Validation of a Scale to Evaluate Group Cohesion in thePhysical Education Area in Secondary School Students

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Abstract

Group cohesion is widely recognised as a critical factor for achieving the objectives set within a work group, serving both as a primary enabler and a potential obstacle to the group processes that shape behaviour. Consequently, this study aimed to examine the factor structure, reliability, and validity of an instrument designed to assess group cohesion among students in Physical Education classes. The sample comprised 306 students from Compulsory Secondary Education in public schools in southwestern Spain. Both exploratory and confirmatory factor analyses were conducted to assess the instrument's structure. The results indicated a unifactorial structure consisting of nine items, demonstrating high reliability (Cronbach's alpha = 0.93) and excellent goodness-of-fit indices. Thus, this instrument can be considered a quick and efficient tool for evaluating group cohesion among students in Physical Education settings, providing valuable insights for stakeholders aiming to foster cohesive group dynamics.

Keywords: Physical Education, Group Cohesion, Secondary School, Validation, Instrument.

Introduction

The concept of group cohesion (GC) has long captivated researchers (Cota, Dion, & Evans, 1993) and is recognised as essential for forming effective work teams. GC can be fostered through a cooperative, values-oriented approach to Physical Education (PE) in classrooms (Nadal & Salvia, 2011). It is a critical factor in skill development (Bollen & Hoyle, 1990), teamwork enhancement (Barrasa & Gil, 2004; Griffin & Pennscott, 1991), and various group dynamics (Evans & Jarvis, 1980). Over time, GC has evolved from a simple concept into a complex, multifaceted construct relevant to diverse social contexts (Beal et al., 2003; Chang & Bordia, 2001). The most widely accepted definition is Carron, Brawley, and Widmeyer's (Carron, Widmeyer, & Brawley, 1989), which characterises GC as a dynamic process wherein a group's inclination to remain united serves both instrumental and emotional needs (Nadal & Salvia, 2011). Nonetheless, defining and measuring GC remains contentious (Albert, 1953; Beeber & Schmitt, 1986; Budge, 1981; Dion & Evans, 1992; Enoch & McLemore, 1967; Hogg, 1992; Mudrack, 1989), with debates centred on its structural dimensions (Cota et al., 1993). Factors influencing GC include interaction frequency, external environment, exclusivity, homogeneity, maturity, clarity of goals, and success (Nadal & Salvia, 2011).

Numerous studies demonstrate the impact of cohesiveness on group and team performance (Beal et al., 2003; Chang & Bordia, 2001; Cohen & Bailey, 1997; Gully, Devine, & Whitney, 1995; Mullen, 1994), though limited research has examined the underlying causes of GC (Kozlowski & Ilgen, 2006). Studies typically focus on factors such as member diversity, group size (Carron & Brawley, 2000), and personality traits (Barrick et al., 1998). The significance of group interaction in shaping outcomes also varies by theoretical framework (Scandroglio, Martínez, & Sebastián, 2008), and GC evolves as groups move from task-oriented to socially cohesive phases (Carron & Brawley, 2000). Research indicates that open communication and frequent interactions promote social cohesion and learning (Briones Pérez & Tabernero Urbieta, 2005; Jackson, May, & Whitney, 1995; Sosik, 1999). Cohesion fosters benefits like improved learning, satisfaction, productivity, and interpersonal relationships, especially among youth (Carron & Dennis, 2001; Nadal & Salvia, 2011; Stockton, Rohde, & Haughey, 1992). For adolescents, small-group experiences are crucial, as peer influence shapes behaviour and identity (Glass & Benshoff, 2002; Sprinthall & Collins, 1988). Social psychology has explored cohesion's role across various group dynamics, from task performance (Bakeman & Helmreich, 1975) to communication (Festinger, Schachter, & Back, 1950), highlighting issues such as definitional validity and

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measurement challenges (Kivlighan Jr & Lilly, 1997). Finally, GC often requires cooperative, communicative, and team-oriented skills (Harris et al., 1993).

In response to the lack of robust tools to measure GC or connectedness in educational and workplace settings, various scientific studies have developed and validated specific assessment scales. For instance, Fraser (1982) created the Learning Environment Inventory (LEI), which includes a subscale to measure GC in classrooms. Similarly, Brawley, Carron and Widmeyer (1987) introduced the Group Environment Questionnaire, specifically for assessing cohesion in sports teams. Roberts (1995) also developed the Students' Sense of School as a Community Questionnaire, focusing on two dimensions: supportive interpersonal relationships and learner autonomy. Despite their contributions, these instruments face limitations in initial validations due to sample size constraints, suboptimal goodness-of-fit indices, or excessive item numbers. Consequently, the Group Cohesion Evaluation Questionnaire (GCEQ) was developed (Glass & Benshoff, 2002), designed to evaluate group cooperation and the impact of activities on GC within challenge courses. The GCEQ was informed by tools such as the Collective Attitudes Scale (Evans & Jarvis, 1986), the Family Reporting Inventory (Beavers, Hampson, & Hulgus, 1985), and the Scales for Assessing Family Cohesion and Adaptability (Olson, Portner, & Lavee, 2013). It has since demonstrated excellent reliability and validity in psychometric evaluations. Recognising the need for methodologically sound tools to assess GC in educational settings, this study aims to examine the psychometric properties, reliability, and validity of a questionnaire designed to measure GC specifically within PE among Compulsory Secondary Education students in public schools in Southwest Spain.

Methodology

Participants

The sample for this research comprised 306 Compulsory Secondary Education students from public schools in Southwest Spain.

Table 1

The Individuals' Sociodemographic Characteristics (N = 306)

Variables	Categories	N	%
Gender	Men	128	41.8
	Women	178	58.2
Age	12	92	30.1
	13	172	56.2
	14	40	13.1
	15	2	0.7
Academic Year	First Grade	145	47.4
	Second Grade	138	45.1
	Third Grade	23	7.5

N: Number; %: Percentage.

Instruments

To characterise the study sample, a preliminary questionnaire included three sociodemographic questions on gender, age, and academic year. Additionally, the GCEQ was employed, initially constructed with 16 items based on previous research and question formats. However, considering the age of participants, it was determined that a more concise format would enhance comprehension and ease of completion (Glass & Benshoff, 2002). Thus, a simplified version with nine items, represented in a single dimension, was used: (1) We get along well together; (2) We feel good about our team; (3) We enjoy helping each other; (4) We stick together during challenges; (5) I feel like my group will keep me safe; (6) We encourage each other in challenges; (7) I feel like I fit in my group; (8) I want to work on more challenges with my group; and (9) We help each other on the challenges. Responses were measured on a Likert scale from 1 ("Not at all like me/my group") to 4 ("Exactly like me/my group"), with the original authors reporting high internal consistency (Cronbach's alpha = 0.91).

Procedure

Using the Department of Education and Employment's list

of educational institutions in Junta de Extremadura (n.d.) (accessed April 4, 2022), all schools offering compulsory secondary education were initially selected. Each school director received an email outlining the study's objectives, with an informed parental consent form attached. Schools opting to participate required parental consent, with PE teachers designated to collect signed forms. The research team arranged school visits to administer the questionnaire, created via Google Forms, which included the GCEQ scale and sociodemographic items. An electronic format was chosen for ease of dissemination, faster data collection, and centralised response storage. A research team member provided access to the questionnaire URL on a tablet, reading items aloud to ensure comprehension before students completed it. Data collection adhered to the ethical guidelines of the Declaration of Helsinki, with anonymity assured. The survey took an average of five minutes, collected between September 2022 and January 2023, with response rates of 4.42%, 4.21%, and 0.70% for first, second, and third graders, respectively. Due to prior administration by the study team and PE teachers, the legitimate response rate reached 100%.

Statistical Analysis

The exploratory factor analysis (EFA) was conducted using FACTOR v.10.10.02 (Rovira I Virgili University, Tarragona, Spain), appropriate for ordinal data collected with a 4-point Likert scale. The robust unweighted least squares (RULS) method with Promin rotation (Lorenzo-Seva & Ferrando, 2019) was applied to extract factors, assuming inter-dimensional correlation. A polychoric correlation matrix was used to assess data properties, while parallel analysis established the correct number of dimensions (Lim & Jahng, 2019). Sampling adequacy was tested via the Kaiser-Meyer-Olkin (KMO) measure and Bartlett's test of sphericity (Shrestha, 2021). Confirmatory factor analysis (CFA) was then performed using AMOS v.26.0.0 (IBM Corporation, Wexford, PA, USA), with items removed if they exhibited cross-loadings above 0.40, communalities below 0.30, or factor loadings below 0.60. Model fit was evaluated with chi-squared probability ($p > 0.05$) and several indices: the comparative fit index (CFI), non-normed fit index (NFI), root mean square error of approximation (RMSEA), root mean square of residuals (RMSR), chi-square per degree of freedom ratio (CMIN/DF), and RMSEA (Marcoulides, 1990). Finally, reliability was assessed using Cronbach's alpha and McDonald's omega coefficients (Perry et al., 2015).

Results

Table 2 provides a comprehensive overview of the descriptive statistics for each survey response, offering insights into the central tendency and variability of the data collected. By employing explained variance derived from eigenvalues, the RULS technique successfully identified a unifactorial structure for the survey, as illustrated in Table 3. This unifactorial structure aligns with the findings of Steger (2006), reinforcing the validity of the measurement instrument. Additionally, the analysis included an examination of the reliability of the predicted a posteriori ratings, drawing comparisons to the research conducted by Zitzmann and Helm (2021). This multifaceted approach not only enhances the understanding of the survey's structural integrity but also contributes to the broader discourse on measurement reliability within the field.

Table 2

Descriptive Statistics of the Scale

Items	Mean	SD	Variance
1. We get along well together	3.30	0.82	0.67
2. We feel good about our team	3.35	0.81	0.66
3. We enjoy helping each other	3.43	0.72	0.52
4. We stick together during the challenges	3.09	0.89	0.79
5. I feel like my group will keep me safe	2.97	0.99	0.98
6. We encourage each other in the challenges	3.03	0.99	0.99
7. I feel like I fit in my group	3.33	0.94	0.88
8. I want to work on more challenges with my group	3.41	0.87	0.75
9. We help each other on the challenges	3.15	0.91	0.84

Note: SD = Standard Deviation. Each score obtained is based on a Likert scale (1–4): 1 is "Not at all like me/my group" and 4 "Exactly like me/my group".

Table 3

EAP Reliability, Variance Proportion, and Explained Variance Based on Eigenvalues

Variables	Proportion of Variance	Eigenvalue	EAP Reliability
1	0.73	6.57	
2	0.06	0.59	
3	0.05	0.47	
4	0.04	0.39	
5	0.03	0.32	0.957
6	0.02	0.23	
7	0.02	0.19	
8	0.01	0.12	
9	0.01	0.07	

Given the one-dimensional nature of the data, no rotation mechanism was applied. The sampling adequacy indicators yielded satisfactory results, with a KMO test value of 0.897 and a Bartlett's test result of 2755.3 (df = 36; p = 0.000), indicating the suitability of conducting EFA. The loading matrix, which delineates the relationships among the nine elements and the single factor, is presented in Table 4. The EFA resulted in a one-factor, nine-item structure, as no problematic items were identified. The polychoric correlation matrix, which illustrates the structural relationships within the questionnaire, is presented in Table 5.

Table 4

Loadings of Factors Taken from the EFA

Items	Factor Loads
1. We get along well together	0.847
2. We feel good about our team	0.884
3. We enjoy helping each other	0.799
4. We stick together during the challenges	0.880
5. I feel like my group will keep me safe	0.840
6. We encourage each other in the challenges	0.742
7. I feel like I fit in my group	0.863
8. I want to work on more challenges with my group	0.787
9. We help each other on the challenges	0.866

Table 5

Polychoric Correlation Matrix

Items	1	2	3	4	5	6	7	8	9
1	1								
2	0.874	1							
3	0.645	0.682	1						
4	0.778	0.734	0.720	1					
5	0.729	0.747	0.707	0.759	1				
6	0.592	0.552	0.575	0.698	0.671	1			
7	0.652	0.752	0.687	0.730	0.769	0.660	1		
8	0.660	0.794	0.629	0.648	0.573	0.548	0.710	1	
9	0.699	0.714	0.714	0.769	0.646	0.723	0.781	0.719	1

Following the completion of the EFA and the establishment of the scale's structure, CFA was conducted to assess the properties of the model, as illustrated in Figure 1. The final structure of the questionnaire, consisting of nine items within a single dimension, is depicted in Figure 1. The numerical values presented in the figure represent the correlations among exogenous variables, the squared multiple correlations for each variable, the inter-factor correlations, and the standardised regression weights, arranged from left to right. Subsequent

to the confirmatory factor analyses, the goodness-of-fit indices of the instrument, as outlined in Table 6, indicated a strong fit between the data and the model, in accordance with the standards set by Bone, Sharma and Shimp (1989). The non-significant chi-squared probability values suggested an excellent model fit. The CMIN/DF index, which is required to be less than 2 for satisfactory model fit, also yielded commendable results. Additionally, the root mean square residual was reported at less than 0.08, indicating accuracy, while the root means square error of approximation fell within the acceptable range of 0.010 to 0.050. Finally, the normed non-centrality fit index and the comparative fit index values, both exceeding 0.9, further confirmed the model's excellent fit. The reliability indices for the questionnaire dimension presented in Table 7 were calculated using Cronbach's alpha, McDonald's omega, and the explained variance. The Cronbach's alpha and McDonald's omega values were considered outstanding, as both exceeded 0.9, in line with the criteria established by Nunally and Bernstein (1994). Additionally, the explained variance (residual values) represented the proportion of variance in the responses attributed to the model dimension rather than to random error.

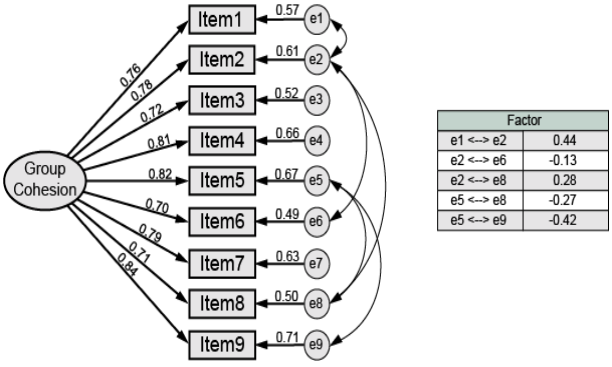

***Figure 1*:** Factor Structure of the Instrument.

Table 6

Questionnaire Goodness-of-Fit Indices

Indices	Value
P (χ^2)	0.284
CMIN/DF	1.977
RMSEA	0.482
RMSR	0.020
NFI	0.973
CFI	0.984

Table 7

Questionnaire Reliability

Indicator	Value
Cronbach's Alpha	0.927
McDonald's Omega	0.928
Explained Variance	6.576

Discussion

This research addresses the need for tools in the educational context that facilitate the analysis of group cohesion among school groups. The study investigated the psychometric properties, reliability, and validity of a scale designed to assess students' perceptions of group cohesion in the context of physical education in public schools in Southwest Spain that offer Compulsory Secondary Education. Confirmatory factor analysis revealed a single-factor model consisting of nine items with excellent goodness-of-fit indices. Additionally, the internal consistency results were remarkable, with both Cronbach's alpha and McDonald's omega exceeding 0.92, surpassing the values obtained in the initial validation (Glass & Benshoff, 2002).

In recent years, numerous studies have emerged focused on the validation of tools for analysing group cohesion in the realm of physical education. For instance, Martin et al. validated the Child Sport Cohesion Questionnaire with a sample of 290 primary school children, revealing a two-dimensional structure in which 14 items were distributed (Martin et al., 2013). Despite the positive results, the limited sample size and the exclusive selection of participants who regularly competed on sports teams render the study less applicable to the broader context of physical education. More recently, Leo and colleagues (Leo et al., 2023) validated the Spanish version of the Class Cohesion Questionnaire for both primary and secondary students, employing a substantial sample of 1,504 students and developing a reduced version of the scale. While the methodology yielded commendable results, some items from the initial validation exhibited notably low factor loadings. Similarly, (Eys et al., 2009) developed and validated the Youth Sport Environment Questionnaire, aimed at assessing cohesion among young athletes. This tool was created through a four-phase process involving independent samples of secondary education students participating in extracurricular sports teams, resulting in a bifactorial structure of 16 items. Although the extracted values for internal consistency and factor loadings were positive, the goodness-of-fit indices revealed certain limitations, likely stemming from issues related to the wording and comprehension of specific items, as acknowledged by the authors in their manuscript.

Conversely, adaptations of these questionnaires in various educational and sports contexts have yielded mixed results. Bosselut et al. (2018) adapted the Group Environment Questionnaire for French university classrooms, resulting in a factorial structure comprising four dimensions and encompassing 16 items. Similarly, Ruiz-Robledillo et al.

(2023) translated this questionnaire into Spanish and tested it with a sample of 309 university students from the Autonomous Community of Valencia, Spain. While both exploratory and confirmatory factor analyses indicated good internal consistency values, the goodness-of-fit indices were at the threshold defined by the scientific literature, likely due to the small sample size. This research revealed noteworthy invariance values across different university samples; however, no confirmatory factor analysis was conducted to ascertain the optimal model for the questionnaire. Additionally, Heuzé and Fontayne (2002) adapted and validated the Group Environment Questionnaire in French across various groups of professional athletes, resulting in a structure of 18 items distributed across four factors with acceptable goodness-of-fit indices. Nevertheless, some factor loadings fell below 0.6, potentially due to low eigenvalues obtained in two dimensions as a result of the limited sample size used in the analysis. Furthermore, Estabrooks and Carron (2000) developed and validated the Physical Activity Group Environment Questionnaire for different groups of elderly individuals participating in physical activity classes. This scale comprised 21 items categorized into four factors, demonstrating excellent goodness-of-fit and internal consistency values, despite the fact that the sample sizes in the various studies rarely exceeded 200 participants.

Restrictions and Upcoming Lines

Like any research, this study has several limitations that must be acknowledged. Firstly, the participants were exclusively drawn from Compulsory Secondary Education, which limits the representation of Primary Education students, where physical education and its potential benefits are particularly significant. Furthermore, there have been no validations of the Group Cohesion Environment Questionnaire in the scientific literature since the initial manuscript, preventing a comparison of our results with previous studies or consideration of issues encountered with specific target populations. Additionally, all participants were located in the Southwest of Spain, introducing social and cultural variables that may influence the results. Future research should aim to include students from the primary education sector in validation studies and expand analyses to encompass all regions of Spain, as the physical education curriculum may differ across locations. Moreover, it is essential for future studies to explore the variables identified as facilitators and/or barriers to group cohesion to gain a comprehensive understanding of the current state of group cohesion in Spanish classrooms, enabling the design and implementation of effective improvement strategies.

Conclusion

This study examined the reliability and validity of an instrument designed to evaluate group cohesion among secondary education students in physical education classrooms in the Southwest of Spain. Our findings indicated that a one-factor solution comprising nine items exhibited strong goodness-of-fit indices and excellent reliability ratings. Given its straightforward and efficient design, this instrument ensures high response rates from students, making it suitable for both educational training and research purposes. In this context, it is essential for educators to foster collaboration within the classroom, as student engagement is vital for achieving the objectives set forth in the teaching-learning process. Furthermore, the field of physical education offers unique opportunities to enhance social interactions and meet the fundamental psychological needs of the group, thereby contributing positively to the overall educational experience.

Support

This work was conducted without external assistance.

Institutional Review Board Statement

An authorised ethics committee did not need to approve the use of these non-identifiable, anonymous data because they were taken from an anonymous teacher poll. This is due to the fact that they are exempt from data protection laws. Furthermore, Regulation (EU) 2016/679 of the European Parliament and of the Council on the protection of individuals concerning the processing of personal data and on the free movement of such data, which was adopted on April 27, 2016, states that anonymous information—that is, information pertaining to an identifiable natural person or to data of a subject that is not, or is no longer, identifiable—is exempt from the application of data protection principles. Commencing on May 25, 2016, this regulation has been required since May 25, 2018. Therefore, the Regulation has no effect on the processing of personal data. Even for statistical or research objectives, its usage is exempt from the approval of an ethical commission.

Data Accessibility Statement

The corresponding author will release the datasets used in the current work to the public upon reasonable request.

Gratitude

The participants in this study made it feasible, and for that, the authors are grateful.

Conflicts of Interest

None that the writers are aware of exist.

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