International Journal of Human Movement and Sports Sciences 13(6): 1238-1245, 2025 http://www.hrpub.org
DOI: 10.13189/saj.2025.130608

Developing Student Cohesion through Differentiation of Movement Tasks in Physical Education Learning

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Received June 30, 2025; Revised October 11, 2025; Accepted November 19, 2025

Cite This Paper in the Following Citation Styles

(a): *[1] Bambang Abdul Jabar, Agus Gumilar, Burhan Hambali, Nayla Khairunissya , "Developing Student Cohesion through Differentiation of Movement Tasks in Physical Education Learning," International Journal of Human Movement and Sports Sciences, Vol. 13, No. 6, pp. 1238 - 1245, 2025. DOI: 10.13189/saj.2025.130608.*

(b): *Bambang Abdul Jabar, Agus Gumilar, Burhan Hambali, Nayla Khairunissya (2025). Developing Student Cohesion through Differentiation of Movement Tasks in Physical Education Learning. International Journal of Human Movement and Sports Sciences, 13(6), 1238 - 1245. DOI: 10.13189/saj.2025.130608.*

Abstract The problem of student cohesion in high school shows several interrelated aspects. Symptoms of depression often appear among high school students; poor communication between parents and children, negative life experiences, and pressure from academic aspects are closely related to depression. In this study, the author intends to examine the cohesion of students through differentiation of movement tasks in physical education learning for high school students with rhythmic activities. The research design used in this study is a quasi-experimental design. A total of 70 male and female student respondents were selected to be involved in this study, with the experimental group consisting of 34 students (physical education learning differentiation of movement tasks through rhythmic activities) and 36 students in the control group (conventional physical activities without differentiation of movement tasks). The results of this study indicate that the relationship among students has made significant progress thanks to the application of movement task differentiation in sports. The results of the non-parametric Mann-Whitney U test confirmed that there was a difference in the increase in cohesion between the experimental group and the control group, with a value of U = 190 and a p-value of 0.001. In this study, the group using movement task differentiation in rhythmic activities showed a significantly higher increase in cohesion compared to the control group, which followed physical education without movement task differentiation in rhythmic activities. This result provides a new innovation in physical education learning in developing students' attitudes.

Keywords Physical Education, Cohesive, Differentiation of Movement Task, Rhythmic Activity

1. Introduction

Fostering student cohesion in secondary schools presents a unique challenge for teachers. Social cohesion, which encompasses positive interpersonal relationships and a sense of belonging, is multidimensional and is measured through a variety of instruments [1]. Supportive relationships, positive teacher and leader beliefs, and accessible environments promote inclusive education, while unsupportive cultures and inadequate learning supports hinder it [2]. Student voice in school reform can deepen implementation efforts and strengthen classroom practices, although power dynamics in adolescent-adult relationships must be considered [3]. While well-intentioned, schools may inadvertently contribute to the isolation of LGBT+ students through gendered spaces, segregated support groups, and curriculum choices [4]. These findings underscore the complexity of addressing student cohesion in secondary schools and the need for a comprehensive approach that takes into account students' diverse experiences and perspectives.

The issue of student cohesion in secondary schools reveals several interrelated issues. Depressive symptoms are prevalent among Chinese secondary school students, with an estimated 24.3% affected [5]. Poor parent-child communication, negative life events, and academic pressure are strongly associated with depression in this population [5]. School engagement plays a significant role in students' academic, motivational, and socio-emotional outcomes, with positive correlations observed across factors [6]. However, health-related moral norms may inadvertently undermine social cohesion by stigmatizing those who deviate from these norms, leading to decreased inclusion and solidarity [7]. The prevalence of depressive symptoms increases with grade level, ranging from 24.5% in middle school to 40.1% in high school [5]. These findings highlight the complex interactions between mental health, the school environment, and social dynamics in secondary education.

Recent studies have explored the impact of physical education on student cohesion and related outcomes. Research has shown that the perceived importance of physical education is associated with group cohesion in secondary school students, with few gender differences observed [8]. The sport education model (SEM) has been shown to significantly improve team cohesion and related social skills compared to traditional teaching methods [9]. Similarly, the implementation of SEM in a university Basic Instruction Program has shown increased group cohesion, particularly in lifelong skills and competitive sport classes [10]. Furthermore, dialogic learning principles applied to school physical education and sport can contribute to school success, social cohesion, and improved health for students and their communities [11]. Teacher behaviors that support classroom-relatedness and cohesion positively influence students' relatedness needs, motivation, and engagement, while behaviors that undermine relatedness lead to negative outcomes [12]. An intervention study using an intercultural movement education approach showed improvements in social cohesion and classroom climate, but also increased assimilationist and segregative attitudes among students [13]. These findings suggest that innovative PE approaches, such as SEM and dialogic learning, can effectively enhance student cohesion and offer broader social and academic benefits. In this case, the author sees a gap related to the condition of cohesion problems with physical education programs that can develop indicators of cohesion through physical activity in physical education learning. Therefore, the author intends to research related to student cohesion through movement task differentiation in physical education learning for high school students with rhythmic activities.

2. Method

2.1. Design

This study is a quasi-experimental study with a pre-test post-test control group design [14]. In this study, the author conducted a differentiation of movement task treatment in physical education learning through rhythmic activities as an experimental group, while the control group carried out conventional physical activities without any differentiation of movement tasks.

2.2. Respondent

The respondents of the study were high school students in the Bandung City area. In this study the author used cluster random sampling. Cluster random sampling is a sampling method in which groups, not individuals, are randomly selected as sampling units [14]. This method is similar to simple sampling, but the focus is on group selection. Researchers chose existing classes to be used as samples in this context [14]. A total of 70 male and female student respondents were selected to be involved in this study, with the experimental group consisting of 34 students and the control group of 36. In order to make it easier to integrate the treatment schedule with other subject schedules at school, the respondent groups were adjusted to their respective classes.

2.3. Instrument

The cohesion instrument used is the Group Environment Questionnaire (GEQ) [15]. Consisting of sixteen questionnaire items and four constructs: group integration tasks (GI-T), group-social integration (GI-S), individual attraction to group tasks (ATG-T), and individual attraction to group-social (ATG-S). These four aspects are represented by two dimensions, namely integration and involvement in the cohesion of group tasks. There is a nine-point Likert scale used to answer each item. The first point indicates total disagreement, while the 9th point indicates total agreement. This instrument has been tested for validity and reliability by the author, with a Cronbach's alpha value if the value is above 0.70 (reliable).

2.4. Procedure

The stage of the experimental program refers to the steps in Teaching Dance for Understanding (TDfU) [16]. This model is designed to improve understanding of dance through a fun, reflective, and systematic learning process. The first step is Dance as Experiential Play, which invites students to engage in dance experiences with a game approach so that they can explore without pressure on certain forms or movement techniques. The second step, Dance Appreciation, directs students to observe and understand various types of dance and the values contained in them. Next, in the Developing Connections step, students are encouraged to connect dance experiences with their personal lives and sociocultural contexts. Then, in the Creative Exploration step, students are given the freedom to create movements or dance sequences based on their imagination and personal expression. The fifth step, skill refinement, focuses on improving the quality of students' technique and movement control in a more directed manner. Finally, the dance performance step is an opportunity for students to show off their learning outcomes while strengthening self-confidence and togetherness in the group. All these steps are very relevant to be applied in rhythmic activity learning in high school because they not only develop students' motor and artistic skills but also build cooperation, self-expression, and group cohesiveness.

In experimental research in physical education, it is important to conduct repeated experiments. This aims to ensure that the results obtained are valid and reliable because the results of a single experiment may not reflect stable or repeatable conditions. This approach is in line with the basic principles of experimental research, which emphasize the importance of replication to confirm findings and reduce the possibility of bias or uncontrolled variability in the data [17], [18]. This study was conducted in eight meetings, each of which was held once a week and lasted for 45 minutes, with a total of two lesson hours (2 JP) per meeting. During the eight meetings, each session provided opportunities for students to engage in activities that support the development of motor skills and social values that are very important in physical education [19].

3. Result

The results of this study are a research analysis to see whether there is an increase in student cohesion through differentiation of movement tasks in physical education learning. The author conducted a paired sample t-test analysis to see the increase in student cohesion, as well as an independent sample t-test to see whether there is a significant difference in student cohesion through differentiation of movement tasks in physical education learning between the experimental group and the control group. The following are the results of the analysis carried out:

Table 1. Description of Pre-Test and Post-Test Data for Experimental Group and Control Group

	Pre-test Cohesion Experiment	Post-Test Cohesion Experiment	Pre-Test Cohesion Control	Post-Test Cohesion Control
N	34	34	36	36
Mean	85.2	113	87.5	96.4
Median	85.0	113	86.0	96.0
Standard deviation	6.51	15.4	10.6	13.1
Minimum	71	83	67	69
Maximum	98	136	112	126

Table 1 shows the data description of this study: pre-test cohesion with 34 respondents, a mean of 85.2, which is the average score of cohesion before treatment/intervention, a median of 85.0, which shows a fairly symmetrical data distribution, and a standard deviation (SD) of 6.51. Score variability is quite low (homogeneous data), and minimum-maximum scores are 71-98. While the post-test cohort had 34 respondents, with a mean of 113, there was a significant increase from 85.2, and the median score was 113, with a normal probability distribution and a standard deviation of 15.4. Variability increased, possibly due to diverse responses to treatment, and the minimum-maximum score was 83-136. The range of values increased. Data interpretation shows that the experimental group experienced a significant increase in cohesion after treatment/intervention, both in terms of average and value distribution. Meanwhile, the control group, Pre-Test Cohesion, with 36 respondents, had a mean of 87.5, where the average is slightly higher than the initial experimental group; a median of 86.0; a standard deviation of 10.6, indicating a moderate variation; and a min-max score of 67-112. While the data obtained post-test cohesion with 36 respondents, mean: 96.4, shows an increase, it is not as high as the experimental group, median 96.0, standard deviation 13.1, and min-max score: 69 - 126. The data shows that the control group also experienced an increase, but not as large as the experimental group. This could be a natural effect or external factors other than the intervention.

The normality test (Shapiro-Wilk) is conducted to see whether the data is normally distributed or not. Table 2 explains that the experimental group with a W value of 0.967 and $p = 0.392$ shows that the pre-test and post-test cohesion data in the experimental group are normally distributed, meaning that parametric statistical analysis (such as paired-sample t-test) can be used for this group, while the control group with a W value = 0.775 and $p < 0.001$ shows that the data is not normally distributed, meaning that analysis is recommended using non-parametric statistical tests (e.g., Wilcoxon Signed-Rank Test). To facilitate the analysis, the author uses the non-parametric paired samples T-Test (Wilcoxon Signed-Rank Test).

The results of the paired samples T-test analysis in Table 3 show the statistical value of the Wilcoxon test; the experiment group shows a very strong difference between the pre-test and post-test. p-value < .001, indicating that the difference is very statistically significant. Mean Difference experiment = -27.50, where the post-test score increased by an average of 27.5 points compared to the pre-test. While the control group mean difference is -10.00, the score increased by an average of 10 points. The results of the analysis concluded that both groups showed a significant increase in cohesion scores from pre-test to post-test. However, the experimental group experienced a much greater increase than the control group (27.5 vs. 10.0 points). This supports that the treatment/intervention in the experimental group is effective in increasing group cohesion. The following is a plot of the results of the analysis of the experimental group and control group cohesion pre-test post-test plots, as seen in Figure 1 and Figure 2.

Table 2. Normality Test (Shapiro-Wilk)

			W	p
Pre-test Cohesion Experiment	-	Post-Test Cohesion Experiment	0.967	0.392
Pre-Test Cohesion Control	-	Post-Test Cohesion Control	0.775	<.001

Note. A low p-value suggests a violation of the assumption of normality

Table 3. Paired Samples T-Test

			Statistic	p	Mean difference	SE difference
Pre-test Cohesion Experiment	Post-Test Cohesion Experiment	Wilcoxon W	0.00	<.001	-27.50	2.61
Pre-Test Cohesion Control	Post-Test Cohesion Control	Wilcoxon W	0.00[a]	<.001	-10.00	1.90

Note. H_a $\mu_{Measure\ 1\ -\ Measure\ 2} \neq 0$

[a] 8 pair(s) of values were tied

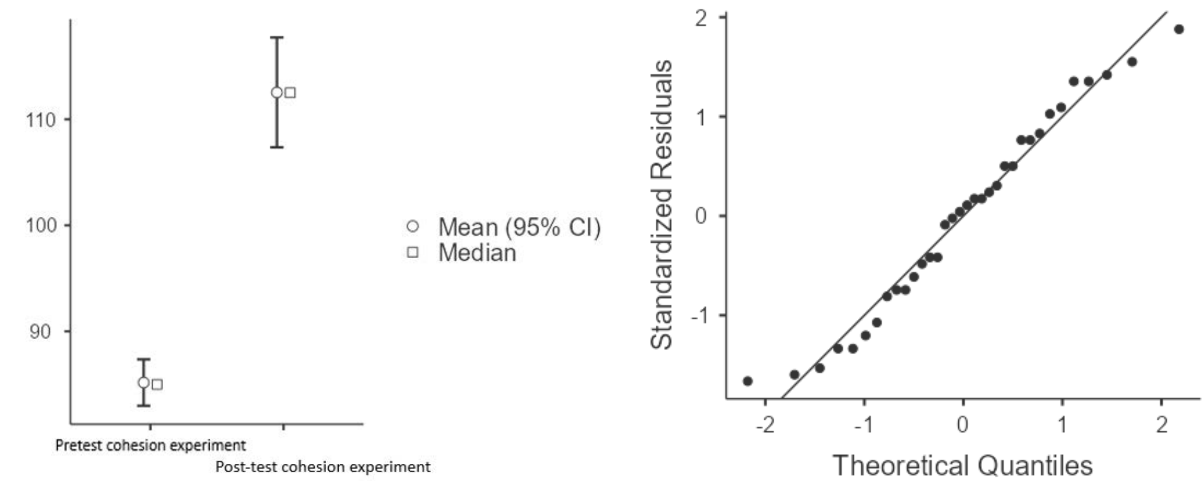

Figure 1. Plot of Pre-test Post Test Cohesion of Experimental Group

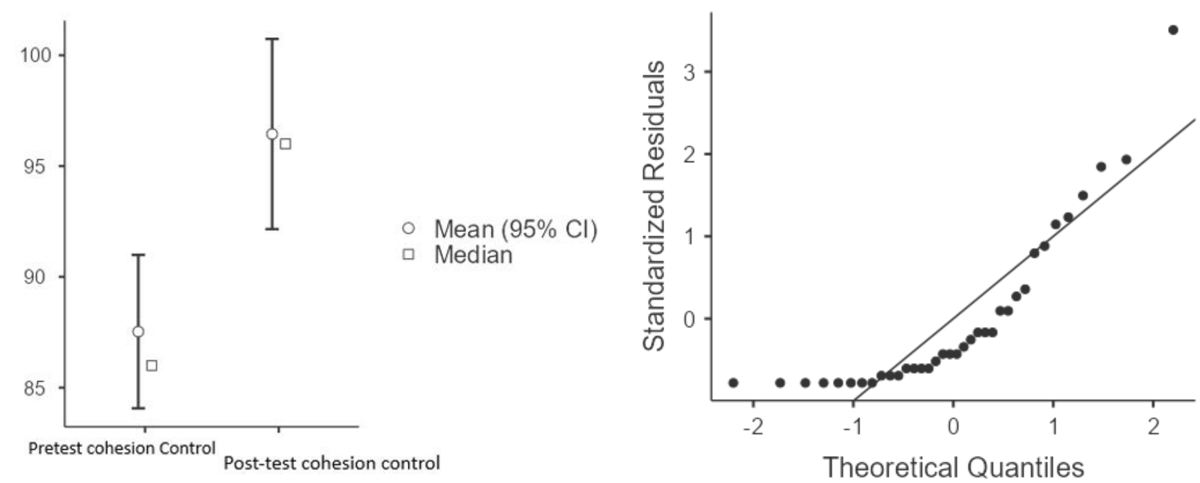

Figure 2. Plot of Pre-test Post Test Cohesion of Control Group

Another analysis is to compare whether there is a significant difference in student cohesion through differentiation of movement tasks in physical education learning between the experimental group and the control group, namely by using an independent sample t-test.

Table 4 explains the description of the data on the increase in cohesion after treatment was given to respondents. The experimental group experienced an average increase in cohesion of 27.4 points (median = 28.5 indicating that more than half of the participants experienced an increase of more than 28 points. The variation was quite large (SD = 15.2), but all participants experienced an increase (min = 2). While the control group had an average increase of only 8.92 points, much lower than the experiment, Median = 4.00, where half of the participants only experienced an increase of 4 points or less, the standard deviation was smaller (11.4), and there were participants who did not experience any increase at all (min = 0).

Table 4. Descriptive Data on Increasing Cohesion of Control and Experimental Groups

	Group	Cohesion
N	Experiment	34
	Control	36
Mean	Experiment	27.4
	Control	8.92
Median	Experiment	28.5
	Control	4.00
Standard deviation	Experiment	15.2
	Control	11.4

Table 5 is the analysis of the Normality Test (Shapiro-Wilk) Independent Sample t-test, W value = 0.962, which is the Shapiro-Wilk statistical value. The p-value of 0.030 is less than 0.05, which means the data is not normally distributed. Because the data is not normal, the use of the independent sample t-test is not recommended directly. Instead, the non-parametric Mann-Whitney U test should be used.

Table 5. Normality Test (Shapiro-Wilk) Independent Sample t-test

	W	p
Cohesion	0.962	0.030

Note. A low p-value suggests a violation of the assumption of normality

Here is the explanation and description of Table 6, Independent Samples T-Test to test whether there is a significant difference in the average increase in cohesion between the two groups (experimental vs. control). The results of the student's t-test analysis assume that the variance of the two groups is the same (homogeneous). The t value = 5.75, $p < 0.001$, indicates a significant difference. Welch's t-test analysis shows an alternative to Student's t-test when the variance is not the same. The t value = 5.70, df = 61.1, $p < 0.001$ still shows a significant difference, more reliable in conditions of unequal variance. The results of the non-parametric Mann-Whitney U test show a value of U = 190, $p < 0.001$, confirming that there is a difference in the increase in cohesion between the experimental and control groups. The three statistical approaches (Student's t, Welch's t, and Mann-Whitney U) all showed highly significant results ($p < 0.001$). Since the assumptions of normality and homogeneity of variance were violated, the results of the Welch's t-test and Mann-Whitney U are the most appropriate to interpret. Thus, the experimental group showed a significantly higher increase in cohesion than the control group.

Table 6. Independent Samples T-Test

		Statistic	df	p
Cohesion	Student's t	5.75[a]	68.0	<.001
	Welch's t	5.70	61.1	<.001
	Mann-Whitney U	190		<.001

Note. H_a $\mu_{Experiment} \neq \mu_{Kontrol}$

[a] Levene's test is significant ($p < .05$), suggesting a violation of the assumption of equal variances

4. Discussion

Based on the results of the analysis that has been done, it shows that student cohesion increases significantly through movement task differentiation in physical education learning. In this study, the experimental group of movement task differentiation in rhythmic activity physical education learning showed a significantly higher increase in cohesion than the control group, namely non-differentiated physical learning activities of movement tasks in rhythmic activity physical education learning. These results highlight that through physical education, rhythmic activity movement task differentiation can develop student cohesion in physical education and sports learning in high schools. This is also reinforced by the results of research that revealed that sports education increases group cohesion in university physical education classes, especially in lifelong skills and competitive sports classes compared to exercise classes [10]. Likewise, the impact of sports education on high school student team cohesion, identifies facilitators such as positive teammate interactions and student leadership [20]. Sports education also significantly increases team cohesion among undergraduate students compared to traditional instruction methods [9]. The importance of physical education and its relationship to group cohesion have also been explored, and there are gender differences in the perception of importance and cohesion among high school students [8]. These studies collectively highlight the potential for sport and physical education to foster team cohesion, which may have long-term benefits for students' social skills and future collaboration.

In addition, there is a positive relationship between student engagement in physical education and teacher support, especially in the behavioral and emotional dimensions [21]. This engagement is influenced by the fulfillment of basic psychological needs for autonomy, competence, and relatedness, as proposed by self-determination theory [22]. Teacher strategies and classroom structures play an important role in meeting these needs and encouraging student engagement [22].

Curricular approaches such as cooperative models and sociomotor games are highlighted as effective approaches in promoting school coexistence and social cohesion through physical education [23]. However, the conceptualization and measurement of social cohesion in the context of sport and physical activity are still underdeveloped, with many studies lacking a comprehensive definition and using limited measurement tools [24]. Future research should focus on improving conceptual engagement and measurement of social cohesion in the physical education environment.

Cohesion among adolescents is an important issue that has implications across contexts. In school settings, team cohesion positively influences the development of communication skills and reduces the risk of deviant behavior [25]. Young sports participants perceive cohesion to have both task and social components, with a variety of methods used to develop group cohesion [26]. Family cohesion plays a critical role in adolescent well-being, particularly in challenging situations. Adolescents from families temporarily disrupted by economic migration experience lower family cohesion and higher existential loneliness [27]. Similarly, bereaved adolescents who report poor family cohesion in the first year after losing a parent to cancer are at an increased risk of long-term negative psychological outcomes, including depression, anxiety, and low well-being [28]. This review underscores the importance of fostering cohesion in multiple aspects of adolescents' lives to enhance their overall health and development.

Cohesion also provides significant benefits for students in higher education. Cohesion has been found to be positively correlated with class attendance [29] and has been associated with increased team effectiveness and job satisfaction in student groups [30]. For PhD students in the life sciences, a cohesive co-author network during and immediately after their studies was associated with higher citation rates in subsequent years [31]. Students often seek affiliation with content-based organizations primarily for a sense of belonging, although morale-related issues can lead to dropout [32]. Task cohesion, in particular, has been shown to significantly predict team effort, effectiveness, and satisfaction in student work groups [30], [33], [34]. These findings suggest that fostering cohesion should be a priority for educators to enhance student success and engagement in academic settings.

There are many different areas of research on team cohesion, and each one offers different opportunities and problems for further study. Cohesion is an understudied aspect of human-autonomy teams, where the dynamics of typical human teams are anticipated to change dramatically when autonomous systems act as colleagues [35]. The authors formulate important research questions for developing successful human-autonomy team science and pinpoint particular aspects of the human-autonomy interaction that are pertinent to cohesiveness. The timing of multidimensional evaluations, issues with self-report measures, and failure to incorporate multilevel temporal frameworks are among the methodological difficulties in cohesion research [36]. Indirect measurements, social network analysis, and agent-based modeling are some of the solutions put out to examine cohesiveness as a dynamic emergent process as opposed to a static state. Cohesion research goes beyond team dynamics to policy contexts; recent expert groups of the European Commission have been studying the future of cohesion policy [37]. Furthermore, dynamic rather than static analytical techniques are needed to understand conflict-cohesion interactions, paying particular emphasis to state roles and environmental restrictions.

5. Conclusions

Physical education is a good medium to develop students' attitudes; through various sports activities and games, it can function as an efficient learning tool in creating cohesion or a sense of unity and togetherness among students. Through interaction and cooperation in physical activities, students learn to support each other, appreciate differences, and establish positive relationships. The results of this study indicate that the relationship between students has progressed significantly thanks to the application of movement task differentiation in sports. In this study, the group that used movement task differentiation in rhythmic activities showed a significantly higher increase in cohesion than the control group, which followed physical learning without movement task differentiation in rhythmic activities. This finding emphasizes that with physical education that utilizes movement task differentiation in rhythmic activities, cohesion between students can be strengthened in the context of physical education and sports learning at the secondary school level.

Acknowledgments

We would like to express our gratitude to the DPPM of the Indonesian Education University and the KONI of Bandung City.

Conflict of Interest

No conflict of interest.

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