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## The effect of handball invasion game models on elementary students' empathy: A sociocultural perspective

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### ABSTRACT

This study aims to examine the effectiveness of a teacher's handbook designed for handball learning grounded in a sociocultural approach, with the objective of enhancing empathy among elementary school students. The research was motivated by global concerns regarding the decline in children's empathy, attributed to increased digitalization and limited direct social interactions, particularly in urban areas such as Sleman. Employing a quasi-experimental method with a non-equivalent control group design, the study involved two groups of students from different elementary schools. The experimental group utilized the teacher's handbook, while the control group received conventional learning. The study instruments included a validated and reliable empathy questionnaire, alongside observations of empathetic behaviors during the learning process. Statistical analysis revealed that the experimental group experienced a significant increase in empathy levels compared to the control group, with a mean difference of 6.2 points. The t-test indicated a significant value ( $p < 0.05$ ), signifying a statistically significant difference between the two groups. These findings demonstrate that the sociocultural-based handball learning model is effective in fostering empathy among students and offers a practical solution for integrating character into physical education through developmentally appropriate game-based learning in elementary schools.

**Keywords:** empathy, physical education, sociocultural, handball, elementary school children

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### INTRODUCTION

Empathy is a foundational social skill in children's development, particularly during their elementary school years. In recent years, global concerns have highlighted a decline in children's empathy, attributed to increased digital engagement and reduced face-to-face interactions (Eisenberg, 2007). In Sleman Regency, urbanization and digitalization have reshaped social structures, potentially limited children's interactive spaces and impacting their social competencies.

Physical Education (PE) in this context holds significant potential in cultivating children's social skills as its activities promote interaction, cooperation, and group decision-making. According to the Indonesian Ministry of Education and Culture Regulation No. 37 of 2018, Physical Education learning encompasses the development of spiritual attitudes, social behaviors, knowledge, and skills. Among these components, social attitudes heavily rely on active interaction and cannot develop in isolation. Research indicates that deliberately designed physical education programs employing harmonious approaches can enhance students' emotional intelligence, particularly in interpersonal aspects directly related to empathy (Sutrisno et al., 2022).

The decline in empathy has been linked to the prevalence of violence and bullying in schools. Data from the Indonesian Child Protection Commission (Komisi Perlindungan Anak

Indonesia/KPAI) reveals that 77% of children have experienced violence in schools, encompassing physical, verbal, and cyber forms (KPAI, 2020). Local studies have similarly documented high rates of verbal abuse and cyberbullying in Sleman's elementary schools (Kurniawan et al., 2018; Azizah et al., 2024). Besides, low empathy can be identified as a contributing factor to aggressive behaviors in educational settings (Jolliffe & Farrington, 2006). In view of this, teachers' understanding of character values such as empathy, responsibility, and cooperation becomes crucial for the successful integration of social values in physical education learning (Lestari & Nugroho, 2021).

Prior studies have demonstrated the effectiveness of cooperative physical education approaches for enhancing students' social skills (Goudas & Magotsiou, 2009; Irmansyah et al., 2020; Aris, 2016). Even among children with special needs, adaptive physical education has proven effective in fostering affective abilities such as empathy through meaningful physical and social interactions (Hidayat et al., 2020). However, most research has focused on traditional games or general physical activities, lacking specific development of invasion game models grounded in sociocultural approaches to build empathy among young students.

Moreover, existing studies have generally not integrated deeper sociocultural principles such as scaffolding, role negotiation, collaborative communication, and guided problem solving elements that have strong potential to be optimized within invasion games like handball. Many instructional models place greater emphasis on technical skill acquisition rather than nurturing socio emotional competencies, leaving a gap in pedagogical practices that intentionally cultivate empathy. Consequently, there is a growing need for learning designs that combine physical interaction with structured social engagement, enabling invasion games to serve as more comprehensive pedagogical tools for developing empathy and other character values in elementary school students.

Grounded in Vygotsky's sociocultural theory, learning is optimized when students engage in meaningful social interactions and receive appropriate scaffolding within the zone of proximal development (ZPD) (Slavin, 2006). Invasion games in physical education, such as handball, are inherently collaborative and competitive, making them naturally aligned with these principles because they require continuous communication, role coordination, and shared decision-making among players. When supported with structured pedagogical frameworks such as the Teaching Games for Understanding (TGUFU) model, these games not only enhance students' tactical awareness but also strengthen their capacity to interpret social cues, negotiate roles, and work cooperatively toward common goals (MacPhail et al., 2008; Barry, 2018).

Furthermore, the dynamic and unpredictable nature of invasion games creates authentic learning situations in which students must adapt to others' actions, understand teammates' perspectives, and manage interpersonal challenges conditions that are highly conducive to the development of empathy and other socio emotional competencies. By integrating sociocultural learning principles with game based instruction, educators can create a holistic learning environment that supports both cognitive growth and the nurturing of positive social interaction skills among elementary school students.

Based on this background, the present study aims to assess the effectiveness of a sociocultural based handball invasion game model in enhancing empathy among elementary school students. The learning model was previously developed through an Educational Design Research (EDR) approach, allowing for iterative refinement and evaluation of its practicality and effectiveness within the context of physical education learning. Through this approach, the model was systematically designed, tested, and improved in collaboration with teachers to ensure that the instructional strategies align with students' developmental needs and classroom realities. The study therefore not only seeks to measure the impact of the model on students' empathy but also to provide empirical evidence supporting the integration of sociocultural principles into game based physical education, offering a structured and contextually relevant framework for character development in elementary schools.

## **METHOD**

The present study employed a quasi-experimental, non-equivalent control group design to test the effectiveness of a sociocultural-based invasion game model in handball learning to improve students' empathy. It allows for the comparison of two distinct groups without full randomization, while still considering the initial equivalence of group characteristics. The experimental group comprised students who participated in handball lessons guided by the developed teacher's handbook, whereas the control group received conventional handball learning without the model handbook. Prior to the intervention, both groups underwent a pretest to measure initial empathy levels. Following a six-week intervention period, a post test was administered to evaluate changes in students' empathy.

The research procedure commenced with preparatory steps, including the development of valid and reliable empathy assessment instruments, selection of samples with comparable characteristics, and training teachers in the utilization of the handbook. The implementation phase involved structured learning over six weeks: the experimental group engaged in lessons using the teacher's handbook, while the control group continued with conventional teaching methods commonly practiced in schools. Upon completion of the intervention, pretest and posttest data were analyzed using inferential statistics, specifically the two independent samples t-test, to determine the significance of empathy improvements between the two groups. Parametric statistical tests were also applied. Additionally, observations of empathetic behaviors, such as tolerance, cooperation, and concern for peers, were conducted throughout the learning period.

The success of the intervention was indicated by a statistically significant increase in empathy scores within the experimental group compared to the control group. Furthermore, the emergence of positive social behaviors during the learning process served as additional evidence that the teacher's handbook functioned not only as a learning aid but also as a medium for reinforcing character values.

The anticipated outcome of this effectiveness test is to obtain empirical evidence supporting the developed teacher's model handbook as an effective tool for developing students' empathy. Consequently, the handbook is expected to serve as an official reference for physical education learning that integrates character development through game-based activities, offering a practical solution for teachers in designing meaningful and contextually relevant lessons.

## **FINDINGS AND DISCUSSION**

### **Findings**

This study was carried out as planned to assess the extent to which a sociocultural-based handball game model in the teacher handbook effectively fosters empathy among elementary school students. This study utilized a quasi-experimental design with a non-equivalent control group model, involving two distinct groups without randomization.

The experimental group consisted of upper-grade students at SD Negeri Berbah 1, who received learning using the sociocultural-based handball game handbook for PE teachers. Conversely, the control group comprised students from SD Negeri Kelodangan, who underwent conventional learning without the specialized book, though covering the same material. Both groups participated at the same frequency twice a week for over six weeks, from January to February. Empathy was measured using a validated and reliable empathy questionnaire. Assessments were conducted before (pretest) and after (posttest) the intervention for each group. Posttest data were analyzed using an independent samples t-test to compare the post-intervention scores between the experimental and control groups, aiming to identify any significant differences attributable to the intervention.

**Table 1. Pre test and post test results**

Group	Pretest Mean	Posttest Mean	Difference
Experimental	32.0	39.6	+7.6
Control	31.5	33.4	+1.9
		6.2 points	

Thus, this effectiveness test aimed to provide empirical evidence on whether the use of a sociocultural-based handball game handbook significantly enhances students' empathy compared to traditional learning.

Based on the results in Table 1, the pretest and posttest data indicate that the experimental group experienced a greater increase in empathy scores compared to the control group. The experimental group's posttest mean score is 39.6, while the control group's is 33.4, resulting in a mean difference of 6.2 points. Besides, normality tests were conducted to ascertain whether the pretest and posttest data from both the control and experimental groups were normally distributed, a prerequisite for parametric statistical analysis. Two methods were employed: the Kolmogorov–Smirnov and Shapiro–Wilk tests. Given that each group had a sample size of 30 ( $n \leq 50$ ), the Shapiro–Wilk test was deemed more relevant.

**Table 2. Normality test results**

Group/Test	Kolmogorov–Smirnov (Sig.)	Shapiro–Wilk (Sig.)	Interpretation
Control Pretest	0.200	0.365	Data are normally distributed
Control Posttest	0.195	0.463	Data are normally distributed
Experimental Pretest	0.200	0.253	Data are normally distributed
Experimental Posttest	0.200	0.462	Data are normally distributed

Based on the Shapiro–Wilk test results (Table 2), all datasets exhibit significance values (p) above 0.05, specifically, 0.365 for the control pretest, 0.463 for the control posttest, 0.253 for the experimental pretest, and 0.462 for the experimental posttest, indicating normal distribution across all datasets. Similar findings were observed with the Kolmogorov–Smirnov test, with significance values  $\geq 0.195$ . Consequently, the pretest and posttest data from both groups met the normality assumption, permitting the use of parametric statistical techniques such as the independent samples t-test for further analysis.

Subsequently, a homogeneity test was conducted to ensure that the variance between the control and experimental groups is consistent. This step is crucial before applying parametric statistical tests, particularly the independent samples t-test, which assumes equal variances across groups.

**Table 3. Validity test results**

Levene’s Test Approach	Levene Statistic	df1	df2	Sig.	Interpretation
Based on Mean	0.012	1	58	0.913	Homogenous
Based on Median	0.037	1	58	0.848	Homogenous
Based on Median (adjusted df)	0.037	1	57.437	0.848	Homogenous
Based on Trimmed Mean	0.010	1	58	0.919	Homogenous

In this study, homogeneity testing was carried out on pretest data using Levene's Test (Table 3). The significance values (p-values) for all approaches exceeded 0.05: 0.913 for the mean-based approach, 0.848 for the median-based approach, and 0.919 for the trimmed mean approach. These results indicate no significant variance differences between the control and experimental groups. Consequently, it can be concluded that the data from both groups are homogeneous, and this satisfies the assumption of homogeneity, allowing for the subsequent use of the independent samples t-test to analyze effectiveness.

An independent samples t-test was then conducted to determine whether there was a significant difference in posttest scores between the experimental and control groups, each comprising 30 students.

The Levene’s Test yielded a significance value of 0.920 ( $> 0.05$ ), which means that the variance of both groups can be considered homogeneous (equal variances assumed). Based on the results of the t-test for Equality of Means, the Sig. (2-tailed) value was obtained at 0.000 ( $< 0.05$ ), which indicates that there is a statistically significant difference between the posttest results of the two groups. The posttest mean score of students in the experimental group was 39.63, while

the control group was 33.47, with a difference of 6.167 points. This difference is significant with a 95% confidence interval between -7.415 and -4.918. Thus, it can be concluded that the use of sociocultural-based invasion game teacher handbook in handball learning was deemed statistically effective in improving students' empathy, and this learning model has a significant impact on learners' empathy compared to conventional learning methods.

**Table 4. Independent samples t-test results**

Test Type	Statistics	Value	Description
Levene's Test	F	0.010	p > 0.05 → Equal variances assumed
	Sig.	0.920	
t-test (Equal variances assumed)	t	-9.887	
	df	58	Degrees of freedom
	Sig. (2-tailed)	0.000	p < 0.05 → There is a significant difference between means.
	Mean Difference	-6.167	The first group was 6.167 points lower.
	Std. Error	0.624	
	95% CI Lower	-7.415	
	95% CI Upper	-4.918	CI does not include 0 → supports significance

**Discussion**

Invasion games like handball offer significant potential in elementary school to develop students' technical skills, teamwork, and social values. However, interviews with educators and analyses of learning materials reveal persistent challenges in effectively fostering empathy among students through these activities. The present study, therefore, aims to assess the effectiveness of a previously developed sociocultural-based handball instructional guidebook in enhancing empathy levels of elementary school students through PE learning. Findings of this study as explained in the previous section indicate a statistically significant improvement in empathy scores within the experimental group compared to the control group.

Specifically, the experimental group achieved a mean posttest empathy score of 39.6, surpassing the control group's average of 33.4 by 6.167 points. An independent samples t-test confirmed the statistical significance of this difference (p < 0.05), suggesting that the sociocultural-based handbook effectively promotes empathy development. These results align with Vygotsky's sociocultural theory (1978), which posits that cognitive and affective development are profoundly influenced by social interactions within specific cultural contexts. In the context of handball learning, the handbook, designed with emphasis on collaboration, teamwork, and social values, provides students with opportunities to engage in scaffolding and operate within their zone of proximal development (ZPD). This environment facilitates perspective-taking and the cultivation of empathetic behaviors. This study also supports the empathy theory proposed by Eisenberg and Fabes (1990), which delineates empathy into two primary components: affective and cognitive. Engaging in handball necessitates cooperation, role-playing, and social conflict resolution, thereby activating both components. This suggests that collective physical activities not only train the body but also cultivate emotional and cognitive faculties.

Besides, Goleman (2016) emphasized that "Empathy represents the foundation skill for all the social competencies important for work" (p. 102). This quote highlights that empathy is not only an emotional aspect but also a social skill that can and should be trained, including in the context of physical learning. Similarly, research by Oboeuf et al. (2023) found a relationship between instrumental (cognitive) empathy and motor creativity in handball. More creative players showed a higher ability to anticipate the actions of others, indicating that social interaction in the game supports the development of cognitive empathy.

Davis (1983), through the Interpersonal Reactivity Index (IRI), has identified four dimensions of empathy: perspective taking, empathic concern, personal distress, and fantasy. A sociocultural game-based approach encourages students to adopt others' perspectives and exhibit

concern for teammates. This aligns with the Teaching Personal and Social Responsibility (TPSR) model developed by Wright and Craig (2011), accentuating the integration of social values into physical education to cultivate empathy, responsibility, and social engagement among students. Value-based handball learning reflects this ethos.

Programs such as Roots of Empathy (Gordon, 2005) and Empathy Week (University of Cambridge, 2024) demonstrated that empathy can be significantly developed over relatively short periods through meaningful social experiences. Even a semester-long empathy training has shown to enhance students' prosocial behaviors and emotional awareness. From a moral decision-making perspective, Decety and Cowell (2014) highlighted the importance of cognitive empathy in understanding others' viewpoints, ultimately shaping prosocial behavior. Consistently, Jones, Bouffard, and Weissbourd (2014) identified nine competencies essential for empathy development, including self-awareness, emotion management, and social skills, which can be honed through collaborative activities like handball.

Furthermore, Schonert-Reichl's (2011) underscores that fostering empathy in children is closely linked to their ability to recognize and comprehend emotions, skills that can be enhanced through structured educational interventions. Penn State University's Activating Empathy program (Penn State Global, 2023) reinforces these findings by emphasizing the importance of social context in the development of empathy, both at the individual and group levels.

Considering the test results and these related studies on students' empathy enhancement, the findings of this study might contribute significantly to the development of physical education curricula that extend beyond physical competencies to encompass students' social and emotional growth. Implementing sociocultural approaches within game-based learning emerges as an effective strategy for nurturing character and empathy among elementary school children. However, this study was limited in terms of the sample size and learning context. A further study could assess the effectiveness of this learning model at different levels of education and to expand the approach to other subjects that encompass elements of social interaction, such as art, social studies, or language.

Moreover, integrating technology, such as interactive digital media or gamification grounded in social values, presents new approaches for supporting empathy development in students. Barrera-Gutiérrez et al. (2025) in this context has seen the potential of using technological tools to enhance students' empathy and emotional intelligence in early education. Participants in their study reported increased readiness to manage disagreements, and such emotional improvements were apparent beyond school: parents reported these children as more capable to express their feelings and interact calmer at home (Barrera-Gutiérrez et al., 2025). Further this study argues that digital tools can make socio-emotional learning more engaging and easier to deliver practically as students are required to participate more actively during the class (Barrera-Gutiérrez et al., 2025). Thus, investigations on how PE learning in elementary schools integrate digital media and invasion games could be carried out to examine how both elements impact learners' empathy development.

Cross-cultural studies are also essential to understand how empathy evolves within diverse social contexts. The handball game learning model, based on a sociocultural approach, has proven effective in increasing empathy in elementary school students. This approach provides cognitive and physical benefits and strengthens students' social-emotional aspects. Therefore, it is worth considering for broad integration into the physical education and character development curriculum in elementary schools.

## **CONCLUSION**

This study underscores the critical importance of fostering empathy among elementary school students, particularly in the context of contemporary social challenges such as digitalization and the decline of direct social interactions. As the introduction outlines, empathy is a vital social competency that contributes to creating an inclusive and violence-free learning environment. By employing a sociocultural-based handball games approach, the study aims to develop a physical education model that enhances physical skills and cultivates social values like

cooperation, tolerance, and compassion. The findings indicate that utilizing a teacher's handbook grounded in sociocultural approach significantly improves students' empathy scores compared to conventional learning methods. This empirical evidence suggests that structured social interactions within collective games can effectively engage empathy's affective and cognitive dimensions. Furthermore, aspects of empathy such as perspective-taking and empathic concern flourish through team dynamics and conflict resolution inherent in handball games. The alignment between the study's objectives and outcomes reinforces the validity of this approach as a pedagogical strategy for integrating character education into the curricula of physical education. Beyond serving as an assessment tool, the handbook functions as a transformative medium for shaping students' social character.

These findings open avenues for extending the implementation of similar educational models across different educational levels and more complex social contexts. Further research could explore the use of this approach in other subjects and integrate digital media as a means of meaningful social interaction. In addition, cross-cultural studies could enrich the understanding of the effectiveness of sociocultural approaches in developing empathy in children in diverse social environments. Thus, sociocultural-based handball game learning is not only a practical solution for teachers but also a philosophical and pedagogical foundation for building an intellectually intelligent, emotionally resilient, and socially empathetic generation.

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