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EDITED BY
Pedro Morouço,
Clínica Espregueira - FIFA Medical Centre of Excellence, Portugal

REVIEWED BY
Henri Tilga,
University of Tartu, Estonia
Amir Romdhani,
University of Jendouba, Tunisia

*CORRESPONDENCE
Stefan Alecu
alecu.stefan@unitbv.ro

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Academic motivation and basic psychological needs among university students in physical education and mountain sports: a self-determination theory study

Stefan Alecu* and Gheorghe Adrian Onea

Department of Physical Education and Special Motricity, Transilvania University of Brașov, Brașov, Romania

Academic motivation in physically demanding university programmes may be better understood by considering motivational quality rather than motivation quantity alone. This cross-sectional observational survey supplemented by structured content analysis examined relationships among basic psychological need satisfaction and frustration, autonomous motivation, controlled motivation, amotivation, continuation intention, and career commitment in first- and second-year students enrolled in Physical Education and Mountain Sports at Transilvania University of Brașov. Data were collected from 6 to 30 October 2025 after ethics approval, yielding a final analytical sample of 237 students. Participants completed the Academic Motivation Scale-College/University version, the Basic Psychological Need Satisfaction and Frustration Scale, contextual and sport-related items, continuation and career indicators, and two open-ended prompts. Original open-ended answers were standardized into 50 motivation and 50 demotivation formulations and independently coded by both authors. Autonomous motivation averaged 5.04 (SD = 1.05), amotivation 2.40 (SD = 0.95), overall need satisfaction 3.72 (SD = 0.73), and overall need frustration 2.21 (SD = 0.76). Need satisfaction correlated strongly with autonomous motivation (Spearman $\rho = 0.704$), whereas need frustration correlated strongly with amotivation ($\rho = 0.661$). In adjusted models, need satisfaction was positively associated with autonomous motivation ($\beta = 0.539$, $p < 0.001$), and need frustration was positively associated with amotivation ($\beta = 0.569$, $p < 0.001$). Human coding agreement was high for motivation (92.0%, $\kappa = 0.898$) and demotivation (94.0%, $\kappa = 0.927$). Teaching/prosocial impact was the most frequent motivation category (33.8%), while curriculum/teaching/assessment was the most frequent demotivation category (23.6%). Overall, self-reported need satisfaction and frustration were differentially associated with motivational quality in this cohort, but the cross-sectional, single-faculty design precludes causal or population-level conclusions.

KEYWORDS
academic motivation, basic psychological needs, higher education, mountain sports, physical education, qualitative content analysis, self-determination theory, university students

1 Introduction

Motivation in higher education is not adequately characterized by how much effort students report investing; the quality and regulatory basis of that effort also matter. Self-Determination Theory (SDT) distinguishes forms of motivation according to the degree to which behavior is experienced as volitional and self-endorsed. Intrinsic motivation and identified regulation are relatively autonomous because students engage out of interest, enjoyment, personal importance, or endorsement of the value of learning. By contrast, introjected and external regulation are more controlled, reflecting internal pressure, obligation, rewards, or external demands, while amotivation describes a lack of intention or perceived reason for acting (Deci and Ryan, 2000; Ratelle et al., 2007; Ryan and Deci, 2020). This distinction is educationally relevant because students who display similar outward persistence may nevertheless experience very different psychological processes. Meta-analytic work across educational settings has linked autonomous motivation with more adaptive patterns of engagement, persistence, learning, and well-being, whereas controlled motivation and especially amotivation show less favorable relationships with many student outcomes (Howard et al., 2021; Bureau et al., 2022; Xie et al., 2026).

Within SDT, the satisfaction and frustration of three basic psychological needs provide a central account of how social and instructional environments relate to motivational quality. Autonomy refers to experiencing volition and psychological ownership of one's actions; competence concerns effectiveness, mastery, and confidence in dealing with challenges; and relatedness concerns connection, belonging, and reciprocal care. Importantly, low need satisfaction should not be treated as equivalent to active need frustration. A student may experience limited choice without feeling overtly controlled, or modest belonging without feeling rejected; frustration reflects the more actively adverse experiences of pressure, failure, or exclusion (Niemiec and Ryan, 2009; Chen et al., 2015; Vansteenkiste et al., 2020). SDT therefore predicts that need satisfaction should support more autonomous forms of regulation, whereas need frustration should be especially relevant to maladaptive states such as amotivation. Longitudinal and process-oriented educational studies further suggest that perceived need support, need satisfaction, and engagement can influence one another over time, underscoring the importance of examining these constructs together rather than as isolated variables (Jang et al., 2016; Yang et al., 2022).

The instructional climate is one plausible context in which these need-based processes operate. Autonomy-supportive teaching does not imply the absence of expectations or structure; rather, it involves acknowledging students' perspectives, providing meaningful rationales, allowing appropriate choice, encouraging initiative, and minimizing unnecessarily controlling language. Structure complements autonomy support by making goals and expectations clear, organizing learning tasks, and providing feedback that helps students develop competence (Aelterman et al., 2019; Reeve, 2006; Jang et al., 2010; Reeve and Cheon, 2021). In higher education, perceived autonomy support has been positively associated with academic motivation and achievement, and university studies similarly suggest that autonomy support, perceived competence, and need satisfaction are relevant to students' engagement and academic functioning (Okada, 2023; Zhou et al., 2022; Chiu, 2022; Jeno et al., 2017; Lozano-Jiménez et al., 2021). These findings make teaching climate a particularly important interpretive context when students must sustain effort across both demanding theoretical and practical components of a degree programme.

Physical Education and Mountain Sports programmes provide a distinctive setting in which these motivational processes may be especially salient. Students in such programmes typically combine theoretical coursework with practical skill acquisition, physical performance, outdoor or mountain activity, and preparation for professional roles in education, coaching, sport, recreation, or related fields. Some also balance university requirements with competitive sport, substantial weekly training, employment, or injury-related limitations. Consequently, experiences of competence, autonomy, belonging, performance pressure, and vocational meaning may intersect more visibly than in many classroom-only programmes. Visible physical-performance assessment may make competence salient, while competing academic and sport demands may heighten the relevance of perceived autonomy; these contextual possibilities were not tested as moderators. At the task level, sport-performance research has examined situational motivational regulation and verbal encouragement across long-jump and strength/endurance assessments (Romdhani et al., 2024a, 2026b). Research in school physical education has consistently linked need-supportive climates and more autonomous motivation with adaptive participation and engagement (Ntoumanis, 2001; Standage et al., 2005; Vasconcellos et al., 2020; Fernández-Espínola et al., 2020), and intervention evidence indicates that reducing controlling teaching while increasing autonomy support can coincide with lower need frustration and amotivation (Cheon et al., 2016; Pelletier et al., 2013). The present study, however, concerns academic motivation toward university study rather than sport motivation itself; task-level encouragement, instructional feedback, and motor-skill demonstrations were not directly assessed; evidence from physical-education research is therefore used to contextualize possible educational mechanisms, not to equate the two domains.

The study used two established SDT-oriented instruments to characterize motivational regulation and psychological need experiences. The Academic Motivation Scale—College/University version (AMS-C28) provides multidimensional scores for intrinsic motivation to know, intrinsic motivation toward accomplishment, intrinsic motivation to experience stimulation, identified regulation, introjected regulation, external regulation, and amotivation (Vallerand et al., 1992). The Romanian administration form used here followed the Romanian reference adaptation identified in the study materials (Miulescu, 2019), while broader cross-cultural validation studies support the scale's use across university contexts (Caleon et al., 2015; Al Ansari et al., 2021). Basic psychological need experiences were assessed with the Basic Psychological Need Satisfaction and Frustration Scale (BPNSFS), which separately captures autonomy, competence, and relatedness satisfaction and frustration (Chen et al., 2015; Kuźma et al., 2020). Treating satisfaction and frustration as distinct dimensions is especially important in the present context because the hypothesized adaptive and maladaptive pathways are not assumed to be simple mirror images of one another.

Relatively little research has combined multidimensional academic motivation, basic-need satisfaction and frustration, sport and contextual characteristics, continuation and career indicators, and transparent human content analysis within a single university faculty focused on Physical Education and Mountain Sports. Thus, the contribution is primarily contextual and integrative rather than a claim to a new SDT mechanism. The present study addressed this contextual gap through a quantitative survey complemented by structured content analysis. Standardized questionnaire measures quantified motivational regulation and need-based experience, while the open-ended component described the content of what students identified as motivating or demotivating. Because the original answers were standardized before coding, the qualitative component is treated as structured content analysis of standardized response representations rather than as a verbatim thematic analysis; its

purpose is descriptive complementarity rather than the construction of latent psychometric profiles (Hsieh and Shannon, 2005; Elo and Kyngäs, 2008; O'Connor and Joffe, 2020). Four hypotheses guided the principal analyses: (H1) overall need satisfaction would be positively associated with autonomous motivation; (H2) overall need frustration would be positively associated with amotivation; (H3) autonomous motivation would be positively associated with intention to continue the degree and career commitment; and (H4) amotivation would be negatively associated with these outcomes. Sex × study-year interactions were examined exploratorily and were not interpreted as evidence of within-person developmental change. H1–H2 were assessed in adjusted need–motivation models and H3–H4 in adjusted intention-to-continue and career-commitment models (Table 1). Other subscale comparisons, sex × study-year interactions, additional correlations, and category-level comparisons were exploratory.

2 Materials and methods

2.1 Design and setting

This cross-sectional observational study was conducted at the Faculty of Physical Education and Mountain Sports, Transilvania University of Brașov, Brașov, Romania. Ethical approval was granted by the Ethics Committee of the Faculty of Physical Education and Mountain Sports (No. 119/02.10.2025). Main in-class paper/tablet data collection took place from 6 to 24 October 2025. A catch-up online form remained open until 30 October 2025 for students who had been absent or preferred electronic completion. The final data-collection period was therefore 6–30 October 2025.

2.2 Participants and recruitment

Convenience sampling was used to recruit intact first- and second-year classes at the Faculty of Physical Education and Mountain Sports. Data collection was carried out by the two authors, Stefan Alecu and Gheorghe Adrian Onea, both lecturers at the faculty. As previously specified for recruitment, they were not acting as the lecturers responsible for grading the sampled modules during questionnaire administration. A neutral standardized recruitment script was used. Participation was voluntary, no course credit, grade adjustment, or monetary incentive was offered, and lecturers responsible for the scheduled class left the room during questionnaire administration to reduce perceived pressure. Students absent from in-class sessions could later access the online version through a generic faculty announcement; no personalized recruitment emails from teaching staff were used. Nevertheless, the researchers' institutional role could have affected students' perceived freedom to participate or criticize teaching and assessment.

The final analytical dataset comprised 237 unique participants with informed consent recorded for all included cases. The sample included 124 first-year and 113 second-year students; recorded sex categories were 144 male, 89 female, and 4 another/self-described. Mean age was 20.29 years (SD = 1.28; range 18–24).

Participant flow was as follows: 312 students were invited, 300 were eligible, 264 consented, and 257 reached session-complete status. After export and final quality control, 20 session-complete records were excluded: 6 duplicate study IDs/double submissions, 4 withdrawals of consent after partial completion, 7 records with more than 20% missing items in a core module (AMS-C28 or BPNSFS), and 3 post-consent eligibility failures because the student was not in the first or second year. The final analytical sample was $N = 237$. Seven consented students did not reach session-complete status.

Sampling was non-probability convenience sampling of intact Year 1 and Year 2 classes; therefore, the sample should not be interpreted as a population-representative sample of all Romanian university students or all physical-education students.

Eligibility required current enrollment in the first or second year at the Faculty of Physical Education and Mountain Sports and informed consent. Post-export quality-control exclusions were duplicate/double submission, consent withdrawal, more than 20% missing items in either core questionnaire module, and discovered failure of the first−/second-year eligibility criterion.

The two authors were the only data collectors. They administered the approved information/consent materials and the standardized paper, tablet, and online procedures described in the study collector instructions. No external research assistants were used.

TABLE 1 Focal coefficients from adjusted multivariable OLS regression models.

Outcome	Predictor	*n*	Adj. R^2	β	*p*
Autonomous motivation	Need satisfaction	156	0.535	0.539	<0.001
Autonomous motivation	Need frustration	156	0.535	−0.255	<0.001
Amotivation	Need satisfaction	173	0.476	−0.196	0.016
Amotivation	Need frustration	173	0.476	0.569	<0.001
Intention to continue	Autonomous motivation	189	0.667	0.564	<0.001
Intention to continue	Controlled motivation	189	0.667	−0.022	0.624
Intention to continue	Amotivation	189	0.667	−0.327	<0.001
Career commitment	Autonomous motivation	189	0.432	0.650	<0.001
Career commitment	Controlled motivation	189	0.432	−0.000	0.996
Career commitment	Amotivation	189	0.432	−0.049	0.565

β denotes the standardized coefficient for the focal continuous predictor. OLS models use HC3 heteroscedasticity-robust standard errors. Models also include age, binary sex category, study year, and first-choice programme as covariates; continuation and career-commitment models include autonomous motivation, controlled motivation, and amotivation simultaneously. Continuous predictors and outcomes were standardized within each analysis sample; binary indicators retained their natural coding. Full coefficients are provided in the Supplementary material.

2.3 Measures

2.3.1 Academic motivation

Academic motivation was assessed using the 28-item Academic Motivation Scale—College/University version (AMS-C28; Vallerand et al., 1992). The Romanian administration form identifies Miulescu (2019) as the reference Romanian adaptation. Items were rated on a 7-point scale ranging from 1 (nu corespunde deloc; does not correspond at all) to 7 (corespunde exact; corresponds exactly). Seven four-item subscales were scored: intrinsic motivation to know, intrinsic motivation toward accomplishment, intrinsic motivation to experience stimulation, identified regulation, introjected regulation, external regulation, and amotivation. Secondary broad composites in the analytical workbook combine identified regulation and the three intrinsic dimensions as autonomous motivation, and introjected plus external regulation as controlled motivation. Each constituent regulation was measured with four items; these broad aggregates group theoretically related but distinct regulations and were not independently validated as higher-order factors in this sample.

2.3.2 Basic psychological needs

Basic psychological need satisfaction and frustration were assessed using the 24-item Basic Psychological Need Satisfaction and Frustration Scale (BPNSFS; Chen et al., 2015). The Romanian-language study form used a 5-point response scale from 1 (complet neadevărat; completely untrue) to 5 (complet adevărat; completely true). The instrument yields autonomy, competence, and relatedness satisfaction and frustration subscales; overall need-satisfaction and need-frustration composites summarized the three respective need dimensions for the principal hypothesis tests, without assuming a validated higher-order structure. The supplied study materials do not identify a separate published Romanian validation of the BPNSFS for university students, so the instrument is described here as a Romanian-language study form derived from the original BPNSFS rather than as an independently validated Romanian version. Available documentation does not specify the translators, forward/back translation, bilingual wording review, or piloting of the BPNSFS study form; therefore, those procedures cannot be confirmed. Language-specific measurement equivalence was not tested (217 Romanian and 20 English respondents).

2.3.3 Academic, sport, and contextual indicators

The dataset also contains age, study year, programme specialization, whether the programme was the student's first choice, competitive-athlete status, primary sport, sport type, competition level, sport experience, weekly training, mountain-sport activity, injury limitation, employment hours, academic-record linkage consent, GPA, credits, attendance, intention to continue (0–10), and career commitment (0–10).

Academic indicators require special caution. In the analytic workbook, 188 of 237 participants are marked as having consented to academic-record linkage; however, the dataset does not identify which individual GPA, credit, or attendance values were actually imported from faculty records. The authors clarified that most academic indicators are student self-report, with de-identified faculty-record import used when available for consenting participants. Reference periods also differ: first-year values may refer to a high-school/admission average or early-semester estimates, whereas second-year values may refer to the 2024–2025 academic year or current-semester provisional figures. Accordingly, GPA, credits, and attendance are not treated as harmonized primary outcomes and are retained only for exploratory supplementary analyses pending source-period harmonization.

2.3.4 Standardized open-ended responses and human content analysis

Participants answered two open-ended questions concerning their reasons for studying at the faculty and factors that reduce their motivation. The authors confirmed that the original student answers were subsequently standardized into a controlled set of 50 formulations for motivation and 50 formulations for demotivation. Accordingly, the bilingual v2.0 export is a derived qualitative coding dataset rather than a verbatim free-text corpus. It contains 237 participant IDs, all matching the analytical dataset; language flags agree with the survey-language field for all records (217 Romanian; 20 English); and each Romanian standardized formulation maps one-to-one to an English counterpart. The standardized formulations are therefore treated as participant-level coded representations of the original answers, not as direct quotations.

The standardized-response export contains repeated formulations by design because each participant was mapped to one of 50 motivation formulations and one of 50 demotivation formulations derived from the original answers. Frequencies therefore represent the number of participants assigned to each standardized formulation. Because the original wording was normalized, the qualitative component is reported as content analysis of standardized response representations rather than as thematic analysis of verbatim free text, and the standardized formulations are not presented as direct quotations. A many-to-one mapping was possible at the participant level, and the normalization preceding coding may have removed idiosyncratic wording. The available methodological record does not document detailed normalization rules or the personnel responsible for that step.

The qualitative component was treated as structured content analysis of standardized response representations (Hsieh and Shannon, 2005; Elo and Kyngäs, 2008). Stefan Alecu and Gheorghe Adrian Onea independently coded all 50 motivation and all 50 demotivation formulations using the study category set. One consensus category was assigned to each standardized formulation; coding reliability therefore concerns these derived units rather than the original free-text responses. Agreement was quantified with Cohen's κ, and disagreements were resolved by consensus; participant-level prevalence was then obtained by weighting each consensus-coded formulation by the number of participants mapped to it (O'Connor and Joffe, 2020).

2.4 Data management and missing data

All 237 participant IDs are unique. Consent was obtained primarily in writing for in-class paper/tablet sessions and electronically through an equivalent tick-box procedure for the online catch-up window; both modes used the same ethics-approved participant information and consent text. Eligibility required participants to be at least 18 years old, and no minors were enrolled. The identifiable linkage key is restricted to the principal investigator and authorized data manager, while the analytical workbook contains study IDs only. Research data

are planned to be retained for 5 years after publication, subject to applicable institutional and ethics requirements, and then securely destroyed. AMS item-level missingness is 74 of 6,636 responses (1.12%), with 192 participants complete on all 28 items. BPNSFS item-level missingness is 86 of 5,688 responses (1.51%), with 177 participants complete on all 24 items.

Missingness was summarized by item and participant. Complete-case deletion was not applied globally; each analysis used participants with valid values for the variables required by that analysis. During data cleaning, the authors adopted a *post hoc* rule excluding records with more than 20% missing items in either core questionnaire module. Four-item subscales were scored only when all four constituent items were present. These rules were adopted during data cleaning and were not preregistered; analysis-specific n values are therefore reported transparently. The reduced sample in some adjusted models (as low as n = 156) warrants caution because missingness mechanisms and alternative missing-data strategies were not evaluated here.

2.5 Statistical analysis

Statistical analyses were specified for IBM SPSS Statistics version 26. Descriptive statistics and Cronbach's alpha were calculated for the primary psychological subscales. Female–male and first- versus second-year comparisons used independent-samples tests with unequal-variance results interpreted where appropriate. Two-way ordinary least-squares models with HC3 heteroscedasticity-robust standard errors examined sex × study-year interactions among male/female participants. Spearman rank correlations summarized bivariate monotonic associations without requiring normally distributed scores, whereas OLS models estimated covariate-adjusted mean associations with HC3 heteroscedasticity-robust uncertainty estimates. Multivariable OLS models used HC3 robust standard errors and adjusted for age, binary sex category, study year, and first-choice programme; continuation and career-commitment models included autonomous motivation, controlled motivation, and amotivation simultaneously. Continuous predictors and outcomes were standardized within each analysis sample, while binary indicators retained their natural coding. The Benjamini–Hochberg procedure controlled the false-discovery rate across families of related tests (Benjamini and Hochberg, 1995). Analyses were cross-sectional and associational; statistical significance did not imply causal direction. Hypothesis-driven inference was confined to the four adjusted model comparisons described above; the remaining analyses were exploratory.

3 Results

3.1 Data integrity and sample profile

The final analytical dataset contains 237 participants. The workbook labels 231 records complete and 6 partial; analysis-specific sample sizes vary because missing questionnaire items are distributed across participants. Item response values fall within the documented AMS (1–7) and BPNSFS (1–5) ranges. Sample characteristics are summarized in Table 2.

Of 312 students invited, 300 were eligible, 264 consented, and 257 reached session-complete status. Twenty records were then excluded during final quality control (6 duplicate/double submissions, 4 consent withdrawals, 7 with >20% missing items in a core questionnaire module, and 3 post-consent eligibility failures), yielding the analytical N = 237. Seven consented students did not reach session-complete status.

TABLE 2 Sample characteristics in the current analytical dataset.

Characteristic	*n*	Value	Range
Age, years	237	20.29 (1.28)	18–24
Sex category: male	144	60.8%	
Sex category: female	89	37.6%	
Sex category: another/self-described	4	1.7%	
Study year: first	124	52.3%	
Study year: second	113	47.7%	
Programme: Physical Education	131	55.3%	
Programme: Mountain Sports	76	32.1%	
Programme: combined/other	30	12.7%	
Programme was first choice	171	72.2%	
Competitive athlete	104	43.9%	
Sport experience, years	237	6.24 (3.21)	1–18
Training, h/week	237	10.60 (6.37)	1.3–30.0
Academic-record linkage consent	188	79.3%	
GPA (0–10 scale)	188	7.67 (0.88)	5.80–9.70
Attendance, %	188	86.55 (7.70)	68.9–100.0
Intention to continue (0–10)	237	8.15 (1.24)	5–10
Career commitment (0–10)	237	7.69 (1.36)	4–10

Values are *n* (%), mean (SD), or range as indicated. GPA and attendance are descriptive only because their source and reference period are heterogeneous across participants; they are not used as primary pooled academic outcomes.

3.2 Psychological scale descriptives and reliability

The seven AMS and six BPNSFS subscales showed high internal consistency in the analytical dataset (Cronbach's α = 0.861–0.912; Table 3). Autonomous motivation was available for 207 participants (M = 5.04, SD = 1.05), controlled motivation for 218 (M = 3.87, SD = 1.28), and amotivation for 229 (M = 2.40, SD = 0.95). Overall need satisfaction was available for 204 (M = 3.72, SD = 0.73) and overall need frustration for 202 (M = 2.21, SD = 0.76).

3.3 Sex category and study-year comparisons

Across the 13 primary subscales, no female-versus-male main-effect comparison and no Year 1-versus-Year 2 main-effect comparison remained significant after FDR correction. In two-way OLS models limited to male/female categories, the sex × study-year interaction remained significant after FDR correction for autonomy satisfaction, relatedness satisfaction, competence satisfaction, and amotivation (Table 4). Because these are cross-sectional subgroup interactions rather than longitudinal change, they are interpreted as exploratory crossover patterns.

The four participants recorded as another/self-described are retained in descriptive summaries but are not included in binary sex

interaction models because the subgroup is too small for stable inference.

3.4 Associations among needs, motivation, and outcomes

The core SDT pattern was strong: overall need satisfaction correlated positively with autonomous motivation (ρ = 0.704), while need frustration correlated positively with amotivation (ρ = 0.661). Need frustration also correlated with controlled motivation (ρ = 0.340), and need satisfaction correlated negatively with amotivation (ρ = −0.491). Continuation intention and career commitment were examined as student-reported contextual outcomes. Key pairwise correlations are shown in Table 5.

Heterogeneous GPA, credit, and attendance indicators were retained for exploratory supplementary interpretation only.

3.5 Multivariable models

In adjusted OLS models with HC3 robust standard errors, need satisfaction was positively associated with autonomous motivation (β = 0.539, $p < 0.001$), whereas need frustration was negatively associated with autonomous motivation (β = −0.255, $p < 0.001$). In the amotivation model, need frustration showed the larger positive association (β = 0.569, $p < 0.001$), and need satisfaction was negatively associated with amotivation (β = −0.196, $p = 0.016$). Autonomous motivation was positively associated with intention to continue (β = 0.564, $p < 0.001$) and career commitment (β = 0.650, $p < 0.001$), whereas amotivation was negatively associated with intention to continue (β = −0.327, $p < 0.001$) but was not independently associated with career commitment after adjustment (β = −0.049, $p = 0.565$). Focal coefficients are shown in Table 1; full model coefficients are provided in the Supplementary material. In these hypothesis-linked adjusted models, H1, H2, and H3 were supported; H4 was partially supported because amotivation was negatively associated with continuation intention but not independently with career commitment.

Models involving intention to continue and career commitment are cross-sectional and associational.

3.6 Human content analysis of standardized responses

The qualitative export was analyzed as a standardized response-representation dataset rather than as a verbatim free-text corpus. Both authors completed independent coding of all 50 formulations per domain. Motivation coding agreed on 46/50 formulations (92.0%; Cohen's κ = 0.898); four disagreements were resolved by consensus. Demotivation coding agreed on 47/50

TABLE 3 Descriptive statistics and internal consistency of AMS-C28 and BPNSFS subscales.

Subscale	*n*	Mean	SD	Cronbach α
Intrinsic motivation—knowledge	230	5.12	1.09	0.882
Intrinsic motivation—accomplishment	231	5.03	1.05	0.861
Intrinsic motivation—stimulation	226	4.91	1.18	0.891
Identified regulation	223	5.17	1.04	0.865
Introjected regulation	226	3.89	1.30	0.894
External regulation	227	3.83	1.34	0.908
Amotivation	229	2.40	0.95	0.868
Autonomy satisfaction	225	3.66	0.82	0.908
Autonomy frustration	223	2.26	0.83	0.912
Relatedness satisfaction	226	3.71	0.75	0.878
Relatedness frustration	223	2.22	0.79	0.894
Competence satisfaction	220	3.78	0.77	0.892
Competence frustration	225	2.16	0.78	0.896

Four-item subscales were scored only when all four constituent items were present. Internal consistency is reported as Cronbach's α.

TABLE 4 Exploratory FDR-significant sex × study-year interactions in the current analysis.

Outcome	Female Y1 M (SD)	Female Y2 M (SD)	Male Y1 M (SD)	Male Y2 M (SD)	Interaction b	*p*	FDR q
Amotivation	2.56 (1.06)	2.17 (0.77)	2.29 (0.91)	2.55 (0.99)	−0.646	0.0132	0.0430
Autonomy satisfaction	3.56 (0.95)	4.04 (0.73)	3.75 (0.77)	3.42 (0.73)	0.816	<0.001	0.0044
Relatedness satisfaction	3.53 (0.83)	3.92 (0.66)	3.81 (0.71)	3.62 (0.74)	0.577	0.0054	0.0232
Competence satisfaction	3.65 (0.84)	4.11 (0.67)	3.85 (0.72)	3.60 (0.79)	0.704	0.0010	0.0066

OLS interaction models use HC3 heteroscedasticity-robust standard errors and include male and female categories only. Benjamini–Hochberg FDR correction was applied across the 13 interaction tests. These are cross-sectional interaction patterns, not within-person change.

formulations (94.0%; $\kappa = 0.927$); three disagreements were resolved by consensus. The final motivation distribution was teaching/prosocial impact 80/237 (33.8%), knowledge/scientific curiosity 53/237 (22.4%), mountain/outdoor identity 49/237 (20.7%), practical mastery/performance 24/237 (10.1%), career/professional identity 22/237 (9.3%), and relatedness/social belonging 9/237 (3.8%). The final demotivation distribution was curriculum/teaching/assessment 56/237 (23.6%), workload/fatigue/time conflict 49/237 (20.7%), institutional/logistical/resources 42/237 (17.7%), financial/career/external pressure 28/237 (11.8%), competence/progress/comparison 24/237 (10.1%), purpose/autonomy/motivation loss 24/237 (10.1%), and support/health constraints 14/237 (5.9%). Exploratory Kruskal–Wallis comparisons of six quantitative outcomes across these categories yielded no FDR-significant omnibus differences in either domain (all $q \geq 0.119$), indicating that the content categories should be interpreted primarily as descriptive content rather than as distinct quantitative motivational profiles (Table 6).

4 Discussion

The findings were broadly consistent with the central SDT distinction between need-supportive and need-thwarting experiences. Three patterns were especially clear. First, overall need satisfaction was strongly associated with autonomous academic motivation. Second, need frustration was strongly associated with amotivation. Third, autonomous motivation and amotivation showed opposing relationships with students' intention to continue the degree, while autonomous motivation was also strongly related to career commitment. These results align with meta-analytic evidence that more

TABLE 5 Key Spearman correlations among motivation, basic needs, and outcomes.

Variable 1	Variable 2	n	ρ	*p*
Autonomous motivation	Overall need satisfaction	182	0.704	<0.001
Autonomous motivation	Overall need frustration	181	−0.509	<0.001
Controlled motivation	Overall need satisfaction	193	−0.111	0.126
Controlled motivation	Overall need frustration	190	0.340	<0.001
Amotivation	Overall need satisfaction	201	−0.491	<0.001
Amotivation	Overall need frustration	200	0.661	<0.001
Autonomous motivation	Intention to continue	207	0.771	<0.001
Controlled motivation	Intention to continue	218	−0.133	0.050
Amotivation	Intention to continue	229	−0.694	<0.001
Autonomous motivation	Career commitment	207	0.647	<0.001
Controlled motivation	Career commitment	218	−0.036	0.597
Amotivation	Career commitment	229	−0.459	<0.001

Pairwise-complete correlations. Main-table outcome correlations are limited to harmonized psychological and student-reported continuation/career indicators; exploratory GPA/attendance associations are not emphasized.

TABLE 6 Final human-consensus content categories for standardized motivation and demotivation representations.

Domain	Consensus category	Unique formulations	Participant assignments, *n* (%)
Motivation	Teaching/prosocial impact	17	80 (33.8%)
Motivation	Knowledge/scientific curiosity	11	53 (22.4%)
Motivation	Mountain/outdoor identity	10	49 (20.7%)
Motivation	Practical mastery/performance	5	24 (10.1%)
Motivation	Career/professional identity	5	22 (9.3%)
Motivation	Relatedness/social belonging	2	9 (3.8%)
Demotivation	Curriculum/teaching/assessment	12	56 (23.6%)
Demotivation	Workload/fatigue/time conflict	10	49 (20.7%)
Demotivation	Institutional/logistical/resources	9	42 (17.7%)
Demotivation	Financial/career/external pressure	6	28 (11.8%)
Demotivation	Competence/progress/comparison	5	24 (10.1%)
Demotivation	Purpose/autonomy/motivation loss	5	24 (10.1%)
Demotivation	Support/health constraints	3	14 (5.9%)

The coding unit was the standardized formulation. Participant prevalence was calculated after consensus by weighting each formulation by the number of participants mapped to it. Motivation intercoder agreement was 92.0% ($\kappa = 0.898$); demotivation agreement was 94.0% ($\kappa = 0.927$). Standardized wording is derived and is not a verbatim quotation.

autonomous forms of student motivation tend to accompany adaptive educational outcomes, whereas amotivation is associated with less favorable patterns (Howard et al., 2021; Bureau et al., 2022). At the same time, the present data are cross-sectional and cannot establish a causal sequence from educational context to need experiences, motivation, or persistence. Their main contribution is therefore to show that distinctions among need satisfaction, need frustration, autonomous regulation, controlled regulation, and amotivation are empirically meaningful within this specific cohort.

The association between overall need satisfaction and autonomous motivation was particularly pronounced ($\rho = 0.704$). In SDT terms, this pattern is consistent with the proposition that students are more likely to engage in learning for personally endorsed or intrinsically meaningful reasons when they experience volition, effectiveness, and social connection (Niemiec and Ryan, 2009). The multivariable model provided convergent evidence: need satisfaction remained positively associated with autonomous motivation after adjustment for age, sex category, study year, first-choice programme status, and need frustration ($\beta = 0.539$, $p < 0.001$). This should not be read as evidence of mediation or temporal prediction, but it does suggest that satisfaction contributes information beyond the simple absence of frustration. The result is also compatible with higher-education research linking perceived autonomy support and need satisfaction with stronger motivation, engagement, and academic functioning (Okada, 2023; Zhou et al., 2022). In practical terms, the finding strengthens the rationale for examining whether university environments help students experience meaningful choice, progress toward mastery, and a sense of belonging across both theoretical and practical modules.

The clearest maladaptive pattern concerned need frustration and amotivation. Overall need frustration correlated positively with amotivation ($\rho = 0.661$), and the adjusted association remained substantial when need satisfaction and basic covariates were considered simultaneously ($\beta = 0.569$, $p < 0.001$). This distinction is theoretically important because frustration reflects more than simply receiving insufficient support. Experiences of pressure, repeated incompetence, exclusion, or disconnection can actively undermine students' sense of agency and efficacy (Chen et al., 2015; Vansteenkiste et al., 2020). The present pattern resembles findings from physical-education intervention research in which reductions in controlling teaching and need frustration accompanied lower amotivation (Cheon et al., 2016), although the designs are not equivalent. Because the current study measured all variables at one point in time, it cannot determine whether need frustration precedes amotivation, whether amotivated students interpret the environment more negatively, or whether both processes reinforce one another.

Motivational quality was also closely related to students' self-reported orientation toward continuing their studies and pursuing a related career. Autonomous motivation correlated strongly with intention to continue ($\rho = 0.771$) and career commitment ($\rho = 0.647$). The especially strong association with continuation intention may partly reflect conceptually adjacent self-evaluations or common-method variance; discriminant validity was not evaluated. In adjusted models that entered autonomous motivation, controlled motivation, and amotivation simultaneously, autonomous motivation remained positively associated with both intention to continue ($\beta = 0.564$, $p < 0.001$) and career commitment ($\beta = 0.650$, $p < 0.001$). Amotivation was negatively associated with continuation intention ($\beta = -0.327$, $p < 0.001$), but it was not independently associated with career commitment after adjustment. Controlled motivation likewise showed negligible independent associations with these outcomes in the jointly adjusted models, consistent with a multidimensional view of regulation rather than a simple autonomous-versus-controlled opposition. This pattern is compatible with person-oriented research showing greater persistence among autonomously motivated students (Ratelle et al., 2007) and with evidence from professional education linking autonomous motivation with productive study processes (Kusurkar et al., 2013; Orsini et al., 2016). The findings should nevertheless be interpreted as associations with intentions and commitment rather than observed retention or later employment.

The sex and study-year analyses require a more cautious interpretation. None of the simple female–male or Year 1–Year 2 main-effect comparisons across the 13 primary subscales survived false-discovery-rate correction. This absence of robust main effects is more informative than isolated unadjusted differences and argues against broad claims that one sex or study year was generally more or less motivated. Exploratory sex × study-year interactions remained significant after correction for autonomy satisfaction, relatedness satisfaction, competence satisfaction, and amotivation, indicating crossover patterns in the observed sample. However, first- and second-year students were different individuals measured at the same time; these interactions cannot be interpreted as within-person change between years. The four participants recorded as another/self-described were appropriately retained in descriptive summaries but excluded from binary interaction models because the subgroup was too small for stable inference. Longitudinal replication with better-balanced groups and formal measurement-invariance testing is needed before developmental or sex-specific interpretations are justified.

The standardized-response content analysis added contextual information about what students themselves identified as motivating. Teaching/prosocial impact was the most frequent consensus category, accounting for 80 of 237 participant assignments (33.8%), followed by knowledge/scientific curiosity (22.4%) and mountain/outdoor identity (20.7%). These categories suggest that many students connected their studies with helping, teaching, coaching, health promotion, scientific understanding, or a personally meaningful relationship with outdoor and mountain activity. Such themes are compatible with the SDT view that values and goals can become more autonomously regulated when they are integrated with personal interests and identity (Deci and Ryan, 2000; Ratelle et al., 2007). However, content and regulatory quality are not the same construct. For example, a teaching-oriented goal could be pursued from genuine personal endorsement, external pressure, or a mixture of motives. Accordingly, the content categories should not be treated as direct indicators of autonomous or controlled regulation. Their descriptive role is reinforced by the fact that category-level Kruskal–Wallis comparisons across the quantitative outcomes did not remain significant after false-discovery-rate correction.

The leading demotivation categories were curriculum/teaching/assessment (23.6%), workload/fatigue/time conflict (20.7%), and institutional/logistical/resources (17.7%). These themes point to areas that may warrant closer institutional inquiry, but they do not establish that specific teaching practices, workload arrangements, or resources caused lower motivation. The practical implication is therefore best framed as a set of testable educational hypotheses. The current survey did not directly measure observed teaching styles, instructor or peer encouragement, or video-modeling practices. Sport-specific assessments have also investigated the source (peer versus coach) and gender of the encourager

(Romdhani et al., 2024b, 2025), but these task-level findings cannot be assumed to explain academic motivation in the present cohort. SDT-informed teaching would combine autonomy support with clear structure: instructors can acknowledge students' perspectives, provide meaningful rationales for demanding tasks, offer appropriate choices, communicate expectations clearly, and provide feedback that makes competence development visible (Reeve, 2006; Jang et al., 2010; Reeve and Cheon, 2021). In a programme that integrates theory, practical performance, and outdoor activity, scheduling, recovery demands, equipment access, and the perceived relevance of assessment may also shape whether students can engage with coursework in a self-endorsed manner. PE-specific literature supports the plausibility of need-supportive approaches, and recent PE research has considered perceived (de) motivating teaching styles in relation to motivational processes (Tilga et al., 2026), but intervention studies in this exact university context are needed before recommending specific programme changes (Ntoumanis, 2001; Standage et al., 2005; Vasconcellos et al., 2020).

The internal-consistency findings were encouraging but also identify an important contextual limitation. Internal consistency was high across the seven AMS-C28 and six BPNSFS subscales in this dataset, with Cronbach's α values ranging from 0.861 to 0.912. This is consistent with prior evidence that the AMS can perform reliably across countries and university populations (Caleon et al., 2015; Al Ansari et al., 2021), and the Romanian AMS-C28 administration form used in the study referenced Miulescu (2019). The Romanian-language BPNSFS study form followed the structure described by Chen et al. (2015), but the supplied study materials do not establish a separate published Romanian validation in university students. The present reliability estimates therefore support internal consistency in this sample but should not be presented as equivalent to a full cross-cultural validation. Factorial validity of the AMS-C28 and six-dimensional BPNSFS structures, omega/composite reliability, and the psychometric status of the broad aggregates were not established by the reported analyses. Future work should examine factor structure, measurement invariance, and convergent validity before making stronger claims about language-specific psychometric equivalence.

Several limitations constrain interpretation. The sample was drawn by convenience from a single faculty, limiting generalizability to other Romanian universities, other countries, or university students more broadly. The cross-sectional design precludes causal and developmental inference, and the reliance on self-report introduces the possibility of shared-method variance. Simultaneous self-report of motivational regulation and intentions may inflate their apparent association; faculty-led administration may also have inhibited criticism despite recruitment safeguards. Missing questionnaire items reduced analysis-specific sample sizes, and the administration modes and Romanian/English language versions were not formally tested for equivalence. The English-language subgroup included only 20 respondents, and no formal factor-structure or measurement-invariance analyses were reported for language, sex, or study-year groups. Subgroup imbalance also limited inference for participants outside the binary sex categories. Academic indicators require particular caution because GPA, credits, and attendance were derived from heterogeneous sources and reference periods, including primarily self-report and some faculty-record linkage, so they do not constitute harmonized measures of university performance. The qualitative component also has a specific provenance limitation: original answers were standardized into a finite set of formulations before coding. This pre-coding normalization may have obscured less common or unexpected themes, and high agreement on standardized formulations cannot demonstrate fidelity to the original accounts. This improved consistency for categorization but reduced linguistic nuance and means that the standardized wording cannot be treated as verbatim quotation. Finally, the >20% module-level exclusion threshold and the requirement for complete four-item subscales were adopted during data cleaning rather than preregistered, and should therefore be understood as *post hoc* analytical decisions. Sensitivity power analyses, regression-diagnostic summaries, confidence intervals for focal regression coefficients, and alternative missing-data sensitivity analyses were not reported; these remain important checks of precision and robustness.

Future research should test these patterns prospectively. A longitudinal design beginning at programme entry and repeating measures at the end of Year 1 and Year 2 would help distinguish cohort differences from within-person change and could directly model whether need satisfaction and frustration precede changes in motivational regulation, engagement, and retention. Harmonized official academic outcomes would permit more defensible analysis of performance, while multi-faculty and multi-university recruitment would improve external validity. Formal measurement-invariance testing across sex, year, programme, language, and administration mode would strengthen interpretation of group comparisons. Future experiments could separately examine situational encouragement, peer versus instructor feedback, and video-modeling techniques (e.g., playback speed and gymnastics-routine memory; Romdhani et al., 2026a) without extrapolating their effects from the present academic-motivation measures. Experimental or quasi-experimental work could also examine whether changes in autonomy-supportive and well-structured teaching in both practical and theoretical modules alter need satisfaction, need frustration, motivational quality, and continuation behavior. Teacher-focused autonomy-support interventions are demonstrably malleable in education (Reeve and Cheon, 2021), making this a feasible next step. Within these limitations, the present study contributes an integrated account of SDT-based academic motivation, basic psychological needs, continuation and career indicators, and human-coded motivational content in an under-studied Physical Education and Mountain Sports university setting.

5 Conclusion

Among first- and second-year Physical Education and Mountain Sports students in this cohort, satisfaction of autonomy, competence, and relatedness was closely associated with more autonomous academic motivation, whereas frustration of these needs was closely associated with amotivation. Autonomous motivation was also strongly related to intention to continue the degree and to career commitment, while amotivation showed an independent negative association with continuation intention. These conclusions remain associational and context-specific. The principal contribution is to situate established SDT distinctions within this Physical Education and Mountain Sports cohort, not to establish the effectiveness of particular teaching interventions. Longitudinal, multi-institutional studies with harmonized

academic outcomes are required before causal, developmental, or population-level conclusions can be drawn.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving humans were approved by Ethics Committee of the Faculty of Physical Education and Mountain Sports. The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

Author contributions

SA: Conceptualization, Writing – original draft, Methodology, Validation, Supervision, Data curation, Writing – review & editing, Project administration. GO: Writing – original draft, Investigation, Formal analysis, Writing – review & editing, Supervision, Validation.

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Conflict of interest

The author(s) declared that this work was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Generative AI statement

The author(s) declared that Generative AI was used in the creation of this manuscript. Generative-AI tools were used for study planning, workflow organization, document-preparation support, and literature-organization assistance. The reported qualitative categories were finalized by independent coding and consensus of the two authors. The authors take responsibility for the final scientific prose, interpretation, citations, and numerical results.

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Supplementary material

The Supplementary material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyg.2026.1983915/full#supplementary-material

References

Aelterman, N., Vansteenkiste, M., Haerens, L., Soenens, B., Fontaine, J. R. J., and Reeve, J. (2019). Toward an integrative and fine-grained insight in motivating and demotivating teaching styles: the merits of a circumplex approach. *J. Educ. Psychol.* 111, 497–521. doi: 10.1037/edu0000293

Al Ansari, A. M., Kumar, A. P., AlSaleh, A. F. F., et al. (2021). Validation of academic motivation scale among medical students using factor analysis and structural equation modeling: middle eastern perspective. *J. Educ. Health Promot.* 10:364. doi: 10.4103/jehp.jehp_1553_20

Benjamini, Y., and Hochberg, Y. (1995). Controlling the false discovery rate: a practical and powerful approach to multiple testing. *J. R. Stat. Soc. Ser. B* 57, 289–300. doi: 10.1111/j.2517-6161.1995.tb02031.x

Bureau, J. S., Howard, J. L., Chong, J. X. Y., and Guay, F. (2022). Pathways to student motivation: a meta-analysis of antecedents of autonomous and controlled motivations. *Rev. Educ. Res.* 92, 46–72. doi: 10.3102/00346543211042426

Caleon, I. S., Wui, M. G. L., Tan, J. P. L., Chiam, C. L., Soon, T. C., and King, R. B. (2015). Cross-cultural validation of the academic motivation scale: a Singapore investigation. *Child Indic. Res.* 8, 925–942. doi: 10.1007/s12187-014-9298-7

Chen, B., Vansteenkiste, M., Beyers, W., Boone, L., Deci, E. L., Van der Kaap-Deeder, J., et al. (2015). Basic psychological need satisfaction, need frustration, and need strength across four cultures. *Motiv. Emot.* 39, 216–236. doi: 10.1007/s11031-014-9450-1

Cheon, S. H., Reeve, J., and Song, Y. G. (2016). A teacher-focused intervention to decrease PE students' amotivation by increasing need satisfaction and decreasing need frustration. *J. Sport Exerc. Psychol.* 38, 217–235. doi: 10.1123/jsep.2015-0236

Chiu, T. K. F. (2022). Applying the self-determination theory (SDT) to explain student engagement in online learning during the COVID-19 pandemic. *J. Res. Technol. Educ.* 54, S14–S30. doi: 10.1080/15391523.2021.1891998

Deci, E. L., and Ryan, R. M. (2000). The "what" and "why" of goal pursuits: human needs and the self-determination of behavior. *Psychol. Inq.* 11, 227–268. doi: 10.1207/S15327965PLI1104_01

Elo, S., and Kyngäs, H. (2008). The qualitative content analysis process. *J. Adv. Nurs.* 62, 107–115. doi: 10.1111/j.1365-2648.2007.04569.x

Fernández-Espínola, C., Almagro, B. J., Tamayo-Fajardo, J. A., and Sáenz-López, P. (2020). Complementing the self-determination theory with the need for novelty: motivation and

intention to be physically active in physical education students. *Front. Psychol.* 11:1535. doi: 10.3389/fpsyg.2020.01535

Howard, J. L., Bureau, J. S., Guay, F., Chong, J. X. Y., and Ryan, R. M. (2021). Student motivation and associated outcomes: a meta-analysis from self-determination theory. *Perspect. Psychol. Sci.* 16, 1300–1323. doi: 10.1177/1745691620966789

Hsieh, H.-F., and Shannon, S. E. (2005). Three approaches to qualitative content analysis. *Qual. Health Res.* 15, 1277–1288. doi: 10.1177/1049732305276687

Jang, H., Kim, E. J., and Reeve, J. (2016). Why students become more engaged or more disengaged during the semester: a self-determination theory dual-process model. *Learn. Instr.* 43, 27–38. doi: 10.1016/j.learninstruc.2016.01.002

Jang, H., Reeve, J., and Deci, E. L. (2010). Engaging students in learning activities: it is not autonomy support or structure but autonomy support and structure. *J. Educ. Psychol.* 102, 588–600. doi: 10.1037/a0019682

Jeno, L. M., Raaheim, A., Kristensen, S. M., Kristensen, K. D., and Hole, T. N. (2017). The relative effect of team-based learning on motivation and learning: a self-determination theory perspective. *CBE-Life Sci. Educ.* 16:ar59. doi: 10.1187/cbe.17-03-0055

Kusurkar, R. A., Ten Cate, T. J., Vos, C. M. P., Westers, P., and Croiset, G. (2013). How motivation affects academic performance: a structural equation modelling analysis. *Adv. Health Sci. Educ.* 18, 57–69. doi: 10.1007/s10459-012-9354-3

Kuźma, B., Szulawski, M., Vansteenkiste, M., and Cantarero, K. (2020). Polish adaptation of the basic psychological need satisfaction and frustration scale. *Front. Psychol.* 10:3034. doi: 10.3389/fpsyg.2019.03034

Lozano-Jiménez, J. E., Huéscar, E., and Moreno-Murcia, J. A. (2021). From autonomy support and grit to satisfaction with life through self-determined motivation and group cohesion in higher education. *Front. Psychol.* 11:579492. doi: 10.3389/fpsyg.2020.579492

Miulescu, A. (2019). The academic motivation scale (AMS): factorial structure, validity and reliability of the Romanian version. *Studia Doctoralia* 10, 29–40. doi: 10.47040/sd0000068

Niemiec, C. P., and Ryan, R. M. (2009). Autonomy, competence, and relatedness in the classroom: applying self-determination theory to educational practice. *Theory Res. Educ.* 7, 133–144. doi: 10.1177/1477878509104318

Ntoumanis, N. (2001). A self-determination approach to the understanding of motivation in physical education. *Br. J. Educ. Psychol.* 71, 225–242. doi: 10.1348/000709901158497

O'Connor, C., and Joffe, H. (2020). Intercoder reliability in qualitative research: debates and practical guidelines. *Int J Qual Methods* 19:1609406919899220. doi: 10.1177/1609406919899220

Okada, R. (2023). Effects of perceived autonomy support on academic achievement and motivation among higher education students: a meta-analysis. *Jpn. Psychol. Res.* 65, 230–242. doi: 10.1111/jpr.12380

Orsini, C., Evans, P., and Jerez, O. (2016). How to encourage intrinsic motivation in the clinical teaching environment? A systematic review from the self-determination theory. *J. Educ. Eval. Health Prof.* 13:8. doi: 10.3352/jeehp.2016.13.8

Pelletier, L. G., Rocchi, M. A., Vallerand, R. J., Deci, E. L., and Ryan, R. M. (2013). Validation of the revised sport motivation scale (SMS-II). *Psychol. Sport Exerc.* 14, 329–341. doi: 10.1016/j.psychsport.2012.12.002

Ratelle, C. F., Guay, F., Vallerand, R. J., Larose, S., and Senécal, C. (2007). Autonomous, controlled, and amotivated types of academic motivation: a person-oriented analysis. *J. Educ. Psychol.* 99, 734–746. doi: 10.1037/0022-0663.99.4.734

Reeve, J. (2006). Teachers as facilitators: what autonomy-supportive teachers do and why their students benefit. *Elem. Sch. J.* 106, 225–236. doi: 10.1086/501484

Reeve, J., and Cheon, S. H. (2021). Autonomy-supportive teaching: its malleability, benefits, and potential to improve educational practice. *Educ. Psychol.* 56, 54–77. doi: 10.1080/00461520.2020.1862657

Romdhani, A., Ghorbel, A., Regaieg, G., Geantă, V. A., Iacobini, A. R., Băltean, A. I., et al. (2026b). The relationship between situational motivation and the effect of verbal encouragement on long jump performance: autonomous vs. controlled motivation. *Sports* 14:193. doi: 10.3390/sports14050193

Romdhani, A., Sahli, F., Ghouili, H., Trabelsi, O., Rebhi, M., Ben Aissa, M., et al. (2024a). Exploring the impact of verbal encouragement on strength, endurance, and psychophysiological responses: enhancing teaching strategies in sports science education. *Front. Sports Active Living* 6:1360717. doi: 10.3389/fspor.2024.1360717

Romdhani, A., Sahli, F., Trabelsi, O., Rebhi, M., Ghouili, H., Sahli, H., et al. (2024b). Peer verbal encouragement is more effective than coach encouragement in enhancing CrossFit-specific 1-RM strength, functional endurance, and psychophysiological assessment performance. *Sports* 12:64. doi: 10.3390/sports12030064

Romdhani, A., Trabelsi, O., Selmi, O., Guelmami, N., Weiss, K., Rosemann, T., et al. (2025). Verbal encouragement during strength and endurance assessments: the gender of the encourager can matter. *Acta Psychol.* 255:104919. doi: 10.1016/j.actpsy.2025.104919

Romdhani, A., et al. (2026a). Comparing three playback speeds in video modeling: effects on visuospatial serial memory of gymnastics routines. *Int. J. Sports Sci. Coach.*:17479541261478839.

Ryan, R. M., and Deci, E. L. (2020). Intrinsic and extrinsic motivation from a self-determination theory perspective: definitions, theory, practices, and future directions. *Contemp. Educ. Psychol.* 61:101860. doi: 10.1016/j.cedpsych.2020.101860

Standage, M., Duda, J. L., and Ntoumanis, N. (2005). A test of self-determination theory in school physical education. *Br. J. Educ. Psychol.* 75, 411–433. doi: 10.1348/000709904X22359

Tilga, H., Paap, H., Diloy-Peña, S., Burgueño, R., and Koka, A. (2026). Linking students' perceptions of physical education teachers' (de)motivating styles to students' leisure time physical activity: the role of motivational processes. *BMC Public Health* 26:2408. doi: 10.1186/s12889-026-28141-2

Vallerand, R. J., Pelletier, L. G., Blais, M. R., Brière, N. M., Senécal, C., and Vallières, E. F. (1992). The academic motivation scale: a measure of intrinsic, extrinsic, and amotivation in education. *Educ. Psychol. Meas.* 52, 1003–1017. doi: 10.1177/0013164492052004025

Vansteenkiste, M., Ryan, R. M., and Soenens, B. (2020). Basic psychological need theory: advancements, critical themes, and future directions. *Motiv. Emot.* 44, 1–31. doi: 10.1007/s11031-019-09818-1

Vasconcellos, D., Parker, P. D., Hilland, T., Cinelli, R., Owen, K. B., Kapsal, N., et al. (2020). Self-determination theory applied to physical education: a systematic review and meta-analysis. *J. Educ. Psychol.* 112, 1444–1469. doi: 10.1037/edu0000420

Xie, J., Hu, X., Wang, P., and Wang, D. (2026). How autonomous motivation predicts college students' academic performance: a cross-sectional study on the mediating roles of self-control and learning habits. *Front. Psychol.* 17:1771128. doi: 10.3389/fpsyg.2026.1771128

Yang, D., Chen, P., Wang, H., Wang, K., and Huang, R. (2022). Teachers' autonomy support and student engagement: a systematic literature review of longitudinal studies. *Front. Psychol.* 13:925955. doi: 10.3389/fpsyg.2022.925955

Zhou, L., Gao, Y., Hu, J., Tu, X., and Zhang, X. (2022). Effects of perceived teacher support on motivation and engagement amongst Chinese college students: need satisfaction as the mediator. *Front. Psychol.* 13:949495. doi: 10.3389/fpsyg.2022.949495