

Pre-Service Physical Education Teachers' Playing Experience and Skill Analysis Ability

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Received: 29/05/2024

Revised: 13/06/2024

Accepted: 21/06/2024

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Abstract

The relationship between playing experience and skill analysis ability among pre-service physical education teachers is understudied. This study examined the relationship between playing experience, general and game-specific, and skill analysis ability among pre-service physical education teachers in Singapore. Pre-service physical education teachers completed surveys of their playing experience and skill analysis ability prior to the start of their physical education teacher education programs. Spearman's rank-order correlations were run to determine the relationships between playing experience, general and game-specific, and skill analysis ability among pre-service physical education teachers. The results showed that the pre-service physical education teachers lacked playing experience in general and were not able to analyze any of the skills commonly taught in schools. Also, there was no correlations between playing experience and skill analysis ability, e.g., a pre-service physical education teacher with playing experience in a game/sport is unable to analyze the skills used in that game/sport, and they are also unable to analyze skills not used in that game/ sport.

Keywords: Fundamental movement skills, Game/ sport experience, Physical education teacher education

How to cite:

Tan, S. M. (2024). Pre-Service Physical Education Teachers' Playing Experience and Skill Analysis Ability. *JUMORA: Jurnal Moderasi Olahraga*, 4(1), 1-16. <https://doi.org/10.53863/mor.v4i1.1123>

1. INTRODUCTION

Pre-service physical education teachers do not enter physical education teacher education programs with a clean slate, they are likely to have played or participated in one or more games/sports prior to their entry into the physical education teacher education programs. Sometimes labeled as athletic experience (e.g., Crickard et al., 2020) or sport experience (e.g., Kavussanu et al., 2008), playing experience refers to one's practical knowledge, skill, or practice derived from direct observation of or participation in a particular game or sport. A crucial ability

that physical education teachers must possess, skill analysis refers to the systematic observation and introspective judgment of the quality of the human movement for the purpose of providing the most appropriate intervention to improve performance (Knudson, 2013). Although skill analysis ability enables physical education teachers to perform essential teacher functions (Rink, 2013), the relationship between playing experience and skill analysis ability among pre-service physical education teachers is understudied. Thus, the aim of this study is to examine the relationship between playing experience and skill analysis ability among pre-service physical education teachers.

The literature reviewed for this study focused on two key areas, i.e., physical education teachers' playing experience and their skill analysis ability. First, physical education teachers' playing experience is understudied, with few studies examining playing experience's influence on the attributes of physical education teachers, i.e., physical education teachers' lesson perceptions, beliefs in the physical education outcome goals, self-confidence to teach physical education, and noticing of students' motor skills. For example, Mitchell et al. (2005) examined the influence of playing, teaching and/or coaching experiences on perceptions of good and bad aspects of a lesson. Participants reported their time and duration spent playing, teaching and/or coaching, and were categorized into 4 experience profiles: (1) no playing, teaching and/or coaching experiences, (2) no playing, but has teaching and/or coaching experiences, (3) has playing, but no teaching and/or coaching experiences, and (4) has playing, teaching and/or coaching experiences. It was found that playing experiences do not differentiate participants in terms of their perceptions of a lesson whereas participants with teaching and/or coaching experiences were more able to perceive pedagogical aspects of the lesson than those without. In another study, Adamakis and Zounhia (2016) examined the influence of Greek pre-service teachers' extracurricular athletic experiences on their beliefs in the four outcome goals of physical education, i.e., physical activity leading to fitness, self-actualization, motor skill development, and social development. Participants reported the level, number of years, and frequency of athletic participation. It was reported that the Greek pre-service teachers' beliefs in the four outcome goals of physical education were not influenced by their extracurricular athletic experiences. Barbara et al. (2022) examined how pre-service teachers' biographies and past experiences in sport and physical education shape their approaches to physical education. It was found that positive past experiences in physical education predicted greater self-confidence to teach physical education, whereas negative past experiences predicted lower self-confidence to teach physical education. Lastly, Reuker (2017) compared four groups of physical education teachers with different pedagogical and sport-specific expertise in terms of their range of noticing while observing students' interaction in physical education lessons. Participants observed four 5-minute clips and identified events that are significant for teaching practice. It was reported that all the participants most often noticed the class as a whole and events related to students' motor skills, and pedagogical approach was least often noticed. With no significant difference found between teachers with and without sport-specific experience in terms of noticing events related to students' motor skills, the author suggested that physical education teacher education programs should emphasize on guiding student teachers to observe and interpret the learning process instead of helping them improve their skill performances.

At present, the limited literature suggests physical education teachers' playing experience has little influence on physical education teachers' lesson perceptions, beliefs in the physical education outcome goals, self-confidence to teach physical education, and noticing of students'

motor skills. Although physical education teachers may often possess extensive playing experience themselves, there are few studies examining the influence of physical education teacher's playing experience on their teaching practice, e.g., skill analysis ability. Mullem (2020) suggests a possible reason for this: Physical education teachers do not rely on their playing experience for their appointments. Instead, physical education teachers' appointments are mainly based on their educational qualifications (Marttinen et al., 2021).

Second, Siedentop and Tennehill (2000) considered skill analysis as a means that is frequently used by experienced physical education teachers in their classes to provide feedback, to manage the classroom and to inform teaching practice. Similarly, Metzler (2011) considered physical education teachers' skill analyses as forms of assessment that enable the teacher to plan and teach. For example, if physical education teachers observe that most students were able to perform a skill well enough, they may decide to move on to new or more advanced content, i.e., games. Conversely, if physical education teachers observe that their students have yet to master the skill, they may decide to give the students more practice on the skill. Likewise, Rink (2014) considered skill analysis as an essential ability for physical education teachers that enables them to provide students with feedback, assess their performance or make decisions about what to do next. Most recently, Ward et al. (2021) discussed the importance of physical education teachers' skill analysis ability, its place in physical education teachers' content knowledge, and how physical education teacher education programs can develop a physical education teacher's skill analysis ability.

Few studies have examined the influence of physical education teachers' playing experience on their skill analysis ability. For example, Armstrong and Hoffman (1979) examined the skill analysis ability among experienced tennis teachers and pre-service physical education teachers. They were tasked to observe and rate videos of the tennis forehand stroke. Despite the tennis teachers having more playing and teaching experience than the pre-service physical education teachers, no differences were found between their ratings of the tennis forehand strokes. It was argued that playing experience did not provide any advantage to the tennis teachers' skill analysis ability and the pre-service physical education teachers' recent background in motor skill instruction placed them on par with the experienced tennis teachers in terms of skill analysis ability. In another study, Nielsen and Beauchamp (1991) examined 48 pre-service physical education teachers' skill analysis ability before and after a 12-week training program where they learned to analyze movement, detect errors, and provide instructional feedback. The pre-service physical education teachers' playing experiences were also considered in the analysis as half of them played Volleyball at high school level, and they rated performances of a familiar skill, i.e., Volleyball forearm pass, and a novel skill, i.e., Team Handball jump shot, for the pre- and post-tests. It was found that pre-service physical education teachers with playing experience were no better than those without, and pre-service physical education teachers' skill analysis ability significantly improved for both the familiar and novel skills after the training program.

In summary, the relationship between playing experience and skill analysis ability among pre-service physical education teachers is understudied. Existing studies suggest that pre-service physical education teachers are not competent in analyzing skills, and playing experience does not facilitate the analysis of familiar and unfamiliar skills. At present, existing studies only considered pre-service physical education teachers' playing experience to one game/sport and assessed their skill analysis ability in a limited number of skills, e.g., one skill related to their playing experience and one unrelated skill. To the best of the author's knowledge, no study has

considered pre-service physical education teachers' playing experience holistically, assessed skill analysis ability across several skills, or recruited participants from the Southeast Asia region. Thus, the aim of this study is to examine the relationship of playing experience and skill analysis ability among pre-service physical education teachers in Singapore. Specifically, the following research questions are addressed:

- a. What is the level of playing experience and skill analysis ability among pre-service physical education teachers in Singapore?
- b. What is the relationship between playing experience, general and game-specific, and skill analysis ability among pre-service physical education teachers in Singapore?

2. METHOD

2.1 Participants

36 pre-service physical education teachers (17 males, 19 females, mean age = 27.42 ± 4.18 years) participated in the study. Approval from the university's institutional review board (IRB-2020-06-031) and informed consent from the participants were obtained before the start of the study. The participants were recruited from National Institute of Education, the sole tertiary institute in Singapore (National Institute of Education, 2023) that offers three physical education teacher education programs, i.e., Bachelor of Science (Education), Diploma in Physical Education, and Post-Graduate Diploma in Education (Physical Education). Entry into the programs is based on the candidates' academic qualifications, physical proficiency test results, and games/sports playing experience, i.e., candidates should preferably have strong sports involvement in secondary school, junior college, or polytechnic (National Institute of Education, 2020a, 2020b, 2020c).

2.2 Research Design

A correlational research design was adopted for this study (Thomas et al., 2011).

2.3 Instruments

To measure playing experience in a game/sport, participants responded to the following items for each game/sport they are currently playing or have played: (1) Name of the game/sport, (2) Number of years you have played or participated in this game/sport, and (3) Number of hours per week you have played or participated in this game/sport. To determine participant's playing experience in a game/sport, the total number of hours spent for each game/sport was calculated using this equation: $T = Y \times 52 \times H$, where T is the total number of hours spent playing the game/sport, Y is the number of years spent playing the game/sport, "52" being the numbers of weeks in a year, and H is the number of hours per session spent playing the game/sport.

To measure skill analysis ability, participants watched eight skill performances and rated whether its critical features are present and performed correctly. The eight skills coincided with those taught in schools (Ministry of Education, 2016), and are often assessed to establish motor proficiency among children (Ulrich, 2000, 2013), i.e., catch, dribble with hand, kick, roll (underhand), strike with bat, strike with racket, throw (overhand), and throw (underhand). The number of critical features ranged from five to eleven, and participants rated the skill performances on criteria sheets. Each criteria sheet contains the skills' illustrations and critical features, obtained from Colvin, Markos, and Walker's (2016) Teaching Fundamental Motor Skills, an often-used course text by physical education teacher education programs and considered

a valid and accurate source (Knudson, 2013). Participants watched the skill performances on videos. The skills were performed by school-age children and videotaped from the best vantage point (Knudson, 2013), i.e., appropriately distanced, situated in front of a uniform background, capturing the performer's dominant side, and right angle to the plane of motion. In each video, the skill performance contains several errors, i.e., critical features missing or erroneously performed. Participants are afforded the use of video functions, e.g., pause, freeze-frame and slow-motion, when watching the skill performance videos. To determine participant's skill analysis ability, their responses are compared against the reference developed by three subject matter experts, i.e., two university faculties specializing in physical education and a physical education curriculum specialist from the education ministry. To facilitate comparison, participant's skill analysis ability is presented as percentages. Intraclass correlation coefficient estimates, and 95% confident intervals were calculated using SPSS statistical package version 28 (SPSS Inc, Chicago, IL) based on a mean-rating ($k = 3$), absolute-agreement, 2-way mixed effects model (Koo & Li, 2016). Intraclass correlation coefficient value was .943, indicating excellent reliability for this measure of skill analysis ability. Basic demographics, i.e., gender, age, and program of study, of the participants were also collected.

2.4 Procedures

Data collection was scheduled in the first week of the participants' physical education teacher education programs to control for history threat (Thomas et al., 2011), i.e., participants might learn about skill analysis from the courses they will be reading during their programs. Data collection was held in a typical tutorial room where participants are seated and can access the internet via their personal devices, e.g., laptop. Participants were briefed on the study and their informed consent obtained prior to data collection. During the data collection, participants first completed the surveys on basic demographics and playing experience. Next, they were provided the eight criteria sheets, access to the eight skill performance videos via their laptops and instructed to watch and rate the skill performances using the criteria sheets. Participants' responses to the surveys and criteria sheets were checked for completeness and collected before they departed the data collection venue.

2.5 Data Analysis

Data is entered into a computer for analysis using SPSS statistical package version 28 (SPSS Inc, Chicago, IL). Descriptive statistics were generated, and non-parametric statistics were performed as preliminary analyses indicated that several variables violated the assumptions of normality (Pallant, 2013). Spearman's rank-order correlations were run to determine the relationships between playing experience, general and game-specific, and skill analysis ability among pre-service physical education teachers.

3. RESULTS

3.1 Playing experience and skill analysis ability in general

In terms of playing experience, the pre-service physical education teachers accumulated an average of 6050.78 ± 4411.74 hours and ranged from 16640 hours (max) to 416 hours (min). 15 (41.67%) pre-service physical education teachers participated in three games/sports, 13 (36.11%) participated in two games/sports, and eight (22.22%) participated in one game/sport. Soccer is the most participated game/sport by 16 pre-service physical education teachers, followed by Badminton (10), Running (10), and Basketball (7). Five or less pre-service physical

education teachers participated in the remaining games/sports. See Table 1 for pre-service physical education teachers' game/sport participation.

In terms of skill analysis ability, the pre-service physical education teachers attained averages of $76.54 \pm 19.84\%$ for catch, $76.11 \pm 20.74\%$ for dribble, $73.41 \pm 17.13\%$ for kick, $43.83 \pm 20.74\%$ for roll (underhand), $67.01 \pm 20.73\%$ for strike with bat, $48.23 \pm 17.90\%$ for strike with racket, $42.93 \pm 19.02\%$ for throw (overhand), and $45.14 \pm 20.11\%$ for throw (underhand). Kelly and Moran (2010) suggested that practitioners need to attain the established level of 80% for skill analysis to be considered competent, thus the results indicate that the pre-service physical education teachers were unable to analyze any of the skills included in the study.

Spearman's rank-order correlations were run to determine the relationships between playing experience and skill analysis among pre-service physical education teachers. There were significant negative relationships between playing experience and skill analysis ability in terms of dribble ($\rho = -.344$, $n = 36$, $p = .040$), kick ($\rho = -.40$, $n = 36$, $p = .016$), and strike with racket ($\rho = -.373$, $n = 36$, $p = .025$). There were no significant relationships between playing experience and skill analysis ability in terms of catch ($\rho = -.059$, $n = 36$, $p = .732$), roll (underhand) ($\rho = -.19$, $n = 36$, $p = .268$), strike with bat ($\rho = -.224$, $n = 36$, $p = .189$), throw (overhand) ($\rho = -.142$, $n = 36$, $p = .410$), and throw (underhand) ($\rho = .017$, $n = 36$, $p = .921$). See Table 2 for the correlations between pre-service physical education teachers' skill analysis ability and general playing experience.

Table 1.

Game/sport participation among pre-service physical education teachers.

Game/sport	n	Hours spent playing the game/sport			
		Mean	SD	Max	Min
Soccer	16	3545.75 h	2710.67 h	9880 h	156 h
Badminton	10	1170 h	1150.61 h	3744 h	156 h
Running	10	3302 h	3497.66 h	9984 h	312 h
Basketball	7	3112.57 h	2864.32 h	8580 h	104 h

Note: Games/sports with five or less participants are not presented in Table 1.

Table 2.

Pre-service physical education teachers' skill analysis ability and its correlations to general playing experience.

Variable	n	Mean	SD	Spearman's Rho	Sig. (2-tailed)
Catch	36	76.54%	19.84%	-.059	.732
Dribble	36	76.11%	20.74%	-.344	.040
Kick	36	73.41%	17.13%	-.40	.016
Roll (underhand)	36	43.83%	20.74%	-.19	.268
Strike with bat	36	67.01%	20.73%	-.224	.189
Strike with racket	36	48.23%	17.90%	-.373	.025
Throw (overhand)	36	42.93%	19.02%	-.142	.410
Throw (underhand)	36	45.14%	20.11%	.017	.921
Playing experience (general)	36	6050.88 h	4411.74 h	1.00	-

3.2 Playing experience and skill analysis ability (Soccer)

Among the 16 pre-service physical education teachers who played Soccer, an average of 3545.75 ± 2710.67 hours of experience was accumulated, and their skill analysis ability attained averages of $71.53 \pm 12.15\%$ for catch, $68.75 \pm 23.06\%$ for dribble, $67.86 \pm 12.23\%$ for kick, $77.09 \pm 13.13\%$ for roll (underhand), $52.34 \pm 17.81\%$ for strike with bat, $69.89 \pm 12.73\%$ for strike with racket, $68.75 \pm 10.48\%$ for throw (overhand), and $75.00 \pm 15.14\%$ for throw (underhand). Spearman's rank-order correlations were run to determine the relationships between playing experience and skill analysis among pre-service physical education teachers who played Soccer. There were no significant relationships between playing experience in Soccer and skill analysis ability, i.e., catch ($\rho = .437$, $n = 16$, $p = .091$), dribble ($\rho = -.42$, $n = 16$, $p = .105$), kick ($\rho = .085$, $n = 16$, $p = .755$), roll (underhand) ($\rho = -.112$, $n = 16$, $p = .680$), strike with bat ($\rho = .338$, $n = 16$, $p = .200$), strike with racket ($\rho = .463$, $n = 16$, $p = .071$), throw (overhand) ($\rho = .410$, $n = 16$, $p = .114$), and throw (underhand) ($\rho = -.003$, $n = 16$, $p = .991$). See Table 3 for the correlations between pre-service physical education teachers' skill analysis ability and game-specific playing experience (Soccer).

Table 3.

Pre-service physical education teachers' skill analysis ability and its correlations to playing experience in Soccer.

Variable	n	Mean	SD	Spearman's Rho	Sig. (2-tailed)
Catch	16	71.53%	12.15%	.437	.091
Dribble	16	68.75%	23.06%	-.42	.105
Kick	16	67.86%	12.23%	.085	.755
Roll (underhand)	16	77.09%	13.13%	-.112	.680
Strike with bat	16	52.34%	17.81%	.338	.200
Strike with racket	16	69.89%	12.73%	.463	.071
Throw (overhand)	16	68.75%	10.48%	.410	.114
Throw (underhand)	16	75.00%	15.14%	-.003	.991
Playing experience (Soccer)	16	3545.75 h	2710.67 h	1.00	-

3.3 Playing experience and skill analysis ability (Badminton)

Among the ten pre-service physical education teachers who played Badminton, an average of 1170.00 ± 1150.61 hours of experience was accumulated, and their skill analysis ability attained averages of $70.00 \pm 14.86\%$ for catch, $76.00 \pm 26.33\%$ for dribble, $71.43 \pm 9.52\%$ for kick, $75.56 \pm 13.66\%$ for roll (underhand), $55.00 \pm 15.81\%$ for strike with bat, $64.55 \pm 13.86\%$ for strike with racket, $70.00 \pm 12.16\%$ for throw (overhand), and $75.00 \pm 10.21\%$ for throw (underhand).

Spearman's rank-order correlations were run to determine the relationships between playing experience and skill analysis among pre-service physical education teachers who played Badminton. There were no significant relationships between playing experience in Badminton and skill analysis ability in terms of catch ($\rho = .177$, $n = 10$, $p = .625$), dribble ($\rho = .292$, $n = 10$, $p = .412$), kick ($\rho = -.33$, $n = 10$, $p = .351$), roll (underhand) ($\rho = -.458$, $n = 10$, $p = .184$), strike with bat ($\rho = -.274$, $n = 10$, $p = .443$), strike with racket ($\rho = -.204$, $n = 10$, $p = .571$), throw (overhand) ($\rho = -.211$, $n = 10$, $p = .559$), and throw (underhand) ($\rho = .00$, $n = 10$, $p = 1.0$). See Table 4 for the correlations between pre-service physical education teachers' skill analysis ability and game-specific playing experience (Badminton).

Table 4.

Pre-service physical education teachers' skill analysis ability and its correlations to playing experience in Badminton.

Variable	n	Mean	SD	Spearman's Rho	Sig. (2-tailed)
Catch	10	70.00%	14.86%	.177	.625
Dribble	10	76.00%	26.33%	.292	.412
Kick	10	71.43%	9.52%	-.33	.351
Roll (underhand)	10	75.56%	13.66%	-.458	.184
Strike with bat	10	55.00%	15.81%	-.274	.443
Strike with racket	10	64.55%	13.86%	-.204	.571
Throw (overhand)	10	70.00%	12.16%	-.211	.559
Throw (underhand)	10	75.00%	10.21%	.00	1.00
Playing experience (Badminton)	10	1170.00 h	1150.61 h	1.00	-

3.4 Playing experience and skill analysis ability (Running)

Among the ten pre-service physical education teachers who participated in Running, an average of 3302.00 ± 3497.66 hours of experience was accumulated, and their skill analysis ability attained averages of $63.34 \pm 12.89\%$ for catch, $78.00 \pm 19.89\%$ for dribble, $64.29 \pm 13.88\%$ for kick, $71.11 \pm 15.89\%$ for roll (underhand), $51.25 \pm 16.08\%$ for strike with bat, $70.91 \pm 14.08\%$ for strike with racket, $65.46 \pm 9.39\%$ for throw (overhand), and $80.00 \pm 14.67\%$ for throw (underhand).

Spearman's rank-order correlations were run to determine the relationships between playing experience and skill analysis among pre-service physical education teachers who participated in Running. There were no significant relationships between experience in Running and skill analysis ability i.e., catch ($\rho = -.431$, $n = 10$, $p = .214$), dribble ($\rho = -.358$, $n = 10$, $p = .310$), kick ($\rho = .321$, $n = 10$, $p = .366$), roll (underhand) ($\rho = .414$, $n = 10$, $p = .234$), strike with bat ($\rho = -.203$, $n = 10$, $p = .574$), strike with racket ($\rho = -.197$, $n = 10$, $p = .586$), throw (overhand) ($\rho = -.101$, $n = 10$, $p = .781$), and throw (underhand) ($\rho = -.364$, $n = 10$, $p = .302$). See Table 5 for the correlations between pre-service physical education teachers' skill analysis ability and sport-specific playing experience (Running).

Table 5.

Pre-service physical education teachers' skill analysis ability and its correlations to playing experience in Running.

Variable	n	Mean	SD	Spearman's Rho	Sig. (2-tailed)
Catch	10	63.34%	12.89%	-.431	.214
Dribble	10	78.00%	19.89%	-.358	.310
Kick	10	64.29%	13.88%	.321	.366
Roll (underhand)	10	71.11%	15.89%	.414	.234
Strike with bat	10	51.25%	16.08%	-.203	.574
Strike with racket	10	70.91%	14.08%	-.197	.586
Throw (overhand)	10	65.46%	9.39%	-.101	.781
Throw (underhand)	10	80.00%	14.67%	-.364	.302
Playing experience (Running)	10	3302.00 h	3497.66 h	1.00	-

3.5 Playing experience and skill analysis ability (Basketball)

Among the seven pre-service physical education teachers who played Basketball, an average of 3112.57 ± 2864.32 hours was accumulated, and their skill analysis ability attained averages of $61.91 \pm 8.74\%$ for catch, $77.14 \pm 17.99\%$ for dribble, $71.43 \pm 8.25\%$ for kick, $71.43 \pm 14.14\%$ for roll (underhand), $37.50 \pm 12.50\%$ for strike with bat, $62.34 \pm 16.95\%$ for strike with racket, $64.94 \pm 6.27\%$ for throw (overhand), and $67.86 \pm 12.20\%$ for throw (underhand).

Spearman's rank-order correlations were run to determine the relationships between playing experience and skill analysis among pre-service physical education teachers who played Basketball. Apart from a significant negative relationship with strike with bat ($\rho = -.772$, $n = 7$, $p = .042$), there were no significant relationships between playing experience in Basketball and skill analysis ability in terms of catch ($\rho = -.668$, $n = 7$, $p = .101$), dribble ($\rho = -.321$, $n = 7$, $p = .482$), kick ($\rho = -.267$, $n = 7$, $p = .562$), roll (underhand) ($\rho = .073$, $n = 7$, $p = .876$), strike with racket ($\rho = .202$, $n = 7$, $p = .664$), throw (overhand) ($\rho = .458$, $n = 7$, $p = .301$), and throw (underhand) ($\rho = -.617$, $n = 7$, $p = .140$). See Table 6 for the correlations between pre-service physical education teachers' skill analysis ability and game-specific playing experience (Basketball).

Table 6.

Pre-service physical education teachers' skill analysis ability and its correlations to playing experience in Basketball.

Variable	n	Mean	SD	Spearman's Rho	Sig. (2-tailed)
Catch	7	61.91%	8.74%	-.668	.101
Dribble	7	77.14%	17.99%	-.321	.482
Kick	7	71.43%	8.25%	-.267	.562
Roll (underhand)	7	71.43%	14.14%	.073	.876
Strike with bat	7	37.50%	12.50%	-.772	.042
Strike with racket	7	62.34%	16.95%	.202	.664
Throw (overhand)	7	64.94%	6.27%	.458	.301
Throw (underhand)	7	67.86%	12.20%	-.617	.140
Playing experience (Basketball)	7	3112.57 h	2864.32 h	1.00	-

4. DISCUSSIONS

4.1 Level of playing experience and skill analysis ability

The aim of this study is to examine the relationship of playing experience and skill analysis ability among pre-service physical education teachers in Singapore, and the first research question address the level of playing experience and skill analysis ability among pre-service physical education teachers in Singapore. Among the pre-service physical education teachers, Soccer was the most participated, followed by Badminton, Running, and Basketball. Few pre-service physical education teachers are experts in the game/sport they participated in, and most were barely amateurs. Ericsson et al. (1993) estimated that experts would have accumulated 10000 hours of experience and amateurs would have accumulated at least 2000 hours of experience in their game/sport. Only one pre-service physical education teacher exceeded the expert level of experience by accumulating 16640 hours of experience in Swimming. Two pre-service physical education teachers approached the expert level of experience in Running (9984 hours) and Soccer (9980 hours). Among the most participated games/sports, the average accumulated experience was 3545.75 ± 2710.67 hours for Soccer, 1170.00 ± 1150.61 hours for Badminton, 3302.00 ± 3497.66 hours for Running, and 3112.57 ± 2864.32 hours for Basketball. It is not only concerning to find that pre-service physical education teachers who played Badminton accumulated less experience than amateurs but also alarming to find that most pre-service physical education teachers barely had the experience of amateurs in their game/sport, i.e., below 2000 hours. Barbara et al. (2022) reported that positive playing experience predicted greater self-confidence to teach physical education, thus pre-service physical education teachers in Singapore may not enjoy these advantages with their obvious lack of playing experience. In addition, the lack of playing experience among pre-service physical education teachers highlights

a predicament for physical education teacher education programs. Common across the three physical education teacher education programs (National Institute of Education, 2020a, 2020b, 2020c) are the Curriculum Studies courses that are designed to provide pre-service physical education teachers with the opportunity to develop their techniques, skills, and game performance in six sports/games, i.e., Badminton, Basketball, Floorball, Soccer, Softball, and Volleyball. Amounting no more than 26 hours for each sport/game course, the sport/game courses make little to no contribution to the pre-service physical education teachers' playing experience.

This study's findings corroborated with previous studies on pre-service physical education teachers' skill analysis ability. Practitioners need to attain the established level of 80% for skill analysis to be considered competent (Kelly & Moran, 2010), and previous studies have found that pre-service physical education teachers are not competent in terms of their skill analysis ability (Kelly & Bishop, 2013). For this study, pre-service physical education teachers were not competent to analyze skills as their average percentages did not exceed 80%. The best skill analysis ability was for the catch ($76.54 \pm 19.84\%$) and the worst was for the throw (overhand) ($42.93 \pm 19.02\%$).

4.2 Relationship between playing experience and skill analysis ability

The second research question of this study addresses the relationship between playing experience, general and game-specific, and skill analysis ability among pre-service physical education teachers in Singapore. Concurring with previous studies (e.g., Armstrong & Hoffman, 1979; Nielsen & Beauchamp, 1991), this study's findings supported the notion that having playing experience in a game/sport does not enable one to analyze the skills used. With their playing experiences in Soccer, Badminton and Basketball, the pre-service physical education teachers were unable to analyze the skills of kicking, striking with racket, and dribbling respectively. In addition, the pre-service physical education teachers with playing experiences in Soccer, Badminton and Basketball were unable to analyze skills not used in the game/sport. Similarly, pre-service physical education teachers with experience in Running were unable to analyze most of the skills competently. Anecdotally, it is likely for one to assume that a person with playing experience in a game/sport will be able to analyze the skills used in that game/sport. This study's findings debunk this commonly held assumption.

The lack of skill analysis ability among pre-service physical education teachers highlights the need of its training within physical education teacher education programs (Abendroth-Smith et al., 1996; Lounsbery & Coker, 2008; Morrison & Harrison, 1997; Overdorf & Coker, 2013; Ward et al., 2021). In terms of skill analysis ability, Abendroth-Smith et al. (1996) argued that physical education teacher education programs focused on teacher requirements and functions and neglected teacher development. Teacher requirements refer to knowing the skill, the skill level of the student, what the skill looks like when done correctly, what the student is doing, and what prescriptions to use to remediate errors, teacher functions refer to teacher's actions of sending information to students, observing and correcting students' performances, whereas teacher development refers to deciding what information to send, what observation methods to use, and how to correct errors. They went on to suggest that physical education teacher education program instructors should collaborate and develop skill analysis models to address the "how" and "what" of observation and in turn, improve the quality of physical education, quantity of actual teaching, and rate of students' success. Calling for curricular reform, Lounsbery and Coker (2008) argued that isolated biomechanics or kinesiology courses are insufficient in enabling pre-

service physical education teachers to analyze skills. Instead, pre-service physical education teachers must be taught to analyze skills in both simulated and field experiences. Finally, Ward et al. (2021) argued that physical education teachers “cannot teach what they do not know” (p. 21), physical education teacher education programs should depart from current practices that only afford pre-service physical education teachers limited experience in skill analysis and implement pedagogies that provide pre-service physical education teachers extensive, deliberate practice in analyzing skills.

Findings from this study are particularly pertinent to Singapore’s physical education teacher education programs as the pre-service physical education teachers were found to not only lack playing experience in games/sports but also skill analysis ability for the skills commonly taught in schools. A possible solution to the lack of playing experience can be implemented during matriculation, i.e., identifying and enrolling pre-service physical education teachers with adequate playing experience. Likewise, a possible solution to the lack of skill analysis ability is curricular reform (Lounsbery & Coker, 2008). The study’s participants will be embarking on their physical education teacher education programs and participating in sports/games courses that only provide them the opportunity to develop their techniques, skills, and game performance. Administrators of Singapore’s physical education teacher education programs should examine the plethora of avenues suggested by Ward et al. (2021) to equip pre-service physical education teachers with the ability to analyze skills. For example, sport/game course instructors can provide criteria checklists and utilize reciprocal peer teaching so that pre-service physical education teachers can learn to analyze the sport/game-specific skills. In addition, instructors can utilize technology and video software during methods courses and practicum, i.e., reviewing video-recordings of pre-service physical education teachers’ lessons, to improve or refine their skill analysis ability.

This study is not without its limitations. First, a self-reporting measure is used to collect the pre-service physical education teachers’ playing experience. Young et al. (2009) cautioned on the validity of self-reporting measures on one’s experiences in the distant past and proposed that playing experiences should be validated with secondary archives of information, e.g., journals, in future studies. Second, the ability to generalize the study’s findings is limited due to its small sample size. Future research should increase the number of participants by recruiting several intakes of pre-service physical education teachers over several years. Third, all the participants are recruited from a single institution, and Adamakis and Zounhia (2016) cautioned that the study’s findings may not apply to other institutions. Future research should include participants from other institutions, i.e., going beyond Singapore to include participants from overseas institutions. Finally, as Wilson et al. (2021) cautioned, the number of skills measured in the study are limited when compared to the many skills physical education teachers are required to teach and assess, and some skills taught and assessed in schools are more complex than those skills measured in the study. Future research should include more skills to be analyzed by the participants.

5. CONCLUSIONS

The aim of this study was to examine pre-service physical education teachers’ playing experience and skill analysis ability. It was found that pre-service physical education teachers in Singapore at the start of their physical education teacher education programs have less playing experience than amateurs in their sport/game, and they lack skill analysis ability for the fundamental movement skills commonly taught in schools. Regarding the relationship between

playing experience and skill analysis ability, it was found that pre-service physical education teachers' playing experience does not correlate with their skill analysis ability, i.e., a pre-service physical education teacher with playing experience in a game/sport is unable to analyze the skills used in that game/sport, and they are also unable to analyze skills not used in that game/sport. Administrators should address the lack of playing experience and skill analysis ability among pre-service physical education teachers by revising existing courses or offering new courses in the physical education teacher education programs.

Acknowledgment

This is a self-funded study. The author sincerely thanks all the study's participants and Associate Professor Steven Tan Kwang San for his advice and guidance during the study and the preparation of this manuscript.

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