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Original Article

Effects of teacher feedback during physical education class on empathy among junior high school students

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Abstract:
Problem Statement Previous studies suggest that engagement in physical exercise and sports contributes to the development of empathy in individuals, highlighting the potential of physical education as a valuable avenue for enhancing empathy. Additionally, it has been demonstrated that feedback can positively impact empathy. However, the optimal feedback forms to foster empathy in adolescents during physical education classes still need further clarification. *Purpose* This study aimed to explore how teacher feedback influences changes in empathy among junior high school students in the context of physical education classes. *Approach* The study included 60 junior high school students (35 boys and 25 girls). Assessment of their cognitive and affective empathy occurred through a pre- and post-gymnastics class (50-min sessions, eight sessions). Teacher feedback during the class was recorded and subsequently categorized. The students addressed by the teacher were identified either by their names or by the number displayed on the bib worn by each student. The bib numbers worn by the students remained consistent throughout the entire gymnastics session in this study. *Results* The frequency of encouragement given to groups by teachers shows a negative correlation with changes in the affective empathy of boys. In contrast, among girls, cognitive and affective empathy changes were positively linked to the frequency of encouragement and general–remedial feedback directed at individuals, respectively. However, inquiries directed at individuals had an adverse effect on the changes in affective empathy among girls. *Conclusion* The findings underscore the crucial role of teacher feedback strategies in fostering empathy among junior high school students. This insight highlights the significance of employing effective teacher feedback strategies to enhance empathy in this demographic.
Keywords: **Empathy, Physical education, Teacher feedback**

Introduction

The prevalence of violence in schools negatively impacts the physical and psychological well-being of children (Ferrara et al., 2019). Research suggests that aggressive behavior in humans is commonly associated with a lack of empathy (Gandhi et al., 2017; Winter et al., 2017). Empathy, a fundamental human ability, plays a crucial role in recognizing and understanding the emotions of others, thereby facilitating the formation and maintenance of interpersonal relationships (Decety & Jackson, 2004; Preston & de Waal, 2002). Consequently, human empathy has been identified as a critical target for promoting overall well-being.

Human empathy consists of cognitive and affective dimensions (de Waal, 2008; Preston & de Waal, 2002). Cognitive empathy involves the capacity to adopt another's perspective, a key factor in discerning the emotions of others (Healey & Grossman, 2018). Individuals with higher levels of cognitive empathy often exhibit a more objective and rational viewpoint than those with lower levels (Green et al., 2018). On the other hand, affective empathy is characterized by the ability to experience the emotions of others without direct emotional stimulation (Healey & Grossman, 2018). Consequently, individuals with high affective empathy frequently demonstrate prosocial behavior (Van Lissa et al., 2017). Techniques aimed at fostering and sustaining human relationships often target the development of these empathic elements.

Physical activity has been suggested as a potential intervention to enhance empathy. Previous studies have shown the positive impact of physical activity, including sports participation, on social skills and personality traits (Bedard et al., 2020; Steca et al., 2018). Recent investigations have further demonstrated that physical activity can increase empathic behavior and activate empathy-related brain regions (Xu et al., 2019, 2020). Our research suggests that physical activity may positively influence cognitive and affective empathy in young adults (Shima et al., 2022; Shima, Jesmin et al., 2021b, 2021a; Shima, Tai, et al., 2021). Thus, incorporating physical education classes into the educational curriculum may offer a promising avenue for enhancing empathy in adolescents. However, the specific aspects of physical education classes that contribute to empathy improvement in adolescents remain uncertain.

Feedback represents another viable strategy for enhancing empathy. The impact of feedback on empathy development among medical students has been frequently reported in the literature (Bockrath et al., 2020; Leung et al., 2022). In the educational context, teacher feedback is believed to influence prosocial

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behavior during classroom activities (Wullschleger et al., 2020). Specifically, positive feedback can foster empathy (Tzanaki, 2022). Nevertheless, the most effective types of feedback for promoting empathy in adolescents during physical education classes have yet to be determined.

In this study, we investigated the relationship between teacher feedback frequency and empathy changes among junior high school students in the context of physical education classes.

Materials and methods

Participants

Sixty-eight 1st-degree Japanese junior high school students, aged 12–13, participated in the study. This study received prior approval from the Gunma University Ethical Review Board for Medical Research Involving Human Subjects (ethical number: HS2021-191) and was carried out from November to December 2022.

Classes

This study focused on the artistic gymnastics class, a standard curriculum component in Japanese junior high schools. The artistic gymnastics class consisted of eight 50-min sessions, occurring 2–3 times per week. In each session, after group warm-up exercises, students evaluated their skill progression by recording themselves before and after practice. In the final session of the artistic gymnastics class, the students created and presented a performance. The instructor for this class was a female teacher.

Categorization of teacher's feedback

Using a wireless microphone held by the instructor, we captured the teacher's feedback to students during the artistic gymnastics session and the teacher's actions using a video camera. Consistent with established research practices (Eto, 2015; Hasegawa, 2004), we classified the teacher's feedback into three distinct categories: "global," applying to all students; "group," referring to a subset of 3–4 students; and "individual," concerning a single student. Additionally, we categorized the content of the teacher's feedback into three types: "affirmative," indicating positive feedback and other verbal affirmations; "remedial," denoting corrective or modifying verbal feedback; and "adverse," representing unfavorable verbal feedback. Moreover, when the teacher's feedback lacked specific details, we categorized it as "general," while feedback accompanied by specific particulars was classified as "specific."

The frequency of such teacher feedback was recorded. Additionally, we documented the frequency at which the teacher provided "encouragement" and "inquiry" to the students. In cases where multiple words were consecutively used and maintained contextual equivalence, they were treated as a single word. Conversely, if the connotation or intended meaning of the word changed, they were treated as separate words.

To identify students addressed by the teacher, we used either their names or the numbers displayed on the bib worn by each student.

Notably, the bib numbers worn by the students remained constant throughout the entire gymnastics session in this study, and a correspondence table correlating the bib numbers with the students' names was established.

Questionnaires

The participants completed the Japanese version of the Questionnaire of Cognitive and Affective Empathy (QCAE) (Nagai & Okada, 2014; Reniers et al., 2011) before and after the artistic gymnastics class (50 min/session, eight sessions). The QCAE, comprising 31 items, required participants to respond on a 5-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree). Higher scores on the QCAE for each component indicate greater empathy in individuals.

Statistical analysis

Eight participants out of the initial 68 were excluded from the analysis because they were absent more than three times in the artistic gymnastic sessions or provided incomplete questionnaires. Therefore, the data of 60 respondents (35 boys and 25 girls) were analyzed. Prism version 9 (MDF, Tokyo, Japan) was utilized for data analysis. Group comparisons were performed using two-way repeated-measure ANOVA with Šídák's multiple comparisons tests. Pearson correlation was employed for analyzing correlations. Statistical significance was established at $p < 0.05$.

Results

Changes in self-reported empathy through the artistic gymnastics class

As depicted in Fig. 1A, boys exhibited an increase in cognitive empathy during the artistic gymnastics class ($p < 0.05$), whereas girls demonstrated a decrease ($p < 0.0001$).

A sex difference was observed in self-reported affective empathy (main effect of sex: $p = 0.0128$), with no significant change in affective empathy throughout the artistic gymnastics class (main effect of time: $p = 0.1076$).

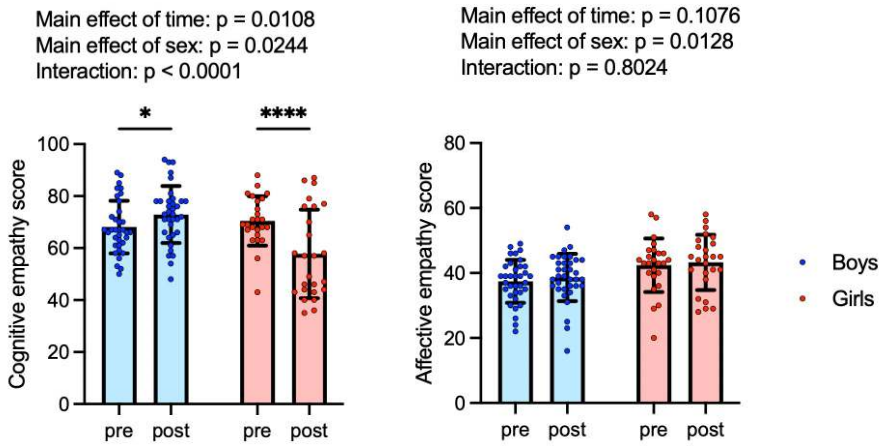

Fig. 1. The changes in self-reported empathy scores among students through the artistic gymnastics class. (A) Cognitive empathy. (B) Affective empathy. Data are presented as the mean ± SD; boys: n = 35, girls: n = 25. $^{*}p < 0.05$, $^{****}p < 0.0001$ compared to pre-class scores.

Relationships between teacher's feedback and the changes in self-reported empathy

The teacher's global feedback did not significantly correlate with changes in self-reported empathy during the artistic gymnastic class (Table 1; all $p > 0.05$). Among boys, there was a significant negative correlation between the frequency of teacher encouragement to the group and changes in cognitive empathy (Table 2; $r = -0.372$, $p < 0.05$). However, no discernible relationship between teacher's feedback and changes in empathy was observed for girls (Table 2).

Notably, changes in cognitive empathy exhibited a positive correlation with encouragement directed at individuals among girls ($r = 0.426$, $p < 0.05$), whereas no such correlation was found among boys. Furthermore, changes in girls' affective empathy demonstrated a positive correlation with general–remedial feedback ($r = 0.437$, $p < 0.05$) and a negative correlation with teacher inquiry directed at individuals (Table 3; $r = -0.465$, $p < 0.05$). These associations were not evident in boys (Table 3).

Table 1. Relationship between the frequency of teacher feedback given to global and the subsequent changes in empathy among students

	The frequency of teacher feedback to global							
	Affirmative		Remedial		Adverse		Encouragement	Inquiries
	General	Specific	General	Specific	General	Specific		
Boys								
Cognitive empathy	-0.007	-0.007	0.007	0.007	-	-0.007	0.009	0.007
Affective empathy	0.250	0.250	-0.250	-0.250	-	0.250	-0.236	-0.250
Girls								
Cognitive empathy	0.064	0.037	-0.037	-0.085	0.108	0.037	-0.042	-0.037
Affective empathy	-0.323	-0.341	0.341	0.300	0.119	-0.341	0.094	0.341

The values are r.

Table 2. Relationship between the frequency of teacher feedback given to groups and the subsequent changes in empathy among students

	The frequency of teacher feedback to group							
	Affirmative		Remedial		Adverse		Encouragement	Inquiries
	General	Specific	General	Specific	General	Specific		
Boys								
Cognitive empathy	-0.069	0.017	-	-0.206	0.119	-	-0.114	0.020
Affective empathy	-0.191	0.155	-	-0.145	0.065	-	-0.372*	0.297
Girls								
Cognitive empathy	0.231	-0.189	-	-0.063	-	-	-0.242	-0.352
Affective empathy	-0.150	-0.100	-	-0.033	-	-	-0.084	-0.249

The values are r. $^{*}p < 0.05$.

Table 3. Relationship between the frequency of teacher feedback given to individuals and the subsequent changes in empathy among students

	The frequency of teacher feedback to individual							
	Affirmative		Remedial		Adverse		Encouragement	Inquiries
	General	Specific	General	Specific	General	Specific		
Boys								
Cognitive empathy	-0.157	0.045	0.060	0.053	-	0.241	0.053	-0.197
Affective empathy	0.088	0.044	0.116	0.066	-	0.063	0.169	-0.112
Girls								
Cognitive empathy	0.252	0.211	0.091	0.160	-	-	0.426*	-0.305
Affective empathy	0.098	0.092	0.437*	-0.090	-	-	0.094	-0.465*

The values are r. *$p < 0.05$.

Discussion

The study indicates a connection between teacher feedback frequency and self-reported empathy changes during artistic gymnastics classes. Boys demonstrated an adverse impact on affective empathy with an increased frequency of encouragement given to groups by the teacher. Conversely, the frequency of teacher encouragement provided to individuals positively influenced girls' cognitive empathy. Additionally, the study revealed that general–remedial feedback given to individuals had a positive effect on the affective empathy of girls, while inquiry given to individuals had a detrimental impact.

Physical activity levels have been linked to cognitive empathy (Shima, Jesmin, et al., 2021a). Our study shows that artistic gymnastics classes can enhance self-reported cognitive empathy (Fig. 1). However, this positive effect was observed in boys but not in girls (Fig. 1). These findings deviate from the typical developmental changes in empathy reported in the literature (Van der Graaff et al., 2014), suggesting that changes in self-reported empathy in our study may be specific to artistic gymnastics classes.

Prior research has demonstrated the efficacy of school-based interventions in enhancing empathy in adolescents (Malti et al., 2016) and their sex differences (Castillo et al., 2013). Additionally, the effects of educational gymnastics on young children differ between males and females (Anderson et al., 2022). Consequently, the changes in empathetic response owing to the artistic gymnastics class may exhibit disparities between sexes.

For boys, changes in cognitive empathy exhibited a significant negative correlation with the frequency of teacher encouragement to groups (Table 2). Previous studies have reported that different feedback forms elicit different empathic reactions among youths (Dickerson & Quas, 2021). The impact of teacher encouragement varies based on children's backgrounds (Alcott, 2017). Our findings suggest that teacher encouragement to groups may present challenges in enhancing students' empathy. While teacher encouragement can contribute to developing students' self-esteem, correlating with empathy (Dittmann & Forstmeier, 2022), boys generally have more developed self-esteem than girls (Bleidorn et al., 2016). Therefore, teacher encouragement feedback to groups may not enhance boys' empathy if not appropriately tailored.

In contrast, our findings indicate that providing suitable encouragement and general–remedial feedback to individuals can enhance girls' cognitive and affective empathy, respectively (Table 3). Prior research suggests that considerate feedback can positively influence emotions (Seehausen et al., 2016). The effect of individual feedback, compared to global or group feedback, on empathy may stem from its alignment with students' specific needs. Additionally, females tend to show a more robust response to feedback than males (Warren et al., 2021); thus, the efficacy of teacher feedback to individuals may be more observable in girls than in boys.

The beneficial effects of general–remedial feedback for girls may be attributed to women being more likely to internalize negative feedback than men (Roberts, 1991). We observed a negative correlation between teacher inquiries to individuals and affective empathy (Table 3). Empathic concerns are negatively associated with disgust (Stevenson et al., 2015), and women tend to experience higher levels of disgust than men (Al-Shawaf et al., 2018). The inquiries by teachers in our study may have triggered feelings of disgust in girls. Further investigation is warranted to elucidate this effect.

This study has several limitations. First, it did not account for the potential impact of other school events, such as classes in other subjects. This study focused solely on examining the association between teacher feedback and changes in students' empathy. To gain a comprehensive understanding of the influence of the school curriculum on students' empathy, future research may need to consider various school activities. Second, this study did not specifically explore different types of feedback (e.g., skill-based and management-based), indicating a need for more detailed investigations in future studies.

Third, the interactions among students, particularly in group work during the artistic gymnastics class, were not evaluated. Given that other-oriented empathy can enhance overall empathy (Riess, 2017), future studies should explore the dynamics of student interactions. Finally, the nature of the relationship between teachers and students remains undetermined. Positive teacher–student relationships have been shown to impact students' self-regulation (Schut et al., 2020). Further research is essential to understand this teacher–student dynamic aspect better.

Conclusions

The results show that the frequency of teacher encouragement directed at individuals positively correlates with girls' cognitive empathy. Conversely, the frequency of encouragement directed at groups from teachers shows an inverse relationship with changes in boys' affective empathy. Furthermore, we observed that general–remedial feedback provided to individuals positively affects girls' affective empathy, while inquiry directed at individuals has a negative impact. These findings underscore the importance of teacher feedback strategies in fostering empathy among junior high school students.

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