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The 2 × 2 achievement goal framework in preadolescents: Factorial and dimensional endorsement in the Greek elementary context

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Abstract

The 2 × 2 achievement goals framework is considered a significant conceptualization for studying motivation in achievement settings. While research has strongly supported the validity of the 2 × 2 framework for adult and adolescent populations, studies with preadolescents produced mixed results, especially regarding the presence of mastery-avoidance goals. The purpose of the present study was to investigate the endorsement of the 2 × 2 achievement goal framework and its underlying assumptions in preadolescents. Participants were 504 preadolescents attending elementary schools in Northern Greece and their 36 teachers. Structural equation modeling including confirmatory factor analysis and the testing of a multiple indicator correlated-trait correlated- method model were used. Results clearly supported the endorsement of the factorial and the dimensional structure of the 2 × 2 goal framework, and measurement invariance of these goals for boys and girls. Implications for research are discussed.

Keywords: 2 × 2 achievement goals, preadolescents, elementary school, mastery-avoidance goals

Introduction

Achievement goals are considered as one of the most important constructs for studying motivation in achievement settings for the past three decades (Senko, Hulleman, & Harackiewicz, 2011; Wirthwein, Sparfeldt, Piquart, Wegerer, & Steinmayr, 2013). A widely adopted, well-established expression of this construct is the 2 × 2 achievement goal framework (Elliot, 1999; Elliot & McGregor, 2001). This framework introduces four types of goals: Mastery-approach, mastery-avoidance, performance-approach and performance-avoidance goals. While findings have strongly supported the validity of the 2 × 2 framework for adult and adolescent populations (e.g., Elliot & Murayama, 2008; Madjar, Kaplan, & Weinstock, 2011; Phan, 2013; Raccanello, Brondino, Pasini, & De Bernardi, 2014), studies with preadolescents produced mixed results, especially with respect to the presence of mastery-avoidance goals (e.g., Bong, 2009; Carr & Marzouq, 2012; Sideridis & Mouratidis, 2008). In addition, researchers have explicitly underscored the necessity to investigate mastery avoidance goals with respect to elementary students (Carr & Marzouq, 2012; Wirthwein et al., 2013). Clarifying the validity of the 2 × 2 framework in adolescents is important considering the relation of these goals with students' cognitive, behavioral and affective outcomes (Liem et al., 2008; Wirthwein et al.,

2013). The purpose of the present study was to investigate the endorsement of the 2 × 2 achievement goal framework and its underlying assumptions in preadolescents through a rigorous set of analyses.

Achievement Goals

Achievement goal theory lies on the general premise that there are merits in conceptualizing students' motivation as the purpose that students adopt when engaging in tasks in achievement situations (Dweck, 1986; Maehr, 1984; Nicholls, 1984). Achievement goals thus, refer to the perceptions that people have regarding the reasons for which they engage in achievement behaviours and reflect the meaning attributed by participants to an achievement situation. In this regard, achievement goals offer a cognitive organizational structure of the way people define success and failure, their emotional reactions and their subsequent behaviours (Ames 1992; Dweck, 1986; Urda, 1997). Historically these goals have been defined by their definition of competence, but later findings have also demonstrated the value of the valence of the outcome (e.g. Elliot, 2005; Senko et al., 2011).

The definition dimension

The definition dimension forms the basis of a mastery–performance distinction, which has been a part of the achievement goal tradition since its inception (Maehr & Nicholls, 1980). Based on this distinction researchers focused on two oppositional groups of achievement goals: Mastery and performance goals. Mastery goals are present when a person engages in an achievement situation aiming at developing competence and include defining success either according to absolute criteria of mastering a task or based on intrapersonal standards of self-improvement. These goals are generally related to skill acquisition and learning (Ames, 1992; Grant & Dweck, 2003; Urdan, 1997).

On the other hand, performance goals are present when a person engages in an achievement situation in order to demonstrate competence and success is defined according to interpersonal standards. Performance goal oriented individuals strive to perform better than others, to succeed at a task by exerting little effort, or to avoid doing less well than others (Covington, 1984; Dweck, 1986; Nicholls, 1990).

The valence dimension

As a response to ambivalent findings concerning the effects of performance goals, researchers argued that the reasons why students would engage in particular academic pursuits could be better understood by simultaneously considering both their goal definition (the criteria they use to judge their own performance) and their goal valence (their general purposes for engaging in a specific behavior). The goal valence distinguishes whether goals are oriented toward attaining success or toward avoiding failure. The introduction of the goal valence led to the partitioning of performance goals into performance-approach and performance-avoidance goals. Performance-approach goals relate to demonstrating high competence, and include goals such as outperforming others, and succeeding with little effort. On the other hand, performance-avoidance goals relate to engaging in order to avoid demonstrating low competence and include goals such as avoid performing worse than others and avoid appearing incompetent (Elliot, 1997; Elliot & Harackiewicz, 1996). Soon after, researchers also applied the valence distinction to the mastery goals, thus separating them into mastery-approach and mastery-avoidance goals (Elliot, 1999; Pintrich, 2000a, 2000b), which led to the 2 × 2 achievement goal framework.¹

¹Additional achievement goal frameworks (e.g., Elliot, Murayama, & Pectrun, 2012) and other approaches to the study of achievement goals, such as the multiple goal perspective (e.g., Harackiewicz, Barron, Pintrich, Elliot, & Thrash, 2002) have been proposed. However, as most previous work has been conducted on the 2 × 2 framework, and the endorsement of this framework in preadolescents is currently debated, more complex conceptualizations of achievement goals were not considered.

Mastery-Avoidance Goals

While mastery-approach goals retained essentially the original meaning of mastery goals, mastery-avoidance goals were associated with engaging in an achievement situation in order to avoid showing task-based or self-referential incompetence (Elliot, 1999; Pintrich, 2000a). The decision to introduce the valence distinction of mastery goals was primarily a theoretical one and was not based on compelling empirical implications like for example, performance goals (Elliot, 1999). As a result, the empirical validity of mastery-avoidance goals has been questioned (Pintrich, 2003; Sideridis & Mouratidis, 2008). However, studies mostly with college student samples have supported the distinct nature of mastery-avoidance goals and their utility in explaining variability in students' motivation and outcomes (Conroy, Elliot, & Hofer, 2003; Elliot & McGregor, 2001; Elliot & Murayama, 2008; Finney, Pieper, & Barron, 2004; Pastor, Barron, Miller, & Davis, 2004; Raccanello et al., 2014; Sideridis, 2008). For example, in a meta-analysis study Huang (2012) indicated the 2 × 2 achievement goal framework was superior to the two- and three-factor models in facilitating the understanding of students' learning outcomes.

Similarly, findings with adolescents are also in support of the empirical validity of this set of goals for this age group (e.g., Bong, 2008; Erdem-Keklik, & Keklik, 2014; King, 2015; Witkow & Fulgini, 2007). In their study Madjar et al. (2011), aimed at specifically tapping the conceptual existence of mastery-avoidance goals among junior high and high school students. The authors used adapted scales from the Patterns of Adaptive Learning Survey (PALS; Midgley et al., 2000) to measure mastery-approach, performance-approach, and performance-avoidance goals, whereas mastery-avoidance goals were measured through an improvised scale designed for the purposes of the study. Their findings indicated that mastery-avoidance goals offer a distinct motivational orientation for these age-groups.

Developmental Perspectives on the Adoption of Achievement Goals

In general, research indicates that younger children's belief systems are less clearly differentiated than those of older children and adolescents. Whereas children are able to distinguish different aspects of their beliefs across different activity domains even before the first grade (Eccles, Wigfield, Harold, & Blumenfeld, 1993), the degree of such differentiation increases with age (Marsh, Craven, & Debus, 1991). Several studies have shown this trend to be applicable for achievement goals as well, i.e. the association between different goals becoming smaller with development (Bong, 2001, 2009; Ross, Shannon, Salisbury-Glennon, & Guarino, 2002). Contextual effects have also been identified with respect to the associations among achievement goals (e.g., Bong, 2009).

A number of antecedents have been identified for achievement goals, such as perceived competence and personal theories of ability (Elliot, 2005; Linnenbrink, 2005; Moller & Elliot, 2006; Van Yperen, 2006). Perceived competence for example, is considered as

the most influential determinant of whether individuals adopt an approach or an avoidance goal valence (Brophy, 2005; Elliot, 2005). For young children however, it is posited that while success is regarded as indicative of their competence, they do not necessarily consider failure to be indicative of their incompetence (Stipek & Mac Iver, 1989).

Self-theories offer also a salient predictor of the goal valence (Dweck, 2000). More specifically, individuals who adopt an entity theory of ability believe that ability is something one either possesses or does not possess and focus more on competence validation than competence acquisition. On the other hand, individuals adopting an incremental theory of ability are more prone to invest effort to improve their ability and focus more on acquiring competence that on having their current competence validated. Thus, an entity theory relates to performance goals, whereas an incremental theory relates to mastery goals.

Young children adopt in their majority incremental theories of ability. For them, failure is generally interpreted as lack of practice (Dweck & Leggett, 1988; Stipek & Mac Iver, 1989). When children enter preadolescence (upper elementary school), they begin to develop differentiated conceptions of ability and more elaborate evaluations of competence (Nicholls, 1984; Stipek & Mac Iver, 1989; Ruble, Boggiano, Feldman, & Loebel, 1980). For example, in this developmental stage children perceive greater ability when an individual performs equally in an achievement situation with less effort. In addition, preadolescents begin to consider the performance of other people when appraising their competence. Thus, preadolescents are expected to consider both previous failures and normative comparison when assessing their competence and in this respect goal definition and goal valence would be of equal importance for this age-group. It is therefore anticipated that the 2 × 2 goal framework and its underlying definition and valence dimensions would be supported in preadolescent samples.

With respect to mastery-avoidance goals, students at this developmental stage would be expected to be aware of whether they engage in an achievement situation in order to avoid showing task-based or self-referential incompetence. This means that, students would be able to state if they are striving to avoid learning less than what they are capable of (self-referential criterion) or whether they are aiming to avoid incomplete understanding of the material (task-based criterion) (Elliot, 1999; Pintrich, 2000a).

The 2 × 2 achievement Goals in Preadolescents

Despite the theoretical support, previous efforts to examine the construct validity of the 2 × 2 achievement goal framework yielded mixed results (e.g., Bong, 2009; Carr & Marzouq, 2012; Chatzistamatiou, Dermitzaki, Efklides, & Leondari, 2015; Sideridis & Mouratidis, 2008). In a study with 1.196 Korean elementary and high school students, Bong (2009) examined the applicability of the 2 × 2 achievement goal framework in school age children along with the relational tendencies of these goals with cognitive-motivational variables. The author measured mastery-approach, performance-

approach and performance-avoidance goals with the PALS (Midgley et al., 2000), and developed an adapted scale for mastery-avoidance goals. Confirmatory factor analysis was employed to compare competing factorial structures of achievement goals with results indicating that the 2 × 2 framework produced the better-fitting solution for all age-groups in the study, with however marginal values for fit indices, especially for younger groups. In addition, for the elementary students in the study, it seemed that models with fewer goals were also plausible solutions and what's more, the correlations among the four achievement goals in the 2 × 2 framework were much higher for elementary students compared to middle school students.

In another study with Greek elementary and high school students, Sideridis and Mouratidis (2008), first used a four-item measure (one item for each achievement goal) to inquire students most salient goal in physical education. Subsequently, they used an open-ended question with an independent sample of students examining all possible goals students tried to achieve in their physical education class. The findings showed that students did not report mastery-avoidance goals and the authors questioned the existence of such goals for this age group. Similarly, Chatzistamatiou et al. (2015) used open-ended questions to investigate elementary students' priorities in learning mathematics. Content analysis results led researchers to support the presence of only mastery-approach and performance-approach goals; however the results of a questionnaire developed based on their findings showed limited psychometric properties.

In the Netherlands, Jansen (2010; as cited in Thijs & Fleischmann, 2015) adapted the Achievement Goal Questionnaire – Revised (AGQ-R; Elliot & Murayama, 2008) in Dutch for use with elementary students. While the four factor structure was supported, mastery-avoidance goals had unacceptable reliability and were considered inappropriate for this age group. On the other hand, Cury, Elliot, Da Fonseca and Moller (2006) administered the Achievement Goal Questionnaire (AGQ; Elliot & McGregor, 2001) to a group of preadolescents in France. Results supported the factorial structure of 2 × 2 framework and the Cronbach's alpha values reported for the four goals ranged from .67 to .87.

One of the few studies that employed sophisticated modelling techniques to tap the 2 × 2 achievement goal framework in preadolescents is that of Chiang, Yeh, Lin and Hwang (2011). The authors applied the multiple indicator correlated trait-correlated method model (Lance, Noble, & Scullen, 2002) to examine the dimensional (second-order factorial) structure of the AGQ in a sample of 3.317 Taiwanese students aged 10 to 16, attending fifth, seventh and ninth grades. However, data from all ages was analysed together based on evidence supporting the invariance of the examined models across the three grade-groups, although the exact type of invariance (e.g. metric, scalar) examined and actual statistical results were not reported. The findings yielded significant problems concerning the second-order structure of the achievement goals, in that each pair of goals had non-equivalent contributions to the correspondent definition /

valence dimension (e.g., performance-approach was considerably more associated to the approach dimension than the mastery-approach). The authors attributed these issues to the cultural context of the study.

Purpose of the study

The purpose of the present study was to investigate the endorsement of the 2 × 2 achievement goals framework and its underlying assumptions in preadolescents through a rigorous set of analyses. The study adds to contemporary achievement goal research in a number of ways: This is one of the first studies (a) to thoroughly examine the factorial (first-order), as well as the dimensional (second-order) factor structure of the 2 × 2 achievement goal framework in preadolescents, (b) to examine the equality of measurement of the four achievement goals for both genders and (c) to validate a translated version of the AGQ-R (Elliot & Murayama, 2008) for use with Greek preadolescents. Considering evidence from the developmental literature (Nicholls, 1984; Stipek & Mac Iver, 1989) in conjunction with theoretical postulations (Elliot, 1999; Pintrich, 2000a) and empirical studies (Bong, 2009; Cury et al., 2006) it is expected that preadolescents would be able to endorse the 2 × 2 achievement goal framework and its underlying assumptions.

Methods

Participants

Participants were selected based on a clustered stratified random sampling procedure. Eighteen schools from the district of Eastern Macedonia – Thrace in Greece, were originally selected based on equal representation of the districts' five prefectures and type of school (urban/rural). Permission was obtained from the Greek ministry of Education, Lifelong learning and Religious Affairs. Two of the schools did not participate due to their unavailability during the data gathering period. Out of the 16 participating schools all 5th and 6th grade classes were asked to participate, including both students. The final sample comprised of 504 students from 39 classrooms.

For the students, 244 (48.4%) were boys and 247 were girls (49%), while 13 students did not provide information regarding their gender. With respect to grade level, 250 students (49.6%) were attending 5th and 254 (50.4%) were attending 6th grade. Finally, students' age ranged from 10 to 13 years, ($M = 11.19$, $SD = .71$).

The Greek elementary school

The Greek educational system is highly centralized: All major policy decisions taken at the ministerial level and teaching principles and practices are common for all schools in the country (Dimopoulos, Dalkavouki, & Koulaidis, 2015; Koutsampelas, & Tsakloglou, 2015). The system is also characterized by a lack of an assessment culture, as until recently limited tools for assessing the system's effectiveness existed

(Dimopoulos et al., 2015; OECD, 2011). The Greek public education is organized into four levels: Pre-school, elementary (also named primary), secondary (lower and upper) and tertiary. Elementary education is compulsory and lasts six years (children aged between six and 12 years) and compulsory subjects are Greek, mathematics, history, religion, environmental studies, geography, arts, foreign languages, music and physical education. The same teacher usually teaches mathematics and language to each class, as well as other courses.

Instruments

Achievement goals. A translated version² of the Revised Achievement Goals Questionnaire was used (AGQ-R; Elliot & Murayama, 2008). The AGQ-R measures the four types of achievement goals present in the 2 × 2 framework, i.e., mastery-approach ("My aim is to completely master the material presented in class."), mastery-avoidance ("My aim is to avoid learning less than I possibly could."), performance-approach ("I am striving to do well compared to other students.") and performance-avoidance goals ("My aim is to avoid doing worse than other students"). The AGQ-R comprises 12 items, three for each goal, and answers are given on a numbered Likert scale ranging from 1 (Strongly agree) to 7 (Strongly disagree).

The AGQ-R represents a significant improvement in the measurement of achievement goals in that its development is based on significant problems identified in the AGQ and other achievement goals measuring instruments, such as not measuring goals per se, collapsing together the goal and motivation underlying the goal, pitting one goal against the other etc. (Elliot & Murayama, 2008). This improvement is evidenced in the applications of the successful application of the revised instrument in different cultural contexts and for different developmental groups (e.g., King, 2015; Phan & Alrashidi, 2014; Sánchez, 2015)

A general achievement goal was preferred over specific achievement goals for language and mathematics classes (e.g., Bong, 2001; 2004; L. H. Anderman, 2004; Vogler & Bakken, 2007). The G-AGQ-R is available upon request by the author of the study.

Procedure

All necessary permissions were obtained by the Greek Ministry of Education. Schools were contacted beforehand; informed consent was received from all participants and the students' parents. Questionnaire batteries were administered to the students during school hours. Questionnaires were completed in Greek following back-translation procedures (Brislin, 1970) and were completely anonymous. Questionnaires were

²The translation was based on a back-translation procedure (Brislin, 1970) with the participation of the author, two English teachers and a professor of Educational Psychology. No other adjustments were made to the instrument.

matched with the use of a code number based on school records not accessible to the research team.

Analysis Plan Overview

The main statistical technique used was maximum likelihood structural equation modelling (SEM), applied with AMOS (Arbuckle, 2006). Several indices were examined to assess model fit including the chi-squared (χ^2) goodness of fit statistic, the chi-squared to degrees of freedom ratio (χ^2/df), the Comparative Fit Index (CFI) and the Root Mean Squared Error of Approximation (RMSEA) (Browne & Cudeck, 1989; Byrne, 2009; Hu & Bentler, 1999; Marsh, Hau, & Wen, 2004; Smith & McMillan, 2001). Adequate fit is indicated by non-significance for the χ^2 and by values lower than 3 or 2 for the χ^2/df . For the CFI values over .90 indicate adequate and over .95 indicate excellent fit. Finally, for

the RMSEA values less than .08 indicate adequate fit and less than .05 excellent fit.

First, the factorial structure of the G-AGQ-R was examined. The 2 × 2 achievement goals model was examined against seven competing ones similar to the procedure followed in previous studies (e.g., Bong, 2009; Elliot & McGregor, 2001). Moreover, the measurement invariance regarding gender was examined for the 2 × 2 model. Next, the dimensional structure of the achievement goals model was investigated by testing the hypothetical underlying valence and definition dimensions as second-order factors. A multiple indicator correlated trait-correlated method model was considered (see Figure 1), which was examined against two conventional second-order factor models.

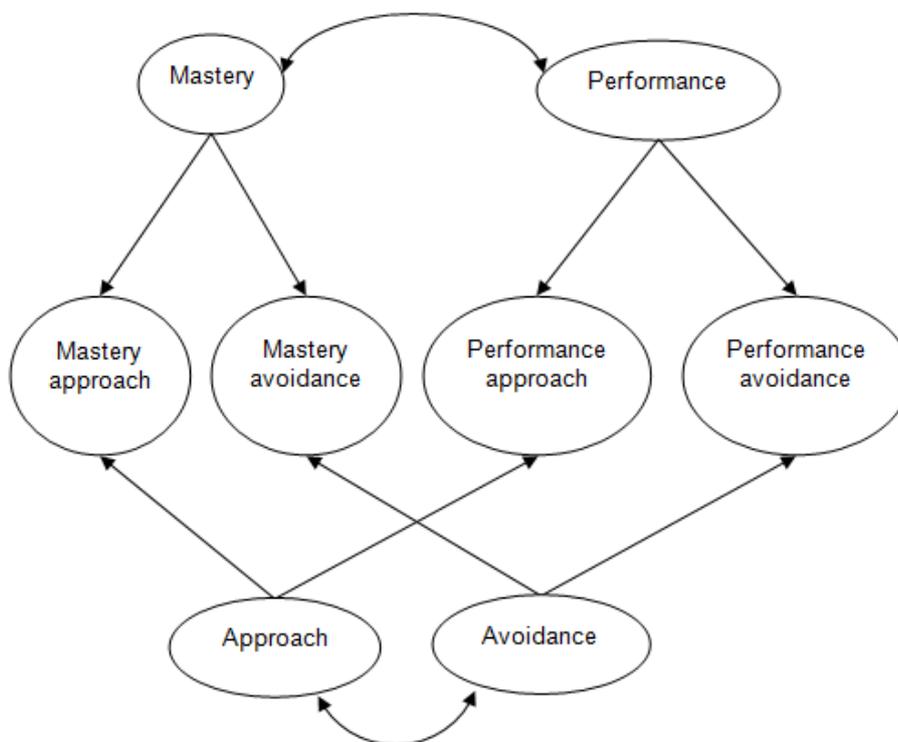


Figure 1. The hypothetical model of the 2 × 2 achievement goals with valence and definition dimensions as second-order factors (multiple indicator trait-correlated method model)

Results

Descriptive statistic

The descriptive statistics in total and by gender, along with Cronbach's alpha for the variables of the study are reported in Table 1. The reported alpha values were similar to that of studies successfully measuring achievement goals in preadolescents (Bong, et al. 2009; Cury et al., 2006). Gender effects were examined

through a multivariate SEM model which is presented later in the text.

As can be seen reliability was at the acceptable range for Mastery-approach, Performance-approach and Performance-avoidance, whereas for Mastery-avoidance internal consistency was merely adequate. The greatest gender differences were present for Mastery-approach and the least for Mastery-avoidance.

Table 1: Descriptive Statistics regarding the Four Achievement Goals for Girls, Boys and for the Total Sample, along with Internal Consistency

Scale	Range	Boys		Girls		Total		α
		<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	
Mastery-approach	1.33 – 7	6.15	1.06	6.44	.88	6.30	.97	.74
Mastery-avoidance	1 – 7	4.00	1.78	4.03	2.02	4.03	1.91	.63
Performance-approach	1 – 7	5.55	1.40	5.76	1.43	5.66	1.41	.79
Performance-avoidance	1 – 7	4.77	1.81	4.95	1.90	4.87	1.83	.72

Note. α = Cronbach's alpha.

The factorial structure of achievement goals

A total of eight models were comparatively examined (e.g., Bong, 2009; Elliot & McGregor, 2001): A unidimensional model with a single achievement goal factor, several models in which achievement goals of the

same definition, the same valence or both, were merged and a model with the four achievement goals as distinct factors. Items were set to load on their respective latent factors and latent factors were freely correlated. Results are presented in Table 2.

Table 2: Goodness-of-Fit Indices for the Eight First-Order Factor Models

Model	χ^2	<i>df</i>	<i>p</i>	χ^2/df	CFI	RMSEA
Goal uni-dimensionality	737.54	54	<.001	13.66	.47	.159
Goal dichotomy						
DA: Mastery (approach-avoidance), Performance (approach-avoidance).	550.22	53	<.001	10.38	.61	.137
DB: Approach (mastery-performance), Avoidance (mastery-performance)	393.67	53	<.001	7.43	.74	.113
Goal trichotomy						
TA: Mastery (approach-avoidance), performance-approach, performance-avoidance.	456.38	51	<.001	8.95	.67	.107
TB: Performance (approach-avoidance), Mastery-approach, Mastery-avoidance.	397.23	51	<.001	7.79	.73	.116
TC: Approach (mastery-performance), Avoidance-mastery, Avoidance-performance.	301.43	51	<.001	5.91	.81	.099
TD: Avoidance (mastery-performance), Approach-mastery, Approach-performance.	192.17	51	<.001	3.77	.89	.074
2 × 2 framework						
A: Mastery-approach, Mastery-avoidance, Performance-approach, Performance-avoidance.	96.79	48	<.001	2.01	.96	.045

As can be seen the 2 × 2 framework presented an excellent fit to the data. Factor loadings were in the expected direction, had high magnitude ($\gamma \geq .53$), and they were also associated with reasonable standard errors ($SE \leq .12$). On the other hand, none of the competing models was in position to provide an adequate explanation for the data. Thus, the 2 × 2 framework presented clearly the best solution to the present data.

Gender-related measurement invariance

The equivalence of the measurement properties of the 2 × 2 for boys and girls was examined next. Three models were sequentially examined: (a) a model with identical factorial structures for the two groups without any

equality constraints (configural invariance model), (b) a model with additional equivalence constraints regarding the factor loadings (metric invariance model) and (c) a model with additional equivalence constraints regarding the intercepts associated with each manifest variable (scalar invariance model).

Results are presented in Table 3. As can be seen the results seem to support the appropriateness of all constrained models leading to the acceptance of the scalar invariance (strong invariance) model based on both the conservative $\Delta\chi^2$ test, as well as on more widely accepted recommendations on the CFI and RMSEA difference (e.g., Chen, 2007; Cheung & Rensvold, 2002). Thus, the model measures achievement goals equivalently for boys as well as for girls.

Table 3: Fit and Statistical Comparison Indices for the Measurement Invariance Models

Model	χ^2	df	p	χ^2/df	CFI	RMSEA	Model comparison				
							$\Delta\chi^2$	Δdf	p	ΔCFI	$\Delta RMSEA$
(a)	151.60	96	<.001	1.58	.958	.034					
(b)	160.08	104	<.001	1.53	.957	.033	8.48	12	>.05	.001	.001
(c)	174.54	116	<.001	1.51	.956	.032	14.46	12	>.05	.001	.001

The dimensional structure of achievement goals

While previous analyses showed that the four-factor model is highly robust and has equivalent measurement properties for both genders for the present data, these analyses do not address the underlying dimensional structure of the 2 × 2 goal framework. This structure was examined with the application of a multiple-indicator correlated trait-correlated method (MI CT-CM) model.

An MI CT-CM model is typically applied to the multi-trait multi-method (MTMM) matrix (Cambell & Fiske, 1959). Although the present data are not in MTMM format, the MI CT-CM model provides a way to confirm the hypothesized dimensional structure (e.g. Elliot & Murayama, 2008). In this model the valence and the definition dimensions, act as second-order factors and are expected to have additive effects on the first-order achievement goal factors. The valence dimension for example consists of an approach factor and an avoidance factor, of which only one is applicable to any given first-order achievement goal factors. For example, performance-avoidance factor is expected to be explained by both the performance factor and the avoidance factor. Factors within each dimension are allowed to be correlated; however this does not apply for factors across dimensions (e.g. the mastery factor and the approach factor). In this way the valence and the definition dimension contribute independently to each achievement goal factor, which allows for each factor to be decomposed into valence, definition and unique residual components.

The model was subjected to maximum likelihood SEM. To achieve model identification some constraints were imposed to the model. First, the paths from each second-order factor were set to be equal. In addition, based on the critical ratio for differences, equality constraints were imposed to the paths of the mastery and the approach factors³. Results indicated acceptable fit for the model: χ^2 (49, N = 504) = 105.81, p < .001, χ^2/df = 2.16, CFI = .96, RMSEA = .048. The model along with standardized parameters is presented in Figure 2.

³In their study, Elliot and Murayama (2008) achieved model identification, for the same model, by setting the covariance between mastery and performance factors to 0. For the current model this constrains produced inflated parameters, an indication that this specification was not appropriate. This difference is not totally unexpected given the differing sample composition in the two studies.

As can be seen the approach and avoidance factors were not significantly associated, whereas mastery and performance factors had a strong positive association.

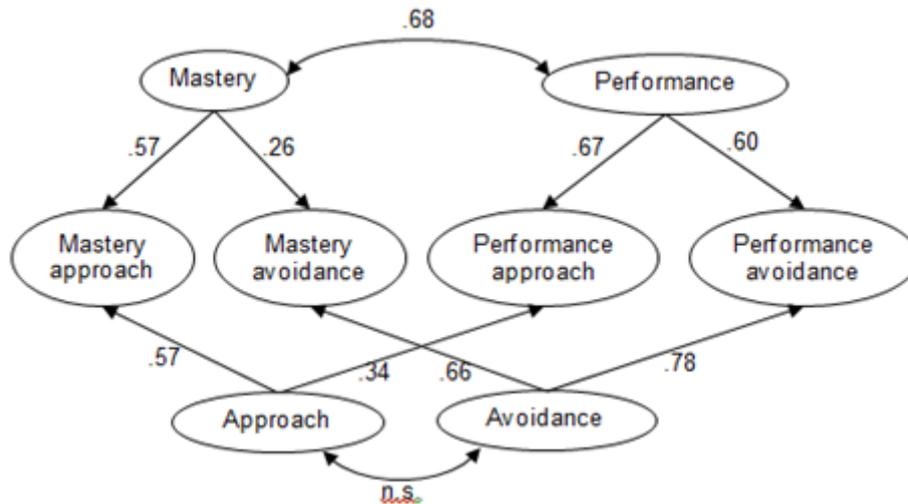


Figure 2: The full dimensional structure of the MI CT-CM model for the 2 × 2 achievement goal framework. Estimates are standardized and significant ($p < .05$)

Two additional competitive models were examined. Both were two-level factor models with the four achievement goals serving as first-order factors, while for the first model the definition dimensions (mastery and approach), and for the second the valence dimensions (approach and avoidance) served as the second order factors. The definition (first) model, $\chi^2(51, N = 504) = 183.04, p < .001, \chi^2/df = 3.59, CFI = .90, RMSEA = .072$, and the valence (second) model, $\chi^2(51, N = 504) = 129.58, p < .001, \chi^2/df = 2.53, CFI = .94, RMSEA = .055$, seemed to present a marginally acceptable explanation to the data. The statistical comparison of the three models however, clearly favoured the MI CT-CM model over both the definition: $\Delta\chi^2_{(2)} = 77.23, p < .05$, and the valence models, $\Delta\chi^2_{(2)} = 23.77, p < .05$. It thus becomes evident that for the present sample achievement goals are comprised of two independent dimensions and that focusing explicitly on one of these dimensions would result in an imprecise depiction of the underlying structure of the 2 × 2 achievement goal framework.

Discussion

The purpose of the present study was to clarify previous findings regarding the endorsement of the 2 × 2 achievement goals framework and its underlying assumptions in preadolescents through a rigorous set of analyses. In addition, the study examined a theoretical model linking achievement goals with the expectancy-value theory of motivation and students' learning outcomes.

Adoption of the 2 × 2 Goal Framework

The results of the study showed that Greek preadolescents clearly endorsed the four achievement goals present in the 2 × 2 framework. In comparison with seven antagonist models the four goal model was the only model in position to show a good fit to the data. Results are in accordance with previous studies that showed that the 2 × 2 goals model produced an adequate fitting solution for preadolescents (Bong, 2009; Cury et al., 2006). However, it should be noted that

other antagonist models were found also to be plausible explanations, when such models were examined in previous studies (Bong, 2009).

The measurement invariance analyses indicated that the 2 × 2 framework model had equivalent measurement properties for both boys and girls. This means that the latent means of achievement goals for boys and girls were immediately comparable. However, for further uses of the G-AGQ-R measurement invariance should be not taken for granted, since measurement invariance is a property of the specific measurement and not of the instrument. Previous studies have supported the existence of such equivalence in adult and adolescent samples (Finney & Davis, 2003; Wang, Biddle, & Elliot, 2007).

The dimensional structure of the 2 × 2 framework was investigated through a MI CT-CM model and with additional comparisons of that model with competing second-order factor models. Results clearly supported the existence of the two valence and the two definition dimensions, which were associated with their respective goals. The results are consistent with developmental theoretical perspectives (Nicholls, 1984; Ruble et al., 1980; Stipek & Mac Iver, 1989) that support the ability of preadolescents to differentiate among the 2 × 2 achievement goals and that posit that both the valence and the definition dimensions would be equally important for preadolescents. The findings of the study delineate previous relative research. While past studies have found that preadolescents adopted and showed clear understanding of all four achievement goals (Carr & Marzouq, 2012), certain studies that based their designs on open-ended questions (Chatzistamatiou et al., 2015; Sideridis & Mouratidis, 2008), rejected the adoption of mastery-avoidance goals by preadolescents. Given that the latter two studies were conducted in the same educational and cultural context as the present study, it is difficult to attribute the differing empirical evidence compared to the present study, to contextual factors. Also, considering that the findings of the study of Chatzistamatiou et al., (2012) led to the development of an instrument with limited psychometric properties, it seems possible that open-ended questions are not an

appropriate means of tapping achievement goals, at least in preadolescents. Preadolescents might be in a position to recognize an achievement goal but being less prone to recall or able to express it, especially in the case of mastery-avoidance goals which entails double negation in its definition.

Limitations

When considering the findings of the present study certain limitations should be kept in mind. First, the measurement of achievement goals was based exclusively on a self-report measure. While supplemental methodologies, such as student interviews, would provide a more complete picture regarding the adoption of achievement goals, the study utilized sophisticated statistical techniques to examine not only the four achievement goals, but their underlying structure as well. In addition, other studies that used research interviews showed that preadolescent students were in position to understand all four achievement goals in the 2 × 2 framework (Karr & Marzouq, 2012). Secondly, the study was based on students attending Greek elementary schools. Additional studies adopting similar methodology will be required to examine whether preadolescents in different cultural/educational contexts show a similar endorsement regarding the 2 × 2 achievement goal framework and its underlying assumptions. Previous studies for example have indicated differential prevalence and endorsement among American and Korean adolescents (e.g., Liem et al., 2008; Middleton & Midgley, 1997; Seo & Taherbai, 2009).

It is also acknowledged that the data in the present study is nested within classes, which are nested within schools. We chose SEM over multilevel techniques not only because of the benefits associated with SEM (e.g., Byrne, 2012; Raykov & Marcoulides, 2012) and its extensive use in prior achievement goal research (e.g., Bong, 2008; Elliot & Murayama, 2008; Liem et al., 2009), but also because in our dataset the variance for the four achievement goals at the school level was close to zero and the variance at the classroom level was small (intra-class correlation ranged from 3.16% to 5.31%). Given that the average classroom size was 12.92, the design effect had a maximum value of 1.74, which is significantly lower than the commonly suggested cut-off point of 2.00 (Muthén & Satorra, 1995; Peugh, 2010). Moreover, the research design of the present study supports additional stricter assumptions for the use of single-level techniques (Lai & Kwok, 2015). In addition, previous studies examining complex achievement goals models reported similar results in SEM and multilevel techniques (e.g., Patrick, Ryan, & Kaplan, 2007).

Final Conclusions

Despite potential limitations the present study has made some significant contributions. This is probably one of the first studies to provide empirical support for the factorial and the dimensional structure of the 2 × 2 in preadolescents (Chatzistamatiou et al., 2015; Sideridis & Mouratidis, 2008) and to indicate that these goals are

measured in an equivalent manner for boys and girls (e.g. Finney & Davis, 2003; Wang, Biddle, & Elliot, 2007). Future studies are expected to extend this line of research by examining the generalizability of the factorial and dimensional endorsement of the 2 × 2 achievement goal framework by preadolescents in different cultural contexts. In addition, future studies will be required to investigate the developmental trajectories and longitudinal associations of the 2 × 2 achievement goals for preadolescents (e.g., Meece & Miller, 2001; Reeve, & Lee, 2014) and potential individual and contextual determinants and effects for these goals (e.g., Michou, Mouratidis, Lens, & Vasteenkiste, 2013; Patrick et al., 2007). Moreover, in investigating potential effects of achievement goals, future studies are advised to include achievement-preceding variables as (endogenous) dependent variables, such as cognitive strategy use, self-regulation, etc. (Curry et al., 2006; Liem et al., 2008; Seo & Taherbai, 2009), in order to clarify the magnitude and the pathways through which achievement goals influence students' learning outcomes.

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