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RESEARCH ARTICLE

Beyond Attendance: The Influence of Sport Engagement Quality on Competitive and Cooperative Consciousness among Undergraduate Students

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Abstract

Attendance records describe participation but do not directly measure developmental change. This cross-sectional study examined associations between sport engagement quality and undergraduates' competitive and cooperative consciousness beyond weekly attendance. A survey of 486 undergraduates from three comprehensive universities measured behavioural, cognitive, emotional, and social engagement, attendance hours, and the two outcomes. Confirmatory factor analysis examined the four-dimension structure. Reported hierarchical regressions attributed increments of $\Delta R^2 = .04$ for competitive and .02 for cooperative consciousness to attendance, followed by $\Delta R^2 = .16$ and .20 respectively for engagement quality. These increments depend on entry order and do not quantify causal contributions. Cognitive and emotional engagement had the largest reported competitive coefficients; social engagement had the largest cooperative coefficient ($\beta = .34$). Coefficient rankings do not establish differences between predictors. K-means clustering identified a low-engagement group labelled attendance-only. The attendance comparison with moderately engaged peers was not statistically significant, which does not establish equivalence. The reported outcome differences from high-quality engaged peers were $d = 0.94$ and 1.08. The social-engagement association with cooperation was steeper among team-based participants, but this does not identify an effect of changing sport format. The results describe concurrent self-reports, not development or programme effectiveness. The correlation and regression summaries require reconciliation before the reported model increments can be relied upon. Engagement measures may complement attendance records; their validity, practical use, and implications for subsequent outcomes require further evaluation.

Keywords: Sport Engagement; Engagement Quality; Competitive Consciousness; Cooperative Consciousness; Undergraduate Students; University Physical Education; Cluster Analysis

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1. Introduction

Universities invest in physical education credits, intramural leagues, sports associations, and campus facilities with aims extending beyond physical fitness. Reviews associate sport participation with psychological and social outcomes in children and adolescents [1] and discuss educational benefits claimed for school sport [2]. These populations and outcomes provide context, but do not directly establish developmental effects among undergraduates. Attendance sheets, enrolment figures, facility bookings, and activity duration describe exposure; they do not by themselves measure changes in competitive or cooperative dispositions. Work on life-skill development similarly cautions that transfer from sport to other settings depends on the experience and is not guaranteed by participation [3], [4]. Campus evaluation therefore needs to distinguish participation counts from evidence of the outcomes that programmes seek to achieve.

Two developmental outcomes carry particular weight in higher education discourse: competitive consciousness — the disposition to notice, value, and mobilise for situations that demand striving against standards and rivals — and cooperative consciousness, the parallel disposition to recognise interdependence and work jointly toward shared goals. Both are routinely invoked as graduate attributes, and sport is their classic training ground because it is one of the few curricular spaces where competition and cooperation operate simultaneously and visibly: teams compete against other teams by cooperating within themselves, a structure theorised since the earliest work on social interdependence [5], [6]. Whether campus sport actually cultivates these dispositions in undergraduates, however, and through what features of the sport experience, remains surprisingly underexamined.

Engagement research distinguishes behavioural, cognitive, and emotional investment [7], examines agentic contributions [8] and conceptual and measurement issues [9], and places engagement in the wider higher education experience [10]. In youth sport, athlete engagement has been studied through confidence, dedication, enthusiasm, and vigour [11]. That construct is distinct from the four engagement-quality dimensions used here. Evidence from adolescent athletes provides a basis for comparison, but does not validate this study's adapted undergraduate measures. Students with similar attendance may report different experiences; assessing that possibility requires measures of those experiences alongside participation frequency.

This study addresses that blind spot with three contributions. First, it tests the incremental validity of sport engagement quality: whether four quality dimensions explain variance in competitive and cooperative consciousness beyond attendance volume and demographics. Second, it tests dimension-outcome specificity: whether the cognitive and emotional facets of engagement align with competitive consciousness while the social facet aligns with cooperative consciousness. Third, it adopts a person-centred perspective, asking whether meaningful engagement profiles exist among undergraduates — including a profile that attends without engaging — and whether sport format conditions the social pathway. Section 2 develops the hypotheses, Section 3 details the method, Sections 4 and 5 report and discuss the results, and Sections 6 and 7 draw implications and conclude.

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2. Literature Review and Hypotheses

2.1 Sport Participation and Psychosocial Development in Higher Education

The review of children and adolescents reports associations of sport participation with self-esteem, social interaction, and depressive symptoms [1]; its predominantly cross-sectional evidence limits causal interpretation. School-sport research reviews claimed benefits across physical, social, affective, and cognitive domains and emphasises context and delivery [2]. Research on positive youth development sharpens the caution: developmental gains arise through identifiable relational and experiential features of sport settings rather than through participation as such [12], and life-skill transfer requires experiences that make skills salient, practised, and discussed [3], [4]. At university age, motives for activity also diversify — appearance, stress relief, affiliation, and challenge coexist [13] — which further loosens any automatic link between showing up and developing. What these literatures jointly imply, and what attendance-based evaluation ignores, is that the developmental question is a quality question.

Higher education adds distinctive stakes to this general picture. Many systems require physical education credit in the early undergraduate years and fund extensive voluntary provision thereafter, so campus sport reaches students with widely differing motives and histories at a formative moment for professional dispositions. University students also exercise more discretion than school pupils over how they participate: within the same badminton class or intramural league, one student may rehearse tactics, seek feedback, and organise teammates while another completes the minutes with minimal investment. Discretion of this kind is precisely the condition under which quality measures should diverge from quantity measures, and it makes undergraduates a stringent test case for the attendance assumption: if quality and quantity dissociate anywhere, they should dissociate here.

2.2 From Attendance to Engagement Quality

School-engagement work distinguishes behavioural, emotional and cognitive investment [7] and agentic contributions [8], while critical reviews examine conceptual and measurement issues [9]. Higher education models add institutional and personal context [10]. Involvement theory draws attention to student investment in university experiences [14]. In sport, Curran et al. [11] examine confidence, dedication, enthusiasm, and vigour in adolescent soccer players, reporting associations with perceived coach climate. This construct provides context but is not identical to the four dimensions adopted here: behavioural effort and persistence; cognitive attention, strategy and skill focus; emotional enjoyment and absorption; and social interaction, assistance and communication. The adaptation requires evidence of measurement quality in the undergraduate setting. Attendance indexes exposure, while the four dimensions describe reported aspects of that experience.

Engagement is conceptually adjacent to, but distinct from, motivation: motives are reasons for acting, whereas engagement is the observable and experiential quality of action once underway [9]. The distinction

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matters methodologically. Measuring motives asks why students come to sport; measuring engagement asks what they do and experience once there, which is the proximal soil in which dispositional outcomes grow. The four-dimension operationalisation adopted here follows the mainstream tripartite structure [7] while separating a social dimension, for two reasons. First, the outcome of central interest — cooperative consciousness — is social in kind, so its most plausible experiential antecedent deserves independent measurement. Second, sport is among the most interactionally dense of curricular settings, and folding interaction into a generic behavioural score would discard exactly the variance this study needs to examine.

2.3 Competitive Consciousness

Competitiveness research distinguishes destructive, other-derogating forms from a personal-development orientation in which competition is valued as a vehicle for self-improvement [15], with trait measures capturing enjoyment of competition and desire to win [16]. The developmental status of competition itself is contested: meta-analytic evidence shows competition can either enhance or undermine performance and motivation depending on how it is structured [17], [18], and competition embedded in cooperative structures can support rather than corrode intrinsic motivation [19]. Self-determination theory explains the contingency: competitive situations feed adaptive striving when they carry competence information rather than ego threat [20], [21]. For undergraduates, then, sport should build competitive consciousness to the extent that they invest attention and effort in mastering performance under challenge — a cognitive and emotional matter — rather than to the extent that they are merely present while competition happens around them.

Treating competitive consciousness as an educational outcome also requires the construct to be malleable and worth cultivating, and both requirements find support. Competitiveness varies meaningfully with experience and context rather than behaving as fixed temperament, and its personal-development form — competing in order to learn and improve — predicts constructive achievement behaviour where hypercompetitive, other-diminishing forms do not [15]. Educationally, the goal is therefore not to maximise competitive appetite but to build a calibrated readiness: the disposition to enter evaluative situations willingly, read them as information-rich, and mobilise effort accordingly [18]. Sport experience plausibly trains exactly this reading when challenge is present and attended to, which is why the cognitive and emotional facets of engagement, rather than raw exposure to competition, anchor hypothesis H2a below.

2.4 Cooperative Consciousness

Social interdependence theory holds that perceiving one's goals as positively linked to others' goals generates promotive interaction — helping, encouraging, coordinating — and that repeated promotive interaction consolidates cooperative dispositions [5], [6]. Sport supplies dense opportunities for exactly this experience: cohesion research documents reliable task and social bonding in sport groups [22]; social identity processes in sport predict prosocial teammate behaviour [23]; and even nominally individual sports contain team-like environments whose collective dimension shapes members' experience [24]. Social support within sport further channels these processes toward wellbeing and persistence [25]. The implication for the present study is direct: cooperative consciousness should be cultivated chiefly through

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the social dimension of engagement — the actual interacting, assisting, and communicating a student does — and this pathway should be stronger where the sport format makes interdependence structural, as in team-based participation.

Cooperative consciousness, for its part, has risen steadily in the hierarchy of graduate attributes as workplaces organise around teams and projects, yet universities possess few curricular sites where cooperation is practised bodily, immediately, and with visible consequences. Sport is one of them: a mistimed pass or an uncovered position gives interdependence a feedback immediacy that classroom group work rarely matches [22]. What theory adds is the warning that this potential is realised through promotive interaction actually performed, not through membership as such [6]: a student can hold a roster place for a semester while interacting minimally. Hypothesis H2b therefore locates the cooperative pathway in measured social engagement rather than in team affiliation, and hypothesis H4 asks whether structural interdependence amplifies what that engagement teaches.

2.5 Engagement Profiles: A Person-Centred Complement

The regressions for H1 and H2 describe average associations between engagement dimensions and outcomes. A person-centred analysis instead groups individuals according to combinations of scores. Wang and Biddle [29] applied this approach to motivational measures in 2,510 participants aged 12 to 15 and identified five clusters. Their profiles were examined in relation to physical activity and physical self-worth, providing a methodological example rather than direct evidence for an undergraduate attendance-only group. The cited study [29] does not by itself establish that profiles with similar attendance must differ in competitive or cooperative consciousness. In the present setting, clustering can examine whether some students report ordinary attendance alongside low behavioural, cognitive, emotional, and social engagement. The stability and interpretation of any such group require assessment in the undergraduate sample.

The existence of such a profile would be more than a statistical curiosity. The life-skill transfer literature holds that developmental outcomes follow from experiences that are salient, practised, and reflected upon rather than from exposure as such [3], [4], and grounded-theory syntheses of positive youth development locate the active ingredients of sport in its relational and experiential features [12]. If a sizeable group of students accumulates exposure without those features, then the average associations estimated in variable-centred models will understate the gap between the best and the worst sport experiences a campus provides, and attendance records will actively conceal it. Compulsory physical education, which reaches students who did not choose sport and whose motives may be extrinsic or unformed [13], is the setting in which such a profile should be most common. Hypothesis H3 therefore predicts not only that profiles exist but that one of them combines typical attendance with low engagement and correspondingly low consciousness outcomes; the profile analysis in Section 4.3 tests that prediction, and the format moderation in Section 4.4 asks whether the setting in which engagement occurs conditions what it yields.

2.6 Hypotheses and Conceptual Model

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Four hypotheses follow. H1: engagement quality explains variance in both competitive and cooperative consciousness beyond demographics and weekly attendance, whose unique contribution is expected to be small. H2a: cognitive and emotional engagement are the strongest dimensional predictors of competitive consciousness. H2b: social engagement is the strongest dimensional predictor of cooperative consciousness. H3: undergraduates fall into distinct engagement profiles, including an attendance-only profile whose participation volume resembles that of engaged peers but whose consciousness outcomes are substantially lower. H4: sport format moderates the social-engagement pathway to cooperative consciousness, with a steeper slope for team-based participants. Figure 1 depicts the model.

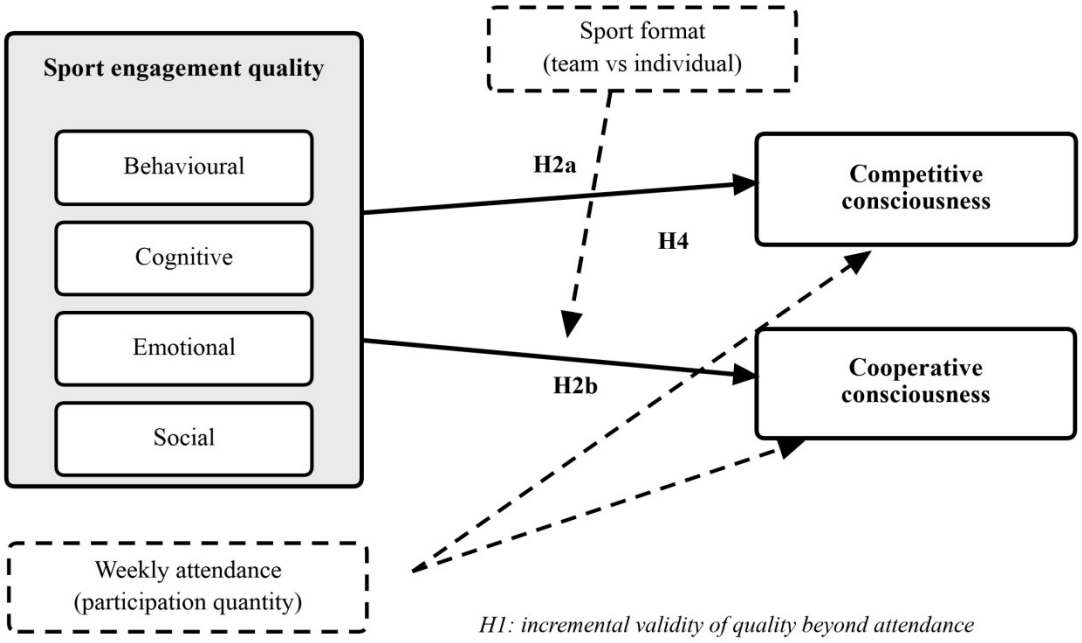


Figure 1. Hypothesised model linking sport engagement quality, attendance, and the two consciousness outcomes.

The model treats attendance not as a rival explanation to be dismissed but as the baseline against which quality must demonstrate incremental value, mirroring how institutions currently measure provision. Gender, year of study, and prior organised-sport experience are modelled as covariates throughout, since all three plausibly relate to both engagement and the outcome dispositions.

3. Methodology

3.1 Design and Participants

A cross-sectional survey was administered at three comprehensive universities between September and November 2024. Participants were recruited through required physical education classes and campus sport associations to capture the full range of involvement, from minimal to intensive. Of 540 questionnaires returned, 486 were valid after screening for completeness and patterned responding (90.0 percent). Table 1

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summarises the sample.

Characteristic	Category	n	%
Gender	Male	203	41.8
	Female	283	58.2
Year of study	First year	132	27.2
	Second year	146	30.0
	Third year	118	24.3
	Fourth year	90	18.5
Primary sport format	Team-based (e.g., basketball, football, volleyball)	199	40.9
	Individual (e.g., running, swimming, badminton singles)	171	35.2
	Mixed or no stable format	116	23.9
Weekly sport sessions	Fewer than 1	89	18.3
	1–2	168	34.6
	3–4	142	29.2
	5 or more	87	17.9

Table 1. Participant characteristics (N = 486)

The mean age was 19.8 years (SD = 1.3). Just under half of the sample reported prior organised-sport experience before university (46.5 percent), operationalised as at least one year of school-team or club membership. Weekly attendance averaged 4.6 hours (SD = 2.9), computed from reported session frequency and typical session duration.

Recruitment through both required classes and voluntary associations was deliberate: sampling only association members would truncate the low-engagement range, while sampling only required classes would under-represent intensive participants. The achieved distribution of weekly sessions in Table 1, spanning fewer-than-weekly to five-plus sessions, indicates that the strategy captured the intended breadth. Non-response was low and unrelated to gender or year of study insofar as class records allowed comparison, though self-selection on unmeasured variables cannot be ruled out in survey research of this kind.

3.2 Measures

Sport engagement quality was measured with sixteen items, four per dimension, adapted for the campus-sport context from the school engagement and athlete engagement traditions [7], [8], [11]. Behavioural items addressed effort and persistence within sessions (e.g., “I keep trying during practice even when a skill is difficult”); cognitive items addressed attention and deliberate strategy (e.g., “I think about how to improve specific aspects of my performance”); emotional items addressed enjoyment and absorption (e.g., “I often get so involved in the activity that time passes quickly”); social items addressed interaction and mutual assistance (e.g., “I encourage or help other students during sport activities”). Competitive consciousness was measured with eight items reflecting a personal-development orientation toward competition, adapted from established competitiveness instruments [15], [16] (e.g., “Competitive situations show me what I still need to improve”). Cooperative consciousness was measured with eight items

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grounded in social interdependence theory [6] (e.g., “When working toward a group goal, I adjust my role for the good of the whole”). All items used five-point agreement scales. Items were translated and back-translated by two bilingual researchers and piloted with 42 students, after which three items were reworded for clarity. Weekly attendance hours entered the models as the quantity indicator; gender, year of study, and prior organised-sport experience served as covariates.

Scale scores were computed as the mean of their items, so that all four engagement dimensions and both outcomes share the original one-to-five metric reported in Table 2; the standardised scores used for clustering and for the moderation analysis were derived from these means. The example items quoted above were chosen to illustrate each dimension's content boundary — behavioural items refer to effort and persistence but not to enjoyment, cognitive items to attention and strategy but not to interaction — because discriminant validity among the four dimensions is a precondition for the specificity hypotheses, and item wording that straddled dimensions would have blurred exactly the distinctions H2a and H2b require. Attendance hours, being the product of frequency and typical duration, were retained as a continuous variable rather than collapsed into the session bands used descriptively in Table 1.

3.3 Procedure and Ethics

Questionnaires were completed on paper during class sessions or online through an institutional survey platform, taking approximately twelve minutes. Participation was voluntary, unpaid, and anonymous; written informed consent was obtained, and students could withdraw at any point without consequence.

3.4 Analytical Strategy

Analyses proceeded in four stages. First, confirmatory factor analysis evaluated the four-dimension engagement structure using fit criteria [26], with composite reliability, average variance extracted, and the Fornell-Larcker criterion informing measurement assessment [27]. Harman's single-factor test was used as a limited diagnostic, not a control for common method bias [28]. Second, hierarchical regressions entered covariates, attendance hours, and then the four quality dimensions to examine H1 and H2. Third, k-means clustering on standardised quality scores examined H3; silhouette values and interpretability guided selection, and analysis of variance compared external variables. Fourth, moderated regression with mean-centred predictors examined H4. Analyses used SPSS 27 and R 4.3 with $p < .05$. Power for an increment of $\Delta R^2 = .02$ is not established by $N = 486$ alone; it also depends on the tested model and effect-size assumptions. Missing item responses were below one percent and handled by person-mean imputation within scales; cases missing an entire scale were excluded during screening.

Three analytical choices require interpretation. Entering covariates and attendance before the four quality dimensions makes the Step 3 increment conditional on those earlier blocks. Changing entry order reallocates shared explained variance; it does not by itself change the full-model fit on the same cases. Thus entry order does not prove that the reported contribution is unbiased or generally conservative. K-means was selected to describe configurations of

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observed quality scores. Silhouette values assess within-sample separation, while comparisons across random starts assess sensitivity to initialisation; neither establishes that discrete population types exist. Comparisons on attendance, the two outcomes, and participation setting describe associations with variables not used to form the clusters. They do not replace independent replication or establish developmental effects. Alternative cluster counts address a different question from repeated initialisations of a fixed count, so the stability criterion should be stated explicitly. Finally, the moderation analysis was restricted to participants with a stable primary sport format. Section 4.4 also reports alternative handling of the mixed-format group; this sensitivity claim requires the corresponding model specifications and outputs for verification.

4. Results

4.1 Measurement Checks and Preliminary Analyses

Reported fit was $\chi^2/df = 2.31$, CFI = .951, TLI = .942, RMSEA = .052 and SRMR = .043. Fit indices should be considered jointly under the relevant modelling conditions [26]. Composite reliability ranged from .82 to .90 and AVE from .51 to .62; each square-root AVE exceeded the corresponding inter-factor correlations [27]. Four factors fitted better than one or two (ΔCFI $\geq$ .06). The first unrotated factor accounted for 27.8 percent of variance. This result neither rules out common method bias nor measures its influence; a 40 percent rule is not established by the cited review [28]. Table 2 reports descriptive statistics, reliabilities, and correlations.

Variable	M	SD	α	1	2	3	4	5	6
1. Weekly attendance (hours)	4.60	2.90	—	—					
2. Behavioural engagement	3.41	0.72	.84	.38	—				
3. Cognitive engagement	3.28	0.75	.86	.27	.56	—			
4. Emotional engagement	3.62	0.79	.89	.31	.49	.53	—		
5. Social engagement	3.35	0.83	.82	.29	.44	.47	.51	—	
6. Competitive consciousness	3.54	0.68	.87	.21	.35	.38	.38	.29	—
7. Cooperative consciousness	3.71	0.64	.85	.14	.28	.32	.35	.52	.41

Table 2. Descriptive Statistics, Reliabilities and Correlations

The correlation pattern already tells the study's central story in miniature. Weekly attendance correlates only modestly with the outcomes (r = .21 with competitive and r = .14 with cooperative consciousness), whereas every quality dimension correlates more strongly, and the dimensional pattern foreshadows the hypothesised specificity: social engagement shows its largest association with cooperative consciousness (r = .52), while cognitive and emotional engagement show their largest associations with competitive consciousness (both r = .38).

Mean engagement scores ranged from 3.28 to 3.62 on the five-point scales. These descriptive means and reported correlations provide context for the associations the

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models describe. Emotional engagement had the highest reported mean and cognitive engagement the lowest; comparisons across these scales do not directly measure enjoyment relative to strategic thinking. Social engagement had the widest reported dispersion (SD = 0.83). The outcome means were 3.71 versus 3.54 for cooperative and competitive consciousness, respectively. Attendance was described as right-skewed. Means alone do not establish the absence of ceiling effects, and distributional adequacy requires the relevant diagnostics.

Covariate comparisons provide descriptive context. Men reported slightly higher competitive consciousness than women (d = 0.21) and lower cooperative consciousness (d = −0.12). Small observed differences do not establish representativeness of the pooled sample. Prior organised-sport experience was associated with higher attendance and engagement across the four dimensions (d = 0.19 to 0.28); these comparisons do not establish carry-over effects. No reliable year-of-study pattern was reported. The models included the three covariates, but adjustment does not remove every source of confounding. Similar coefficient patterns were reported in gender subgroups; their uncertainty and comparability require the subgroup outputs.

4.2 Incremental Validity of Engagement Quality (H1 and H2)

Table 3 reports covariate-block R^2 values of 6 percent for competitive and 4 percent for cooperative consciousness. Attendance added ΔR^2 = .04 and .02, followed by ΔR^2 = .16 and .20 for the four engagement dimensions; total R^2 was .26 in both models. These sequential increments depend on the specified entry order. The final attendance coefficient was β = .09 for competitive consciousness, marked significant in Table 3, and β = .05 for cooperative consciousness, marked non-significant. Table 3 does not report the earlier attendance coefficients, so the extent of coefficient shrinkage cannot be established from it. The correlation and regression summaries require reconciliation before H1 can be assessed conclusively.

Predictor	Competitive consciousness (β)	Cooperative consciousness (β)
Step 1: Gender (male = 1)	.08	−.06
Step 1: Year of study	−.03	.02
Step 1: Prior organised-sport experience	.10*	.05
Step 2: Weekly attendance hours	.09*	.05
Step 3: Behavioural engagement	.17**	.07
Step 3: Cognitive engagement	.21**	.12*
Step 3: Emotional engagement	.19**	.16**
Step 3: Social engagement	.08	.34**
R^2 after Step 1 (covariates)	.06**	.04**
ΔR^2 Step 2 (attendance)	.04**	.02**
ΔR^2 Step 3 (engagement quality)	.16**	.20**
Total R^2	.26	.26

Table 3. Hierarchical regression predicting the two consciousness outcomes (standardised coefficients from the final step; * p < .05, ** p < .01)

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For competitive consciousness, the reported coefficients were cognitive β = .21, emotional β = .19, behavioural β = .17, and social β = .08 (ns). For cooperative consciousness, social engagement had the largest reported coefficient (β = .34), followed by emotional (β = .16) and cognitive engagement (β = .12); behavioural engagement was non-significant. These rankings are descriptive. Tests against zero do not test differences between coefficients or across outcomes, and non-significance does not establish a zero contribution. The pattern therefore does not confirm distinct developmental mechanisms. Figure 2 depicts model-implied scores; the mapping from four dimensions to its engagement axis and the prediction settings are needed to reproduce the plotted values.

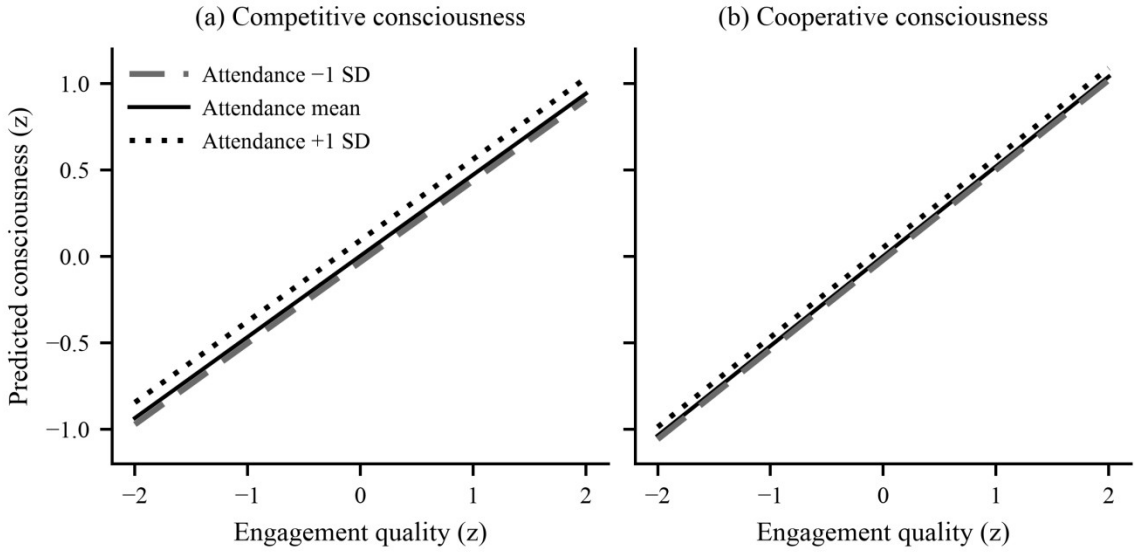


Figure 2. Model-Implied Consciousness Scores by Engagement and Attendance

Figure 2 displays model predictions, not changes caused by an intervention. Reproduction requires the engagement-score definition, covariate settings and prediction equations. Separation along the engagement axis and near-overlap of attendance lines do not establish developmental gains or programme benefits.

Two additional analyses were reported. A latent-variable model reportedly retained the coefficient pattern, with a larger combined engagement estimate and small attendance paths; bootstrap intervals using 5,000 resamples reportedly excluded zero for the quality coefficients marked significant in Table 3. Latent modelling addresses measurement error only under its specified measurement assumptions. A relative-importance analysis attributed 81 percent of explained cooperative variance and 74 percent of explained competitive variance to the four quality dimensions, with attendance shares of 11 and 17 percent respectively. These are shares of explained variance, not total outcome variance or causal effects. The model specification, decomposition method and complete outputs are needed to assess these additional analyses.

4.3 Engagement Profiles (H3)

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Two- to five-cluster k-means solutions were examined on the four standardised quality dimensions. A three-cluster solution was selected using silhouette value (.46) and interpretability. Consistency across random starts was reported; this is not independent replication. Figure 3 labels the groups high-quality engaged (n = 139, 28.6 percent), moderately engaged (n = 217, 44.7 percent), and attendance-only (n = 130, 26.7 percent).

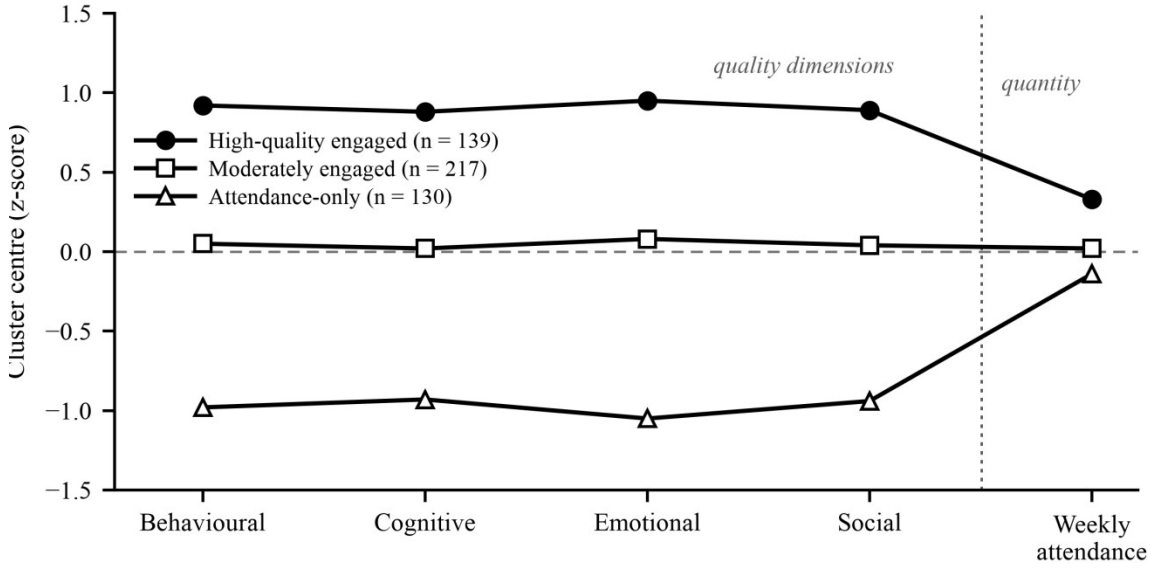


Figure 3. Engagement profile centres on the four quality dimensions and weekly attendance (z-scores)

The attendance-only group reported 4.1 versus 4.4 weekly hours in the moderately engaged group ($p = .24$). This non-significant comparison does not establish equivalent attendance or an inability to distinguish students from attendance records. The low-engagement cluster had centres nearly a standard deviation below the sample mean. Reported outcome comparisons were $F(2, 483) = 38.6$, $p < .001$, $\eta^2 = .138$ for competitive consciousness and $F(2, 483) = 47.2$, $p < .001$, $\eta^2 = .163$ for cooperative consciousness. Reported Tukey comparisons placed high-quality engaged students above attendance-only students, with $d = 0.94$ and $d = 1.08$ respectively; the moderately engaged group lay between them. These are between-group associations in concurrent self-reports, not developmental consequences. H3 remains a descriptive profile interpretation rather than a validated individual classification.

The attendance-only group contained a larger reported share of required-physical-education participants (61.5 percent, against 38.2 percent in the other two groups combined) and a smaller team-format share (29.2 percent, versus 46.0 percent among high-quality engaged students). Gender and year-of-study comparisons were not significant; this does not show demographic equivalence. The composition suggests an association between setting and profile membership, not that compulsory provision causes disengagement. Motivational-profile research [29] supplies context, but motives for attending and the effects of redesigning provision were not established by these comparisons. Selection, prior experience and other setting differences remain possible explanations.

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4.4 The Moderating Role of Sport Format (H4)

The stable-primary-format subsample (n = 370) yielded a reported social-engagement by sport-format interaction for cooperative consciousness ($\beta = .11$, $p = .014$, $\Delta R^2 = .012$). Simple slopes were b = 0.49 for team-based and b = 0.27 for individual-sport participants, both reported as significant. The competitive-consciousness interaction was $\beta = .04$, $p = .38$. Its non-significance does not establish absence of moderation. The contrast between these p-values does not itself test a difference between outcomes. Figure 4 illustrates conditional associations, not the causal effect of changing a participant's sport format.

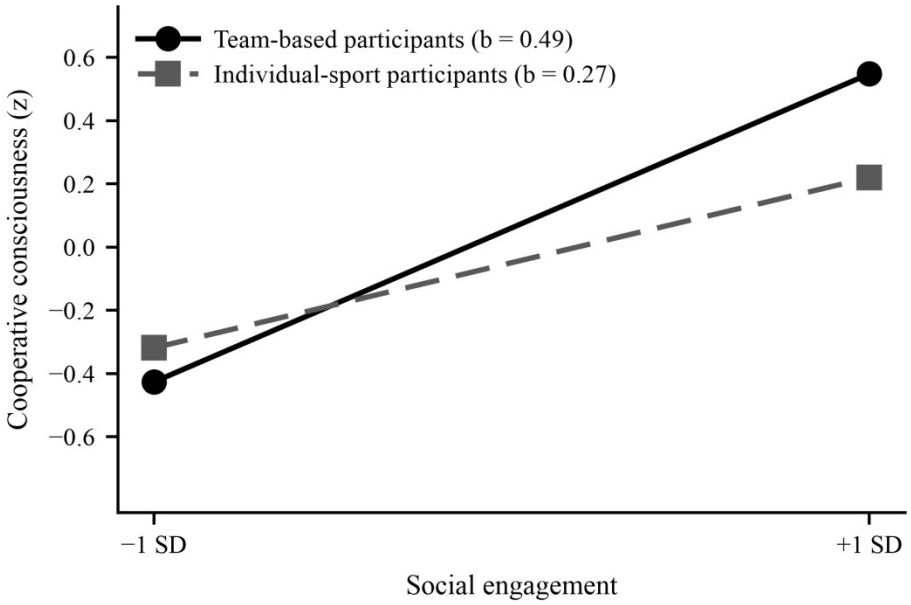


Figure 4. Simple slopes of social engagement on cooperative consciousness by primary sport format

Social interdependence theory offers a possible interpretation of the cooperative association [5], [6], but sport format is not a direct measure of the proposed psychological mechanism. The positive individual-sport slope is compatible with team-like experiences within individual sports [24]; it does not identify their effects. A format main effect was also reported, with higher cooperative consciousness among team-based participants (d = 0.24), alongside the interaction adjusted for the main effect and covariates. Alternative classification of the mixed-format group reportedly preserved the result. The corresponding specifications and outputs are needed to evaluate that sensitivity claim, and adjustment does not rule out selection or residual confounding.

4.5 Summary of Hypothesis Tests

Table 4 summarises the reported tests for the four hypotheses. Its provisional assessments distinguish descriptive patterns from causal claims and formal comparisons that were not reported. The analyses use overlapping observations and measures; they are not independent replications. The incremental-validity analysis

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(H1) describes sequential model fit; H2a and H2b concern coefficient patterns that require direct contrasts for ranking claims. H3 describes an analytically defined cluster, without establishing equivalent attendance or developmental loss. H4 concerns a conditional association with format. None of these results independently demonstrates change in students over time.

Hypothesis	Test	Key evidence	Verdict
H1: Engagement quality explains variance beyond demographics and attendance	Hierarchical regression (Table 3)	ΔR^2 attendance = .04 / .02; ΔR^2 quality = .16 / .20; attendance β = .09 (significant) / .05 (ns)	Provisional
H2a: Cognitive and emotional engagement are the strongest predictors of competitive consciousness	Final-step coefficients (Table 3)	Cognitive β = .21, emotional β = .19, behavioural β = .17; social β = .08 (ns)	Provisional
H2b: Social engagement is the strongest predictor of cooperative consciousness	Final-step coefficients (Table 3)	Social β = .34; emotional β = .16, cognitive β = .12; behavioural ns	Provisional
H3: An attendance-only profile combines typical attendance with low engagement and low outcomes	K-means clustering; ANOVA with Tukey tests (Figure 3)	Attendance-only n = 130 (26.7%); 4.1 vs 4.4 weekly hours (p = .24); d = 0.94 and 1.08 versus high-quality engaged	Provisional
H4: Sport format moderates the social pathway to cooperative consciousness	Moderated regression, n = 370 (Figure 4)	Interaction β = .11, p = .014, ΔR^2 = .012; slopes b = 0.49 (team) vs 0.27 (individual); interaction ns for competitive consciousness	Provisional

Table 4. Summary of hypotheses, tests, and evidence (statistics as reported in Sections 4.2–4.4)

5. Discussion

The reported analyses describe associations between engagement and the two outcomes. Engagement quality added sixteen to twenty percentage points of sequential explained variance (H1); cognitive and emotional coefficients were largest for competitive consciousness, and the social coefficient was largest for cooperation (H2a, H2b). The low-engagement cluster had lower outcome scores (H3), and the cooperative association was steeper in team formats (H4). These patterns require the measurement, numerical-reconciliation and comparison qualifications above. They do not jointly establish causal mechanisms, equivalent attendance, or a programme effect.

5.1 Quality Explains What Quantity Cannot

Attendance added at most four percent of outcome variance in the reported entry sequence, and engagement quality subsequently added sixteen to twenty percent. Ratios of these increments are roughly four to one for competitive and ten to one for cooperative consciousness, but they depend on entry order and on comparing a block of four dimensions with one attendance variable. They are not ratios of causal importance or developmental benefit. Involvement theory [14] motivates considering student investment alongside participation. The life-skills literature also distinguishes exposure from transfer [3], [12]. These perspectives suggest questions for longitudinal evaluation; the present estimates describe concurrent associations. Comparisons with

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engagement research in academic settings [7], [10] require attention to differences in constructs, populations and analysis. The reported campus-sport associations do not establish that a quality measure generally outperforms attendance in other settings. Attendance remains a measure of exposure, while engagement describes reported experience. A programme evaluation should also measure the intended outcomes and changes over time. These data do not show that all development occurs through the engagement dimensions used here.

Two qualifications matter. Entry order allocates shared explained variance, while the change in one coefficient is not itself a decomposition of that variance. Earlier-step attendance coefficients are not shown in Table 3, so their shrinkage cannot be quantified from the table. The reported final R^2 of .26 leaves most variation unexplained, but it does not identify the causes of the remainder. The correlation and regression summaries also require reconciliation. Neither the reported increment nor the coefficient ranking identifies a developmental signal or a causal contribution.

5.2 Dimensional Specificity and Its Mechanisms

The dimensional pattern does not strengthen a causal reading by itself. Competitive consciousness was associated with cognitive and emotional engagement, which can be considered alongside self-determination accounts of competence and motivation [20], [19]. The smaller, non-significant social coefficient does not establish no association or prove a difference from the other coefficients. Likewise, the largest reported cooperative coefficient does not establish a distinct causal pathway. Sport-development and motivational theories [2], [23] offer candidate explanations that require direct measurement and temporal evidence. Keeping dimensions separate may help describe patterns, but the present analysis does not show which developmental process a programme operates or whether a single composite has inferior predictive performance.
Behavioural engagement was significant in the competitive model and non-significant in the cooperative model. This difference in significance does not itself establish that its associations differ across outcomes. The same caution applies to social engagement. Direct coefficient contrasts, their uncertainty and an appropriate model would be needed to examine specificity. Challenge, effort and social interaction can be considered as candidate design features, but these regressions do not show that they form dispositions through separable mechanisms. Recommendations about combining them should be tested against measured outcomes in subsequent evaluations.

5.3 The Attendance Illusion

The profile analysis describes a low-engagement cluster comprising more than a quarter of the sample. Its outcome scores were lower than those of the high-quality engaged group, but these are concurrent differences. The non-significant attendance comparison does not establish identical participation or show that development failed to occur. A cluster centre does not locate every member in the lowest decile. Motivational-profile research [29] motivates examining variation in experience, but the present grouping neither diagnoses individuals nor establishes programme failure. Possible evaluation responses include

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measuring engagement alongside participation records and reviewing what experiences programmes offer. A four- to eight-item pulse administered twice a semester is a proposal, not a short form validated by this study. Item selection, reliability, construct coverage, responsiveness and classification performance would require separate evaluation. The study also does not establish implementation cost or that a short form reproduces these clusters. Attendance, engagement and outcome measures should retain their distinct meanings. An engagement score should not be converted automatically into a quality-adjusted attendance metric or used as proof that a programme produced developmental benefits.

5.4 Theoretical Implications

The reported factor and coefficient patterns motivate further work on multidimensional engagement in campus sport. The behavioural, cognitive and emotional distinction [7] provides a starting point, while the social dimension may describe experiences not fully captured by the other scales. Reported correlations and factor fit do not establish that the construct transferred unchanged across populations, nor that the social scale is equivalent across sport formats. Higher-education perspectives [10], [9] emphasise contextual and relational features, and work on agentic engagement [8] illustrates another possible dimension. These frameworks do not settle the status of the present social dimension. Comparing alternative measurement models, examining item content and testing invariance would help distinguish a separate construct from contextual expressions of existing dimensions. Predictive value should be assessed with appropriate comparisons and independent data before selecting a composite or separate scales for practical use.

Social interdependence theory [5], [6] offers a candidate explanation for the larger cooperative slope in team-based sport. The reported interaction concerns sport format, however, and does not directly test whether experienced goal interdependence mediates an association with dispositions. Students may select formats for reasons also related to engagement and outcomes, and formats can differ in coaching, access and prior experience. A positive association among individual-sport participants is compatible with team-like settings [24], but is not evidence that such settings caused their scores. The mechanism would need direct measures of interdependence, an explicit identification strategy and evidence about temporal ordering. Programme changes that alter coordination demands could be evaluated, but the present cross-sectional comparison does not estimate the benefit of those changes.

Accounts of competitiveness [15], [17] provide hypotheses about mastery-relevant experience and competitive orientation. The observed cognitive and emotional coefficients can be discussed alongside self-determination theory [20], [21], but the study cannot determine whether experience shaped dispositions, dispositions shaped engagement, or both reflect other influences. A non-significant social coefficient does not exclude sociability as relevant. The opposing-processes account suggests that the same

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situation may involve approach or avoidance [18], while competition within cooperative structures has been studied in relation to motivation [19]. These perspectives motivate tests of how challenge is framed; they do not establish trainability of the present outcomes. Claims about sport and character [2] or transfer [3], [4] need evidence of change and application beyond the activity. The attendance-only cluster identifies lower concurrent scores, not a subgroup in which transfer has been shown to fail. Whether programmes can alter those experiences and subsequent outcomes remains a question for follow-up research.

6. Implications and Limitations

6.1 Practical Implications

Three directions for evaluation follow from the reported associations. First, programmes could examine activities intended to engage attention, emotion and social interaction, such as small-sided games, stable rosters, explicit skill goals and reflection. Literature on deliberately structured sport and transfer [4], [3] provides a rationale for evaluating such designs, not proof of their effects in this sample. Second, engagement questionnaires could complement attendance records if their validity and practical burden are assessed in the intended setting. The present clustering does not establish early detection accuracy or individual diagnostic thresholds. Third, intervention designs could specify the outcomes they aim to influence. Interdependence and teamwork proposals [22], [6], and challenge framing or feedback proposals [11], [21], should be tested with appropriate outcome measures. A short pulse embedded in registration is one possible delivery method, but shortening or adapting the present measures requires further validation. No costs, implementation effects or improvement after redesign were estimated here. Required physical education can be investigated as a setting associated with profile membership without assuming that attendance requirements cause low engagement. Decisions should also consider access, participation barriers and students' accounts of their experiences.

Evaluation can consider sessions, programmes and institutional reporting together. At session level, tactical questions, sustained activity and partner-dependent tasks could be examined as ways to encourage different experiences. Their effects on engagement and subsequent outcomes should be measured rather than assumed. At programme level, team and individual options, roster continuity and feedback practices may shape opportunities, but their benefits also depend on access, student preferences and implementation. At institutional level, attendance can describe reach and engagement measures can add information about reported experience. Neither replaces direct assessment of the outcomes a programme claims to improve. Coordinating these levels is a design proposal, not a comparison tested by this survey. A programme might collect richer information without improving experiences, while a useful activity might be missed by an insensitive measure. An evaluation therefore needs evidence about both delivery and outcomes, rather than assuming that a new metric will

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produce the intended developmental change.

6.2 Implications for Institutional Evaluation

The distinction between participation and outcomes may also be relevant to orientation, mentoring, service learning and student societies. Application beyond campus sport requires evidence about the constructs and settings concerned. A brief engagement measure could be considered alongside attendance, but its adaptation, validity and sensitivity to change need evaluation. Reported participation and engagement should remain separate indicators unless a defensible combination has been developed. The study does not establish that an institution reaching fewer, highly engaged students is more effective than one reaching more students with lower scores. Comparisons would need attention to access, case mix, programme objectives and measured outcomes. Infrastructure, staff time, privacy arrangements and student burden are implementation requirements to assess, not costs shown to be negligible by this survey. A monitoring system should support evaluation without treating engagement scores as demonstrated developmental gains.

Two cautions accompany these proposals. First, self-reported engagement should inform programme evaluation with attention to response bias. Attaching credit or sanctions may alter responses, and the current design has not ruled out common method bias [28]. Use for individual assessment would require a separate evaluation of the instrument and its consequences. Second, an association between engagement and these outcomes does not establish engagement as a causal mediator or a substitute for measuring developmental change. Evaluation should assess the intended outcomes and reconsider the associations as cohorts, formats, and delivery modes change. Involvement theory [14] motivates attention to student investment, but participation volume and reported engagement remain distinct descriptive measures whose educational meaning requires evidence.

6.3 Limitations and Future Research

Five limitations bound the conclusions. The design is cross-sectional, so directional paths are theoretical: existing competitive or cooperative dispositions may influence engagement, reciprocal relations are possible, and temporal order is not established. All constructs were self-reported; Harman's test and discriminant-validity checks do not exclude common method bias [28]. Behavioural observation and independent measurement sources would strengthen future work. The multi-site convenience sample came from one national higher education system, limiting generalisation; sample size alone does not establish adequate power for every analysis. Attendance was self-reported rather than logged, introducing measurement error whose direction and magnitude cannot be inferred here. Finally, unmeasured motivational regulation, instructor behaviour, and peer composition may relate to engagement and outcomes [10], [25]. Longitudinal panels and interventions that vary session design could examine temporal ordering and possible change. Repeated measurements could also test the stability of the attendance-only profile. Cross-cultural replication is needed because meanings and sport provision vary across systems. Future studies should pair self-reports with objective

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participation records from facility entry systems and with qualitative accounts from attendance-only students themselves, whose experience of being present without being engaged — and of what would change that — is the missing voice in the present design.

K-means clustering divides a continuous score space whether or not the population contains discrete types. The attendance-only label should therefore describe the reported low-engagement region, not a natural category or individual diagnosis. Outcome differences and associations with setting do not validate its boundaries or establish their practical consequences. Students near a boundary may be assigned differently under small changes in measurement or specification; this is not evidence that an intervention would move them into a more favourable group. Alternative clustering and latent-profile models could examine sensitivity to modelling assumptions, but neither method proves that natural types exist. Repeated measurements and independent samples would help assess stability, classification uncertainty and possible change.

7. Conclusion

This cross-sectional survey of 486 undergraduates describes associations among attendance, engagement quality, and competitive and cooperative consciousness. Reported models attributed larger sequential increments to the four quality dimensions than to attendance, and the cluster and format analyses described further variation. These results do not establish that sport produced the dispositions, that low-engagement students failed to develop, or that changing engagement or format would improve outcomes. Coefficient rankings need direct comparisons, non-significant attendance differences do not establish equivalence, and the correlation and regression summaries require numerical reconciliation. The practical implication is to evaluate participation, experience and outcomes as distinct constructs. Engagement measures may add descriptive information to attendance records, but their use in programme assessment requires validation and attention to uncertainty. Longitudinal and intervention evidence is needed to assess developmental claims.

The study brings incremental model fit, dimensional patterns, engagement profiles and format interactions into one undergraduate survey. These analyses offer hypotheses and measurement questions, rather than independent demonstrations of a developmental process. The feasibility and accuracy of shorter routine instruments were not evaluated, and a low-engagement cluster is not a count of students for whom a programme has failed. Further work should reconcile the reported statistics, document reproducible model specifications, assess measurement comparability and examine subsequent outcomes. Institutions considering engagement measures should evaluate their usefulness alongside participation access, practical burden and the outcomes they aim to support.

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Author Contributions

X.G.: Writing – Original Draft Preparation; Writing – Review & Editing; Investigation; Data Curation. S.P.W.: Supervision; Funding Acquisition; Methodology

Conflict of Interest

The authors declare no conflict of interest.

Generative AI Statement

The original manuscript reported AI use only for minor language polishing, with no research content, data or interpretation generated. Later editorial revisions used AI to check sources and clarify methods. No new data were generated or analyses rerun.

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