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Achievement Goals and Exercise Motivation among Chinese Adolescents: The Mediating Roles of Basic Psychological Needs and Achievement Positive Emotions

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Abstract

Having achievement goals does not necessarily mean that adolescents exercise out of personal interest or because they value the activity. This study examined whether basic psychological needs and achievement positive emotions separately and sequentially mediated the associations between achievement goals and autonomous motivation, controlled motivation, and amotivation among Chinese adolescents. A total of 350 students were recruited from four public secondary schools in a city in eastern China to complete questionnaires assessing achievement goals, basic psychological needs, achievement positive emotions, and exercise motivation. After screening, data from 325 students aged 13–18 years were retained for analysis. Structural equation modeling and bootstrap analyses were used to examine the proposed relationships in this cross-sectional sample. Achievement goals were positively associated with autonomous motivation and negatively associated with controlled motivation and amotivation. Both basic psychological needs and achievement positive emotions accounted for significant indirect associations between achievement goals and each motivational outcome, while the direct associations remained significant. Basic psychological needs were also positively associated with achievement positive emotions. The estimated sequential indirect associations through basic psychological needs followed by achievement positive emotions were positive for autonomous motivation and negative for controlled motivation and amotivation. These findings suggest that efforts to support adolescents' exercise motivation should consider the goals they pursue together with their experiences of autonomy, competence, relatedness, enjoyment, hope, and pride.

Introduction

Concerns about physical fitness and obesity have drawn attention to adolescents' exercise habits. Earlier research on Chinese students described declines or fluctuations in physical fitness(Li et al., 2019), while regular exercise has been identified as important for preventing obesity and supporting health (Ao et al., 2019; Calcaterra et al., 2022; Wacks & Weinstein, 2021). Encouraging sustained participation therefore requires attention to exercise motivation. Adolescents may participate in physical education without developing sufficient motivation to maintain exercise outside class, making the stimulation and maintenance of motivation an important concern for physical educators (Neil-Sztramko et al., 2021; Teixeira et al., 2012). The problem is not simply whether students have opportunities to exercise, but also what encourages them to participate willingly and continue doing so. This study examines achievement goals, basic psychological needs, and achievement positive emotions in relation to different forms of exercise motivation among Chinese adolescents.

Self-determination theory (SDT) provides a framework for distinguishing autonomous motivation (AUTM), controlled motivation (CONM), and amotivation (AMO) (Ryan & Deci, 2022). Organismic Integration Theory (OIT), a sub-theory of SDT, addresses how extrinsic motivation becomes internalized and differentiates forms of behavioral regulation(Ryan & Deci, 2020, 2022). Through internalization, socially endorsed rules and values become personally endorsed (Mansell, 2020; Ryan & Connell, 1989). This process is relevant to understanding why an activity initially undertaken in response to demands

may acquire personal value. In the present study, AUTM comprises intrinsic motivation and identified regulation. Intrinsic motivation involves exercising for enjoyment, whereas identified regulation involves recognizing the personal value of exercise, even when the activity itself is not enjoyable (Hattie et al., 2020; van Sluijs et al., 2021). CONM comprises external regulation, involving rewards, punishment, or others' demands, and introjected regulation, involving internal pressure such as guilt. AMO refers to an absence of intention to act, which may accompany a lack of perceived value or competence (Ryan & Deci, 2022). These distinctions concern different reasons for participation rather than simply whether adolescents report being motivated.

The distinction between these forms of motivation is relevant to understanding exercise participation. Different regulations have been linked to effort and commitment in exercise (Cid et al., 2019; Elliot & Harackiewicz, 1996; Wilson et al., 2004). (Soos et al., 2019) reported a positive relationship between AUTM in physical education and leisure-time physical activity. Rodrigues et al. (2020) likewise linked autonomous motivation positively with enjoyment, intention to continue exercising, and persistence, whereas controlled motivation was negatively associated with these outcomes. The absence of intention represented by AMO also differs from exercising under pressure(Barszcz et al., 2023). The present study therefore examines autonomous motivation, controlled motivation, and amotivation as distinct outcomes, focusing on their associations with achievement goals, basic psychological needs, and achievement positive emotions rather than actual exercise behavior.

Achievement goals and exercise motivation

Within Achievement Goal Theory (AGT), achievement goals (AG) concern the purposes individuals pursue in competence-related activities (Elliot & Dweck, 2013). The 3×2 framework distinguishes task-based, self-based, and other-based standards of competence, each combined with an approach or avoidance focus (Elliot et al., 2011). Task goals concern meeting activity requirements, self-goals concern performance relative to one's previous achievements, and other goals concern performance relative to others. This produces six dimensions: task-approach, task-avoidance, self-approach, self-avoidance, other-approach, and other-avoidance. An important distinction from earlier mastery formulations is that completing a task successfully and improving on previous performance need not represent the same goal (Elliot et al., 2011; Ingrell et al., 2020). In exercise, an adolescent may aim to perform an activity correctly, improve a previous performance, or avoid doing worse than others. The framework has been extended to sport (Mascret et al., 2015) and provides the basis for the achievement goal measure used here.

Research connecting achievement goals with motivation has not produced an identical pattern across goal frameworks and settings. Barkoukis et al. (2007) reported positive associations between mastery goals and self-determined motivation among adult sport-center participants, but negative associations for performance goals. In physical activity among American university students, Lee et al. (2022) reported positive relationships of task-, self-, and other-oriented goal climates with autonomous motivation. Grajcevci and Shala (2021) also found positive relationships between mastery and

performance goal orientations and intrinsic motivation among university students. These findings establish a connection between achievement goals and motivation, although the reported patterns differ across the goals and settings examined. They motivate further examination in adolescent exercise, including the psychological needs and emotions associated with goal pursuit. The question addressed here is whether these variables help account for the associations between AG and the three motivational outcomes.

The mediating role of basic psychological needs

Basic Psychological Needs Theory (BPNT), within SDT, identifies three basic psychological needs (BPN): autonomy, competence, and relatedness. These needs are fundamental to motivation and psychological development (Ryan & Deci, 2017). Autonomy concerns self-direction and volition, competence concerns capability and mastery, and relatedness concerns belonging and supportive connections with others (Ryan & Deci, 2022). In exercise, these needs relate to having choices about participation, feeling capable of meeting activity demands, and experiencing support from exercise companions. Their fulfillment is relevant to both intrinsic motivation and the internalization of behavioral regulation, through which activities become personally valued (Ryan & Deci, 2020). Research with adult exercisers has linked BPN positively with intrinsic motivation and negatively with AMO (Markland & Tobin, 2010). Autonomy and relatedness have also been negatively associated with CONM in exercise (Valero-Valenzuela et al., 2021). These findings support examining BPN in relation to willingness, pressure, and lack of intention as distinct aspects of exercise motivation.

The proposed mediating role of BPN draws on the Contextual Motivation Model developed by Standage et al. (2003). This framework connects motivational climates in physical education with psychological needs and self-determined motivation. Autonomy-supportive and mastery-oriented environments were associated with greater fulfillment of autonomy, competence, and relatedness, which in turn was linked to self-determined motivation and willingness to participate outside school. Subsequent studies have similarly related task-oriented climates to BPN and motivational outcomes in physical education and sport (Cid et al., 2019; Claver et al., 2020; Monteiro et al., 2018). Task-focused conditions have been linked particularly to the fulfillment of competence needs (Cid et al., 2019; Di Battista et al., 2019). These studies inform the proposed pathway from AG through BPN to exercise motivation.

Applying this pathway to adolescents' exercise goals requires considering how goal pursuit relates to their experiences of autonomy, competence, and relatedness. The emphasis on task completion and personal improvement described in AG research is relevant to experiences of mastery, while the exercise context may support or restrict choices and relationships (D’astous et al., 2020; Hidayat et al., 2018; Kazak et al., 2021). BPN therefore offer a possible intermediate link between goals and motivation, not merely an additional predictor of the same outcomes. Previous work has examined BPN as a mediator in achievement-related motivation (Claver et al., 2020; García-González et al., 2019; Méndez-Giménez et al., 2012). Building on this approach, the present study examines the indirect associations of AG with AUTM, CONM, and AMO through BPN within the same exercise setting.

The mediating role of achievement positive emotions

Achievement positive emotions (APE) provide a second possible pathway. Achievement emotions concern achievement activities and their outcomes, including experiences of success and failure (Pekrun et al., 2006). Drawing on Achievement Emotion Theory (AET), the present study focuses on enjoyment, hope, and pride. These are positive, activating emotions, but they refer to different aspects of achievement experience (Pekrun, 2017; Pekrun et al., 2023). Enjoyment concerns pleasure in the activity itself; hope concerns the prospect of attaining a goal; pride follows accomplishments attributed to one's ability or effort. Their inclusion allows the study to consider positive experiences associated with participation, anticipated success, and accomplishments, rather than pleasure alone. The focus is on these three emotions, not on the full range of positive and negative emotions that adolescents may experience during exercise.

Achievement goals have been linked to emotional experiences in academic and physical activity settings. Pekrun et al. (2009) connected AG with emotions including enjoyment, hope, and pride, offering a framework for considering emotions in achievement-related processes. Academic studies have associated mastery goals with more enjoyment and fewer negative emotions (Alhadabi & Karpinski, 2020; Rinas et al., 2020). In sport, Ruiz et al. (2017)related task orientation to enjoyment among athletes. Dewar and Kavussanu (2011) similarly linked task orientation with happiness and excitement. This offers related evidence about positive emotional experiences, although those emotions are not identical to the three examined here. The relationships are not necessarily uniform across goals: the research discussed by Lüftenegger et al. (2016) described more complex associations involving self-goals and emotions. These findings inform the proposed links of APE with AG and the three motivational outcomes in adolescent exercise.

Evidence concerning emotions and motivation also gives a reason to examine APE as a mediator. Huhtiniemi et al. (2019) reported a positive association between autonomous motivation and enjoyment in physical education. Mack et al. (2015) found that fitness-related pride was associated with moderate-to-vigorous physical activity through intrinsic motivation and identified regulation among young adults. In contrast, Rodrigues et al. (2020) positioned motivation as a predictor of enjoyment, linking AUTM positively and CONM negatively to that outcome. Thus, these studies provide evidence of related emotional and motivational experiences, but do not all test emotion as an antecedent of motivation. Their findings also provide less direct information about hope and pride in relation to CONM and AMO. The present study therefore examines APE as a potential mediator of the associations between AG and each motivational outcome.

BPN and APE within the same model

The two proposed mediators may also be related to one another. Huhtiniemi et al. (2019) found that fulfillment of BPN was positively associated with enjoyment among fifth- and eighth-grade students in physical education. Among Chinese university students learning English, Feng et al. (2023)linked BPN

fulfillment with more positive emotions and fewer negative emotions. Yang et al. (2024) examined BPN as a mediator between teacher support and achievement emotions among Chinese college students, while Keller et al. (2024) reported links between BPN and positive emotions among teachers. These findings connect experiences of autonomy, competence, and relatedness with emotional responses. The constructs nevertheless refer to different experiences: BPN concern autonomy, competence, and relatedness, whereas APE concern enjoyment, hope, and pride associated with achievement (Pekrun et al., 2017; Ryan & Deci, 2022). These findings suggest that considering BPN and APE only as separate pathways would omit a theoretically relevant relationship between them. The present model therefore includes the association from BPN to APE alongside their respective associations with motivation.

Related work provides an example of considering these variables in sequence. Song et al. (2021)examined BPN and positive emotions as sequential mediators between trait mindfulness and job satisfaction among Chinese preschool teachers. That study involved a different population, predictor, and outcome, so its findings are not direct evidence for the exercise model proposed here. The present ordering draws on the need-related pathway in the Contextual Motivation Model (Standage et al., 2003), the goal–emotion framework of Pekrun et al. (2009), and the evidence linking BPN with emotional experiences. AG is positioned as an antecedent of BPN; fulfillment of these needs is expected to be associated with APE, which may in turn relate to exercise motivation. This sequential pathway is considered alongside the indirect pathways through each mediator separately and the direct association between AG and exercise motivation. Figure 1 presents the theoretical framework of the study, showing these proposed relationships and their theoretical foundations.

The present study

The unresolved issue is how these relationships operate together in Chinese adolescents' exercise motivation. Chinese studies discussed in the preceding literature have included adult and university populations(Chen et al., 2022; Gao et al., 2024; Zhou & Fabiano, 2024; Zhou, 2021), whereas the school-based studies cited above have often addressed physical education climates or particular relationships among needs, emotions, and motivation. These findings establish relevant connections without resolving the specific combination examined here. The present study focuses on adolescents' exercise goals, BPN, and APE, retaining AUTM, CONM, and AMO as separate outcomes. In particular, it asks whether the associations between goals and motivation involve BPN and APE separately and whether an additional indirect association follows the proposed BPN–APE sequence. This preserves the distinction between willingness to exercise, participation under pressure, and an absence of intention in evaluating the model.

Accordingly, a cross-sectional study was conducted among adolescents in a city in eastern China. AG was represented by its six goal dimensions, BPN by autonomy, competence, and relatedness, and APE by enjoyment, hope, and pride. The structural analysis concerned the AG construct rather than separate structural effects of each goal dimension. Direct paths were retained alongside the individual and sequential indirect paths to the three motivational outcomes. The proposed sequence represents a

theoretical ordering, not an observed progression over time. The hypotheses therefore concern associations and indirect effects; the design does not establish that changes in goals precede changes in needs, emotions, or motivation. The hypotheses are presented in six groups.

H1. AG is significantly associated with BPN, APE, AUTM, CONM, and AMO.

H2. BPN are significantly associated with APE, AUTM, CONM, and AMO.

H3. APE are significantly associated with AUTM, CONM, and AMO.

H4. BPN mediate the associations between AG and each exercise motivation outcome: AUTM, CONM, and AMO.

H5. APE mediate the associations between AG and each exercise motivation outcome: AUTM, CONM, and AMO.

H6. BPN and APE sequentially mediate the associations between AG and each exercise motivation outcome (AUTM, CONM, and AMO), with BPN preceding APE in the proposed model.

Methods

Study design

A cross-sectional correlational design was used to examine the relationships among AG, BPN, APE, and exercise motivation in adolescents. AG was specified as the exogenous variable, BPN and APE as mediators, and AUTM, CONM, and AMO as the outcome variables. Data were collected using self-report questionnaires.

Participants

A total of 350 students were recruited from four public secondary schools in a city in eastern China, including two junior high schools and two senior high schools. Access to the schools was arranged through the researcher's local educational contacts. School selection followed a stratified purposive approach based on administrative area and school level. One junior high school and one senior high school were selected from each of two administrative areas. Second-year students at both school levels were targeted because final-year students faced additional academic and entrance examination pressures. All 350 questionnaires were returned. After screening, 25 questionnaires were excluded because of incomplete responses, apparently random answers, or highly repetitive response patterns. The final sample consisted of 325 students (174 male and 151 female), including 152 junior high school students and 173 senior high school students. Participants were aged 13–18 years, with most aged 14 (n = 150) or 17 (n = 172); the remaining three students were aged 13 (n = 2) or 18 (n = 1).

Procedure

This study was approved by the Ethics Committee for Research Involving Human Subjects at Universiti Putra Malaysia (JKEUPM-2023-037). All methods were performed in accordance with the relevant guidelines and regulations. Before data collection, the researcher contacted school principals and physical education teachers to explain the purpose and procedures of the study, and the participating schools agreed to take part. Informed consent was obtained from the parents or legal guardians of all participants under 18 years of age, and assent was obtained from the participating minors before data collection. Students were informed that participation was voluntary, that their responses would remain anonymous and confidential, and that participation would not affect their grades. Paper-and-pencil questionnaires were administered during class because students had limited access to electronic devices at school. The questionnaire included four scales together with demographic questions concerning age, gender, and school level, and approximately 30 minutes were allowed for completion. Before administration, the researcher explained the instructions and asked students to complete the questionnaires independently and respond honestly. Students could ask for clarification if necessary, and completed questionnaires were returned directly to the researcher.

Measures

All four questionnaires used a seven-point response scale, ranging from 1 (entirely disagree) to 7 (entirely agree).

Achievement goals

AG were assessed using the 3×2 Achievement Goal in Exercise Questionnaire, adapted from Elliot et al.'s (2011) Elliot et al. (2011)3×2 Achievement Goal Questionnaire. The initial 24-item questionnaire assessed six dimensions: task-approach, task-avoidance, self-approach, self-avoidance, other-approach, and other-avoidance goals. Classroom-related wording was adapted to the exercise context, including references to fitness, health, exercise outcomes, and performance. For example, “To be healthier than before” represented a self-approach goal, whereas “To avoid being less healthy than others” represented an other-avoidance goal. Following the pilot study, three items (SAP4, OAP2, and OAV2) were removed, resulting in a final 21-item questionnaire for the main study. The factor structure of the final instrument was subsequently evaluated using confirmatory factor analysis (CFA).

Basic psychological needs

BPN were assessed with an 18-item questionnaire combining 11 items from the Basic Psychological Needs in Exercise Scale (BPNES) (Vlachopoulos & Michailidou, 2006)) and seven items from the Psychological Need Satisfaction in Exercise Scale (PNSES) (Wilson et al., 2006). The additional PNSES items comprised two autonomy items, two competence items, and three relatedness items. The resulting questionnaire contained six items for each of the three dimensions. Its content concerned choices about exercise, capability in exercise activities, and relationships with exercise companions. All 18 items were retained following CFA.

Exercise motivation

Exercise motivation was measured using the Chinese version of the Behavioral Regulation in Exercise Questionnaire-2 (Liu et al., 2015; Markland & Tobin, 2004). The study used 18 items assessing external regulation (four items), introjected regulation (three items), identified regulation (three items), intrinsic regulation (four items), and amotivation (four items). The identified regulation item "I get restless if I do not exercise regularly" was excluded from the instrument used in this study. In the motivation model, identified regulation and intrinsic regulation were grouped under AUTM, while external and introjected regulation were grouped under CONM. AMO was represented as a separate factor.

Achievement positive emotions

Achievement positive emotions were assessed using the Achievement Positive Emotion in Exercise Questionnaire (APEEQ), developed for this study with reference to the Achievement Emotions Questionnaire–Revised (AEQ-R) manual (2022) and Pekrun et al. (2023). The questionnaire contained 17 items assessing enjoyment, hope, and pride. Participants reported how they typically felt during exercise.

Translation and content review

Translation followed Brislin (1970) translation and back-translation approach. The adapted achievement goal and emotion questionnaires were first translated into Chinese by three linguistic experts and then back-translated into English by a separate team of three. The review considered semantic consistency, clarity, and cultural appropriateness. Feedback was also obtained from three postgraduate and four undergraduate students proficient in both languages. The research team refined the instruments after reviewing the translations and feedback.

Content validity was assessed through expert review (Beck & Gable, 2001). Five experts in physical education and sport science evaluated the adapted achievement goal and emotion questionnaires and the seven additional PNSES items. Each item was rated on a four-point scale from 1 (not relevant) to 4 (very relevant), and the item-level content validity index (I-CVI) was calculated as the proportion of experts assigning a rating of 3 or 4. The items submitted for expert review demonstrated satisfactory content validity, with I-CVI values of .80 or above.

Pilot study

A pilot study was conducted with an independent sample of 126 students who were not included in the main study. The pilot sample comprised 67 junior high and 59 senior high students, including 66 male and 60 female participants. Questionnaire completion took approximately 30 minutes. Corrected item-total correlations were examined, with .35 used as the item-screening threshold. Cronbach's alpha coefficients ranged from .786 to .931 across the subscales in the pilot sample.

Statistical analysis

Data were analyzed using SPSS 27.0 and AMOS 26.0. Analyses were based on the final dataset of 325 valid cases. Frequencies and percentages were used to summarize participant characteristics, while means and standard deviations described the study variables. Skewness and kurtosis were examined to assess distributional characteristics (Hair et al., 2010), and potential multivariate outliers were assessed using Mahalanobis distance (Ben-Gal, 2005). CFA was conducted to evaluate the measurement model before testing the structural relationships. Structural equation modeling was performed using maximum likelihood estimation.

Items within the multidimensional constructs were parceled at the dimension level for the SEM analysis. AG was represented by six dimension-level indicators: task-approach, task-avoidance, self-approach, self-avoidance, other-approach, and other-avoidance. BPN was represented by autonomy, competence, and relatedness, and APE by enjoyment, hope, and pride. AUTM was represented by identified and intrinsic regulation, whereas CONM was represented by external and introjected regulation. AMO was represented by its four individual questionnaire items. The structural model therefore comprised six latent constructs and 20 observed indicators.

Measurement evaluation included factor loadings, construct reliability (CR), and average variance extracted (AVE) (Hair et al., 2010). The study used an AVE value above .50 as a criterion for convergent validity and a CR value above .70 as a reference for construct reliability. Discriminant validity was assessed by comparing each construct's AVE with its squared correlations with the other constructs (Rönkkö & Cho, 2022). These assessments were conducted before interpreting the relationships in the structural model.

Model fit was evaluated using the chi-square statistic, the chi-square-to-degrees-of-freedom ratio, the comparative fit index (CFI), the Tucker–Lewis index (TLI), and the root mean square error of approximation (RMSEA). The goodness-of-fit index (GFI), adjusted goodness-of-fit index (AGFI), incremental fit index (IFI), and normed fit index (NFI) were also examined. The study adopted reference values of at least .90 for CFI and TLI (Bentler, 1990; Bentler & Bonett, 1980) and below .08 for RMSEA (Steiger, 1990). Standardized path coefficients described the structural relationships, and squared multiple correlations summarized the variance explained in the endogenous variables.

The structural model included paths from AG to BPN, APE, and each motivational outcome, from BPN to APE and each outcome, and from APE to each outcome. The mediation analysis distinguished the indirect paths through BPN alone, through APE alone, and through BPN followed by APE for AUTM, CONM, and AMO. Indirect effects were assessed using 5,000 bootstrap resamples and 95% bias-corrected confidence intervals. An indirect effect was considered statistically significant when its confidence interval did not include zero (Hayes, 2012). Direct and indirect effects were considered together when interpreting the mediating roles of BPN and APE.

Results

Preliminary analyses

Means and standard deviations for the questionnaire subscales are presented in Table 1. Across the observed indicators, skewness ranged from − 0.837 to 0.493 and kurtosis from − 1.220 to − 0.044. Cases flagged as potential multivariate outliers were retained in the final analysis.

Table 1
Descriptive statistics for the questionnaire subscales (N = 325)

Construct	Subscale	M	SD
AG	Task-approach	5.15	1.27
AG	Task-avoidance	4.84	1.14
AG	Self-approach	5.06	1.35
AG	Self-avoidance	5.08	1.33
AG	Other-approach	4.37	1.38
AG	Other-avoidance	4.32	1.34
BPN	Autonomy	4.74	1.34
BPN	Competence	4.77	1.37
BPN	Relatedness	4.80	1.37
APE	Enjoyment	4.71	1.25
APE	Hope	4.60	1.21
APE	Pride	4.80	1.37
Motivation	Identified regulation	5.44	1.36
Motivation	Intrinsic regulation	5.29	1.41
Motivation	External regulation	4.80	1.11
Motivation	Introjected regulation	4.64	1.23
Motivation	Amotivation	2.87	1.14

Note. M = mean; SD = standard deviation. AG = achievement goals; BPN = basic psychological needs; APE = achievement positive emotions.

Measurement model

The measurement model yielded $\chi^2(155) = 321.517$, $p < .001$, $\chi^2/df = 2.074$, CFI = .951, TLI = .939, and RMSEA = .058 (Table 2). Standardized factor loadings ranged from .506 to .887. The reported average variance extracted (AVE) values ranged from .505 to .729, with all constructs exceeding the .50 criterion. Construct reliability (CR) ranged from .671 to .889 (Table 3). CR exceeded .70 for AG (.861), BPN (.889),

APE (.850), CONM (.744), and AMO (.846), whereas AUTM was below the .70 reference value (CR = .671). In the reported discriminant-validity assessment, each construct's AVE exceeded its squared correlations with the other constructs.

Table 2
Fit indices for the measurement and structural models

Index	Measurement model	Structural model
χ^2	321.517	339.335
df	155	158
p	< .001	< .001
χ^2/df	2.074	2.148
CFI	.951	.946
TLI	.939	.935
RMSEA	.058	.060
GFI	.917	.912
AGFI	.887	.883
IFI	.951	.947
NFI	.910	.905

Note. CFI = comparative fit index; TLI = Tucker–Lewis index; RMSEA = root mean square error of approximation; GFI = goodness-of-fit index; AGFI = adjusted goodness-of-fit index; IFI = incremental fit index; NFI = normed fit index.

Table 3
Construct reliability and average variance extracted

Construct	CR	AVE
Achievement goals	.861	.515
Basic psychological needs	.889	.729
Achievement positive emotions	.850	.654
Autonomous motivation	.671	.505
Controlled motivation	.744	.593
Amotivation	.846	.579

Note. CR = construct reliability; AVE = average variance extracted.

Structural model and direct associations

The structural model yielded $\chi^2(158) = 339.335$, $p < .001$, $\chi^2/df = 2.148$, CFI = .946, TLI = .935, and RMSEA = .060. CFI, TLI, and RMSEA met the study's reference criteria in both models, although AGFI was below .90 in the measurement (.887) and structural (.883) models. The structural model accounted for 34.9% of the variance in BPN, 16.8% in APE, 59.7% in AUTM, 57.7% in CONM, and 56.1% in AMO.

AG was positively associated with BPN (β = .591, p < .001) and APE (β = .270, p < .001). BPN was also positively associated with APE (β = .188, p = .017). With both mediators included, AG remained positively associated with AUTM (β = .250, 95% bias-corrected bootstrap CI [.096, .409]) and negatively associated with CONM (β = −.235, 95% CI [− .448, − .035]) and AMO (β = −.219, 95% CI [− .389, − .055]). None of these three confidence intervals included zero.

BPN was positively associated with AUTM (β = .293, $p < .001$) and negatively associated with CONM (β = −.352, $p < .001$) and AMO (β = −.206, $p = .002$). APE was likewise positively associated with AUTM (β = .435, $p < .001$) and negatively associated with CONM (β = −.377, $p < .001$) and AMO (β = −.510, $p < .001$). These direct associations supported H1–H3. The standardized direct paths are summarized in Fig. 2; the specific indirect effects are reported below.

Note

AG = achievement goals; BPN = basic psychological needs; APE = achievement positive emotions; AUTM = autonomous motivation; CONM = controlled motivation; AMO = amotivation. Measurement indicators and error terms are omitted for clarity.

Indirect effects

Specific indirect effects through BPN and APE are reported in Table 4. Using 5,000 bootstrap resamples, the indirect associations through BPN were positive for AUTM (effect = .173) and negative for CONM (effect = − .208) and AMO (effect = − .122). The 95% bias-corrected confidence intervals excluded zero for all three paths, supporting H4.

The indirect associations through APE followed the same pattern: positive for AUTM (effect = .117) and negative for CONM (effect = − .102) and AMO (effect = − .137). All three confidence intervals excluded zero, supporting H5.

For H6, the sequential indirect effects through BPN followed by APE were positive for AUTM (effect = .048, p = .049) and negative for CONM (effect = − .042, p = .045) and AMO (effect = − .057, p = .044). The 95% bias-corrected confidence intervals excluded zero for CONM and AMO. For AUTM, the interval was [.000, .107], with the lower limit displayed as .000 at three decimal places.

The total effects of AG were .589 for AUTM, − .586 for CONM, and − .535 for AMO. The direct associations between AG and each motivational outcome also remained statistically significant with both mediators included. Thus, the reported indirect associations through BPN and APE coexisted with direct associations between AG and AUTM, CONM, and AMO.

Table 4
Specific indirect effects of achievement goals on exercise motivation

Pathway	Standardized indirect effect	95% BC CI	p
AG → BPN → AUTM	.173	[.079, .279]	.001
AG → BPN → CONM	−.208	[− .325, − .094]	.001
AG → BPN → AMO	−.122	[− .225, − .027]	.015
AG → APE → AUTM	.117	[.043, .220]	.001
AG → APE → CONM	−.102	[− .195, − .036]	.001
AG → APE → AMO	−.137	[− .255, − .052]	.001
AG → BPN → APE → AUTM	.048	[.000, .107]	.049
AG → BPN → APE → CONM	−.042	[− .095, − .001]	.045
AG → BPN → APE → AMO	−.057	[− .123, − .002]	.044

Note. Effects are standardized estimates. BC CI = bias-corrected confidence interval, based on 5,000 bootstrap resamples. AG = achievement goals; BPN = basic psychological needs; APE = achievement positive emotions; AUTM = autonomous motivation; CONM = controlled motivation; AMO = amotivation.

Discussion

This study examined how AG, BPN, and APE were associated with autonomous motivation, controlled motivation, and amotivation among adolescents in a city in eastern China. In the specified model, AG was positively associated with AUTM and negatively associated with CONM and AMO. Both BPN and APE accounted for specific indirect associations between AG and each motivational outcome, while the direct associations remained significant. The positive association between BPN and APE also provided a link within the proposed sequential pathway. The corresponding indirect estimates were negative for CONM and AMO and positive for AUTM. Taken together, the findings concern the reasons adolescents give for exercising: personal interest and value, pressure, or an absence of intention. They suggest that both need-related and emotional experiences are relevant to understanding these reasons alongside the goals adolescents pursue.

Achievement goals and different forms of exercise motivation

The association between AG and AUTM is consistent with the view that competence-related goals can give exercise a personally meaningful direction. The task-, self-, and other-based standards in the 3×2 framework concern what adolescents are trying to accomplish, rather than participation alone (Elliot et

al., 2011). One possible interpretation is that pursuing recognizable exercise goals helps adolescents connect their efforts with outcomes they value. The positive association with AUTM is compatible with this interpretation, while the negative associations with CONM and AMO extend the pattern beyond enjoyment and personal value. In this model, goal pursuit was also associated with less pressure-based regulation and lower amotivation.

The overall AG association should be interpreted alongside the differing goal-specific findings discussed earlier. Barkoukis et al. (2007)linked mastery goals positively and performance goals negatively with self-determined motivation, whereas Lee et al. (2022) and Grajcevci and Shala (2021) reported positive relationships involving more than one goal orientation. The present result supports considering achievement goals in adolescent exercise motivation, but it does not resolve these differences. The analysis estimated an overall AG association rather than comparable goal-specific effects, and the earlier studies involved different populations and settings.

The negative associations with CONM and AMO have different meanings. CONM concerns participation under external demands or internal pressure, whereas AMO concerns a lack of intention (Ryan & Deci, 2022). Higher AG was associated with less of both experiences, alongside greater enjoyment-based or personally valued participation. Retaining the three outcomes therefore distinguishes pressure from a lack of intention, rather than reducing the findings to a general statement about 'better motivation.' These are differences among students assessed at one time, not observed transitions from one form of motivation to another.

The AG result concerns a construct represented by six goal dimensions. The analysis cannot identify which goal orientation accounts for its association with motivation; differences in indicator means or loadings do not provide a comparison of their structural effects.

Basic psychological needs as a mediating pathway

The BPN pathway connects achievement goals with need-related experiences and, in turn, motivational regulation. The positive AG–BPN path is consistent with the need-related component of the Contextual Motivation Model (Standage et al., 2003). Related research has connected task-oriented climates with autonomy, competence, and relatedness in physical education and sport(Cid et al., 2019; Claver et al., 2020; Monteiro et al., 2018). These findings support considering psychological needs in achievement-related motivation. However, motivational climates and personal goals are not identical predictors: the present results concern students' reported goals and needs, not the effects of a teacher or coach creating a particular environment.

BPNT and OIT suggest that exercise experienced as voluntary, within one's capabilities, and socially supported can be pursued for personally endorsed reasons (Ryan & Deci, 2022). Goal pursuit may relate to these experiences by giving students opportunities to recognize mastery and personal progress (Monteiro et al., 2018). Yet having an exercise target does not itself mean that participation is experienced as chosen, effective, or socially connected. An adolescent may pursue a clear target while

feeling pressured, unable to perform the activity, or disconnected from others. This distinction provides a theoretical interpretation of the BPN pathway: it concerns how students experience participation alongside what they are trying to achieve.

The positive association between BPN and AUTM agrees with the relationship between needs and autonomous exercise motivation discussed by Markland and Tobin (2010) and Ryan et al. (2021). The negative associations with CONM and AMO concern pressure and lack of intention, respectively. Within OIT, personally endorsed participation differs from compliance with external demands or internal obligations; perceiving competence and value in an activity also differs from seeing little reason to act (Ryan & Deci, 2022). The findings are consistent with BPN being relevant to all three outcomes. Because the needs were represented together, this interpretation concerns BPN as modeled rather than a separate effect of any single need.

The specific indirect effects through BPN are important because they were estimated with APE also included. Thus, the BPN pathway did not disappear when positive emotional experiences were taken into account. Within the model, need-related experiences accounted for part of the AG–motivation associations through paths that did not pass through APE. This is consistent with earlier applications of BPN as a mediator in achievement-related motivation (García-Romero et al., 2022; Méndez-Giménez et al., 2012; Monteiro et al., 2018), while locating the proposed pathway alongside an emotional mediator. It supports an interpretation in which the personal endorsement of exercise is not described solely by how positively students feel during participation.

Achievement positive emotions as a mediating pathway

APE provided another specific indirect pathway between AG and the three motivational outcomes. The positive AG–APE association is consistent with research connecting achievement goals with emotional experiences. Academic studies have related mastery goals to enjoyment and other positive emotions (Alhadabi & Karpinski, 2020; Rinas et al., 2020), while sport research has linked task orientation to enjoyment, happiness, and excitement (Dewar & Kavussanu, 2011; Ruiz et al., 2017). A plausible interpretation is that the goals through which students evaluate exercise are associated not only with perceived capability or choice, but also with how achievement experiences feel to them. Accomplishments and anticipated progress can make the activity emotionally meaningful, although the present study did not observe goal attainment as a separate process.

Enjoyment, hope, and pride broaden the emotional account beyond pleasure during participation (Pekrun, 2017; Pekrun et al., 2023). Enjoyment can make exercise rewarding in the moment, hope can orient attention toward attainable future goals, and pride can connect previous effort with a sense of accomplishment (Mack et al., 2015; Pekrun, 2006). These distinctions offer theoretical interpretations of the combined APE association. The structural model did not estimate the independent contributions of the three emotions.

The positive APE–AUTM association is consistent with Huhtiniemi et al. (2019) findings on enjoyment and autonomous motivation in physical education. (Mack et al., 2015) also linked fitness-related pride to physical activity through intrinsic motivation and identified regulation among young adults. The current analysis differs in retaining exercise motivation as the outcome and examining APE alongside BPN. Its negative associations with CONM and AMO suggest that positive achievement experiences were relevant not only to enjoyment and personal value, but also to pressure-based participation and lack of intention. One possible interpretation is that exercise experienced as rewarding and meaningful gives adolescents' reasons to participate that are less dependent on obligation. For AMO, the corresponding interpretation concerns having a reason to engage rather than simply experiencing less pressure.

The direction of the emotion–motivation relationship remains important. Rodrigues, Teixeira, et al. (2020) examined motivation as a predictor of enjoyment and exercise-related outcomes, whereas the present model positions APE before motivation. Students who participate for personally endorsed reasons may also find exercise more enjoyable. The current result is therefore consistent with an emotional indirect pathway under the proposed ordering but does not distinguish that ordering from motivation preceding emotional experience.

The relationship between BPN and APE and the sequential pathway

The positive BPN–APE association connects the two mediating accounts. It is consistent with the relationship between BPN and enjoyment reported among school students in physical education (Huhtiniemi et al., 2019). Related findings in other settings include associations between needs and emotions among Chinese university students learning English (Feng et al., 2023), the mediating role of BPN between teacher support and achievement emotions, and links between BPN and positive emotions among teachers (Keller et al., 2024). The present result places a comparable association within the proposed exercise motivation model. Its theoretical meaning is that experiences of volition, capability, and connection may be related to the emotional significance of participating and achieving. Conceptually, BPN and APE address different aspects of this experience, even though the model allows them to be related.

Linking BPN to APE distinguishes the sequential account from an account limited to separate indirect paths. The proposed sequence suggests that achievement goals may be associated with autonomy, competence, and relatedness, which may in turn be associated with enjoyment, hope, and pride relevant to motivation. Song et al. (2021) examined BPN and positive emotions as sequential mediators between mindfulness and job satisfaction among preschool teachers. This is a related application, but involves a different population, predictor, and outcome. The present ordering draws on the need-related pathway described by Standage et al. (2003) and the goal–emotion connection developed by Pekrun et al. (2009), linking need-related and emotional experiences within adolescent exercise.

The sequential estimates were .048 for AUTM (p = .049), − .042 for CONM (p = .045), and − .057 for AMO (p = .044). They were numerically smaller than the corresponding indirect estimates through BPN or APE

alone. The proposed sequence thus represented an additional route within the model rather than its largest estimated indirect pathway. These are descriptive comparisons; differences between the indirect effects were not statistically tested.

The coexistence of the separate and sequential paths is central to interpreting the model. BPN retained a pathway to motivation that did not pass through APE, and AG remained associated with APE after BPN was included. The BPN–motivation associations were therefore not confined to paths through APE, and the AG–APE association was not fully accounted for by BPN. Jointly including the mediators distinguishes these coexisting routes statistically. It does not establish synergy between them or show that the same sequence is necessary for every adolescent.

The model accounted for 34.9% of the variance in BPN and 16.8% in APE, compared with 56.1%–59.7% in the three motivational outcomes. Although the specified variables described a substantial proportion of variation in motivation, most of the variation in APE remained outside the combination of AG and BPN represented here. The model therefore does not provide a comprehensive account of adolescents' emotional experiences. Residual variation alone does not identify which additional influences should be included, but it marks the limits of the proposed need-related and emotional explanation.

Theoretical contribution and contextual scope

The contribution of the study lies in considering need-related and emotional accounts together. The Contextual Motivation Model emphasizes BPN in achievement-related motivation, while AET directs attention to emotions associated with activities and achievement outcomes. In the present model, BPN and APE each showed specific indirect associations, and the link between them allowed a sequential association to be examined. The findings thus locate both kinds of experience within an achievement-goal and SDT framework, rather than treating either as a sufficient explanation on its own.

Retaining three motivational outcomes distinguishes personal value and interest, pressure, and lack of intention rather than treating them as a single score. The broad pattern of associations therefore concerns different features of motivation, not simply its strength. The study also adds evidence from adolescent exercise in this eastern Chinese city to the adult, university, and physical education settings considered in the preceding literature. Its contextual contribution is to examine these relationships in this sample; wider cultural and developmental applicability remains to be established.

Implications

The findings suggest that support for adolescents' exercise motivation should consider goal pursuit together with BPN and APE. The model brings achievement emotions into the need-related account of motivation derived from the Contextual Motivation Model (Standage et al., 2003). First, physical education teachers could help students set personally meaningful exercise goals, such as increasing running distance or mastering a movement, and provide feedback that makes progress visible. This is consistent with the emphasis on task mastery and personal improvement in previous research (Cid et al.,

2019; Monteiro et al., 2018). Goal setting should be accompanied by opportunities to choose activities, experience competence, and receive support from teachers and peers, reflecting autonomy, competence, and relatedness within BPNT (Ryan & Deci, 2022). Second, educators could attend to enjoyment, hope, and pride alongside students' performance. Activities that students enjoy, attainable targets for future progress, and recognition of accomplishments correspond to the different achievement experiences represented by these emotions (Pekrun et al., 2017). For example, discussing an improvement can acknowledge what a student has achieved and help identify a realistic next goal, rather than simply asking for greater effort. Third, parents and community organizers could provide shared exercise opportunities that combine personal goals with social connection. Family fitness activities, learning skills together, and keeping progress records may provide occasions for encouragement and accomplishment. Parents and adolescents could agree on shared activities while setting individual targets, and use progress records to acknowledge improvement. This would keep attention on personal development within a supportive family setting. Community activities such as hiking or cycling could allow adolescents to select an appropriate pace and participate with others, providing opportunities for autonomy, competence, and relatedness (Vlachopoulos, 2007). Across these settings, attention should extend beyond attendance to whether adolescents participate through personal interest and value, experience pressure, or lack an intention to exercise. The current overall AG model does not establish which goal dimension should be prioritized. Because these practices were not experimentally tested, they are suggestions for program development and evaluation rather than demonstrated interventions for changing exercise motivation.

Limitations

Several limitations should be considered. First, the cross-sectional design cannot establish the temporal ordering assumed in the mediation model. AG, BPN, APE, and exercise motivation were measured at the same occasion, so the indirect effects do not demonstrate that changes in goals preceded changes in needs, emotions, or motivation. Longitudinal and experimental research could provide stronger evidence about the proposed sequence. Second, participants were recruited from four schools in one city in eastern China, and most were aged 14 or 17. The findings may not generalize to adolescents in other regions or educational settings. Studies involving students from additional regions and school levels could examine the applicability of the model and possible developmental differences. The pooled analysis cannot determine whether the pathways differ between junior and senior high school students or reflect a specifically Chinese cultural process. Third, all constructs were assessed using self-report questionnaires, leaving the observed relationships open to common method influences. Combining questionnaires with interviews and observations could provide complementary information about adolescents' goals and exercise experiences. Fourth, AG, BPN, and APE were modeled as constructs represented by their respective dimensions. The analysis therefore does not identify separate goal-specific, need-specific, or emotion-specific effects. More differentiated analyses would be required to establish whether particular goals or psychological experiences relate differently to the three motivational outcomes. Fifth, the emotional account included enjoyment, hope, and pride but not

negative achievement emotions. Future studies could include boredom, hopelessness, anger, and shame to examine a broader range of exercise experiences. Finally, actual exercise behavior was not an outcome. The results do not demonstrate changes in exercise frequency, intensity, persistence, or physical health. Following exercise participation over time would help determine whether the motivational relationships identified here correspond to subsequent behavior rather than assuming that stronger reported motivation translates into sustained participation.

Conclusion

This study examined BPN and APE as mediators of the relationship between AG and exercise motivation among adolescents in a city in eastern China. AG was positively associated with AUTM and negatively associated with CONM and AMO. Specific indirect associations through BPN and through APE were observed for all three outcomes, while direct associations remained. The estimated sequential pathway through BPN followed by APE showed the same directional pattern, linking AG positively with AUTM and negatively with CONM and AMO. Together, these findings indicate that need-related and emotional experiences are both relevant to understanding adolescents' reasons for exercising. The model does not reduce motivation to a single level of willingness, but distinguishes personal interest and value from pressure and lack of intention. Its practical relevance is to encourage consideration of goals, psychological needs, and emotional experiences together when developing support for adolescent exercise. The cross-sectional evidence identifies relationships for further investigation rather than establishing a causal sequence or demonstrating lasting changes in exercise behavior.

Declarations

Ethics Approval and Consent to Participate

This study was approved by the Ethics Committee for Research Involving Human Subjects (JKEUPM), Universiti Putra Malaysia (JKEUPM Ref. No.: JKEUPM-2023-037). All methods were performed in accordance with the relevant guidelines and regulations. Informed consent was obtained from the parents or legal guardians of all participants under 18 years of age, and assent was obtained from the participating minors before data collection.

Conflict of Interest

The authors declare that they have no competing interests.

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Author Contribution

XL: Study design, data collection, data analysis, and manuscript drafting. SS: Research supervision, interpretation of results, and critical revision of the manuscript. GQ: Manuscript review and editing. All authors read and approved the final manuscript.

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Data Availability

The data supporting the findings of this study were collected from adolescent participants. Requests for access to the data may be directed to the corresponding author and will be considered in accordance with applicable ethical and institutional requirements.

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Figures

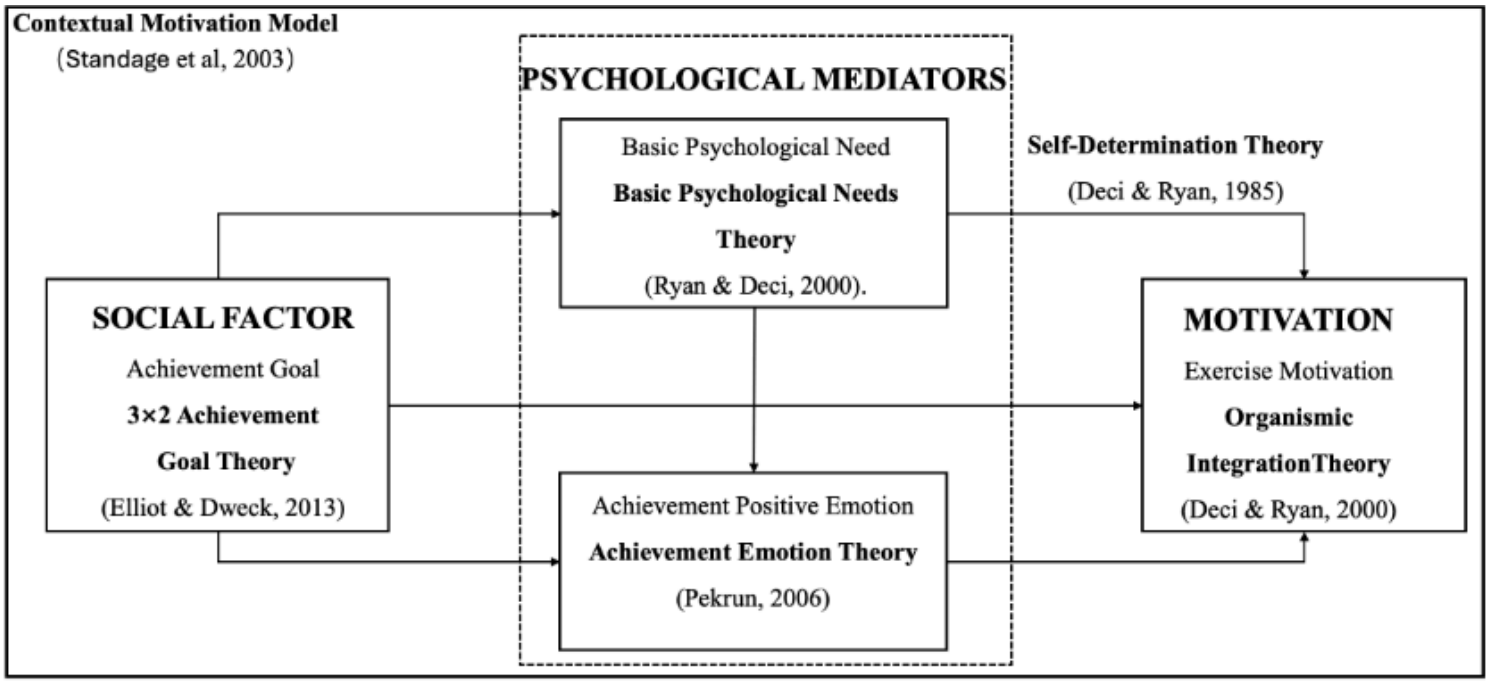


Figure 1

Theoretical framework of the study.

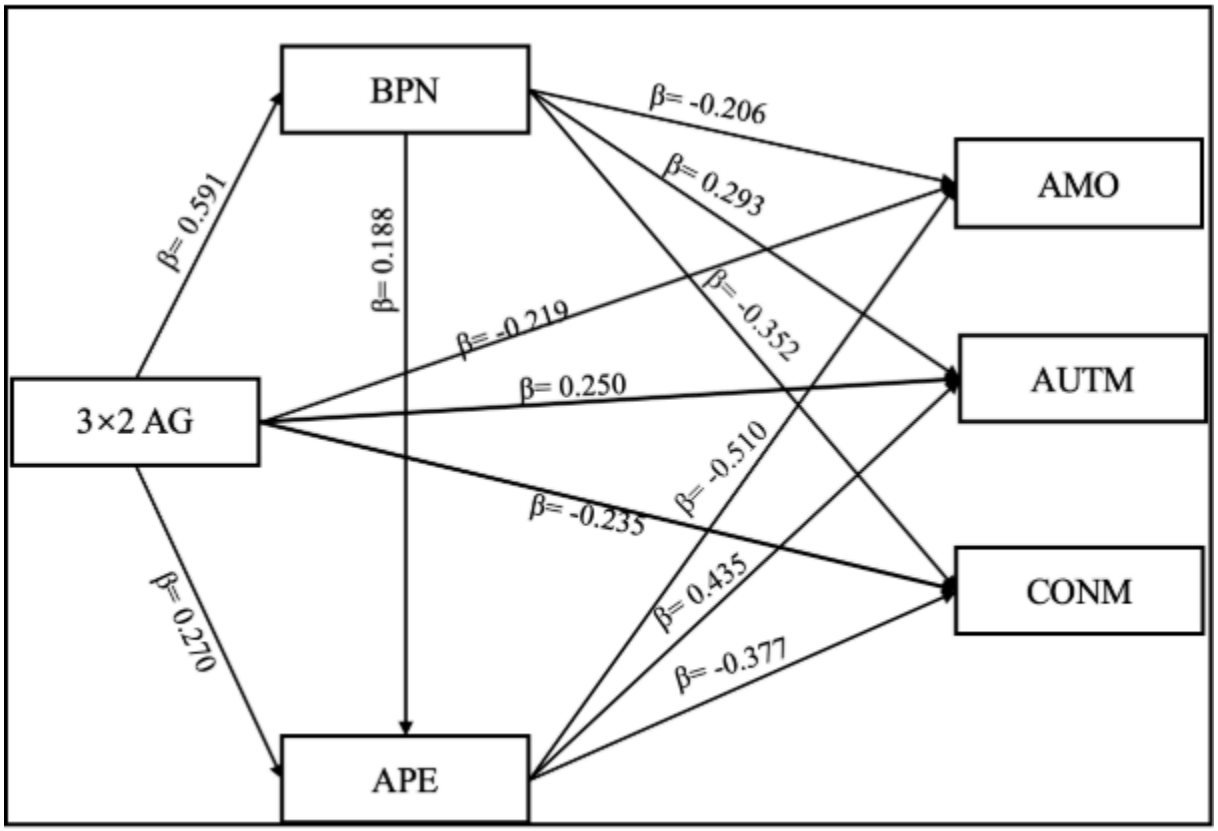


Figure 2

Structural model with standardized path coefficients.

Note. AG = achievement goals; BPN = basic psychological needs; APE = achievement positive emotions; AUTM = autonomous motivation; CONM = controlled motivation; AMO = amotivation. Measurement indicators and error terms are omitted for clarity.