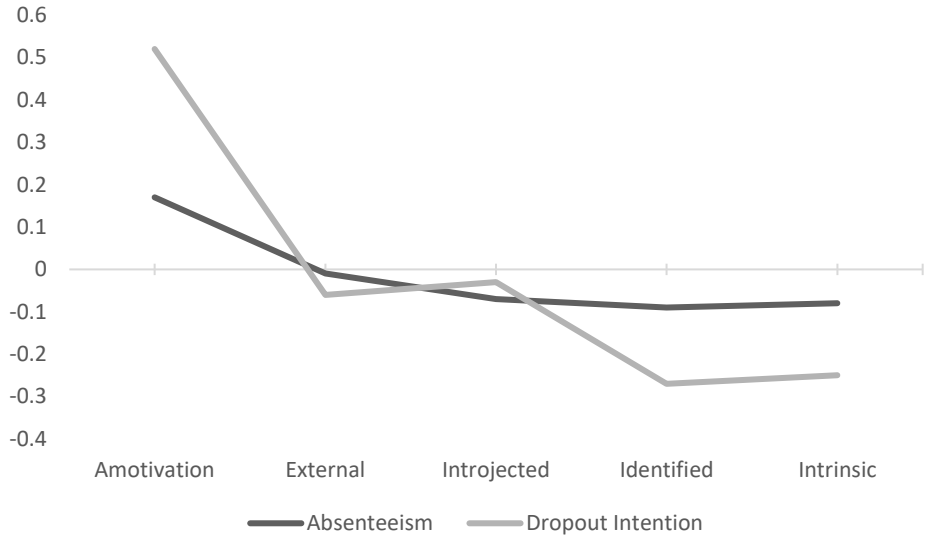

Figure 6
Graphical Representation of Correlations between Motivation and Maladaptive Persistence Outcomes

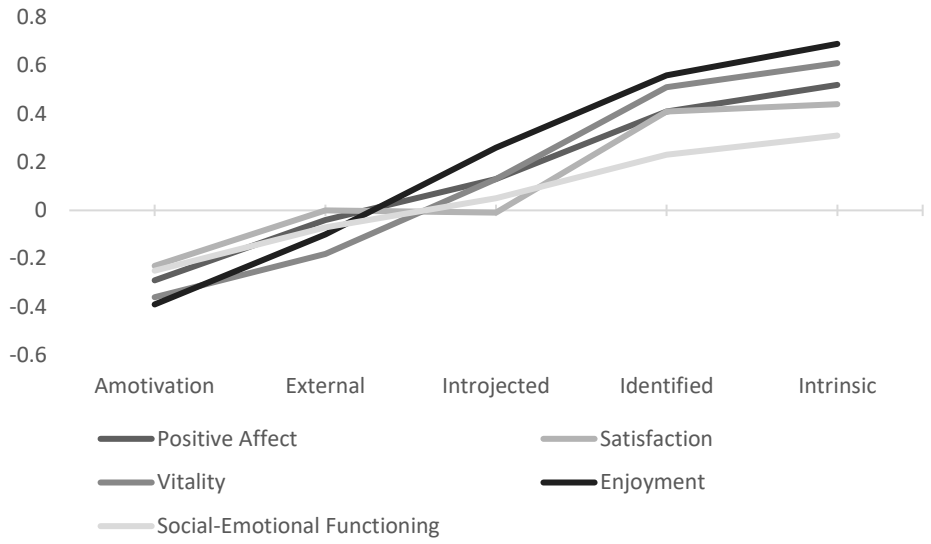

Figure 7
Graphical Representation of Correlations between Motivation and Adaptive Well-being Outcomes

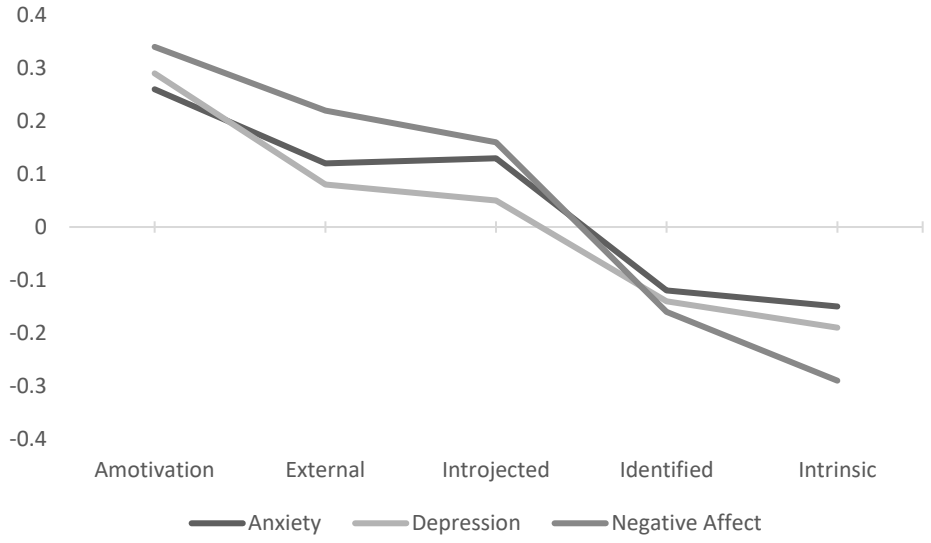

Figure 8
Graphical Representation of Correlations between Motivation and Maladaptive Well-being Outcomes

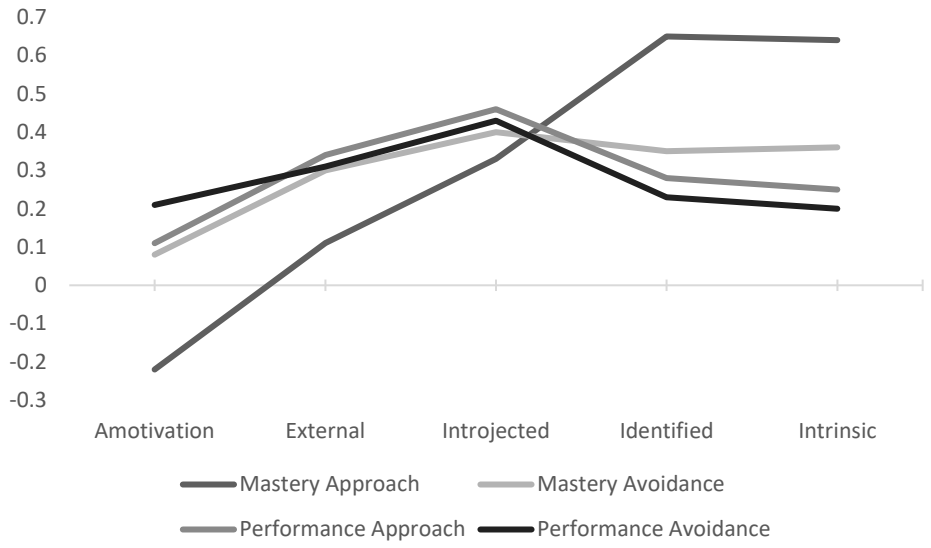

Figure 9
Graphical Representation of Correlations between Motivation and Goal Orientations

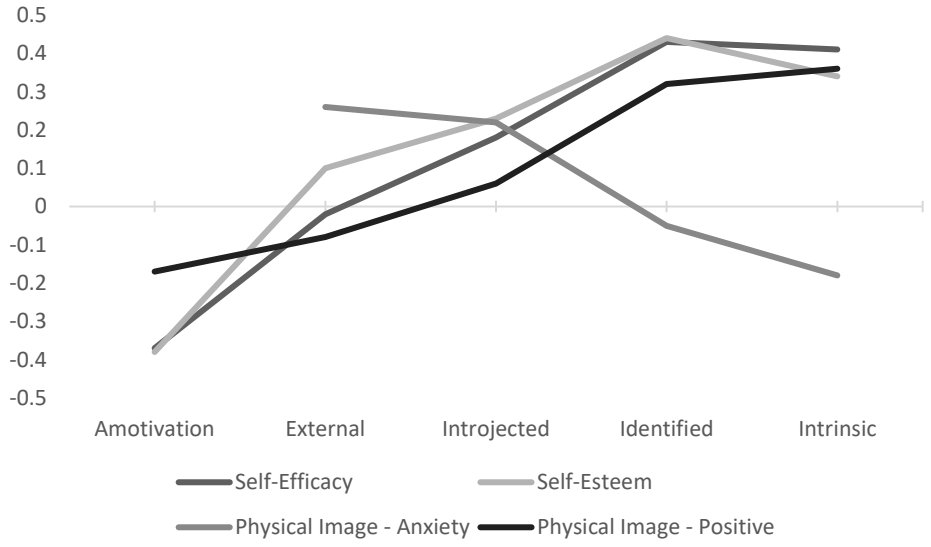

Figure 10
Graphical Representation of Correlations between Motivation and Self-Evaluation Outcomes

Table 1: *Correlations between Regulations*

	Intrinsic	Integrated	Identified	Introjected	External	Amotivation
Intrinsic	-	15	210	193	206	131
Integrated	.845	-	19	20	19	15
Identified	.878	.897	-	243	249	158
Introjected	.363	.382	.589	-	251	156
External	-.058	<.001	.333	.643	-	167
Amotivation	-.503	-.393	-.492	.017	.426	-

Note. Corrected correlations (ρ) below the diagonal. Number of samples included in calculation above the diagonal.

Table 2: *Classification of Outcomes into Adaptive and Maladaptive Categories*

Outcomes		
Adaptive		Maladaptive
Academic Performance (Objective)	Academic Performance (Self-Report)	Physical Image - Anxiety
Satisfaction (General)	Enjoyment	Absenteeism
Effort	Self-Esteem	Dropout Intention
Continuance Intention	Self-Efficacy	Anxiety
Intent to Exercise	Mastery Approach	Depression
Physical Activity	Performance Approach	Boredom
Engagement	Vitality	Negative Affect
Physical Image - Positive	Positive Affect	
Social-Emotional Functioning		

Note. Mastery avoidance and performance avoidance were not included in this classification as they are neither clearly adaptive nor maladaptive.

Table 3: *Meta-Analytic Correlations between Motivation Types and Academic Performance*

Outcome			95% CI				
Motivation	k	ρ	Lower	Higher	Sdt. Error	T^2	I^2
Objective Academic Performance							
Amotivation	24	-.21	-.27	-.15	.03	.01	89.28
External	33	-.03	-.08	.01	.02	.01	80.71
Introjected	30	-.01	-.05	.04	.02	.01	84.86
Identified	33	.11	.06	.17	.03	.02	93.80
Integrated	3	.04	-.27	.34	.07	.01	81.49
Intrinsic	23	.13	.07	.19	.03	.01	85.46
Self-Report Academic Performance							
Amotivation	32	-.28	-.33	-.23	.02	.01	82.91
External	26	-.02	-.06	.03	.02	.01	85.11
Introjected	28	.07	-.01	.16	.04	.03	94.45
Identified	27	.29	.22	.35	.03	.02	91.70
Intrinsic	33	.32	.26	.39	.03	.02	90.06

Note. k = number of samples; ρ = correlation after correction for reliability and weighted by samples size. Std Error = Standard error.

Table 4: *Meta-Analytic Correlations between Motivation Types and Persistence Outcomes*

Outcome			95% CI				
Motivation	k	ρ	Lower	Higher	Std. Error	T^2	I^2
Effort							
Amotivation	13	-.41	-.51	-.31	.05	.04	95.10
External	17	-.08	-.20	.05	.06	.05	96.23
Introjected	16	.25	.15	.35	.05	.02	91.91
Identified	15	.51	.41	.62	.05	.04	94.52
Intrinsic	16	.54	.43	.64	.05	.03	94.30
Continuance Intention							
Amotivation	6	-.27	-.44	-.10	.07	.02	90.50
External	10	-.02	-.15	.10	.05	.02	91.72
Introjected	9	.02	-.07	.11	.04	.01	84.45
Identified	10	.31	.20	.43	.05	.02	92.97
Intrinsic	7	.26	.08	.43	.07	.02	92.95
Intent to Exercise							
Amotivation	6	-.26	-.52	.00	.10	.03	93.09
External	12	.03	-.11	.17	.06	.05	96.00
Introjected	12	.25	.14	.37	.05	.03	93.06
Identified	11	.51	.41	.61	.04	.02	88.23
Intrinsic	12	.43	.32	.55	.05	.02	94.08
Physical Activity							
Amotivation	17	-.12	-.19	-.05	.03	.01	87.61
External	24	-.03	-.09	.03	.03	.02	88.36
Introjected	25	.14	.08	.20	.03	.02	90.26
Identified	25	.31	.23	.39	.04	.05	95.93
Intrinsic	23	.33	.26	.41	.04	.04	95.10
Engagement							
Amotivation	13	-.43	-.53	-.32	.05	.03	94.50
External	22	-.10	-.20	.00	.05	.07	97.29
Introjected	23	.26	.19	.34	.04	.04	95.03
Identified	23	.57	.47	.68	.05	.05	96.18
Intrinsic	20	.62	.54	.70	.04	.03	93.83
Absenteeism							
Amotivation	3	.17	-.08	.43	.05	.01	71.11
External	4	-.01	-.15	.14	.04	<.01	60.89
Introjected	4	-.07	-.18	.03	.03	<.01	30.08
Identified	4	-.09	-.19	.02	.02	<.01	0.00
Intrinsic	4	-.08	-.32	.16	.07	.01	82.96
Dropout Intention							
Amotivation	5	.52	.09	.94	.15	.17	99.47
External	7	-.06	-.15	.02	.03	.01	89.42
Introjected	7	-.03	-.28	.21	.10	.04	97.55
Identified	7	-.27	-.43	-.12	.06	.04	97.60
Intrinsic	7	-.25	-.41	-.10	.06	.02	94.14

Note. k = number of samples; ρ = correlation after correction for reliability and weighted by samples size. Std Error = Standard error.

Table 5: *Meta-Analytic Correlations between Motivation Types and Well-being Outcomes*

Outcome			95% CI				
Motivation	k	ρ	Lower	Higher	Sdt. Error	T^2	I^2
Anxiety							
Amotivation	18	.26	.15	.37	.05	.05	96.94
External	20	.12	.06	.19	.03	.01	87.55
Introjected	17	.13	.04	.23	.05	.03	95.40
Identified	16	-.12	-.21	-.02	.04	.02	93.03
Intrinsic	16	-.15	-.26	-.05	.05	.04	96.47
Depression							
Amotivation	4	.29	-.23	.81	.16	.09	97.86
External	6	.08	-.12	.27	.08	.04	95.47
Introjected	6	.05	-.09	.18	.05	.03	93.06
Identified	5	-.14	-.31	.02	.06	.03	94.46
Intrinsic	4	-.19	-.39	.00	.06	.03	95.18
Boredom							
Amotivation	4	.58	.23	.93	.11	.06	96.81
External	3	-	-	-	-	-	-
Introjected	3	-	-	-	-	-	-
Identified	4	-.45	-.69	-.21	.07	.02	87.25
Intrinsic	3	-.48	-.75	-.22	.06	.01	83.21
Negative Affect							
Amotivation	10	.34	.22	.47	.05	.02	84.84
External	13	.22	.11	.32	.05	.03	89.98
Introjected	12	.16	.04	.27	.05	.04	91.83
Identified	13	-.16	-.30	-.02	.07	.04	92.94
Intrinsic	15	-.29	-.44	-.14	.07	.05	95.19
Positive Affect							
Amotivation	14	-.29	-.42	-.16	.06	.04	94.66
External	17	-.04	-.16	.08	.06	.07	96.39
Introjected	18	.13	.02	.25	.06	.05	94.44
Identified	18	.41	.28	.54	.06	.06	96.04
Intrinsic	14	.52	.37	.66	.07	.06	96.48
Satisfaction (General)							
Amotivation	8	-.23	-.49	.04	.11	.07	97.32
External	11	.00	-.12	.12	.05	.02	91.91
Introjected	11	-.01	-.16	.14	.07	.11	98.40
Identified	10	.41	.24	.57	.07	.04	96.33
Intrinsic	9	.44	.31	.58	.06	.03	94.47
Vitality							
Amotivation	8	-.36	-.47	-.25	.05	.02	93.30
External	10	-.18	-.30	-.05	.05	.03	94.14
Introjected	11	.13	.00	.27	.06	.04	95.75
Identified	11	.51	.34	.69	.08	.08	97.68
Intrinsic	10	.61	.46	.76	.07	.04	94.95
Enjoyment							
Amotivation	7	-.39	-.67	-.11	.12	.11	98.32
External	9	-.10	-.32	.11	.09	.07	96.94
Introjected	9	.26	.02	.49	.10	.12	98.17
Identified	8	.56	.41	.71	.06	.03	92.58
Intrinsic	9	.69	.52	.85	.07	.03	94.07

Social-Emotional Functioning							
Amotivation	6	-.25	-.37	-.12	.05	.01	82.15
External	6	-.07	-.22	.08	.06	.02	87.76
Introjected	6	.05	-.07	.17	.05	.01	75.50
Identified	5	.23	.12	.33	.04	.01	64.78
Intrinsic	3	.31	.15	.46	.04	<.01	56.77

Note. k = number of samples; ρ = correlation after correction for reliability and weighted by samples size. Std Error = Standard error.

Table 6: *Meta-Analytic Correlations between Motivation Types and Goal Orientations*

Covariate			95% CI				
Motivation	k	ρ	Lower	Higher	Sdt. Error	T^2	I^2
Mastery Approach							
Amotivation	14	-.22	-.41	-.02	.09	.09	97.59
External	17	.11	-.02	.25	.06	.08	96.87
Introjected	18	.33	.22	.44	.05	.06	95.91
Identified	16	.65	.51	.79	.07	.06	96.17
Intrinsic	16	.64	.56	.71	.03	.01	86.60
Mastery Avoidance							
Amotivation	10	.08	-.07	.23	.07	.04	95.11
External	7	.30	.12	.48	.07	.04	95.16
Introjected	7	.40	.25	.54	.06	.03	93.09
Identified	7	.35	.15	.55	.08	.05	96.18
Intrinsic	5	.36	.18	.53	.06	.01	87.05
Performance Approach							
Amotivation	18	.11	-.01	.24	.06	.06	96.62
External	17	.34	.27	.40	.03	.01	82.94
Introjected	17	.46	.38	.53	.03	.01	85.50
Identified	17	.28	.22	.34	.03	.01	82.75
Intrinsic	16	.25	.17	.32	.04	.01	85.47
Performance Avoidance							
Amotivation	18	.21	.12	.30	.04	.03	93.29
External	19	.31	.22	.40	.04	.03	90.86
Introjected	19	.43	.33	.53	.05	.03	92.11
Identified	19	.23	.12	.34	.05	.04	94.12
Intrinsic	15	.20	.10	.29	.04	.03	91.08

Note. k = number of samples; ρ = correlation after correction for reliability and weighted by samples size. Std Error = Standard error.

Table 7: *Meta-Analytic Correlations between Motivation Types and Self-Evaluation Covariates*

Covariate			95% CI				
Motivation	k	ρ	Lower	Higher	Sdt. Error	T^2	I^2
Self-Efficacy							
Amotivation	13	-.37	-.49	-.26	.05	.04	94.06
External	16	-.02	-.14	-.14	.05	-.14	-0.14
Introjected	13	.18	.05	.31	.06	.04	94.95
Identified	15	.43	.31	.55	.06	.05	95.42
Intrinsic	11	.41	.24	.57	.07	.07	96.74
Self-Esteem							
Amotivation	3	-.38	-.72	-.03	.08	.01	90.37
External	5	.10	-.13	.32	.08	.02	90.83
Introjected	5	.23	.01	.44	.07	.02	92.04
Identified	5	.44	.21	.67	.08	.04	95.68
Intrinsic	5	.34	.18	.51	.05	.02	88.36
Physical Image - Anxiety							
External	6	.26	.17	.34	.03	<.01	45.74
Introjected	6	.22	.05	.40	.07	.02	85.11
Identified	5	-.05	-.28	.17	.08	.02	87.35
Intrinsic	5	-.18	-.29	-.07	.04	<.01	54.01
Physical Image - Positive							
Amotivation	4	-.17	-.26	-.08	.03	<.01	34.82
External	5	-.08	-.22	.06	.05	.01	86.89
Introjected	5	.06	-.04	.16	.04	.01	78.95
Identified	5	.32	.19	.45	.05	.01	80.85
Intrinsic	5	.36	.23	.49	.05	.01	81.99

Note. k = number of samples; ρ = correlation after correction for reliability and weighted by samples size. Std Error = Standard error.

Table 8: *Relative Weights Analysis of Motivation Predicting Outcomes*

Outcome	R^2	Amotivation		External		Introjected		Identified		Intrinsic	
		RW	%	RW	%	RW	%	RW	%	RW	%
Academic Achievement											
Objective	.17	.07	38.00	.02	12.40	.01	3.90	.04	20.25	.04	25.44
Self-report	.30	.08	27.05	.03	9.52	.01	2.66	.06	21.40	.12	39.37
Persistence											
Effort	.36	.05	15.17	.04	11.46	.04	11.79	.12	33.08	.10	28.51
Continuance Intentions	.27	.03	11.78	.02	8.58	.02	8.71	.12	44.66	.07	26.28
Physical Activity	.27	.03	9.88	.05	17.47	.03	9.56	.11	39.12	.06	23.98
Absenteeism	.15	.06	38.95	.02	14.05	.01	5.44	.03	20.95	.03	20.60
Engagement	.47	.05	11.62	.06	12.75	.05	10.87	.16	34.12	.14	30.63
Well-being											
Anxiety	.16	.06	40.37	.01	7.92	.03	18.28	.02	14.06	.03	19.38
Depression	.44	.05	15.17	.04	11.46	.04	11.79	.12	33.08	.10	28.51
Negative Affect	.53	.13	25.21	.03	5.49	.05	8.74	.13	24.13	.19	36.43
Positive Affect	.53	.07	13.01	.03	4.86	.01	2.51	.14	25.99	.28	53.63
Satisfaction	.28	.02	6.91	.02	5.38	.04	14.00	.09	32.20	.12	41.50
Vitality	.49	.04	7.61	.09	17.80	.04	7.18	.18	35.83	.16	31.59
Enjoy	.52	.05	10.49	.02	3.58	.03	6.27	.14	27.40	.27	52.26
SE-Functioning	.33	.07	21.16	.02	6.10	.01	2.74	.09	25.61	.15	44.40
Goal Orientations											
Mastery Approach	.65	.05	8.08	.05	6.98	.06	8.99	.29	44.30	.20	31.65
Mastery Avoidance	.40	.02	5.01	.08	19.05	.07	17.38	.08	20.12	.16	38.45
Performance Approach	.40	.02	4.31	.09	22.93	.12	30.40	.07	16.57	.10	25.79
Performance Avoidance	.26	.06	21.65	.03	13.25	.11	41.15	.03	11.93	.03	12.03
Self-Evaluations											
Self-Efficacy	.24	.06	0.06	.02	7.01	.02	7.40	.08	34.10	.06	25.96
Self-Esteem	.24	.09	39.02	.02	9.18	.02	7.07	.06	26.28	.04	18.44
Physical Image – Anxiety	.23	.05	21.86	.01	6.25	.05	20.44	.05	20.76	.07	30.69
Physical Image – Positive	.27	.02	8.23	.04	16.79	.02	7.66	.11	40.98	.07	26.34
Average Relative Weight			17.42		10.88		11.52		28.13		30.95

Note. RW is an estimated R^2 associated with each predictor. % is this same relative weight converted to a percentage of total R^2. Highlighting indicates strongest estimated predictor.