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Family–School Collaboration for Preschoolers' Physical Activity During Movement Restrictions: Barriers, Strategies, and Implications

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Abstract

The COVID-19 pandemic disrupted traditional educational and physical activity routines, particularly for preschool children who require consistent movement for optimal development. This study examined the role of family–school collaboration in supporting preschoolers' physical activity (PA) during periods of movement restrictions. A total of 489 participants (46 teachers and 443 parents) completed the Preschoolers' Home Collaboration Questionnaire (PHCQ-T and PHCQ-P). Findings revealed that 35% of parents engaged in family exercise every 2–3 days, typically for 21–30 minutes. In contrast, teachers reported engaging in 31–60 minutes of daily physical activity. Both home and preschool environments faced barriers to PA, including poor weather, time constraints, lack of space or equipment, and limited confidence or knowledge in organising physical activities. Gender differences in activity preferences were notable: boys preferred basketball ($p < 0.001$), football ($p = 0.004$), and balance biking ($p = 0.034$), while girls showed a preference for gymnastics ($p = 0.029$), yoga ($p = 0.036$), roller skating ($p = 0.021$), and skateboarding ($p = 0.022$). Despite challenges, over 80% of both teachers and parents agreed that shared responsibility and collaboration were essential for promoting PA. Communication preferences varied: parents favoured livestreaming and chat groups, while teachers preferred news platforms and chat groups. However, preschoolers overall failed to meet the National Association for Sport and Physical Education's recommendation of 120 minutes of daily PA. This study highlights the urgent need for sustained family–school partnerships to promote preschoolers' physical activity, particularly during disruptions. A proposed multi-platform hybrid model—featuring weekly livestreams, interactive chats, and accessible digital resources could support PA continuity. Furthermore, targeted training for parents and teachers is necessary to enhance their capacity to engage children effectively in physical activities.

Introduction

During the COVID-19 pandemic, online teaching, based on collaboration between families and schools, has provided robust support for global education, owing to its multiple advantages, including remote learning, comfort, and accessibility (Mukhtar et al., 2020). However, as the pandemic gradually comes to an end, children are gradually returning to regular face-to-face schooling. Nevertheless, it remains vital to stay vigilant against the potential resurgence of the pandemic (Malaysia (MOH), 2023) and the emergence of Anthrax (WHO, 2025). Such public health threats may recur unpredictably and result in prolonged disruption. The unscheduled closure of schools has disrupted classes. Therefore, establishing a flexible hybrid teaching mode that integrates school- and family-based learning, and adjusting the proportions based on different educational needs and pandemic conditions, becomes increasingly important. Such measures can provide greater adaptability for the education system, ensuring the continuity and stability of education, and effectively addressing potential periods of pandemic restrictions.

The importance of physical activity (PA) in preschoolers' development (Gabbard, 2021) has led the National Association for Sport and Physical Education (NASPE) to recommend that preschoolers (aged 3–5 years) engage in a minimum of 120 minutes of daily exercise; 60 minutes of scheduled exercise, and 60 minutes of unstructured exercise (Beets et al., 2011). However, under restrictive circumstances, stakeholders have not followed recommendations for children's physical activity (Graber et al., 2021). The disruption of classes in schools has led to irregular preschoolers' physical activity, which has subsequently affected preschoolers' motor, musculoskeletal, and psychological development (Cordovil et al., 2021; Kim et al., 2021), as well as the risk of being overweight or obese (Ferentinou et al., 2023; Tsangaridou, 2017). Physical inactivity due to class disruptions has increased the average body mass index (BMI), with boys more affected than girls (An, 2020). These findings underscore the critical need for consistent, structured physical activity programmes for preschoolers to mitigate adverse effects during movement restrictions.

Family–school collaboration has exerted a positive influence on children's physical activity behaviours (Van Lippevelde et al., 2012), influencing both motor skills and physical competences (Chapelski et al., 2023). Previous studies have addressed family-school collaboration during crises primarily through technology-mediated and family-supported solutions. Mukhtar et al. (2020) demonstrated that online platforms supported continuity of academic instruction during lockdowns, while Clarke et al. (2021) emphasised parental involvement as a critical success factor. In a systematic review, Santos et al. (2023) found that short-term family–school collaboration interventions were more effective than long-term interventions at enhancing physical activity, physical fitness, health behaviours, and lifestyle-related skills, highlighting the necessity of long-term strategies. However, gaps persist in the context of preschoolers' physical activity (PA): First, existing collaborations focus on general education but fail to address PA's unique requirements; Second, researchers have noted reduced PA during restrictions, and no prior study systematically examined how barriers such as weather, parental time constraints, and facility shortages interact.

The importance of collaboration between families and schools was further underscored during the COVID-19 pandemic, as traditional opportunities for physical activity became severely restricted. Through cooperative efforts, parents and educators can address and mitigate common barriers to physical

Table 1. Demographic Data of Teachers and Preschoolers

Teacher		Frequency	Percentage
Male		0	0%
Female		46	100%
Teaching Experience	< 1 year	12	26.09%
	1-5 years	26	56.52%
	6-10 years	4	8.7%
	11-15 years	3	6.52%
	> 15 years	1	2.17%
Preschoolers		**Frequency**	**Percentage**
Male		243	54.85%
Female		200	45.15%
Age	3-4 Years Old	165	37.25%
	4-5 Years Old	135	30.47%
	5–6 Years Old	143	32.28%

activity, including unfavourable weather conditions, limited access to facilities, concerns regarding injury, and time constraints. Implementing a family–school collaborative program tailored to periods of movement restriction is essential to ensure that preschool children engage in sufficient physical activity to support their healthy development (Elinder et al., 2021). Given that preschoolers are generally unable to participate effectively in online learning and should minimise screen exposure, understanding both the necessity and feasibility of family–school collaboration becomes crucial. Effective implementation depends not only on proactive leadership and institutional support from schools but also on the active engagement and cooperation of families.

Methods and Materials

Participants

This study recruited 500 participants, comprising 46 preschool teachers and 454 parents, from three preschools in Quanzhou, an urban city in southeastern China. The overall response rate was 97.8%, with valid responses obtained from all 46 teachers and 443 parents. The participants included preschool teachers responsible for organising daily physical activities for children, as well as parents of the enrolled preschoolers. In accordance with ethical standards for research involving human subjects, all participants provided informed consent electronically prior to data collection. The demographic data of the participants were collected as shown in Table 1.

Instrumentation

For this study, the Preschool and Family Co-Teaching Questionnaire (PHCQ) was adapted from an existing instrument designed to assess barriers to physical activity, incorporating perspectives from parents, school administrators, preschool teachers, and sport educators (Bulca et al., 2019). The PHCQ comprises two components: the Parent Questionnaire (PHCQ-P) and the Teacher Questionnaire (PHCQ-T).

The PHCQ-T consists of 18 items: two on demographic information, two on physical activity status, 12 on perceived barriers to preschool physical activity, and two on responsibility and attitudes toward co-teaching. The internal consistency of the PHCQ-T, as measured by Cronbach's alpha, was 0.83, indicating good reliability.

Similarly, the PHCQ-P includes 18 items: two on demographic information, three on physical activity status, 11 on barriers to physical activity within the family context, and two on responsibility and attitudes. The PHCQ-P demonstrated acceptable internal consistency, with a Cronbach's alpha of 0.65.

Data Collection and Analysis

Two types of data were collected in this study: demographic information and responses from the Preschool and Family Co-Teaching Questionnaire (PHCQ). Descriptive statistics were used to describe the status of and barriers to preschool children's physical activity during the non-restricted period, as well as to explore parents' and teachers' expectations, perceived responsibilities, and attitudes toward children's participation in physical activity during restricted conditions.

Additionally, an independent sample t-test was conducted to compare differences in children's physical activity levels by gender during the non-restricted period. Statistical significance was determined at the $p < 0.05$ level.

Results

Physical Activity Status

According to the family questionnaire (PHCQ-P), the most reported physical activities among children during the non-restricted period were hiking (46.95%), jumping (46.50%), and running (43.34%) (see Table 2). An independent sample t-test was conducted to examine sex differences in children's preferred physical activities. Significant gender-based differences were found in the top sport preferences. Boys ($n = 243$) were more likely to prefer basketball ($p < 0.001$), football ($p = 0.004$), and balance biking ($p = 0.034$). In contrast, girls ($n = 200$) showed a stronger preference for gymnastics ($p = 0.029$), yoga ($p = 0.036$), roller skating ($p = 0.021$), and skateboarding ($p = 0.022$).

The most common frequency with which parents accompanied their children for physical activity was every 2–3 days, reported by 35.44% of respondents. In contrast, a small percentage (2.26%) reported never engaging in physical activity with their children. Most parents (78.10%) reported spending 10–30 minutes per session exercising with their children, while only a small proportion (3.16%) reported sessions lasting more than 60 minutes (see Table 3). In the preschool setting, physical activity was typically conducted through a combination of teacher-led play and free play, as reported by 56.52% of teachers. Fewer than half of the children (45.65%) engaged in physical activity for 30–60 minutes daily, and only a minority (13.04%) participated for more than 90 minutes each day (see Table 3).

Table 2. Physical Activities Selected by Children Based on Personal Preference

Activity	Total		Comparison between gender			
	Frequency (n=443)	Percentage	Gender	Frequency	Percentage	Sig.
Hiking	208	46.95	Boy (n=243)	108	51.92%	0.245
			Girl (n=200)	100	48.08%	
Running	192	43.34	Boy (n=243)	114	59.38%	0.094
			Girl (n=200)	78	40.62%	
Climbing	50	11.29	Boy (n=243)	25	50.00%	0.465
			Girl (n=200)	25	50.00%	
Skipping	206	46.50	Boy (n=243)	118	57.28%	0.339
			Girl (n=200)	88	42.72%	
Basketball	147	33.18	Boy (n=243)	101	68.71%	0.000**
			Girl (n=200)	46	31.29%	
Football	68	15.35	Boy (n=243)	48	70.59%	0.004**
			Girl (n=200)	20	29.41%	
Throwing	44	9.93	Boy (n=243)	27	61.36%	0.362
			Girl (n=200)	17	38.64%	
Baseball	1	0.23	Boy (n=243)	1	100.00%	0.365
			Girl (n=200)	0	0.00%	
Tennis	4	0.9	Boy (n=243)	3	75.00%	0.417
			Girl (n=200)	1	25.00%	
Hip-Hop Dance	5	1.13	Boy (n=243)	3	60.00%	0.817
			Girl (n=200)	2	40.00%	
Latin Dance	3	0.68	Boy (n=243)	0	0.00%	0.083
			Girl (n=200)	3	100.00%	
Swimming	9	2.03	Boy (n=243)	4	44.44%	0.527
			Girl (n=200)	5	55.56%	
Kung Fu	3	0.68	Boy (n=243)	1	33.33%	0.453
			Girl (n=200)	2	66.67%	
Taekwondo	2	0.45	Boy (n=243)	0	0.00%	0.158
			Girl (n=200)	2	100.00%	
Gymnastics	20	4.51	Boy (n=243)	6	30.00%	0.029*
			Girl (n=200)	14	70.00%	
Yoga	10	2.26	Boy (n=243)	2	20.00%	0.036*
			Girl (n=200)	8	80.00%	
Balance Bike	100	22.57	Boy (n=243)	64	64.00%	0.034*
			Girl (n=200)	36	36.00%	
Skateboard	5–6	5–6	Boy (n=243)	41	44.09%	0.022*
			Girl (n=200)	52	55.91%	
Roller Skating	63	14.22	Boy (n=243)	26	41.27%	0.021*
			Girl (n=200)	37	58.73%	

* p<0.05, ** p<0.01

Table 3. Children's Exercise Frequency, Duration, and Activity Types at Home and in Preschool

Exercise			Frequency	Percentage
Home	Frequency of exercise	Never	10	2.26%
		Every 5-6 days	103	23.25%
		Every 2-3 days	157	35.44%
		Every day	109	24.60%
		Multiple times a day	64	14.45%
	Duration of exercise	＜10 minutes	26	5.87%
		11-20 minutes	162	36.57%
		21–30 minutes	184	41.53%
		31-60 minutes	57	12.87%
		> 60 minutes	14	3.16%
Preschool	Form of Exercise	Fully Teacher-led	2	4.35%
		Teacher-led > Free-play	11	23.91%
		Teacher-led = Free-play	26	56.52%
		Teacher-led ＜ Free-play	7	15.22%
		Fully Free-play	0	0%
	Duration of exercise	＜10 minutes	2	4.35%
		11-30 minutes	17	36.96%
		31-60 minutes	21	45.65%
		61-90 minutes	0	0%
		> 90 minutes	6	13.04%

Physical Activity Barriers

As shown in Table 4, teachers identified several key barriers to preschool physical activity during the non-restricted period. The most reported barriers included bad weather (58.70%), insufficient available facilities and venues (45.65%), concerns about injury during physical activity (45.65%), lack of activity equipment and materials (43.48%), limited time (43.48%), and the inability to effectively plan physical activities (43.48%). Similarly, parents reported their own set of perceived barriers to facilitating physical activity at home. These included insufficient facilities and venues (46.28%), lack of equipment or materials (17.61%), difficulty in planning physical activities (16.06%), concerns about their child getting injured (5.42%), and frequent illness among children (1.58%).

Responsibility and Attitude

Most of both teachers (80.40%) and parents (88.03%) agreed that responsibility for supporting children's physical activity during the restriction period should be shared between preschool and family (Table 5). A smaller proportion of teachers (8.7%) believed that preschools should bear greater responsibility, while a minority of parents (4.74%) felt that families should take on more of the burden.

Regarding interactive physical activity methods during restriction periods, both teachers (32.26%) and parents (37.25%) preferred communication via chat groups such as WeChat or WhatsApp. Teachers showed a stronger preference for online news platforms (e.g., websites or official accounts), with 41.94% favouring this method compared to 23.48% of parents. Conversely, livestreaming platforms (e.g.,

Table 4. Physical Activity Barriers Encountered at Preschool and Home

			Teacher (n=46)		Parent (n=443)	
No	**Physical Activity Barriers**	Response	Frequency	Percentage	Frequency	Percentage
1	Bad weather	YES	27	58.70%	NA	NA
		NO	19	41.30%	NA	NA
2	Insufficient available facilities and venues	YES	21	45.65%	205	46.28%
		NO	25	54.35%	238	53.72%
3	Worry about getting injured	YES	21	45.65%	24	5.42%
		NO	25	54.35%	419	94.58%
4	Lack of activity equipment	YES	20	43.48%	78	17.61%
		NO	26	56.52%	365	82.39%
5	Inadequate time	YES	20	43.48%	263	59.37%
		NO	26	56.52%	180	40.63%
6	Inability to plan physical activities	YES	20	43.48%	71	16.03%
		NO	26	56.52%	372	83.97%
7	Getting sick	YES	13	28.26%	7	1.58%
		NO	33	71.74%	436	98.42%
8	Poor motor skills	YES	12	26.09%	130	29.35%
		NO	34	73.91%	313	70.65%
9	Unfamiliar in organizing physical activity	YES	11	23.91%	NA	NA
		NO	35	76.09%	NA	NA
10	Not wanting to participate	YES	8	17.39%	29	6.55%
		NO	38	82.61%	414	93.45%
11	Lack of physical strength and energy	YES	8	17.39%	13	2.39%
		NO	38	82.61%	430	97.27%
12	Lack of a physical activity atmosphere	YES	7	15.22%	76	17.16%
		NO	39	84.78%	367	82.84%
13	Economic pressures	YES	NA	NA	15	3.39%
		NO	NA	NA	428	96.61%

TikTok or Zoom) were preferred by 36.34% of parents, compared to 25.81% of teachers.

In summary, under normal conditions, children engaged in physical activity both at preschool and with their families, reflecting the shared responsibility between teachers and parents. During periods of restriction, it is essential to offer diverse modes of physical activity delivery while considering the practical realities faced by both parents and educators to enable effective and sustainable online collaboration.

Discussion

The National Association for Sport and Physical Education (NASPE) recommends that preschoolers (ages 3–5) engage in at least 120 minutes of physical activity daily. However, this study's findings indicate that preschoolers fall significantly short of this benchmark. Fewer than half of the preschoolers engaged in 30–60 minutes of physical activity per day at school, while parents typically participated in family physical activities with their children 2–3 days per week. This shortfall becomes even more pronounced during periods of global restriction, such as those experienced during the COVID-19 pandemic, when

Table 5. Perceived Responsibilities and Preferred Interaction Methods of Teachers and Parents

	Responsibility and Interaction form		**Frequency**	**Percentage**
Teacher (n=46)	Who should hold greater responsibility for promoting children's physical activity: preschools or parents?	Preschool only	1	2.17%
		Preschools should take more responsibility than the parents	4	8.70%
		Responsibility should be equally shared between preschool and parents	37	80.43%
		Home should take more responsibility than preschool	4	8.70%
		Parents only	0	0.00%
	Which online platform or interaction format is most appropriate for promoting physical activity among children?	Online news platforms (e.g., official websites, educational blogs, WeChat public accounts)	17	36.96%
		Chat groups (e.g., WeChat, WhatsApp)	16	34.78%
		Live streaming platforms (e.g., TikTok, Zoom, YouTube Live)	13	28.26%
Parent (n=443)	Who should hold greater responsibility for promoting children's physical activity: preschools or parents?	Preschool only	3	0.68%
		Preschools should take more responsibility than the parents	29	6.55%
		Responsibility should be equally shared between preschool and parents	390	88.04%
		Home should take more responsibility than preschool	21	4.74%
		Parents only	0	0.00%
	Which online platform or interaction format is most appropriate for promoting physical activity among children?	Online news platforms (e.g., official websites, educational blogs, WeChat public accounts)	109	24.60%
		Chat groups (e.g., WeChat, WhatsApp)	169	38.15%
		Live streaming platforms (e.g., TikTok, Zoom, YouTube Live)	165	37.25%

opportunities for physical activity are further reduced.

Previous studies have primarily explored family–school collaboration through technology-mediated (Mukhtar et al., 2020) and family-supported (Clarke et al., 2021) approaches. However, these studies have mainly focused on general education and have failed to address the unique requirements of physical activity. This gap means that issues such as declines in sleep quality during restrictions (Aguilar-Farias et al., 2021), increased difficulties in emotion regulation (Alonso-Martínez et al., 2021), and obstacles in the development of fundamental movement skills (Abe et al., 2022) are not fundamentally resolved. These findings highlight an urgent need for targeted interventions and collaborative strategies, particularly between families and schools, to promote adequate physical activity among preschoolers, especially during periods of restricted movement and access to structured play environments.

This study found that teachers' and parents' sense of responsibility significantly influences the frequency and duration of preschool children's participation in physical activities. Teachers who demonstrate a stronger sense of responsibility are more likely to implement teacher-led physical activity sessions. In contrast, parents with higher perceived responsibility tend to engage in family-based physical activities more frequently and for longer durations. These findings suggest that when teachers and parents actively embrace their roles in promoting physical activity, they can effectively guide and support preschool children in achieving adequate levels of physical activity, thereby contributing to children's physical health and overall development. However, this heightened sense of responsibility also means that teachers and parents may encounter more challenges in promoting physical activity. They are often the ones who must recognise and proactively address barriers that hinder children's participation.

From the research, bad weather conditions and time constraints emerge as primary barriers influencing both school and family-based physical activity (Table 4). Additionally, significant correlations exist among various obstacles to physical activities. In practice, some of these issues can be mitigated through creative and flexible approaches. For example, adverse weather can be addressed by providing suitable indoor activity spaces. Limited facilities and venues can be compensated for through equipment substitutions that still encourage movement. The absence of standard activity equipment can be overcome by modifying teaching strategies to utilise existing space and materials efficiently. Likewise, limited time can be counterbalanced with short, frequent activity sessions using available resources. It appears that possessing adequate knowledge of physical skills can resolve most obstacles to physical activities. Indeed, research data indicate a significant correlation between the lack of physical skills and major obstacles such as inadequate sports facilities and equipment, underscoring the importance of physical skill knowledge in preschool physical activities. Ensuring the acquisition of appropriate skills, knowledge, and facilities is crucial for promoting physical activity among preschool children during restrictions (Walker et al., 2022). Moreover, educators acknowledge that insufficient training limits their ability to provide opportunities for physical activity (Coleman & Dyment, 2013).

What types of sports skills and knowledge are more essential for teachers and parents to possess? Based on the study's findings, parents should acquire a set of versatile, broadly applicable sports skills and knowledge, including hiking, running, skipping, and others. In addition, the study revealed gender-related preferences in children's activity choices. Families with boys may benefit from placing greater emphasis on sports such as basketball, football, and balance biking, while families

with girls may consider encouraging gymnastics, yoga, and roller skating. These activities align more closely with their interests and engagement patterns. Parents generally reported participating in family physical activities for approximately 30 minutes per session, once every 1–2 days. For some parents managing multiple family responsibilities, the frequency and duration of family physical interactions were slightly higher. Based on these findings, it is advisable to promote a realistic, sustainable activity schedule that aligns with family routines, such as 30-minute sessions three times per week, to support consistent engagement in physical activity at home.

To ensure preschoolers engage in adequate physical activity during periods of restriction, online teaching can be an effective tool for fostering family–school collaboration. Research findings indicate that parents most frequently engage through online chat groups and livestreaming platforms, while teachers prefer online chat groups and official accounts (e.g., school websites or educational social media channels). Given these preferences, it is recommended to adopt a multi-platform approach to accommodate the diverse needs and habits of both parents and teachers, thereby enhancing the effectiveness of online collaboration. A proposed online physical activity schedule could include: livestreamed physical activity sessions (approximately 30 minutes) held once per week (e.g., Tuesdays at 7:00 p.m.); interactive online chat group discussions (approximately 30 minutes) once per week (e.g., Thursdays at 7:00 p.m.), and weekly articles and instructional videos shared through official school accounts, featuring parent–child physical activity content and guided lesson plans. This structured and flexible approach can help maintain children's physical activity levels while supporting consistent communication and shared responsibility between families and schools. In addition, Wilhelmsen and Sørensen (2019) proposed that conditions for promoting family–school collaboration include continuous systemic communication, trust in the capabilities of school personnel, and joint problem-solving and professional cooperation.

Conclusion

The critical importance of collaboration between families and schools in promoting physical activity among preschoolers globally, particularly during challenging times such as the COVID-19 pandemic. By understanding children's preferences and collectively addressing barriers, both parents and educators can enhance engagement and create a supportive environment for regular physical activity. Strengthening family-school partnerships not only reinforces family bonds but also provides organisational support for implementing diverse, interactive, and age-appropriate activities. Moreover, the use of interactive platforms and adaptability to evolving circumstances further enhances the effectiveness of physical activity interventions. This coordinated effort contributes to improved physical health, emotional well-being, and the overall development of young children. Ultimately, this collaborative model underscores the importance of synergy between home and school environments in fostering healthy, active lifestyles, laying a strong foundation for the holistic development of preschoolers.

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Disclosure of potential conflicts of interest
The authors have no competing interests to declare that are relevant to the content of this article.

Ethical endorsement
This study was performed in line with the principles of the Declaration of Helsinki. Approval was granted by the Ethics Committee of Quanzhou Normal University (June 2021/No.QZSYLL 202106)

Informed Consent
Informed consent was obtained from all individual participants included in the study.

Data Availability
All data has been provided to Baidu Baidu Netdisk, accessible through the link: https://pan.baidu.com/s/1xWMw3eJkCZxabUifQwKOIw?pwd=66w9

Code Availability
The code used in this study is available upon request from the corresponding author. We are committed to transparency and reprehensibility in research, and we encourage fellow researchers to contact us for access to the code supporting our findings.

Author Contributions
Conceptualisation, methodology, data curation, formal analysis, writing and editing Li Y.; validation and supervision, Ler HY.; visualisation and administration, Su L. Interpreting and editing the results Wee EH. All authors have read and agreed to the published version of the manuscript.

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