Evaluating New and Existing Validity Evidence for the Academic Motivation Scale

Amanda J. Fairchild, S. Jeanne Horst, Sara J. Finney, & Kenneth E. Barron

James Madison University

Amanda J. Fairchild, S. Jeanne Horst, and Sara J. Finney, Center for Assessment and Research Studies—MSC 6806, Department of Graduate Psychology, James Madison University, Harrisonburg, VA, 22807; Kenneth E. Barron, Department of Psychology—MSC 7401, James Madison University, Harrisonburg, VA, 22807.

Correspondence concerning this article should be addressed to Amanda J. Fairchild, fairchaj@jmu.eduT, Phone: (540)438-5838, Fax: (540) 568-7878.

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Abstract

The current study evaluates existing and new validity evidence for the Academic Motivation Scale (AMS; Vallerand et al., 1992). Based upon Deci and Ryan's (1985; 2000) self-determination theory, the scale is designed to assess the extent to which an individual's academic motivation is intrinsically or extrinsically driven. Data analysis using a sample of 1406 American college students provided construct validity evidence in the form of both a well-fitting seven-factor model and adequate internal consistency of the item responses representing each of the subscales. Convergent and discriminant validity evidence as represented by correlations with additional known measures of motivation provided further insight into the distinctiveness of the seven subscales. Unfortunately, support for the scale's simplex structure, that would represent the developmental continuum of self-determination theory, was not adequately substantiated. Both practical implications for the further use of this measure, as well as theoretical implications for self-determination theory, are discussed.

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Self-determination theory proposes that humans have an innate desire for stimulation and learning from birth, which is either supported or discouraged within their environment (Deci & Ryan, 1985; 2000). The degree to which this natural drive, or *intrinsic motivation,* is realized is contingent on the fulfillment of one's psychological needs. That is, fulfillment of these needs is a necessary precursor to intrinsic motivation. Self-determination theory delineates three psychological needs that impact intrinsic motivation: the need for competence, the need for autonomy, and the need for relatedness (Deci & Ryan, 1985). Throughout development, social contexts either stifle or promote intrinsic motivation based upon fulfillment of these needs.

Theorists have since been able to differentiate several specific types of motivation based on the interaction of these needs and the environment: 1) *intrinsic motivation*- the drive to pursue an activity simply for the pleasure or satisfaction derived from it, 2) *extrinsic motivation*- pursuing an activity out of a sense of obligation, or as a means to an end, and 3) *amotivation*- the absence of intent or drive to pursue an activity due to one's failure to establish contingencies between their behavior and the activity (Vallerand, Pelletier, Blais, Brière, Senécal, & Vallière, 1992). These differential states have been argued to fall along a motivational continuum that reflects the degree of self-determined behavior, ranging from amotivation to extrinsic to intrinsic (Deci & Ryan, 2000).

Deci and Ryan (1985) further differentiated various forms of extrinsic motivation. Specifically, they distinguished four types of extrinsic motivation: external regulation, introjected regulation, identified regulation, and integrated regulation. These four types of extrinsic motivation vary in the degree of self-determination that the individual associates with the behavior, where more internalized or more integrated behaviors produce a greater sense of self-determination.

Thus, as one moves along the extrinsic continuum (from external to integrated), motivation begins to take on more and more characteristics associated with intrinsic motivation (Ryan & Deci, 2000). At the lowest end of the continuum, adjacent to amotivation, externally regulated motivation is the least self-determined behavior and is described as resulting from *external* influences or reward contingencies. Moving upward along the continuum, introjected regulated behaviors are still controlled in part by the environment, but also by *internal* reward contingencies, such as guilt and obligation. Further along the continuum, identified regulation, while still extrinsically motivated, entails the person attributing personal value to their behavior. Ryan and Deci's last subtype of extrinsic motivation is integrated regulation. This last subtype of extrinsic motivation differs from intrinsic motivation only slightly. That is, while it is still extrinsically motivated (i.e., pursued for external reasons), the self fully endorses and enjoys the activity. See Figure 1.

Other researchers have taken Deci and Ryan's original theory and added further distinctions along the motivational continuum. Namely, Vallerand et al. (1992) broke down Deci and Ryan's unified construct of intrinsic motivation into separate subscales of intrinsic motivation. They based this division on Deci's (1975) proposition that intrinsic motivation may be driven by specific, differentiated factors. Vallerand et al.'s examination of this research prompted them to distinguish between three subscales of intrinsic motivation: 1) *intrinsic motivation to know*, 2) *intrinsic motivation to accomplish*, and 3) *intrinsic motivation to experience stimulation*. Intrinsic motivation to know refers to the desire to perform an activity for the enjoyment one receives while learning new things. Intrinsic motivation to accomplish refers to the desire to perform an activity for the satisfaction that one receives from accomplishing or creating new things. Finally, intrinsic motivation to experience stimulation refers to the desire to perform an activity to experience sensory stimulation. This stimulation may reflect either intellectual or physical sensations.

Prior research distinguishing between intrinsic and extrinsic motivation has suggested that individuals who are more intrinsically motivated not only employ deeper-level processing strategies and perform better academically, but also have better psychological well-being and derive more satisfaction out of a number of life's activities (Grolnick & Ryan 1989; Miserandino, 1996; Ryan & Deci, 2000; Sheldon & Kasser, 1998). Such outcomes underscore the importance of research on the consequences of intrinsically motivated behavior. However, we first need to recognize that any results are contingent on the measurement tools used to operationalize and measure intrinsic and extrinsic motivation. Thus, researchers need to responsibly examine the field's existing measurement tools in order to assess validity evidence and usefulness of scores. This not only demands exploration of those instruments new to the field, but also requires the reexamination of the area's standards (Crocker & Algina, 1986; Gregory, 1992). Effective validity studies not only demand the integration of multiple sources of evidence, but also must continually take place over time. That is, the use of scores from a measure cannot be deemed valid based upon evidence from a single study. Rather, multiple studies must be implemented over different samples, and an extensive collection of validity evidence must be gathered (Crocker & Algina, 1986; Gregory, 1992; Messick, 1995).

Assessing Construct Validity

Benson (1998) described three necessary components to developing a strong case for construct validity: 1) a substantive component, 2) a structural component, and 3) an external component. All three are fundamental in creating a case for construct validity. The substantive component of the procedure involves theoretically and empirically defining the domain of interest, so that potential variables, or observables, of a construct are adequately represented in measurable ways. The structural component of the procedure involves examining the internal relationships among items or subscales representing a particular measure using such statistical analyses as correlations, exploratory and confirmatory factor analyses, and reliability analyses. The external component entails establishing a nomological net, or examining the relationships between the construct of interest and related constructs. These external investigations provide convergent and discriminant validity coefficients. Researchers emphasize that this third step is particularly critical in establishing necessary validity evidence for a scale (Benson, 1998; Benson & Hagtvet, 1996).

Using Benson's (1998) strong program of construct validity as a framework, the present investigation reconsiders Vallerand et al.'s (1992) *Academic Motivation Scale* (AMS) in order to further evaluate validity evidence for the scale's scores. This scale is based on self-determination theory as posited by Deci and Ryan (1985). Specifically, this study will reconsider previous research that has explored the measurement properties of this scale (e.g., Cokley, 2000; Cokley, Bernard, Cunningham, & Motoike, 2001; Vallerand et al., 1992; 1993) as well as collect and analyze new data to reexamine these properties.

The Academic Motivation Scale (AMS)

The AMS is the English translation of the *Echelle de Motivation en Education* (Vallerand et al., 1992; 1993). Based on self-determination theory, this 28-item instrument is divided into seven subscales, reflecting one subscale of amotivation, three ordered subscales of extrinsic motivation (external, introjected, and identified regulation), and three distinct, unordered subscales of intrinsic motivation (intrinsic motivation to know, to accomplish things, and to experience stimulation).

In an initial study of the AMS, Vallerand et al. (1992) collected responses from 745 Canadian college students in order to examine the factor structure underlying item responses and the reliability of the AMS scores. A confirmatory factor analysis (CFA) of the seven-factor structure provided adequate model fit, but only after 26 error covariances were introduced into the model. This modification obviously changed the original specification of the model, yet no discussion of the role of the error covariances, nor their interpretation, was presented. In addition, the model was not cross-validated on a new sample after the extensive modifications. Still, initial analyses indicated generally good internal consistency of the scores. Specifically, Vallerand et al. reported that Cronbach's coefficient alphas for the subscales ranged from .83 to .86, with the exception of the identified subscale of extrinsic motivation, which had an internal consistency of .62. In addition, test-retest reliability over a one-month period ranged from .71 to .83 for the subscales.

Vallerand et al. (1993) continued the study of the scale's properties by examining the scores' construct validity using responses from 217 Canadian students. Correlations between the AMS subscales and other subscales representing achievement-related constructs were hypothesized and estimated. Results generally indicated support for hypothesized relationships between these constructs and the AMS, providing construct validity evidence. However, Vallerand et al. found problems with the intrinsic motivation-stimulation subscale in the study. Specifically, the scores on the intrinsic motivation-stimulation subscale had weak correlations with various hypothesized motivational antecedents, such as perceived competence, informational educational climate, autonomy supportive education climate, individual optimism, and level of self-actualization. This leads one to question the construct validity of the scores of this subscale.

In addition, if individuals move developmentally along a motivational continuum, Vallerand et al. (1993) hypothesized that a simplex pattern would be revealed when looking at correlations among the ordered subscales of the AMS. A simplex pattern is investigated by examining the magnitude of the correlations between the ordered subscales. Specifically, Vallerand et al. argued that higher positive correlations are expected between the ordered subscales that fall next to each other on the continuum, while the highest negative correlation is expected between anchors of the continuum (i.e., those subscales that occur on opposite ends of the continuum). Thus, for the AMS, it was hypothesized that adjacent motivation subscales would have the strongest positive relationships, with relationships weakening as distance between types of motivation becomes greater. Further, the hypothesized simplex structure would suggest that motivation subscales at opposite ends of the continuum should exhibit negative relationships with one another (i.e., negative relationship between intrinsic motivation subscales and amotivation subscale). If support for this simplex pattern were found, this would corroborate Deci and Ryan's self-determination continuum. Unfortunately, these relationships were not fully supported empirically by Vallerand et al. (1993). Specifically, Vallerand et al. highlighted that the intrinsic motivation to experience stimulation subscale, while not adjacent to the introjected subscale, had a stronger positive relationship with the introjected than identified regulation subscale. In addition, the amotivation subscale had a stronger negative relationship with the identified regulation subscale than with the intrinsic motivation to experience stimulation subscale.

A third study by Cokley (2000) extended the initial validity work of Vallerand and his colleagues by examining the psychometric properties of the AMS for an American college student sample. Specifically, Cokley conducted the study to reexamine the hypothesized simplex structure of the scale. However, Cokley, similar to Vallerand et al. (1993), only found partial support for the simplex pattern. Cokley noted that the correlations deviated from the simplex in the following ways. First, contrary to hypotheses, the strongest negative correlation was not found between amotivation and the three types of intrinsic motivation. Instead, the strongest negative correlation was found between identified regulation and amotivation. Second, all three intrinsic motivation subscales had stronger positive correlations with introjected regulation than identified regulation. However, these differences were minor (.01- .04). Cokley stated that these results may suggest that introjected regulation is “more self-determined” than believed. Finally, correlations between the intrinsic motivation to accomplish subscale and the identified and introjected subscales were approximately equal to the correlation between these extrinsic subscales themselves. Cokley concluded that given these results, intrinsic and extrinsic motivation, as operationalized by the AMS, may not be as distinct as theory suggests.

A final study by Cokley, et al. (2001) examined the functioning of the AMS with a second sample of American students. In this investigation, they reexamined the scale’s factor structure and correlated the AMS with academic self-concept and grade point average (GPA). They found that the hypothesized seven-factor structure did not have adequate model fit, though it outperformed five-factor (amotivation, a unified intrinsic motivation factor, and three separate factors of extrinsic motivation), three-factor (amotivation, a unified extrinsic motivation factor and a unified intrinsic motivation factor), two-factor (an extrinsic motivation factor and an intrinsic motivation factor) and one-factor (a unified motivation factor) models. In addition, they found that similar to Vallerand et al. (1992), the identified regulation subscale of extrinsic motivation had less reliable scores than other subscales, with a Cronbach’s coefficient alpha of .70. Unlike Vallerand et al. (1993), Cokley et al. (2001) found that the various intrinsic motivation subscales did not correlate as hypothesized with GPA. In addition, two out of the three extrinsic motivation subscales (external regulation and introjected regulation) were as correlated with GPA as amotivation. Therefore, the authors called for further study of the underlying factor structure and construct validity of the scores.

Previous research has left much to be explored with the AMS. Several inconsistencies are evident in the results of previous research. First, problems exist with the proposed seven-factor structure. Although Vallerand et al. (1992) found some support for the structure (only after adding error covariances), Cokley et al. (2001) did not. Specifically, Cokley (2000; Cokley et al., 2001) expressed that the dimensionality of the AMS needs to be readdressed due to possible overlap between the intrinsic and extrinsic motivation subscales. Second, the motivation subscales do not support the hypothesized simplex structure. Third, the identified regulation subscale of extrinsic motivation has had questionable reliability. Additionally, researchers point to the need for further investigation of the AMS with larger samples before confidently interpreting results (Cokley et al., 2001). Finally, limited convergent and discriminant validity evidence has been gathered (Cokley et al., 2001; Vallerand et al., 1993). Unfortunately, the expected relationships with the limited criteria gathered were not consistently supported, leading to ambiguity concerning the meaning of these scale scores. It is therefore not surprising that there has been a specific call for gathering further construct validity evidence (Cokley, 2000; Cokley et al., 2001).

Purpose of the Current Study

By all accounts, further investigation of the AMS is warranted in order to feel confident in the scale's use in motivational research. Past investigations (Cokley, 2000; Cokley et al., 2001; Vallerand et al., 1992; 1993) have offered insight into the scale's functioning and provided some evidence for the validity of its scores, however a number of important questions regarding the validity of scores from the AMS remain. The current study seeks to address the issues revealed in past research in order to better understand how the AMS functions as a measure of academic motivation. Recall that the structural component of Benson's (1998) strong program of construct validity first focuses on the relationships between the items, or observables, themselves. Therefore, we reexamined the proposed seven-factor model of the scale and compared its functioning to that of five- and three-factor models in order to readdress dimensionality issues previously acknowledged in the literature (Cokley et al., 2001). In addition, we examined the reliability of the individual subscales. However, factor structure and reliability are not sufficient to provide empirical support for an instrument on its own. Rather, extensive validity evidence also needs to be collected. Accordingly, we considered the relationship of scores from the AMS with scores from other motivational measures (the external component of Benson’s strong program of construct validity). Table 1 includes a summary of these relationships.

[Insert Table 1 about here]

Specifically, we were able to compare and contrast students’ AMS scores to a variety of other motivational measures that were being collected as part of a university-wide assessment day to offer important evidence regarding the convergent and discriminant validity of subscale scores of the AMS. The additional measures of motivation that we collected reflected classic as well as contemporary approaches to studying achievement motivation. Specifically, our classic measures of achievement motivation focused on an individual’s desire to approach versus avoid achievement situations (Atkinson, 1974), and our contemporary measures focused on achievement goal theory (Dweck & Leggett, 1988; Nicholls, 1984) and other assessments of intrinsic and extrinsic motivation (Amabile, Hill, Hennessey, & Tighe, 1994).

To evaluate approach motivational tendencies, we collected responses on Spence and Helmrich’s (1983) Work and Family Orientation scale (WOFO). This scale contains three subscales used to measure why individuals positively approach and demonstrate varying levels of achievement motivation: (1) work orientation (the desire to work hard and complete tasks), (2) mastery orientation (the desire to seek out and master challenges), and (3) competitiveness orientation (the desire to surpass and outperform others). Thus, we expected that the WOFO would be able to nicely discriminate between the intrinsic, extrinsic, and amotivation scales of the AMS.

Specifically, if the AMS is functioning as hypothesized, we would clearly expect that the intrinsic motivation subscales of the AMS should be positively associated to the work and mastery orientation subscales of the WOFO. Furthermore, we would expect that the intrinsic motivation to know and to experience subscales of the AMS should share the strongest positive correlation with the mastery orientation subscale of the WOFO, and the intrinsic motivation to accomplish subscale of the AMS should share the strongest positive correlation with the work orientation subscale of the WOFO. Predictions between the intrinsic motivation subscales of the AMS and the competitiveness subscale of the WOFO are more speculative, but we would expect weak, positive associations between intrinsic motivation to accomplish and intrinsic motivation to experience stimulation and no relation with intrinsic motivation to know (or the weakest positive relationship). In contrast, we would expect the extrinsic motivation subscales of the AMS to be negatively associated to the mastery orientation subscale of the WOFO, but positively associated with the competitiveness subscale of the WOFO. Predictions between the extrinsic motivation subscales of the AMS and the work subscale of the WOFO are more tentative. As an individual moves along the continuum from external regulation to identified, the work orientation subscale may start to show stronger, positive relationships. In other words, this would be another example of a simplex pattern where the correlation is weakest (or even negative) for external regulation and strongest and positive as it approaches identified regulation and intrinsic motivation. Finally, because the subscales of the WOFO measure three different reasons to demonstrate *approach* motivation in achievement situations, we would expect that the amotivation subscale of the AMS should be negatively related to all three of the WOFO subscales. This should be particularly true for students high in work and mastery orientation.

To evaluate avoidance motivational tendencies, we collected responses on Hagtvet and Benson’s (1997) Motive to Avoid Failure (MAF) scale. This scale assesses the extent to which individuals react negatively to, and avoid, achievement situations. We would clearly expect that the amotivation subscale of the AMS should be positively associated with an individual’s overall score on the MAF. In addition, we would expect that the intrinsic motivation subscales of the AMS would be negatively associated with MAF. Predictions between the extrinsic motivation subscales of the AMS and the MAF are less certain, but may again function depending on level of extrinsic motivation. As an individual moves along the continuum from external regulation to identified regulation, positive relationships may be more likely with external regulation while null or negative relationships are more likely as motivation approaches identified regulation.

Regarding more contemporary approaches to studying achievement motivation, we first collected a measure of students achievement goal orientation, using modified versions of surveys used by Elliot and McGregor (2001) and Finney, Pieper, and Barron (in press). Achievement goals represent the purpose or reason for an individual’s achievement pursuits. Originally, achievement goal researchers (e.g., see Ames 1992 for a review) distinguished between two types of achievement goals: mastery and performance goals. When pursuing mastery goals, individuals focus on developing and improving their skills. In contrast, when pursuing performance goals, individuals focus on demonstrating their ability compared to others. Early researchers often likened the mastery-performance goal distinction to intrinsic and extrinsic motivation, noting that mastery goals were more tied to “learning for its own sake”, whereas performance goals were more tied to “learning as a means to an end” (Pintrich & Schunk, 1996). Thus, we would clearly expect the intrinsic motivation subscales of the AMS to be more positively correlated with mastery goals, the extrinsic subscales of the AMS to be more positively correlated with performance goals, and the amotivation scale to be negatively correlated to both mastery and performance goals. Recently, achievement goal theorists (Elliot & McGregor, 2001) have crossed the mastery-performance goal distinction with approach-avoidance distinctions from classic motivation theory, resulting in a more complex, 2 x 2 model of mastery-approach goals, mastery-avoidance goals, performance-approach goals, and performance-avoidance goals. Thus, the predictions that we made above for the relations between mastery and performance and the AMS, are for approach achievement goals (specifically, mastery-approach and performance-approach). Clear predictions for mastery-avoidance and performance-avoidance achievement goals are less certain and are therefore exploratory in the current study. Finally, predictions between mastery-approach and the three extrinsic motivation subscales of the AMS are less certain but may function as a simplex pattern. As an individual moves along the continuum from external regulation to identified, negative relationships are predicted with external regulation while null or positive relationships are more likely as one becomes identified.

Other researchers (Brophy, 1983, Pieper, 2003) also have argued that a fifth goal orientation exists that reflects work avoidance (the desire to do as little work as possible in achievement situations). We expect that work avoidance will be negatively related to the intrinsic motivation subscales and positively related to the amotivation subscale of the AMS. Predictions for the relationships between the extrinsic motivation subscales and work avoidance are likely to be null, but may function as a simplex pattern. It is important to note that Vallerand et al. (1993) collected validity evidence with goal measures as well, but limited that investigation to just mastery-approach goals and work avoidance goals (i.e., two of the five types of goals that have been proposed).

Lastly, we also collected a motivational measure that served as an alternative measure of intrinsic-extrinsic motivation, Amabile et al.'s (1994) Work Preference Inventory (WPI). The WPI delineates two primary scales that assess an individuals' overall intrinsic versus extrinsic motivation for their academic work. Thus, we would clearly predict that the intrinsic motivation subscales of the AMS should be positively related to the intrinsic motivation subscale of the WPI, the extrinsic motivation subscale of the AMS should be positively related to the extrinsic subscales of the WPI, and the amotivation scale of the AMS should be negatively related to both the intrinsic and extrinsic subscales of the WPI. Predictions between the intrinsic motivation subscale of the WPI and the three extrinsic motivation subscales of the AMS are less certain but, once again, may function as a simplex pattern. As an individual moves along the continuum from external regulation to identified, negative relationships are predicted with external regulation while null or positive relationships are more likely as one becomes identified. Similarly, predictions between the extrinsic motivation subscale of the WPI and the three intrinsic motivation subscales of the AMS are tentative but relationships are expected to be negative.

In sum, the purpose of the current study was four-fold:

1) Using responses from the AMS obtained from a large sample of students, we will examine the fit of a seven-factor model of academic motivation in comparison to the fit of five-factor and three-factor models.
2) We will estimate the internal consistency of the scores for each subscale and evaluate their adequacy (i.e., α >.70).

3) We will calculate the correlations among the AMS subscales to examine the simplex pattern hypothesized by Vallerand et al. (1993) and Cokley (2000). Specifically, the amotivation subscales are hypothesized to have the strongest negative correlations with the three types of intrinsic motivation. Adjacent subscales should have stronger positive correlations than subscales farther apart (e.g., external regulation more strongly positively correlated with introjected than identified).
4) We will investigate hypothesized relationships between the AMS scores and the scores from other motivation and goal orientation measures to provide needed convergent and discriminant validity evidence.

Method

Participants and Procedure

Participants were entering college students at a mid-sized, east-coast university who participated in a university-wide Assessment Day the week before the Fall semester began. Students completed a number of different paper and pencil instruments, which included several measures of motivation. These measures were administered as tools that are used in the ongoing assessment of students' motivational development and change over the course of their college career.

In each session trained proctors administered the instruments. Specifically, the proctors distributed the instruments and read instructions aloud before students began responding. All students were given time to complete each instrument before the next one was introduced. The AMS was administered near the end of the test battery.

A total of 1,406 students completed the 28-item questionnaire. The participants had an average age of 18 years, 66% were female, and 88% were Caucasian. Because students were randomly assigned to complete various instruments, only data from a subsample of 915 students were used to estimate correlations between the AMS and all other measures.

Measures

Academic Motivation Scale (AMS; Vallerand et al., 1992). The AMS consists of 28 items, in which students respond to the question stem "Why are you going to college?" As noted in the introduction, there are seven subscales on the AMS: Amotivation (AMOT), External Regulation (EMER), Introjected Regulation (EMIN), Identified Regulation (EMID), Intrinsic Motivation to Know (IMTK), Intrinsic Motivation to Experience Stimulation (IMES) and Intrinsic Motivation to Accomplish (IMTA). The items are rated on a scale, ranging from one (does not correspond at all) to seven (corresponds exactly). Each subscale consists of four items each; thus subscale scores can range from four to twenty-eight. A high score on a subscale indicates high endorsement of that particular academic motivation. An example of an AMOT item is "I once had good reasons for going to college; however, now I wonder whether I should." A sample EMER item is "because with only a high-school degree I would not find a high paying job later on." A sample EMIN item is "to show myself that I am an intelligent person." A sample EMID item is "because this will help me make a better choice regarding my career orientation." A sample IMTK item is "because I experience pleasure and satisfaction while learning new things." A sample IMES item is "for the pleasure that I experience when I read interesting authors." A sample IMTA item is "for the pleasure that I experience while surpassing myself in my studies."

Work and Family Orientation Questionnaire (WOFO; Spence & Helmrich, 1983). The WOFO is a 19-item measure of achievement motivation that purports to represent stable, enduring personality traits. The WOFO has three subscales, work orientation, mastery, and competitiveness, which are rated on a scale from one (strongly disagree) to five (strongly agree). The work orientation subscale has six items, with scores ranging from 6 to 30. High scores suggest a desire to work hard and do a good job. An example of a work item is “I find satisfaction in working as well as I can.” The mastery subscale has eight items, with scores ranging from 8 to 40. High scores suggest a preference for difficult and challenging tasks and reaching personal goals for achievement. An example of a mastery item is “If I am not good at something, I would rather keep struggling to master it than move on to something I may be good at.” The competitiveness subscale has 5 items, with scores ranging from 5 to 25. High scores suggest enjoyment of interpersonal competition and the desire to be better than others. An example of a competitiveness item is “It is important to me to perform better than others on a task.” The Cronbach’s coefficient alpha for the work, mastery and competitiveness subscales, computed on scores from the current sample, were .74, .64, and .78, respectively.

Motive to Avoid Failure (MAF; Hagtvet & Benson, 1997). The MAF consists of six items that are rated from one (almost never) to four (almost always). The six items represent one overall factor with scores ranging from 6 to 24. Students who score high on the MAF express a high need to avoid evaluative situational contexts. An example of an item is “Just thinking about working on new, somewhat difficult tasks makes me feel uneasy.” Cronbach’s coefficient alpha computed on scores from the current sample was .83.

Attitudes Toward Learning (ATL;Finney et al., in press; Pieper, 2003). The ATL is a measure of achievement goal orientation that includes five subscales: performance-approach (PAP), performance-avoidance (PAV), mastery-approach (MAP), mastery-avoidance (MAV), and work-avoidance (WAV). The ATL was adapted from Elliot and McGregor’s (2001) Achievement Goal Questionnaire and assesses students’ goals across all of their college courses for the upcoming semester, rather than evaluating students’ achievement goals for one specific course.

Research by Finney, et al. (in press) and Pieper (2003) supported the factor structure and use of these items when assessing goal orientation at a more general level.

Four of the subscales consist of three items (specifically, the PAP, PAV, MAP, and MAV subscales), with scores ranging from 3 to 21. High scores on PAP reflect a desire to demonstrate ability compared to others. An example item is “My goal this semester is to get better grades than most of the other students.” High scores on PAV reflect a desire to avoid negative judgments compared to others. An example item is “I just want to avoid doing poorly compared to other students this semester.” High scores on MAP reflect a desire to develop and improve one’s competency. An example item is “Completely mastering the material in my courses is important to me this semester.” Finally, high scores on MAV reflect a desire to avoid negative outcomes (such as making a mistake or forgetting something) and being unable to develop one’s skills. An example item is “I’m afraid that I may not understand the content of my classes as thoroughly as I’d like.” Cronbach’s coefficient alphas computed using the current sample were .85, .62, .71, and .73 for PAP, PAV, MAP, and MAV, respectively.

The work-avoidance subscale consists of four items with scores ranging from 4 to 28. High scores reflect a desire of doing as little work as possible. An example of an item is “I really don’t want to work hard in my classes this semester.” Cronbach’s coefficient alpha for the work-avoidance scores was .81.

Work Preference Inventory (WPI; Amabile et al.,1994). The WPI is a 30-item measure rated on a four-point Likert scale, from one (never or almost never true of me) to four (always or almost always true of me). The WPI is comprised of two primary subscales; intrinsic motivation (IM) and extrinsic motivation (EM). Originally written for working adults, and later rewritten for college students, the student version is titled the “Preferences for Coursework.” An example of an

IM item is “I enjoy tackling problems that are completely new to me”; an example EM item is “I am strongly motivated by the recognition I can earn from other people”. The two primary scales, IM and EM, are comprised of 15 items each, with possible scores ranging from 15 to 60. Higher scores indicate higher endorsement of the particular construct. Cronbach’s coefficient alphas computed using the current sample were .78 and .66 for the IM and EM subscales, respectively.

Results

To address the first purpose of our study, we conducted several confirmatory factor analyses (CFA). CFA allows researchers to compare the ability of competing theoretical models to explain the relationships among observed variables. In the current study, a total of three competing models were specified to explain the relationships among responses to the 28 AMS items. The alternative models employed were a subset of the models tested by Cokley et al. (2001): (a) a seven-factor model based upon Vallerand et al.’s (1992) work; (b) a five-factor model corresponding to self-determination theory as defined by Deci and Ryan (1985; Ryan & Deci, 2000); and (c) a three-factor model consisting of an amotivation factor, a general intrinsic motivation factor, and a general extrinsic motivation factor. For each model, the error variances for the items were not allowed to correlate, whereas the correlations among the factors were freely estimated.

The χ^2 test is typically reported as an index of model fit. However, the χ^2 is particularly sensitive to sample size (as sample size increases, power increases, and the test of fit becomes more stringent). In addition, most researchers are interested in the approximate fit of the model to the data instead of an exact fit evaluation determined solely by the χ^2 test (Bentler, 1990). Because of the reasons listed above, two additional goodness-of-fit indices were reported: the root mean square error of approximation (RMSEA) and the comparative fit index (CFI). The RMSEA is an absolute index that assesses lack of fit due simply to model misspecification. It provides a measure of discrepancy per degree of freedom (Browne & Cudeck, 1993). The RMSEA index has been found to be very sensitive to misspecified factor loadings and moderately sensitive to misspecified factor correlations (Hu & Bentler, 1998). A value of approximately .06 or less indicates adequate fit (Hu & Bentler, 1999). The CFI (Bentler, 1990), an incremental fit index, was also used in the current study. The CFI represents the improvement in fit of the hypothesized model over an independence model, in which all variables are hypothesized to be uncorrelated. It has been found that the CFI is also very sensitive to misspecified factor loadings and moderately sensitive to misspecified factor correlations (Hu & Bentler, 1998). The CFI ranges from 0 to 1, with larger values indicating better fit. Hu and Bentler (1999) recommended that a cutoff equaling or greater than .95 indicates adequate model fit. In addition to examining fit indices, the standardized residuals corresponding to each model will be examined in order to better understand the cause of misfit.

We analyzed the data using LISREL 8.53 (Jöreskog & Sörbom, 1993). PRELIS 2.53 (Jöreskog & Sörbom, 1996) was also used to examine the distribution of scores. There were several items that displayed univariate kurtosis. Specifically, all the items serving as indicators of the amotivation construct had extreme leptokurtic distributions (i.e., some values greater than 15). While maximum likelihood (ML) estimation is somewhat robust to nonnormality, it tends to perform less well if data have positive kurtosis (Chou, Bentler, & Satorra, 1991). Therefore, we felt that the extreme levels of positive kurtosis for several items dictated the use of methods that adjusted results for item distribution. Specifically, the Satorra-Bentler (S-B) Scaled χ^2 and robust standard errors (Satorra & Bentler, 1994) were calculated and reported. Research has shown that the S-B Scaled χ^2 outperforms the ML χ^2 when data are non-normal (e.g., Curran, West, & Finch, 1996). In addition, the RMSEA and CFI were also adjusted for nonnormality by incorporating the S-B Scaled χ^2 into their calculations (the S-B Scaled χ^2 for both the proposed and the independence models were needed to calculate the robust CFI). Yu and Muthén (2002) have suggested that cutoffs at or below approximately .05 for the robust RMSEA and at or above approximately .95 for the robust CFI indicate adequate fit.

Table 2 presents the fit indices for the three hypothesized models. Analyses revealed two important conclusions. First, the fit of the seven-factor model to the data was supported. Furthermore, evaluation of the standardized residuals indicated that the seven-factor model reproduced the relationships among all items well. Specifically, there were only five correlation residuals above .15, with the majority close to zero. In addition, the stem-leaf plot of the residuals was symmetric around zero, with most residuals in the middle and few in the tails. Jöreskog (1993) notes that this is indicative of a “good” model. Second, the five- and three-factor models did not show adequate fit to the data. The standard residuals from the five-factor model indicated that the relationships between the intrinsic motivation items were not well reproduced by the model. This indicates the necessity of modeling the three intrinsic motivation types as distinct constructs.

[Insert Table 2 about here]

All unstandardized pattern coefficients for the seven-factor model were statistically significant. The standardized factor pattern and structure coefficients are presented in Table 3. All standardized pattern coefficients had values at or above .59, with half having values at or above .80. Subsequent squaring of these values produced the variance accounted for in the item by the factor. These values ranged from .35 to .75.

[Insert Table 3 about here]

Given the adequate fit of the seven-factor model, we calculated the reliability of the scores to address the second purpose of the study. The Cronbach's coefficient alpha values indicated that the subscales demonstrate adequate internal consistency (see Table 4). In addition, the means and standard deviations for each subscale are reported. In general, the means follow the same pattern reported in previous studies (Cokley et al., 2001; Vallerand et al., 1993) with AMOT being the least endorsed, while EMER and EMID were the most endorsed.

[Insert Table 4 about here]

Next to address the third purpose of the study, we investigated the correlations of the AMS subscales. Correlations among the constructs were calculated via CFA and are therefore disattenuated for measurement error. These factor correlations provided limited support for the simplex pattern. As theorized, self-determination lies on a continuum ranging from amotivation, to external, introjected, and identified regulation, and finally to intrinsic motivation. The three different types of intrinsic motivation (IMTK, IMES, IMTA) are simply subtypes of intrinsic motivation and do not follow a continuum. Therefore, one would expect to see strong correlations between these three intrinsic motivation factors that do not follow a specific pattern. The results from the current study show that the three intrinsic motivation factors were highly correlated (.71 - .87). In fact, the relationships between these motivation types were much higher than those Vallerand et al. (1993) reported (.58 - .62). To support the simplex pattern, stronger relationships should be found between adjacent types of motivation than between types farther apart on the continuum. In addition, amotivation and the three different types of intrinsic motivation should display negative correlations with one another as they anchor the opposite ends of the continuum. However, we found numerous deviations from the simplex pattern. The relationship between IMTA and EMIN was of similar magnitude to the relationships between IMTA and the other intrinsic measures. This, of course, does not support the simplex pattern. The intrinsic motivation factors were negatively correlated with amotivation. However, EMID displayed a more negative relationship with amotivation than these intrinsic subscales. If this measure effectively displayed the presence of the self-determination continuum, one would expect the EMID and AMOT correlation to be weaker than the correlations between AMOT and the intrinsic motivation factors. The relationships between EMER and the other subscales most closely displayed a simplex pattern. EMER is more highly correlated with EMIN and EMID than the intrinsic motivation factors. However, one would have expected a stronger relationship between EMER and EMIN than between EMER and EMID; this was not supported. Unlike EMER, EMIN does not display a simplex pattern. The majority of the relationships are of approximately the same magnitude, and the strongest relationship is found with an intrinsic motivation factor (IMTA). EMID, IMES, and IMTA also deviate from a simplex pattern.

An additional approach to investigating the simplex pattern involves examining the structure coefficients (which can be found within the parentheses of Table 3). Structure coefficients are used to estimate the relationships between each particular item and each factor. If factors in a model are related, the structure coefficient will reflect a non-zero relationship between an item and a factor even though the item's pattern coefficient has been fixed to zero (Thompson, 1997). This means that even though a factor may not have a direct effect upon the item (i.e., factor pattern coefficient set to zero), it may have an indirect effect on the item through its relationship with the factor for which the item is serving as an indicator. An examination of the structure coefficients indicates that the amotivation factor is distinct. As for the remaining six motivation types, an interesting pattern exists. Specifically, the structure coefficients tend to be highest for the motivation types that lie closest on the continuum to one another. For example, EMER items have higher structure coefficients with EMIN and EMID factors than with any intrinsic motivation factor or AMOT. Given that these motivation types are more specific versions of extrinsic motivation, one would expect to see this pattern. This pattern is found in general across the motivation types. However, EMIN and IMTK items seem to have moderate structure coefficients with several factors. This is important to note because this would not be expected if there were a clear simplex pattern. This can best be understood by examining the factor correlations. Both EMIN and IMTA tend to have moderate to high correlations with the majority of the other motivation factors. In summary, both the factor correlations and the structure coefficients show numerous departures from the hypothesized simplex pattern. Unfortunately, these departures are not easily interpretable because they are not simply a function of one subscale performing poorly. Therefore, this study further emphasizes the lack of full support for the simplex pattern similar to Vallerand et al. (1993) and Cokley (2000).

Finally to address the fourth purpose of our study, we investigated the pattern of correlations between the AMS subscales and other scales to provide necessary convergent and discriminant validity evidence. Our first comparison involved the pattern of correlations between the AMS and WOFO. As predicted, all three of the intrinsic motivation subscales of the AMS were positively associated to the work orientation and mastery orientation subscales of the WOFO (See Table 5). Also, as predicted, the correlations supported that the IMES subscale was stronger for the mastery orientation subscale ($r = .40$) than the work orientation subscale ($r = .29$) and that the IMTA subscale was stronger for the work orientation subscale ($r = .47$) than the mastery orientation subscale ($r = .41$). However we did not find any differences in strength between the IMTK subscale and the work and mastery orientation subscales (r’s = .41 for both). The correlations also supported weak, positive associations between all three intrinsic motivation subscales of the AMS and the competitiveness orientation subscale of the WOFO, with the strongest occurring for the IMTA subscale (*r* = .19).

[Insert Table 5 about here]

Some of the hypotheses regarding the relationships between the extrinsic subscale scores of the AMS and the WOFO scores were supported, while others were not. As predicted, we found that all three of the extrinsic motivation subscales of the AMS positively predicted the competitiveness subscale of the WOFO. Interestingly these decreased along the extrinsic motivation continuum (.29 with the EMER subscale, .28 with the EMIN subscale, and .14 with the EMID subscale). However, contrary to predictions, the extrinsic subscales of the AMS were not negatively correlated to the mastery orientation subscale of the WOFO. At the extreme end of the extrinsic motivation scale of the AMS, the EMER subscale and mastery orientation of the WOFO were found to have a null relationship (*r* = -.03), whereas mastery orientation actually shared a positive relationship with the EMIN subscale (*r* = .20) and the EMID subscale (*r* = .11). Our predictions for extrinsic subscales of the AMS and the work orientation subscale were more speculative, however we did partially confirm that the relationship became stronger and positive as one moved along the extrinsic motivation continuum (.02 with the EMER subscale, .28 with the EMIN subscale, and .28 with the EMID subscale).

Finally, our predictions regarding the relationships between the AMOT subscale of the AMS and the WOFO also received mixed support. Although we had predicted that all three approach orientations of the WOFO should be negatively correlated to the AMOT subscale of the AMS, the competitiveness subscale demonstrated a null relationship (*r* =.03), the mastery subscale demonstrated only a weak, negative relationship (*r* = -.10), and the work subscale a negative relationship (*r* = -.19).

Our second comparison involved the pattern of correlations between the AMS and the MAF (See Table 6). As predicted, we found that the intrinsic motivation subscales of the AMS were all negatively related to one's MAF score. In addition, we found that the AMOT subscale was positively related to MAF. Finally, for the extrinsic motivation subscales of the AMS, we found some support for the idea that the relationship started out positive and became weaker as one moved along the extrinsic motivation continuum (.14 with the EMER subscale, .10 with the EMIN subscale, and .02 with the EMID subscale).

[Insert Table 6 about here]

Our third comparison involved the pattern of correlations between the AMS and the ATL (See Table 7). The ATL differentiated five different types of achievement goals, but our a priori predictions centered primarily on MAP, PAP, and WAV goals. The results of MAV and PAV goals are included for exploratory reasons.

[Insert Table 7 about here]

As predicted, all three of the intrinsic motivation subscales of the AMS were positively associated with MAP goals, and all three intrinsic motivation subscales were negatively related to WAV goals. Although no additional a priori predictions were made for any of the AMS intrinsic motivation subscales, it is interesting to note that all three intrinsic motivation subscales shared positive associations with PAP goals and MAV goals. And, for the most part, they shared no relationship with PAV goals (with the exception of a weak, positive relationship for the IMTA subscale).

Regarding the extrinsic motivation subscales of the AMS, as predicted, all three subscales were positively associated with PAP goals. Our predictions between the extrinsic motivation subscales and MAP and WAV goals were more tentative, but were predicted to follow a simplex pattern. This pattern was confirmed in general for both goals. The correlations between MAP and EMER, EMIN, and EMID were .12, .33, and .35, respectively. The correlations between WAV and EMER, EMIN and EMID were .05, -.21, and -.24, respectively. Although no additional a priori predictions were made, it is interesting to note that all three extrinsic motivation subscales of the AMS shared positive associations with MAV and PAV goals.

Regarding our predictions for the AMOT subscale of the AMS, we found MAP goals were negatively associated (r = -.20) and that WAV goals were positively associated (r = .22). However, contrary to predictions that a negative relationship between AMOT and PAP goals would also exist, a null relationship was found (r = -.02).

WPI. Our final comparison involved the pattern of correlations between the AMS and the WPI (See Table 8). As predicted, all three of the intrinsic motivation subscales of the AMS were positively related to the IM subscale of the WPI, and all three of the extrinsic motivation subscales of the AMS were positively related to the EM subscale of the WPI. However, contrary to predictions, the AMOT subscale of the AMS shared only a weak, negative relationship with the IM subscale of the WPI (r = -.10) and a null relationship with the EM subscale of the WPI (r = -.02). Contrary to predictions, we found mixed support for a simplex pattern for the three extrinsic AMS motivation subscales and the IM subscale from the WPI (-.08 with EMER, .21 with EMIN, and .16 with EMID). In addition, the three intrinsic motivation subscales of the AMS were not negatively related to the EM subscale of the WPI as predicted (two were null and one was positive).

[Insert Table 8 about here]

GPA. The predictive utility of the AMS in terms of end of the semester GPA was found to be weak (see Table 9). All the relationships were essentially zero, except the relationship between

AMOT and GPA. Similar to the Cokley et al. (2001) findings, and contrary to Vallerand et al. (1993) findings, intrinsic motivation was not related to academic achievement.

[Insert Table 9 about here]

Discussion

Our goals for this study were the following: compare a seven-factor model of academic motivation to five-factor and three-factor models; estimate the internal consistency of the scores for each subscale; investigate the scale's simplex pattern, as hypothesized by Vallerand et al. (1993); and evaluate relationships with other motivational constructs to gather convergent and discriminant validity evidence.

Unlike Cokley et al. (2001), we found support for the seven-factor structure. Further, the addition of 26 error covariances was unnecessary to achieve adequate fit, as was required in the initial study of the AMS (Vallerand et al., 1992). In addition, the seven-factor model represented the relationships among the items better than a five- or three-factor model. We generally found good internal consistency for scores from each of the AMS subscales. Although our internal consistency estimate for the EMID subscale was higher than in previous studies (Vallerand et al., 1992, 1993; Cokley et al., 2001), it continued to remain the least reliable subscale.

Although the factor structure was supported and the reliability estimates for the scores were adequate, the interrelationships among adjacent subscales raised questions concerning the hypothesized motivational continuum. Specifically, the simplex pattern of the scale was not supported, as the correlations between the subscales did not display the hypothesized ordered magnitudes.

In addition, Cokley et al. (2001) questioned the distinctiveness of the IM subscales. In our current study, IMTA and IMTK were correlated .87. With this high correlation, it may be difficult to argue that these differential entities of intrinsic motivation represent different subtypes. However, correlational analyses revealed differential relationships of the intrinsic measures with other criteria, suggesting some utility for their separation or continued investigation of their distinctiveness. Additionally, the CFA supported the seven-factor model and fit better than a model unifying the three types of intrinsic motivation.

Investigation of the AMS subscales with respect to hypothesized relationships with other motivational criteria in order to gather convergent and discriminant validity evidence yielded fairly strong support. As predicted, scores from the three intrinsic motivation subscales correlated positively with scores from the mastery and work subscales of the WOFO, MAP subscale of the ATL, and the IM subscale of the WPI and correlated negatively with the MAF scale and WAV subscale of the ATL. Contrary to our predictions, the intrinsic motivation subscales were all positively correlated with the competitiveness subscale of the WOFO. As predicted, scores from the three extrinsic motivation subscales correlated positively with scores from the competitiveness subscale of the WOFO, PAP subscale of the ATL, and EM subscale of the WPI. In addition, we found some support for the ordered pattern of the correlations between the three extrinsic motivation subscales of the AMS and the MAF, work subscale of the WOFO, MAP subscale of the ATL, WAV subscale of the ATL, and the IM subscale of WPI. Support was mixed because the correlations between the criteria and both the EMIN and EMID subscales often were identical rather than showing a clear continuum of magnitude. Contrary to predictions that there would be negative relationships between the three extrinsic motivation subscales of the AMS and the mastery subscale of the WOFO, two of the three correlations were positive and the other was null. Finally, as predicted, scores from the AMOT subscale of the AMS correlated positively with the scores from the MAF scale, and WAV subscale from the ATL and negatively correlated with the scores from the mastery and work subscales of the WOFO, MAP subscale of the ATL, and IM subscale of the WPI. Contrary to additional predictions of negative relationships, we found null relationships between the AMOT subscale and the competitiveness subscale of the WOFO, PAP subscale of the ATL, and EM subscale of the WPI.

In sum, the AMS functioned well on some of Benson's (1998) criteria for establishing construct validity. First, a seven-factor structure representing the intercorrelations among the items was supported. Second, adequate internal consistency estimates of the scores for each of the seven subscales was found. Third, the majority of the a priori predictions concerning relationships with other motivation measures were supported. However, lack of support of the simplex pattern in both this study and previous studies causes concern. The lack of support for the motivation continuum may reflect either one of two things: a limitation in current scale construction or a limitation in its theoretical foundations.

In regard to scale construction, we found two potential problems. First, a number of subscales seem to restrict item focus on a centralized theme apart from motivation itself. This choice of item content may be contributing to the lack of support for the scale's hypothesized simplex structure. For example, the EMID and EMER subscales both refer to *future* aspirations in one's job or career, while the EMIN subscale does not reflect this content. This discrepancy may account for the higher correlations between these non-adjacent subscales. Similarly, the item content of the EMIN subscale seems to refer more heavily to intrinsic motivation than do either of the other extrinsic motivation subscales. As a result, EMID, which is purportedly adjacent to the intrinsic motivation subscales, yielded lower correlation coefficients with the scores from the intrinsic motivation scale than did EMIN. An example of item content problems with the intrinsic motivation items can be found with the IMES subscale where the majority of the items are linked to the content of reading. Again, content problems across the various items may be the potential culprit behind these inconsistent relationships. Second, the current version of the scale fails to include the integrated regulation component of extrinsic motivation, which was originally included in Deci and Ryan's self-determination continuum (Ryan & Deci, 2000). This omission is not addressed in any of the initial or subsequent studies evaluating the scale and therefore remains untested. Thus, both of these problems raise questions about the current items being measured and call for a return to Benson's (1998) first stage of establishing construct validity, the substantive component, before evaluating structural and external components again.

Another possibility that needs to be considered and may offer insight into inconsistent findings with the AMS across numerous studies (Cokley, 2000; Cokley et al., 2001; Vallerand et al., 1992, 1993) questions the scale's theoretical foundations. That is, intrinsic and extrinsic motivation may not be mutually exclusive constructs at opposite ends of a motivational continuum as self-determination theory suggests. For example, Amabile et al. (1994) noted that, "there is little support for the assumption that intrinsic and extrinsic are polar opposites, with people falling into one discrete category or the other" (p. 959). Likewise, Lepper and Henderlong (2000) emphasized that the two are not mutually exclusive. Finally, Covington and Müeller (2001) reviewed that "the weight of recent evidence suggests that intrinsic and extrinsic tendencies may best be conceived as two independent orientations, not just two endpoints on single continuum" (p. 163). A parallel debate has occurred in the goal orientation literature where performance and mastery goals were once previously dichotomized, and researchers have since come to conceptualize the possibility of a multiple goals approach (c.f., Barron & Harackiewicz, 2000). Our failure to support the simplex structure in the current investigation, as well as others questioning its existence based on empirical evidence (e.g., Cokley, 2000), further attests to the fact that the conceptualization of intrinsic-extrinsic motivation as a developmental continuum may need to be re-evaluated. Rather, perhaps one needs to consider how subscales combine or interact to promote motivation.

Whatever the source of problematic functioning, the issue remains that there may not be sufficient validity evidence, at present, to support the scale’s use in motivational research. We recommend further investigation of the properties of scores from the AMS, as well as reconsidering its theoretical underpinnings. This may include rewriting old items and/or writing new items, adding additional subscales, and/or rethinking exactly how Deci and Ryan’s self-determination continuum “works”.

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Table 1

Predicted relationships between AMS subscales and other measures

	WOFO Subscales			MAF Scale	ATL Subscales					WPI Subscales	
AMS	M	W	C		PAP	PAV	MAP	MAV	WAV	EM	IM
AMOT	-	-	-	+	-	NP	-	NP	+	-	-
EMER	-	-	+	+	+	NP	-	NP	+	+	-
EMIN	-	NS	+	NS	+	NP	NS	NP	NS	+	NS
EMID	-	+	+	NS	+	NP	+	NP	NS	+	+
IMTK	+	+	NS	-	NP	NP	+	NP	-	-	+
IMTA	+	+	+	-	NP	NP	+	NP	-	-	+
IMES	+	+	+	-	NP	NP	+	NP	-	-	+

Note. A positive sign (+) indicates a positive relationship is predicted; a negative sign (-) a negative relationship predicted. The letters NS indicate a null relationship, and the letters NP indicate no a priori predictions were made either because of no existing theory or because the motivational continuum complicates a single prediction (+, -, or ns). M=Mastery, W=Work, C=Competitiveness, MAF=Motive to Avoid Failure, PAP=Performance-approach, PAV=Performance-avoidance, MAP=mastery-approach, MAV=mastery-avoidance, WAV=work-avoidance, EM=extrinsic motivation, IM=intrinsic motivation.

Table 2

Fit Statistics for the Alternative Achievement Motivation Models (N = 1406*)*

Model	ML χ^2	S-B Scaled χ^2	df	Robust CFI	Robust RMSEA
a) Seven-factor Model	2150.33	1735.19	329	.967	.055
b) Five-Factor Model	3627.17	3167.38	340	.934	.077
c) Three-Factor Model	6323.72	6471.10	347	.858	.110

Note: Robust CFI = robust comparative fit index; Robust RMSEA = robust root mean square error of approximation.

Table 3

Standardized Factor Pattern and Structure Coefficients from the Confirmatory Factor Analysis of the Seven-Factor Achievement Motivation Model (N = 1406)

Items	AM	EMER	EMIN	EMID	IMTK	IMES	IMTA
AMOT1	**.81(.81)**	.00(-10)	.00(-05)	.00(-.25)	.00(-.15)	.00(-.01)	.00(-.12)
AMOT2	**.72(.72)**	.00(-.09)	.00(-.04)	.00(-.22)	.00(-.14)	.00(-.01)	.00(-.11)
AMOT3	**.76(.76)**	.00(-.09)	.00(-.05)	.00(-.23)	.00(-.15)	.00(-.01)	.00(-.11)
AMOT4	**.79(.79)**	.00(-.09)	.00(-.05)	.00(-.24)	.00(-.15)	.00(-.01)	.00(-.12)
EMER1	.00(-.07)	**.61(.61)**	.00(.29)	.00(.43)	.00(.07)	.00(.03)	.00(.13)
EMER2	.00(-.10)	**.81(.81)**	.00(.39)	.00(.57)	.00(.09)	.00(.04)	.00(.17)
EMER3	.00(-.10)	**.83(.83)**	.00(.40)	.00(.59)	.00(.09)	.00(.04)	.00(.17)
EMER4	.00(-.10)	**.87(.87)**	.00(.42)	.00(.61)	.00(.10)	.00(.05)	.00(.18)
EMIN1	.00(-.04)	.00(.34)	**.71(.71)**	.00(.39)	.00(.40)	.00(.36)	.00(.55)
EMIN2	.00(-.05)	.00(.37)	**.76(.76)**	.00(.43)	.00(.44)	.00(.39)	.00(.60)
EMIN3	.00(-.05)	.00(.38)	**.79(.79)**	.00(.44)	.00(.45)	.00(.40)	.00(.62)
EMIN4	.00(-.05)	.00(.40)	**.83(.83)**	.00(.46)	.00(.47)	.00(.42)	.00(.65)
EMID1	.00(-19)	.00(.43)	.00(.34)	**.62(.62)**	.00(.31)	.00(.17)	.00(.31)
EMID2	.00(-.22)	.00(.51)	.00(.40)	**.72(.72)**	.00(.36)	.00(.20)	.00(.37)
EMID3	.00(-.22)	.00(.50)	.00(.39)	**.70(.70)**	.00(.35)	.00(.19)	.00(.36)
EMID4	.00(-.20)	.00(.47)	.00(.37)	**.66(.66)**	.00(.33)	.00(.18)	.00(.34)
IMTK1	.00(-.13)	.00(.08)	.00(.40)	.00(.35)	**.70(.70)**	.00(.50)	.00(.61)
IMTK2	.00(-.15)	.00(.09)	.00(.46)	.00(.41)	**.81(.81)**	.00(.57)	.00(.71)
IMTK3	.00(-.16)	.00(.09)	.00(.48)	.00(.42)	**.83(.83)**	.00(.59)	.00(.73)
IMTK4	.00(-.15)	.00(.09)	.00(.44)	.00(.39)	**.78(.78)**	.00(.55)	.00(.68)
IMES1	.00(.00)	.00(.03)	.00(.30)	.00(.16)	.00(.42)	**.59(.59)**	.00(.43)
IMES2	.00(-.01)	.00(.05)	.00(.43)	.00(.23)	.00(.60)	**.85(.85)**	.00(.62)
IMES3	.00(-.01)	.00(.05)	.00(.45)	.00(.24)	.00(.63)	**.89(.89)**	.00(.65)
IMES4	.00(-.01)	.00(.04)	.00(.41)	.00(.22)	.00(.57)	**.80(.80)**	.00(.59)
IMTA1	.00(-.12)	.00(.17)	.00(.62)	.00(.41)	.00(.70)	.00(.58)	**.80(.80)**
IMTA2	.00(-12)	.00(.18)	.00(.66)	.00(.43)	.00(.74)	.00(.61)	**.84(.84)**
IMTA3	.00(-.12)	.00(.18)	.00(.66)	.00(.43)	.00(.74)	.00(.62)	**.85(.85)**
IMTA4	.00(-.12)	.00(.18)	.00(.66)	.00(.43)	.00(.73)	.00(.61)	**.84(.84)**

Note. The standardized factor pattern coefficients are presented first followed by structure coefficients in parenthesis. The pattern coefficients in bold were freed to be estimated, whereas the pattern coefficients equal to .00 were fixed at zero. AMOT = Amotivation, EMER = Extrinsic Motivation External Regulation, EMIN = Extrinsic Motivation Introjected Regulation, EMID = Extrinsic Motivation Identified Regulation, IMTK = Intrinsic Motivation to Know, IMES = Intrinsic Motivation to Experience Stimulation, IMTA = Intrinsic Motivation to Accomplish

Table 4

Correlations, Reliability, Means, and Standard Deviations for the Seven AMS subscales (N = 1406)

Variable	AMOT	EMER	EMIN	EMID	IMTK	IMES	IMTA
AMOT	1.0						
EMER	-.12	1.0					
EMIN	-.06	.48	1.0				
EMID	-.31	.71	.56	1.0			
IMTK	-.19	.11	.57	.50	1.0		
IMES	-.01	.05	.51	.27	.71	1.0	
IMTA	-.15	.21	.78	.51	.87	.73	1.0
Cronbach's Coefficient α[a]	.85 (.84,.86)	.85 (.84,.86)	.85 (.84,.86)	.77 (.75,.79)	.86 (.85,.87)	.86 (.85,.87)	.90 (.89,.91)
Mean	4.92	21.37	17.66	22.86	20.09	13.04	16.94
SD	2.37	4.97	5.39	3.81	4.52	5.32	5.36

Note. [a]The 95% percent confidence intervals for Cronbach's Coefficient alpha were calculated using a method employing the central F distribution (see Fan & Thompson, 2001). Correlations among the constructs were calculated via CFA and are therefore disattenuated for measurement error. AMOT = Amotivation, EMER = Extrinsic Motivation External Regulation, EMIN = Extrinsic Motivation Introjected Regulation, EMID = Extrinsic Motivation Identified Regulation, IMTK = Intrinsic Motivation to Know, IMES = Intrinsic Motivation to Experience Stimulation, IMTA = Intrinsic Motivation to Accomplish. Scale scores can range from 4 to 28.

Table 5

Correlations Between the AMS Subscales and the WOFO Subscales (N = 915)

AMS Subscale	Work	Mastery	Competitiveness
AMOT	-0.186**	-0.108**	0.031
EMER	0.015	-0.026	0.292**
EMIN	0.283**	0.196**	0.278**
EMID	0.282**	0.112**	0.136**
IMTK	0.408**	0.413**	0.101**
IMTA	0.471**	0.413**	0.186**
IMES	0.294**	0.398**	0.118**

Note. AMOT = Amotivation, EMER = Extrinsic Motivation External Regulation, EMIN = Extrinsic Motivation Introjected Regulation, EMID = Extrinsic Motivation Identified Regulation, IMTK = Intrinsic Motivation to Know, IMTA = Intrinsic Motivation to Accomplish, IMES = Intrinsic Motivation to Experience Stimulation.

**$p<0.01$.

Table 6

Correlations Between the AMS Subscales and the MAF Scale (N = 915)

AMS Subscale	MAF Scale
AMOT	0.171**
EMER	0.140**
EMIN	0.100**
EMID	0.024
IMTK	-0.218**
IMTA	-0.150**
IMES	-0.173**

Note. AMOT = Amotivation, EMER = Extrinsic Motivation External Regulation, EMIN = Extrinsic Motivation Introjected Regulation, EMID = Extrinsic Motivation Identified Regulation, IMTK = Intrinsic Motivation to Know, IMTA = Intrinsic Motivation to Accomplish, IMES = Intrinsic Motivation to Experience Stimulation.

** $p<0.01$.

Table 7

Correlations Between the AMS Subscales and the ATL (N = 915)

AMS Subscale	MAP	PAP	MAV	PAV	WAV
AMOT	-0.198**	-0.015	0.041	0.028	0.220**
EMER	0.117**	0.288**	0.092**	0.261**	0.046
EMIN	0.327**	0.332**	0.253**	0.323**	-0.213**
EMID	0.351**	0.200**	0.159**	0.182**	-0.238**
IMTK	0.443**	0.166**	0.117**	0.008	-0.374**
IMTA	0.476**	0.273**	0.179**	0.094**	-0.396**
IMES	0.361**	0.177**	0.141**	0.017	-0.298**

Note. AMOT = Amotivation, EMER = Extrinsic Motivation External Regulation, EMIN = Extrinsic Motivation Introjected Regulation, EMID = Extrinsic Motivation Identified Regulation, IMTK = Intrinsic Motivation to Know, IMTA = Intrinsic Motivation to Accomplish, IMES = Intrinsic Motivation to Experience Stimulation, MAP=Mastery-Approach Subscale, PAP=Performance-Approach Subscale, MAV=Mastery-Avoidance Subscale, PAV=Performance-Avoidance Subscale, WAV=Work-Avoidance Subscale.

**$p < 0.01$.

Table 8

Correlations Between the AMS Subscales and the WPI subscales (N = 915)

AMS Subscale	EM	IM
Amotivation	-0.019	-0.1**
EMER	0 .372**	-0.082
EMIN	0.382**	0.209**
EMID	0.244**	0.156**
IMTK	0.078	0.548**
IMTA	0.214**	0.484**
IMES	0.082	0.462**

Note. EMER = Extrinsic Motivation External Regulation, EMIN = Extrinsic Motivation Introjected Regulation, EMID = Extrinsic Motivation Identified Regulation, IMTK = Intrinsic Motivation to Know, IMES = Intrinsic Motivation to Experience Stimulation, IMTA = Intrinsic Motivation to Accomplish, EM=Extrinsic Motivation, IM=Intrinsic Motivation.

**$p < 0.01$.

Table 9

Correlations Between the AMS Subscales and GPA (N=1274)

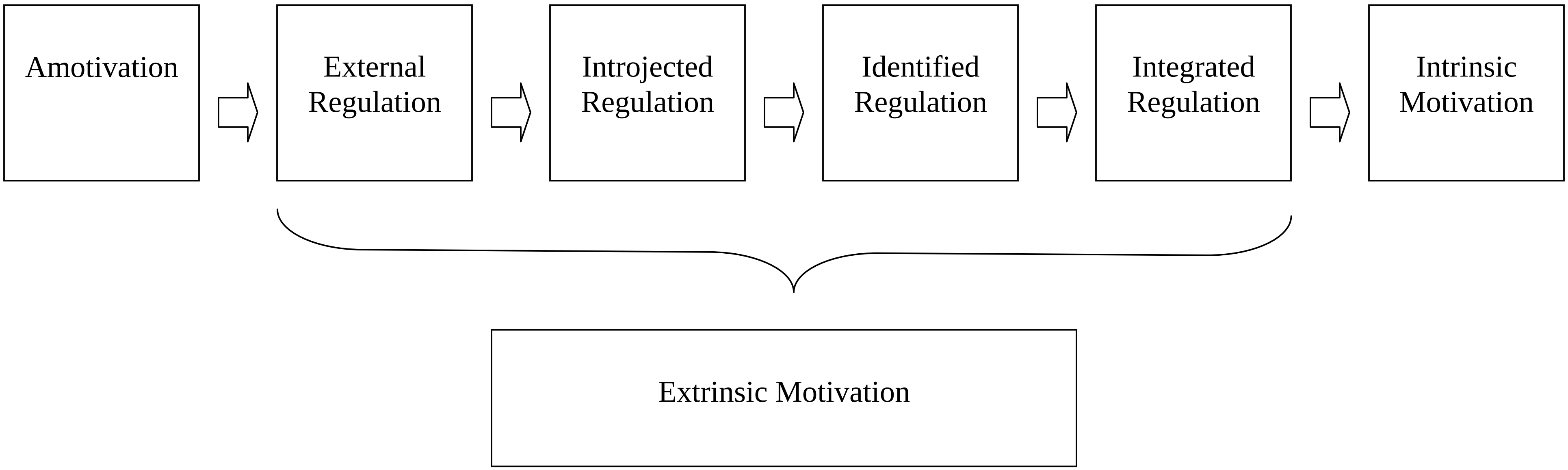
AMS Subscale	GPA
AMOT	-0.103**
EMER	-0.028
EMIN	-0.011
EMID	0.041
IMTK	0.051
IMTA	0.019
IMES	-0.013

Note. AMOT = Amotivation, EMER = Extrinsic Motivation External Regulation, EMIN = Extrinsic Motivation Introjected Regulation, EMID = Extrinsic Motivation Identified Regulation, IMTK = Intrinsic Motivation to Know, IMES = Intrinsic Motivation to Experience Stimulation, IMTA = Intrinsic Motivation to Accomplish

** $p < 0.01$.

Figure Caption

Figure 1. The motivational continuum of self-determination theory.


Amotivation
External Regulation
Introjected Regulation
Identified Regulation
Integrated Regulation
Intrinsic Motivation
Extrinsic Motivation