Assessing the Psychometric Properties of the Achievement Goals Questionnaire Across Task Contexts

Krista R. Muis

McGill University

Philip H. Winne

Simon Fraser University

Author Note

Correspondence concerning this article should be addressed to Krista R. Muis, McGill University, Faculty of Education, Department of Educational and Counselling Psychology, 3700 McTavish St., Montreal, Quebec, H3A 1Y2, or via e-mail krista.muis@mcgill.ca.

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Abstract

A program of research is necessary to examine the psychometric properties of instruments designed to measure individuals' achievement goal orientations. Recently, research on achievement goal orientation has examined the stability of achievement goals to assess how context might influence individuals' achievement goals. Accordingly, studies are necessary to establish factorial invariance across contexts. We examined the psychometric properties of the Achievement Goal Questionnaire (AGQ; Elliot & McGregor, 2001) across task contexts within a single classroom environment. We tested the factor structure by comparing five competing models and evaluated the invariance of the factor structure across four task contexts. Results revealed that the hypothesized four-factor structure was replicated, construct- and discriminant-related evidence of validity were supported, and both internal consistency and test-retest reliability estimates were satisfactory. Moreover, invariance held at all levels across the various contexts.

Keywords: Achievement goal orientation, measurement, factorial invariance, psychometrics, reliability.

Résumé

Un programme de recherche est nécessaire afin d'examiner les propriétés psychométriques d'instruments conçus pour mesurer les orientations des individus envers des objectifs de réussite. Récemment, la recherche sur l'orientation envers des objectifs de réussite s'est intéressée à la stabilité de ces objectifs afin d'évaluer comment le contexte pouvait influer les orientations envers des objectifs de réussite chez divers individus. C'est d'ailleurs ceci qui justifie les études permettant d'établir l'invariance factorielle quels que soient les contextes examinés. À cet effet, nous avons examiné les propriétés psychométriques du questionnaire sur les objectifs de réussite (AGQ ; Elliot et McGregor, 2001) dans différents contextes d'activité au sein d'un seul même environnement en salle de classe. Nous avons étudié la structure factorielle en comparant cinq modèles différents et avons évalué l'invariance de cette structure selon quatre contextes d'activités. Les résultats indiquent que la structure à quatre facteurs proposée a été reproduite, que la validité discriminante et des constructs ont été soutenues, et que les coefficients estimés de l'uniformité interne et de la fiabilité test-rest sont satisfaisants. D'ailleurs, l'invariance a été soutenue à tous les niveaux quels que soient les contextes examinés.

Mots-clés: Les orientations envers des objectifs de réussite, la mesure, les propriétés psychométriques, l'invariance factorielle, la fiabilité.

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Introduction

Imagine a teacher assigns students a task that provides opportunities for students to work together, allows them to select a topic for the task, and allows them to submit the assignment for formative feedback prior to submission for summative assessment. Three weeks later, the same teacher tells students they will be given an exam graded on normative standards, and scores will be posted in the class. Would students' achievement goals be similar for both tasks? Theoretically, the likely answer is no. As Ames (1992) proposed, the various tasks and learning activities that teachers set for their students can have powerful influences on how students engage with the tasks, the amount of effort they expend, and the strategies they choose to complete the tasks. Specifically, tasks can influence learners' orientations toward differing achievement goals. Midgley, Kaplan, and Middleton (2001) define achievement goals as "the purposes for behavior that are perceived or pursued in a competence-relevant setting" (p.77).

Initially, theorists proposed two types of achievement goals: a mastery goal and a performance goal (e.g., Anderman & Maehr, 1994; Dweck & Leggett, 1988; Elliot & Dweck, 1988; Maehr & Pintrich, 1991; Meece, 1991). Today, theorists conceptualize achievement goals within a trichotomous or 2 x 2 framework. Within the trichotomous framework (e.g., Elliot & Church, 1997; Middleton & Midgley, 1997; Pintrich, 2000), three distinct achievement goal orientations are proposed: a mastery goal, performance-approach goal, and a performance-avoid goal. A mastery goal orientation (or mastery-approach orientation) describes learners who strive to develop competence and task mastery. Learners with a mastery goal orientation are theorized to believe effort and outcome co-vary. In contrast, a performance-approach goal orientation characterizes learners who strive to demonstrate aptitude and seek favourable judgments; demonstrations of competence are in comparison to others. The third goal is a performance-avoidance orientation, whereby learners strive to avoid appearing unable and avoid negative judgments. Like the performance-approach orientation, comparisons of competence are made with other individuals.

The 2 x 2 achievement goal framework (Elliot & McGregor, 2001) divides goals into a mastery-performance dichotomy plus an approach-avoidance dichotomy. This adds a fourth goal orientation, a mastery-avoidance orientation, whereby a learner's goal is to avoid failure rooted in an intrapersonal perspective (relative to oneself, like the mastery-approach orientation) rather than in comparison to others. For the mastery-avoid goal construct, incompetence is the focus. A mastery-avoid oriented learner, for example, may strive to avoid misunderstanding or failing to learn course material, or strive not to forget what has been learned (Elliot & McGregor, 2001). Conceptually, the mastery component in a mastery-avoid goal orientation emerges from optimal antecedents (e.g., motive dispositions, implicit theories, socialization histories) that may facilitate positive consequences (such as mastery-approach goals; see Elliot & McGregor, 2001, for a complete discussion). The avoidance component, however, is hypothesized to emerge from non-optimal antecedents and may result in negative consequences (such as performance-avoidance goals).

Several studies have examined the consequences of endorsing various goals and how those goals relate to achievement (Elliot, 1999). For example, performance-approach goals correlated with positive factors such as absorption during task involvement (Elliot & Harackiewicz, 1996), high performance outcomes (Elliot & Church, 1997), task value (Wolters, Yu, & Pintrich, 1996), and intrinsic motivation (Elliot & Harackiewicz, 1996; Elliot & Church, 1997). Performance-approach goals also have been linked to negative outcomes such as test anxiety (Elliot & McGregor, 1999; Middleton & Midgley, 1997), low self-efficacy (Skaalvik, 1997), and higher avoidant help-seeking (Middleton & Midgley, 1997; Ryan & Pintrich, 1998). Performance-avoidance goals have been associated with negative outcomes, such as low absorption during task engagement (Elliot & Harackiewicz, 1996), an unwillingness to seek help with schoolwork (Middleton & Midgley, 1997), and reduced intrinsic motivation (Elliot & Church, 1997). Mastery-approach goals have been found to relate to positive outcomes, such as long-term retention of information (Elliot & McGregor, 1999), intrinsic motivation (Elliot & Church, 1997; Elliot & Harackiewicz, 1996), help-seeking (Ryan & Pintrich, 1998), and persistence (Pintrich, 2000). Finally, a mastery-avoid orientation has been found to correlate with negative outcomes such as low achievement (Crippen, Biesinger, Muis, & Orgill, 2009), disorganization and emotionality (Elliot & McGregor, 2001), and positively relate to outcomes such as fear of failure (Fryer & Elliot, 2007).

Studies have also examined psychometric properties of various types of instruments used to measure achievement goals (Elliot & McGregor, 2001; Finney, Pieper, & Barron, 2004; Jagacinski & Duda, 2001; Midgley et al., 1998). For example, Finney et al. (2004) examined the factor structure of the Achievement Goal Questionnaire (AGQ; Elliot & McGregor, 2001) in a general academic context. A sample of 2111 freshman undergraduate students completed the AGQ along with other various instruments. Results supported the four-factor structure that Elliot and McGregor (2001) hypothesized. Moreover, correlations between each of the four dimensions were low, and Cronbach alpha reliability coefficients were greater than .70, with the exception of the performance avoidance subscale (.54).

Our review of the literature suggests the majority of studies have examined relations between achievement goals and other cognitive, affective, and achievement outcomes. Psychometric assessments of the various scales also have been conducted on specific samples (Elliot & McGregor, 2001), between groups to assess factorial invariance (Midgley et al., 1998), or across general or domain-specific contexts (Finney et al., 2004; Jagacinski & Duda, 2001). More recently, however, studies have explored the stability of goal orientations across contexts (Fryer & Elliot, 2007; Muis & Edwards, 2009; Senko & Harackiewicz, 2005; Winne, Muis, & Jamieson-Noel, 2005). As Pintrich (2000) stated, studies are needed to determine whether achievement goals are constant across contexts or whether they change as contexts change. Accordingly, theorists have suggested that achievement goals may not be as stable as theorists typically assume (Fryer & Elliot, 2007; Muis & Edwards, 2009; Senko & Harackiewicz, 2005; Winne et al., 2005). Results from the few studies that have examined goal stability found support for both stability and change (Fryer & Elliot, 2007; Muis & Edwards, 2009; Senko & Harackiewicz, 2005; Winne et al., 2005).

For example, Senko and Harackiewicz (2005) examined whether individuals who received ongoing performance feedback on a series of tasks engaged in goal-switching (e.g., switching from one goal type to another) or goal intensification (e.g., to strengthen or reduce the pursuit of one goal). In the first study, tasks included four non-cumulative multiple-choice exams. For the second study in a laboratory setting, feedback was manipulated such that participants performed either "well below average" or "well above average" on a first mathematics task, and "well above average" on the second set of tasks. Results from Senko and Harackiewicz's (2005) first study revealed that individuals' goal orientations remained stable throughout the semester, although poor exam performance predicted a significant decrease in mastery-approach and performance-approach goals, and an increase in performance-avoidance goals. In the second study, they found that negative feedback reduced individuals' mastery-approach goals.

In another study, Muis and Edwards (2009) examined the stability and change in students' achievement goal orientations across varying tasks over the course of two undergraduate classes. For both classes, achievement goals were measured four times: prior to two assignments and two exams. Using four different complimentary techniques, results across both studies revealed evidence for stability and change across tasks. Moreover, the level of change that occurred across the different tasks was similar, which the authors argued suggested that task specificity was not a key factor in the amount of change that occurred over the course of the semester. Based on these results, they proposed that other factors, such as fear of failure, anxiety, or interest in a specific task may be more predictive of goal change than the task itself.

We question, however, whether changes in students' mean level of achievement goals were a function of true differences or a function of fluctuations in students' interpretations of items across the task contexts. In particular, given that few studies have conducted psychometric assessments of the instruments researchers typically use to measure achievement goals, and given the new direction in this line of work, more research is needed to further establish construct validity and reliability. Particularly, it is imperative that factor analytic work is conducted to establish factorial invariance across contexts. Typically, factorial invariance is conducted across groups to assess whether group differences are meaningful and valid (i.e., 'Can items be interpreted similarly across groups? [Chan, 2000]). Measurement equivalence needs to be established prior to examining mean differences across groups. If items are not equivalent, then differences between groups' means cannot be meaningfully established—the construct may not be the same across groups.

A parallel argument applies to differences in achievement goals across time or contexts. When students respond to questionnaire items after receiving performance feedback (Senko & Harackiewicz, 2005; Winne et al., 2005) or are responding to individual items that focus specifically on a particular task (Fryer & Elliot, 2007; Muis & Edwards, 2009), context and content changes. Theoretically, because there may be cumulative effects of feedback or differing effects due to task specificity on item interpretation, it is not assured *a priori* that data on students' goal orientations reflect the same constructs from time to time.

We addressed these issues by investigating whether students' goal orientation exhibited invariant factorial structure across various tasks after receiving feedback about those tasks. As Chan (2000) argued, this is essential before comparing observed data in exploring for differences across time and tasks. As well, we add to the empirical literature by further exploring the psychometric properties of one of the most widely used instruments, the Achievement Goal Questionnaire (AGQ; Elliot & McGregor, 2001). Specifically, we explored factorial invariance across four different task contexts, and examined construct- and discriminant-related evidence of validity and reliability of the items with a sample of 99 university undergraduate students enrolled in an introductory educational psychology course. Given the small sample size, precision of estimates may be affected and, as such, we suggest that results are interpreted with caution.

Method

Participants

Participants were 99 students—13 males and 86 females—taking an educational psychology course. The mean age of students was 23.12 years (*SD* = 6.97), and the mean selfreported GPA was 3.42 (*SD* = 2.96, *N* = 85). The sample was participating in a multi-faceted study and responded to other questionnaires about study tactics that are not relevant here.

Measures

Goal orientation. We used the 12-item Achievement Goal Questionnaire (AGQ; Elliot & McGregor, 2001) to assess students' achievement goals for their educational psychology course. Students indicated their agreement with each statement on a scale of 1 (not at all true of me) to 7 (very true of me). The AGQ generates four theoretically orthogonal subscales of three items each: mastery-approach, mastery-avoidance, performance-approach, and performance-avoidance. Sample items are: "I desire to completely master the material presented in this class" (mastery-approach), "I worry that I may not learn all that I possibly could in this class" (mastery-avoid), "It is important for me to do better than other students" (performance-approach), and "My goal in this class is to avoid performing poorly" (performance-avoid).

Procedure

In this course, students wrote two five-page papers that required them to reason with course content and apply it to teaching. They also took two multiple-choice exams, a midterm covering the fist half of the course, and a final covering the second half of the course. In week 2 of the semester, before participants were given any assignments or exams, they completed the AGQ. Each time an assignment or exam was handed back with feedback, they completed the AGQ again. Instructions and items for the AGQ were the same across all tasks. Students were asked to indicate how well each statement best described them.

Results

Descriptive Statistics and Discriminant Validity

Using SPSS 19 (IBM), we first examined sub-scales of the AGQ for normality. Kline (1998) suggested using absolute cut-off values of 3.0 for skewness and 8.0 for kurtosis. All items on the AGQ were well within these ranges (ranging from –1.79 to 0 for skewness and from –1.18 to 4.88 for kurtosis). Means, standard deviations, and Cronbach alphas are reported in Table 1. To examine discriminant-related validity, we examined correlations between each of the theoretically defined goal orientation sub-scales. Correlations should be low to provide evidence of four distinct dimensions. As shown in Table 2, most correlations between sub-scales across the four time points were near zero. The exceptions were correlations between the two mastery orientation sub-scales and between the two avoidance sub-scales, which were moderate. We also examined correlations between and within each of the goal orientation sub-scales across time. As shown in Table 3, correlations within each goal orientation ranged from moderate to high, whereas correlations between each of the goal orientations were predominantly low, although some moderate correlations were found between the two mastery orientations.

Table 1.

Descriptive Statistics and Cronbach αs for Goal Orientations.

	Time 1 Start of Course			Time 2 Think Paper 1			Time 3 Midterm			Time 4 Think Paper 2		
Scale	M	SD	α	M	SD	α	M	SD	α	M	SD	α
Mastery Approach	5.77	.89	.70	5.54	1.12	.86	5.34	1.20	.87	5.20	1.17	.89
Mastery-Avoid	4.26	1.49	.85	4.34	1.44	.87	4.29	1.50	.93	4.36	1.46	.90
Performance Approach	4.36	1.40	.90	4.31	1.57	.96	4.22	1.62	.95	3.99	1.53	.96
Performance-Avoid	4.47	1.43	.67	4.36	1.49	.84	4.14	1.47	.87	4.14	1.43	.89

Note: Ns varied across times. $N = 99$, $N = 71$, $N = 76$, and $N = 53$ for times 1, 2, 3, and 4, respectively.

Table 2.

Correlations Between Each Goal Orientation Across Tasks.

Think Paper 1	1	2	3
MAP_1			
MAV_2	.43**		
PAP_3	-.05	.08	
PAV_4	-.01	.41**	.32**
Midterm	1	2	3
MAP_1			
MAV_2	.56**		
PAP_3	.03	.02	
PAV_4	-.04	.39*	.12
Think Paper 2	1	2	3
MAP_1			
MAV_2	.50**		
PAP_3	-.07	-.12	
PAV_4	-.10	.39**	.13

Note: MAP = mastery approach, MAV = mastery avoidance, PAP = performance approach, PAV = performance avoidance, * $p < .05$, and ** $p < .01$.

Table 3.

Correlations Between Each Goal Orientation Across Time.

	Time 2				Time 3				Time 4			
Time 1	1	2	3	4	1	2	3	4	1	2	3	4
MAP_1	.75 [b]	.44 [b]	.00	-.10	.66 [b]	.40 [b]	-.07	-.12	.66 [b]	.54 [b]	-.13	-.03
MAV_2	.37 [b]	.72 [b]	-.04	.32 [b]	.28 [a]	.66 [b]	-.13	.35 [b]	.37 [b]	.68 [b]	-.22	.20
PAP_3	-.05	-.05	.77 [b]	.04	-.12	-.15	.74 [b]	.04	-.03	-.01	.74 [b]	-.01
PAV_4	.01	.31 [b]	.20	.67 [b]	-.08	.23 [a]	.15	.73 [b]	-.07	.15	.16	.60 [b]
Time 2												
MAP					.89 [b]	.53 [b]	-.08	-.04	.92 [b]	.57 [b]	-.06	-.03
MAV					.50 [b]	.86 [b]	.01	.46 [b]	.58 [b]	.89 [b]	-.18	.36 [b]
PAP					-.01	-.13	.92 [b]	.06	-.04	-.06	.80 [b]	-.01
PAV					-.12	.35 [b]	.05	.88 [b]	-.06	.34 [b]	.03	.86 [b]
Time 3												
MAP									.85 [b]	.51 [b]	-.12	-.07
MAV									.44 [b]	.80 [b]	-.16	.36 [a]
PAP									-.05	-.05	.83 [b]	.02
PAV									-.05	.36 [a]	.14	.88 [b]

Note: MAP = mastery approach, MAV = mastery avoidance, PAP = performance approach, PAV = performance avoidance, [a] $p < .05$, and [b] $p < .01$.

Evaluating Fit of the Factor Structure: Construct Validity

EQS 6.0 (Multivariate Software Inc) was used to cross-validate Elliot and McGregor's (2001) 2 x 2 model of goal orientation. We used data from the start of the course to test five competing models also tested by Elliot and McGregor (2001) and Finney et al. (2004) that might explain relationships among item responses. Model A was a four-factor model based on the 2 x 2 framework for goal orientation. Model B was a three-factor model that included a performance approach factor, a performance-avoid factor, and an overall mastery factor. Model C was a three-factor model that included a mastery approach factor, a performance approach factor, and an overall avoidance factor. Model D was a two-factor model that included an overall mastery factor and an overall performance factor. Finally, Model E was a two-factor model that included an overall approach factor and an overall avoidance factor. Given that alternative models B through E are nested within the four-factor model (the hypothesized model, model A), a chi-square difference test ($\Delta\chi^2$) can be conducted between Model A and each respective model. If the $\Delta\chi^2$ is significant, the more complex model (Model A) fits significantly better than the alternative model. Accordingly, differences between chi-square statistics and the comparative fit index (CFI) were used to compare models. The CFI is particularly sensitive to misspecified factor pattern correlations and is a useful fit index when sample sizes are not large (Tabachnick & Fidell, 1996). A value of .95 or higher indicates good fit (Hoyle & Panter, 1995).

Table 4 displays chi-square, $\Delta\chi^2$, and CFI values for all five models. The chi-square and CFI values for model A were 83.63 ($df = 48$, $N = 99$, $p < .01$) and .95, respectively. This suggests a good fit to the data. For model B, the chi-square and CFI values were 127.63 ($df = 51$, $p < .01$) and .85, suggesting a moderate fit to the data. Chi-square and CFI values for model C were 127.54 ($df = 51$, $p < .01$) and .85, again, suggesting a moderate fit. Model D resulted in a chi-square of 176.02 ($df = 53$, $p < .01$) and a CFI of .75. Finally, model E resulted in a chi-square of 204.33 ($df = 53$, $p < .01$) and a CFI of .70. Consistent with Elliot and McGregor's (2001) and Finney et al.'s (2004) results, our data validate the four-factor model of goal orientation for mastery approach, mastery avoidance, performance approach, and performance avoidance.

Table 4.

Fit Statistics for the Five Goal Orientation Models.

Model	χ^2	$\Delta\chi^2$	Δdf	CFI	ΔCFI
Four-Factor Model	83.63 (df = 48)	-----	-----	.93	-----
Overall Mastery	127.63 (df = 51)	44	3	.85	-.08
Overall Avoidance	127.54 (df = 51)	43.91	3	.85	-.08
Overall Mastery and Overall Performance	176.02 (df = 53)	92.39	5	.75	-.18
Overall Approach and Overall Avoidance	204.33 (df = 53)	120.70	5	.70	-.23

Invariance of the Factor Structure

We then investigated whether students' goal orientations exhibited invariant factorial structure across the different time points. Five steps are involved in testing for factorial invariance. In step one, the data are tested separately at each time for fit to the model (Byrne, 1998), in our case, the 2 x 2 model of goal orientation. If this test is passed, four more tests are applied to establish that differences across time can be validly attributed to genuine differences rather than to differences in the architecture of the construct in different times, or to varying biases in measurements (Cheung & Rensvold, 2002). First, configural invariance is tested to examine whether the 2 x 2 architecture of the latent traits that gives rise to item responses does not vary across time. Second, metric invariance is tested by adding a constraint that loadings of the item responses on the latent constructs are invariant across time. Third, scalar invariance is examined to test whether the observed variables have the same degree of statistical bias—the distance of a mean from a fixed point—over time. This is accomplished by setting the influence of a latent trait to zero and computing predicted values of the observed variables at each time. There should be no differences (Hancock, 1997). Last, testing for measurement error invariance examines invariance of the factor variances and co-variances over time. Invariance of factor co-variances indicates that relationships among factors are similar across time, and invariance of factor variances indicates the ranges of scores on factors are similar over time. Because these two tests are statistically independent, order of assessment is irrelevant.

Separate estimations of the fit of the data to Elliot and McGregor's 2 x 2 model revealed adequate fit at each time. The chi-square and CFI values for the factor structure at time 1 (start of the course) were 83.63 (df = 48, N = 99) and .95, respectively, as we reported previously. At time 2, the chi-square and CFI values were 69.91 (df = 48, N = 71) and .97, respectively. At time 3, chi-square and CFI values were 84.04 (df = 48, N = 76) and .95, respectively. Finally, at time 4, chi-square and CFI values were 74.26 (df = 48, N = 53) and .95, respectively.

Because our data adequately fit the 2 x 2 model of goal orientation at each time, we proceeded to test for invariance of measurement properties by adding successive constraints on parameters. The fit of the model after adding a constraint was compared to the model at the previous step in terms of differences in chi-square and CFI (Cheung & Rensvold, 2002). A ΔCFI value less than or equal to -.01 indicates that the null hypothesis of invariance should not be rejected (Cheung & Rensvold, 2002). If the fit of the more constrained model is statistically or practically worse than the less constrained model at the prior step, it would be concluded the parameters being constrained differ across time; that is, they are not invariant. In Table 5, we report statistics for these tests of configural invariance, metric invariance, scalar invariance, and measurement error invariance. All four levels of invariance were satisfied across the four points in time.

Table 5.

Tests of Invariance Across Contexts.

Model	χ^2	$\Delta\chi^2$	Δdf	CFI	ΔCFI
Configural Invariance (nothing held invariant)	310.74 (df = 192)	-----	-----	.95	-----
Metric Invariance (coefficients held invariant)	330.61 (df = 216)	19.87	24	.95	.00
Scalar Invariance (coefficients and intercepts held invariant)	359.91 (df = 240)	29.3	24	.95	.00
Measurement Error Invariance I (coefficients, intercepts and factor covariances held invariant)	369.42 (df = 258)	9.51	18	.95	.00
Measurement Error Invariance II (coefficients, intercepts, factor covariances and factor variances held invariant)	388.53 (df = 270)	19.11	12	.95	.00

Reliability

To assess the reliability of each of the four dimensions, Cronbach's co-efficient alpha was calculated within each. With the exception of two of the estimates at the start of the course (for the mastery approach and performance-avoid subscales), reliabilities were all greater than .80, which indicated good internal consistency. Test-retest reliabilities were also computed across the four contexts. Values ranged from .60 to 74 (half of which were greater than .70), which indicates good test-retest reliability. Reliability statistics are presented in Tables 1 and 6 (for test-retest).

Table 6.

Test-Retest Reliability Coefficients for Each Goal Orientation.

	$r_{Time\ 1 \cdot Time\ 2}$	max $r_{Time\ 1 \cdot Time\ 2}$	$r_{Time\ 1 \cdot Time\ 3}$	max $r_{Time\ 1 \cdot Time\ 3}$	$r_{Time\ 1 \cdot Time\ 4}$	max $r_{Time\ 1 \cdot Time\ 4}$
Mastery Approach	.75	.78	.66	.78	.66	.79
Mastery-Avoid	.72	.86	.66	.89	.68	.87
Performance Approach	.77	.93	.74	.92	.74	.93
Performance-Avoid	.67	.75	.73	.76	.60	.77

Note: max $r_{time\ 1 \cdot Time\ n}$ represents the maximum correlation possible between time 1 and each subsequent time, computed by $\sqrt{(\alpha_1 \bullet \alpha_n)}$.

Discussion

This study contributes to the literature on achievement goal theory by providing further evidence of construct and discriminant validity, reliability, and factorial invariance across tasks within a single classroom environment. For construct validity, results from our study demonstrate support for the four-factor model of achievement goals that Elliot and McGregor (2001) proposed. Compared to the four competing models, the 2 x 2 framework resulted in a much better fit than the trichotomous or dichotomous frameworks. The generalizability of the factor structure with our sample is an important addition to the few psychometric studies that have been done with achievement goal instruments in general.

The low to moderate correlations between each of the achievement goals across the various contexts provides evidence of discriminant-ralted validity. Based on our results, we posit that each of the goal orientations represents a distinct construct. Like Elliot and McGregor (2001) and Finney et al. (2004), participants in our study endorsed each of the goal orientations across the various task contexts. Moreover, given that test-retest reliabilities were within an acceptable range, individuals' levels of endorsements did not vary much over the different contexts, nor did their interpretations of the items designed to measure the four dimensions. That is, our results unambiguously show that over time and across various contexts, students' interpretations of the 12 items do not change.

Substantively, results from the tests for factorial invariance indicate that items do not function differentially for any of the sub-scales across tasks. The range of each latent trait scale, which measures individuals' levels of endorsement, is similar over time. Accordingly, full measurement equivalence at the item level is established across tasks and any direct mean comparisons to assess changes in levels of goal endorsement over time can be meaningfully made. Establishing factorial invariance across tasks and time is important given that research in this area is moving toward examining the stability of goal orientations over tasks, time, and as a function of feedback. In these situations, it is pertinent that research is conducted to examine item functioning over time. Our study addressed this gap in the literature.

Limitations and Future Directions

One limitation of our study is sample size. Although data from our sample fit the hypothesized model quite well, future research could use larger sample sizes. However, we note an important value that our study adds is the longitudinal and naturalistic nature of the design: students estimated their achievement goals over time and tasks within one classroom setting. Given that attrition is problematic with longitudinal designs, we recommend researchers begin with larger sample sizes to provide more power to detect slight variations in item interpretations. We also recommend more psychometric work on other instruments designed to measure students' achievement goals like the Patterns of Adaptive Learning Scales (Midgley et al., 2000). Studies are also needed to explore whether slight changes to items that are written for specific tasks, rather than for a specific course, influence item interpretation or construct validity. Psychometrically sound instruments that can be modified slightly without altering theoretical frameworks are needed to further explore the nature of achievement goals and how those goals influence important educational outcomes.

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