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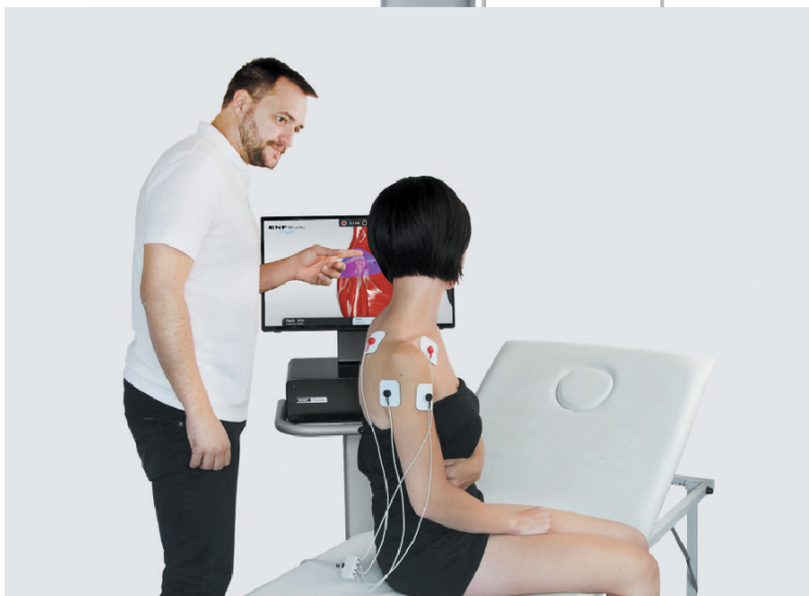

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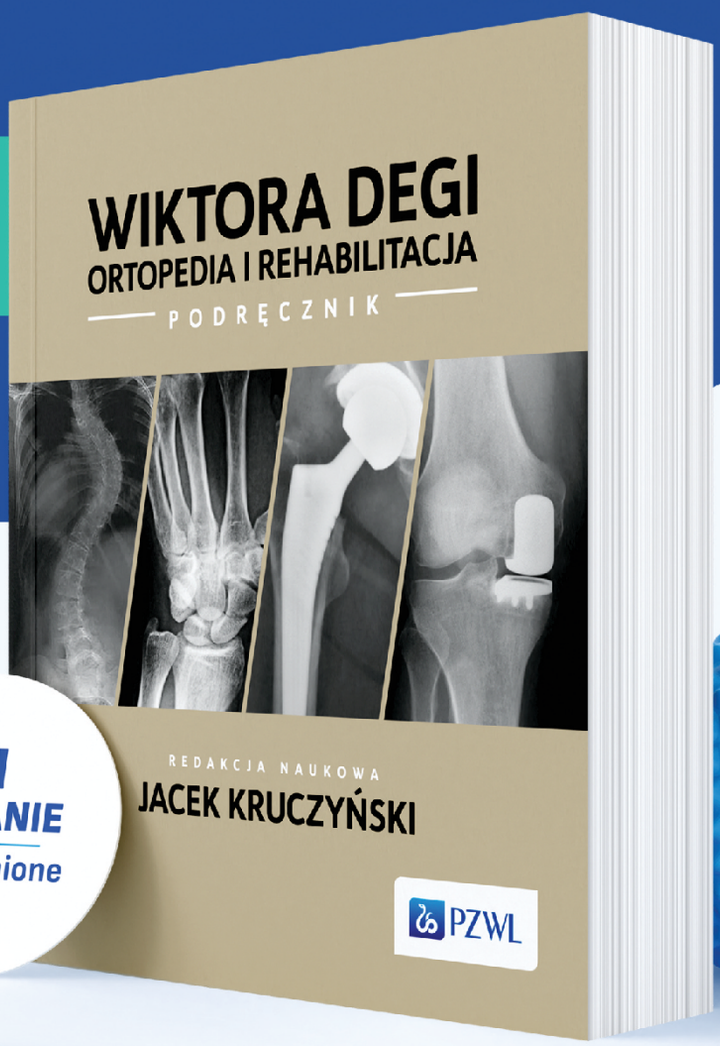

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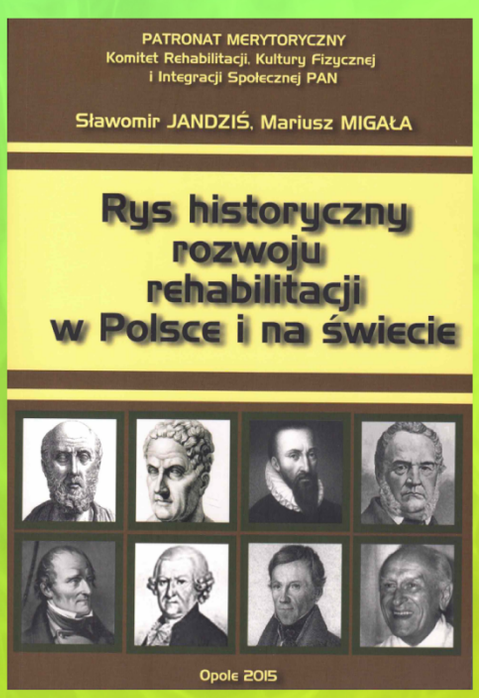

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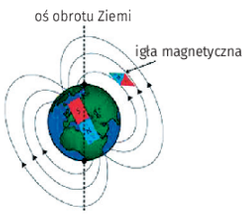

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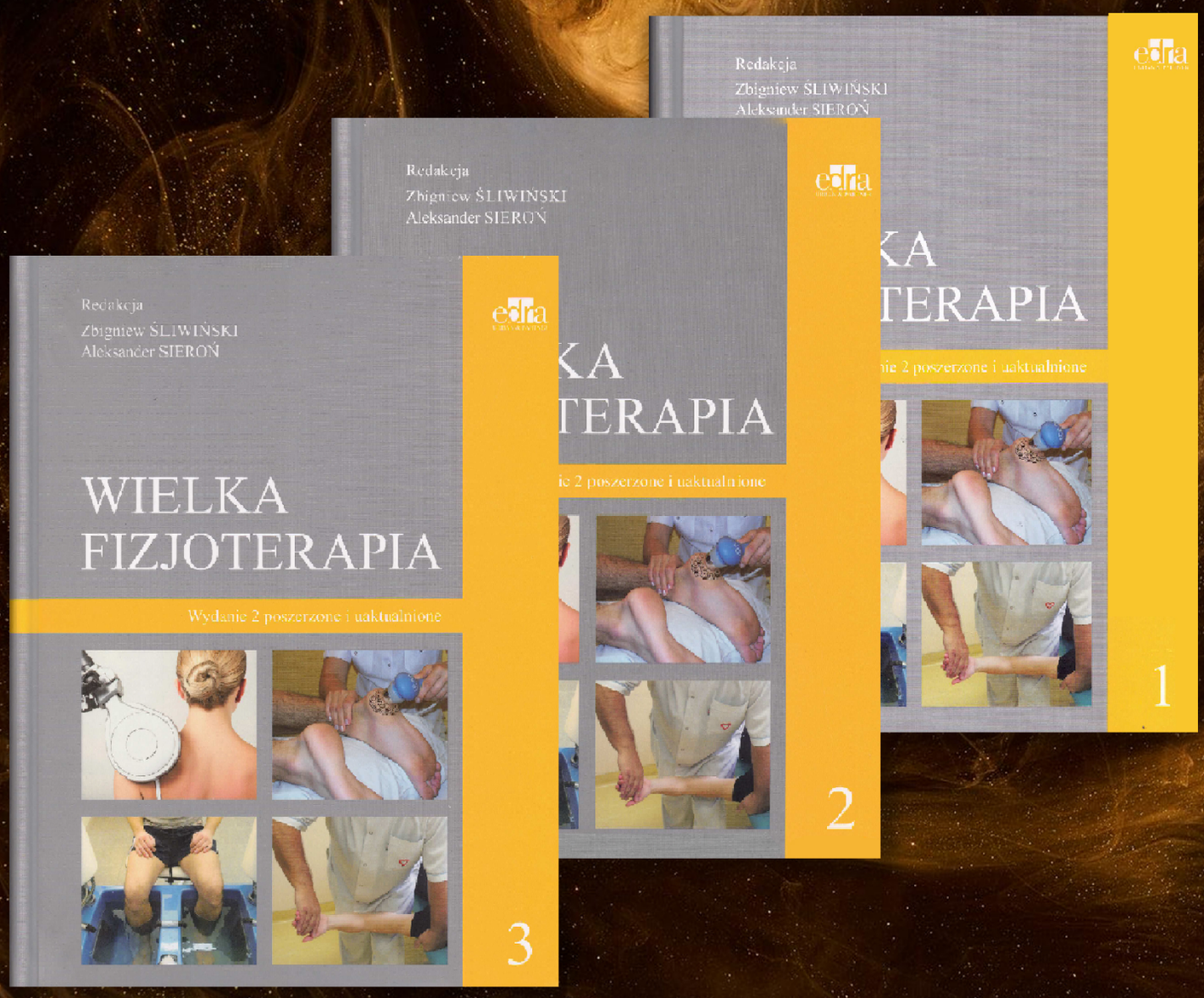

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Blended teaching to improve the mood state and motor performance skills of student-athletes in softball: A randomized-controlled trial

Nauczanie mieszane w celu poprawy nastroju i umiejętności motorycznych młodych sportowców w softballu: Randomizowane badanie kontrolowane

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Abstract

The implementation of blended teaching in physical education has increased significantly, but there was a lack of evidence about its effectiveness in improving mood state and motor performance skills in student-athletes, which became a gap in this study. Therefore, this study aims to examine the effect of blended teaching as an effort to improve mood state and motor performance skills of student-athletes both males and females in softball subject matter. Participants in this study were student-athletes from Mancak 1 junior high school (Indonesia). There was 41 participants had been allocated in control group (n = 21) and blended teaching (n = 20). The profile of mood state scale was used to measure the level of mood while the test of gross motor development-2 function was used to measure the motor performance skills of student-athletes. The Mann–Whitney U test was used to test the difference in values for each variable. Based on the study results, we observed that there was no difference in the scores of mood state and motor performance skills in male and female between control group and blended teaching group at the baseline ($p \geq 0.05$). However, the second finding found contrasting differences between the control and blended teaching groups in male and female in terms of mood state scores and motor performance skills at the post-intervention stage ($p \leq 0.05$). The third finding shows that blended teaching has a much larger effect size compared to the control group (full-online). Thus, we emphasize that blended teaching is an innovation in teaching softball in physical education classes that has proven to be effective in replacing full-online teaching.

Keywords:

Teaching model, mood state, motor performance skills, physical education

Streszczenie

Wdrażanie mieszanej metody nauczania w wychowaniu fizycznym znacząco wzrosło. Jednak brakowało dowodów dotyczących jej skuteczności w poprawie nastroju oraz umiejętności motorycznych młodych sportowców, co wskazywało na lukę badawczą, którą niniejsze badanie miało na celu wypełnienie. Dlatego też badanie to miało na celu zbadanie wpływu mieszanej metody nauczania jako narzędzia do poprawy nastroju oraz umiejętności motorycznych młodych sportowców, zarówno chłopców, jak i dziewczynek, w softballu. Uczestnikami badania byli młodzi sportowcy z Gimnazjum Mancak 1 w Indonezji. 41 uczestników zostało przydzielonych do dwóch grup: 21 do grupy kontrolnej i 20 do grupy korzystającej z mieszanej metody nauczania. Skala Profile of Mood State była używana do mierzenia poziomu nastroju, podczas gdy Test of Gross Motor Development-2 służył do oceny umiejętności motorycznych młodych sportowców. Test Mann-Whitney'a U był stosowany do oceny różnic między zmiennymi. Na podstawie wyników zaobserwowaliśmy brak różnic w wynikach dotyczących nastroju i umiejętności motorycznych wśród obu płci między grupą kontrolną a grupą korzystającą z mieszanej metody nauczania na etapie początkowym ($p \geq 0,05$). Jednakże drugie odkrycie ujawniło kontrastowe różnice między grupą kontrolną a grupą mieszanej metody nauczania pod względem wyników nastroju i umiejętności motorycznych na etapie po interwencji ($p \leq 0,05$). Trzecie odkrycie pokazało, że metoda mieszana ma znacznie większy rozmiar efektu w porównaniu z grupą kontrolną, która korzystała z metod całkowicie online. Dlatego podkreślamy, że metoda mieszana to innowacyjne podejście w nauczaniu softballu w lekcjach wychowania fizycznego i okazała się skuteczną alternatywą dla nauczania całkowicie online.

Słowa kluczowe:

model nauczania, nastrój, umiejętności motoryczne, wychowanie fizyczne

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Introduction

These days, teaching physical education (PE) during and after the COVID-19 pandemic crisis has shifted from face-to-face to an online learning system [1, 2, 3], from elementary school, high school until university level [4, 5]. Governments in several countries tried to prevent the transmission of COVID-19 virus between student-athletes and PE teaching can continue at home [6]. However, data reported that online-based PE teaching had a low effectiveness and many obstacles were found in implementing it [7], for example the disruption of internet network which cause difficulties for students to learn sports movement skill via online [8]. In addition, previous research explained that teaching PE through online still did not show better results than traditional [9], thus this was a major obstacle for teachers and student-athletes in carrying out the PE learning process in an effective manner. Softball was one of the subjects in the PE curriculum that all student athletes must learn online. The achievement of high performance in a sport, especially softball, is influenced by several factors such as technique, physical, motor performance and psychology [10].

The mood state (MS) issue is one of psychological aspects that gets attention in the current PE process, because MS shows a significant decline in all people including student-athletes during and after the COVID-19 pandemic crisis [11, 12]. According to Andrade, Cruz, Correia, Santos & Bevilacqua [3], MS is an important element in performance, education and health. Basically, MS can be interpreted as a condition that reflects the psychological state of student-athletes which can be positive or negative due to the impact of the surrounding environmental conditions [13, 14]. Then Selmi et al [15], in his research explained that MS was influenced by several factors such as family or school. MS has an important role for student-athletes in following the PE process optimally in the long term, because positive MS has the potential to reduce levels of burnout, depression [16], stress [17, 18], anger [19], on the other hand student-athletes with negative MS tend to have a low level of involvement in learning activities [20, 21, 22]. A previous study has confirmed that the benefits of MS can trigger enthusiasm in student-athletes to achieve a goal in the context of physical education [23], or sports [24]. Research by Legey et al [25], reported that positive MS can help student athletes more active in physical activity.

Motor performance skill (MPS) was considered as an important issue and got attention by several major countries in the world [26]. In this study, the global term MPS was used to describe fundamental movement skills including when displaying skills in sports situations [27], such as jumping, running, throwing, hitting [28, 29]. However, another definition explains that MPS is an advanced level of fundamental movement skills that can be used in dynamic situations to apply and test their skills in a sporting activity [30]. MPS is one of the important factors that support the performance of student-athletes in softball. According to Razak et al [31], softball has a high level of competition, so student athletes must have high performance in terms of MPS. Data from previous studies have well documented the benefits of developing MPS, for example if student-athletes have high MPS level, they will show a high involvement in physical activity [32, 33], and ultimately have a good degree of health [34], and good physical condition [35].

Blended teaching (BT) was claimed to be an innovation in PE learning to overcome problems in online classes [12]. Blended can be interpreted as a teaching by combining face-to-face and online meetings [36, 37, 38]. For example, on the first day, student-athletes carried out softball learning via offline, then on the second day it carried out by online, and the activity was carried out repeatedly. In online class, planning must be carried out by involving technology such as laptops, computers or smartphones connected to the zoom meeting platform or google meet [39, 40]. BT, according to previous studies, was believed to have several advantages, such as flexibility, reducing costs, saving time and increasing interaction between teachers and student-athletes [41]. In addition, Wang et al [36], explained that another advantage of BT is it has potential to transfer more sports knowledge and skills to student athletes. BT has been widely used in educational contexts, especially physical education [42] and sports [43], but there was a lack of evidence about the effectiveness of BT in improving MS and MPS in the context of PE which was became a gap in this study. In addition, another gap that was found in previous research on BT was mostly carried out through a systematic review [41, 36, 40], scoping review [44, 45], and case studies [46]. Thus, we offered a unique and novelty in this study, namely analyzed the effects of BT through experimental research by comparing with control (full-online) teaching to improve MS and MPS.

Based on the explanation above, this study aims to improve MS and MPS in student-athletes both male and female in softball subject matter in PE class. This research contributes as an important information for teachers about which teaching model is more effective in the current era to improve the aspects of MS and MPS.

Material and methods

Participants

Participants in this study were student-athletes from Mancak 1 junior high school (Indonesia). A total of 42 participants (female = 22; male = 20) were recruited based on inclusion criteria such as: (i) not enthusiastic about the learning process, (ii) not currently experiencing any injuries or illness. Prior to this study, all participants were required to sign a letter of intent to participate in this study. The recruitment activities were carried out before the research began. In this study the participants were divided into 2 groups, namely CON (full-online) and BT. However, at the intervention stage, there was 1 woman from the BT class withdrew due to illness, so that only 41 participants completed the study with details: CON class (n = 21; female = 11; male = 10) and BT (n = 20; female = 10; male = 10) (CONSORT flow chart see Fig. 1). All participants were given a reward of 5 USD as an appreciation for their contribution to this research. The characteristics of the participants are presented in Table 1.

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Table 1. Mean±SD characteristics of the participants from the two groups

Characteristic	CON (n = 21)	BT (n = 20)
Age (y)	11.38 ± 0.59	11.86 ± 0.35
High (cm)	153.29 ± 4.84	156.38 ± 2.65
Weight (kg)	45.62 ± 4.31	47.52 ± 3.58

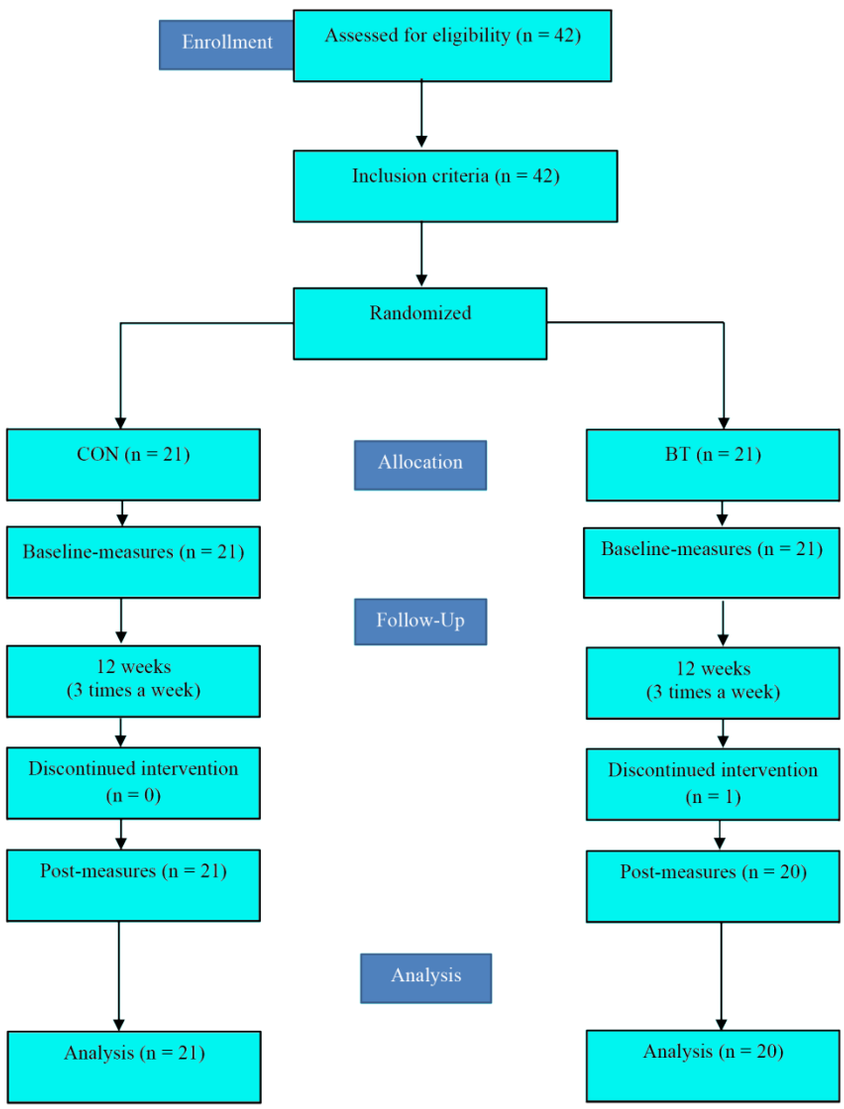

Figure 1. CONSORT flow chart

Assessment

MS. Our research adopts the Profile of Mood State Scale (PMSS) instrument from previous studies. This instrument has 24 question items from six negative mood state subscales: (i) anger, (ii) confusion, (iii) depression, (iv) fatigue, (v) tension and (vi) vigor. One positive mood state subscale: (i) enthusiasm [23]. Responses were assessed with a Likert scale from 1 to 5 [47].

MPS. The movement performance of student-athletes was assessed through the Test Of Gross Motor Development-2 (TGMD-2) [48], consisting of the following tests:

Locomotor skills

1. Run.
2. Gallop.
3. Hop.
4. Leap.
5. Jump horizontally.
6. Slide sideways.

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Object control skills

1. Strike ball.
2. Dribble ball.
3. Catch ball.
4. Run up and ball.
5. Overhand throw a tennis ball.
6. Underhand roll a tennis ball.

The participants carried out each type of movement for 4 times. If their movements complied with the skill criteria, they would get a score of 1-4. If it did not meet the criteria, they would got a score of 0. The total score was added up and became the final score for analysis [49].

Design and procedure

This experimental research was carried out in March-May 2023 and before carrying out the study, we had asked permission from the Jakarta State University to conduct research at Mancak 1 High School as one of the schools in Indonesia (approval number: 560/UNJ /2023). In addition, this research was carried out based on the guidelines of the Helsinki Declaration for Humans.

At the first meeting in experimental research, all participants were gathered and informed about the research objectives and all their personal data was guaranteed confidentiality. After that, all participants carried out the pretest (baseline), namely filling out the MS questionnaire, MPS test through TGMD-2. The distribution of the MS questionnaires was carried out in class 10-A and they were given 20 minutes to complete the filling. After completing the questionnaire, the next step was to carry out the TGMD-2 test in the field area for 40 minutes and all data was collected by the research team. In the second meeting the participants carried out an intervention program, namely BT with a duration of 1 hour, while the CON group followed daily class, namely full-online teaching. At the last meeting (post-intervention) all participants filled out the MS questionnaire, the TGMD-2 test. All these activities were carried out for 12 weeks.

BT program

BT was carried out at PE class, namely 08.00-09.00 in the morning. BT activities included: (i) Hitting the ball, (ii) Throwing and catching to a wall, (iii) Ladder steps side-ways, (iv) Ladder steps side-ways, (v) Skipping with ropes, (vi) Jumping and landing game, (vii) Dribble around cones and pass back, (viii) Dribble around cones and shoot for goal. Each learning activity was carried out with a duration of 5 minutes and a 2 minute break. For the BT-online part, it was carried out at homes through a zoom meeting, while the BT-offline part was carried out face-to-face in the school field. Characteristics of the blended model presented Figure 2.

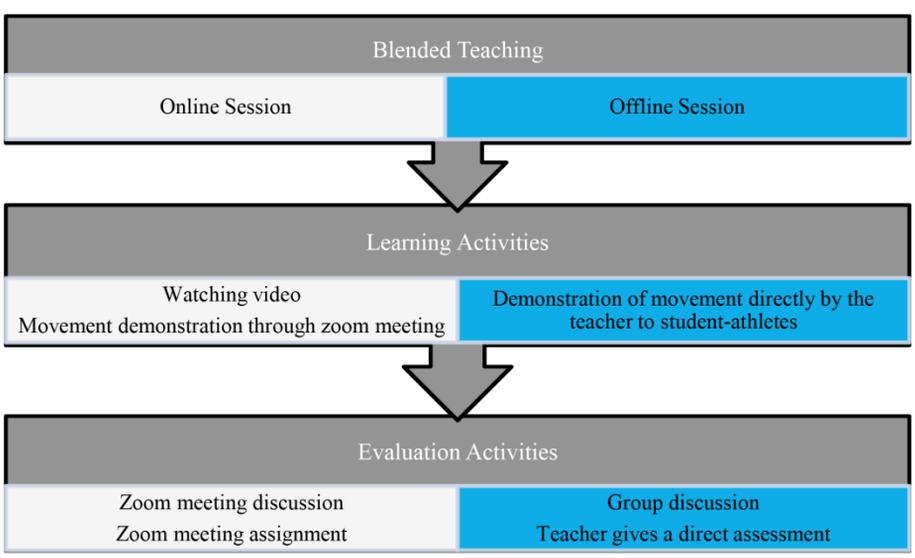

Figure 2. Characteristics of the blended model

Statistical Analysis

Descriptive statistics were presented in the form of mean ± standard deviation (parametric) or mean rank (non-parametric). Kolmogorov-Smirnov analysis was used to test normality. Differences between pretest (baseline) and post-intervention about MS and MPS in the CON and BT groups in each gender (male and female) was calculated using the Independent sample t-test if the data was normal distributed, and Mann-Whitney U tests if the data was not normally distributed. Meanwhile, to analyze the effect size (ES) of the two groups on MS and MPS researcher used Cohen'd with the criteria: 0.00-0.20 (trivial), ≥ 0.20-0.49 (small), 0.50-0.80 (moderate), ≥ 0.80 (large) [37]. All data were analyzed by IBM SPSS v.25.0 (Armonk, NY, USA) and the chosen significance level was 0.05.

Results

Based on the analysis of the Kolmogorov-Smirnov tests, the results show that the data was not normally distributed. Based on the results of Tables 2 and 3, we observed that in female and male participants at baseline stage there was no overall significant difference between CON and BT groups in MS related to anger ($p \geq 0.05$), confusion ($p \geq 0.05$), depression ($p \geq 0.05$), fatigue ($p \geq 0.05$), tension ($p \geq 0.05$), vigor ($p \geq 0.05$), enthusiasm ($p \geq 0.05$) and MPS related to run ($p \geq 0.05$), gallop ($p \geq 0.05$), hop ($p \geq 0.05$), leap ($p \geq 0.05$), jump horizontally ($p \geq 0.05$), slide sideways ($p \geq 0.05$), strike ball ($p \geq 0.05$), dribble ball ($p \geq 0.05$), catch ball ($p \geq 0.05$), run up and ball ($p \geq 0.05$), overhand throw a tennis ball ($p \geq 0.05$), underhand roll a tennis ball ($p \geq 0.05$).

Meanwhile, Table 4 and 5 show different results, we observed that

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in male and female participants at the post-intervention stage, there was overall significant differences between CON and BT in MS related to anger ($p \leq 0.05$), confusion ($p \leq 0.05$), depression ($p \leq 0.05$), fatigue ($p \leq 0.05$), tension ($p \leq 0.05$), vigor ($p \leq 0.05$), enthusiasm ($p \leq 0.05$) and MPS related to run ($p \leq 0.05$), gallop ($p \leq 0.05$), hop ($p \leq 0.05$), leap ($p \leq 0.05$), jump horizontally ($p \leq 0.05$), slide sideways ($p \leq 0.05$), strike ball ($p \leq 0.05$), dribble ball ($p \leq 0.05$), catch ball ($p \leq 0.05$), run up and ball ($p \leq 0.05$), overhand throw a tennis ball ($p \leq 0.05$), underhand roll a tennis ball ($p \leq 0.05$).

Table 2. Differences in MS and MPS for females between CON and BT group at baseline stage

Variable	Group	n	Mann-Whitney U Tests			
			Mean Rank	Z	p	ES
MS-Negative						
Anger (points)	CON	11	10.91	−0.077	0.939	−0.02
	BT	10	11.10			
Confusion (points)	CON	11	11.32	−0.263	0.792	−0.06
	BT	10	10.65			
Depression (points)	CON	11	10.86	−0.122	0.903	−0.03
	BT	10	11.15			
Fatigue (points)	CON	11	10.77	−0.197	0.844	−0.04
	BT	10	11.25			
Tension (points)	CON	11	11.36	−0.298	0.766	−0.07
	BT	10	10.60			
Vigor (points)	CON	11	11.23	−0.188	0.851	−0.04
	BT	10	10.75			
MS-Positive						
Enthusiasm (points)	CON	11	11.09	−0.074	0.941	−0.02
	BT	10	10.90			
MPS-Locomotor skills						
Run (points)	CON	11	10.95	−0.044	0.965	−0.01
	BT	10	11.05			
Gallop (points)	CON	11	10.27	−0.629	0.529	−0.14
	BT	10	11.80			
Hop (points)	CON	11	10.50	−0.466	0.641	−0.10
	BT	10	11.55			
Leap (points)	CON	11	10.95	−0.039	0.969	−0.01
	BT	10	11.05			
Jump horizontally (points)	CON	11	10.23	−0.656	0.512	−0.14
	BT	10	11.85			
Slide sideways (points)	CON	11	10.77	−0.191	0.848	−0.04
	BT	10	11.25			
MPS-Object control skills						
Strike ball (points)	CON	11	10.68	−0.260	0.795	−0.06
	BT	10	11.35			
Dribble ball (points)	CON	11	10.95	−0.038	0.969	−0.01
	BT	10	11.05			
Catch ball (points)	CON	11	10.64	−0.339	0.735	−0.07
	BT	10	11.40			
Run up and kick ball (points)	CON	11	10.23	−0.696	0.487	−0.15
	BT	10	11.85			
Overhand throw a tennis ball (points)	CON	11	10.27	−0.617	0.537	−0.13
	BT	10	11.80			
Underhand roll a tennis ball (points)	CON	11	10.59	−0.340	0.734	−0.07
	BT	10	11.45			

Note. MS: mood state; MPS: motor performance skills, CON; control; BT: blended teaching; ES: effect size, significance level at $p \leq 0.05$.

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Table 3. Differences in MS and MPS for males between CON and BT group at baseline stage

Variable	Group	n	Mann-Whitney U Tests			
			Mean Rank	Z	p	ES
MS-Negative						
Anger (points)	CON	10	11.05	−0.435	0.664	−0.10
	BT	10	9.95			
Confusion (points)	CON	10	11.05	−0.452	0.651	−0.10
	BT	10	9.95			
Depression (points)	CON	10	11.00	−0.431	0.666	−0.10
	BT	10	10.00			
Fatigue (points)	CON	10	9.90	−0.521	0.603	−0.12
	BT	10	11.10			
Tension (points)	CON	10	10.95	−0.353	0.724	−0.08
	BT	10	10.05			
Vigor (points)	CON	10	10.90	−0.311	0.756	−0.07
	BT	10	10.10			
MS-Positive						
Enthusiasm (points)	CON	10	9.90	−0.468	0.640	−0.10
	BT	10	11.10			
MPS-Locomotor skills						
Run (points)	CON	10	10.05	−0.382	0.702	−0.09
	BT	10	10.95			
Gallop (points)	CON	10	10.45	−0.479	0.632	−0.11
	BT	10	11.60			
Hop (points)	CON	10	10.05	−0.402	0.688	−0.09
	BT	10	10.95			
Leap (points)	CON	10	10.45	−0.042	0.967	−0.01
	BT	10	10.55			
Jump horizontally (points)	CON	10	10.80	−0.237	0.813	−0.05
	BT	10	10.20			
Slide sideways (points)	CON	10	10.90	−0.334	0.738	−0.07
	BT	10	10.10			
MPS-Object control skills						
Strike ball (points)	CON	10	10.55	−0.040	0.969	−0.281
	BT	10	10.45			
Dribble ball (points)	CON	10	9.95	−0.450	−0.01	−0.039
	BT	10	11.05			
Catch ball (points)	CON	10	10.55	−0.042	−0.10	0.779
	BT	10	10.45			
Run up and kick ball (points)	CON	10	10.55	0.968	−0.01	0.969
	BT	10	10.45			
Overhand throw a tennis ball (points)	CON	10	10.85	0.653	−0.01	−0.06
	BT	10	10.15			
Underhand roll a tennis ball (points)	CON	10	10.55	0.967	−0.039	−0.01
	BT	10	10.45			

Note. MS: mood state; MPS: motor performance skills, CON; control; BT: blended teaching; ES: effect size, significance level at $p \leq 0.05$.

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Table 4. Differences in MS and MPS for females between CON and BT group at post-intervention stage

Variable	Group	n	Mann-Whitney U Tests			
			Mean Rank	Z	p	ES
MS-Negative						
Anger (points)	CON	11	14.95	−3.257	0.001	−0.71
	BT	10	6.65			
Confusion (points)	CON	11	13.73	−2.180	0.029	−0.48
	BT	10	8.00			
Depression (points)	CON	11	13.82	−2.321	0.020	−0.51
	BT	10	7.90			
Fatigue (points)	CON	11	14.55	−2.895	0.004	−0.63
	BT	10	7.10			
Tension (points)	CON	11	14.73	−−3.043	0.002	−0.66
	BT	10	6.90			
Vigor (points)	CON	11	14.77	−3.001	0.003	−0.65
	BT	10	6.85			
MS-Positive						
Enthusiasm (points)	CON	11	6.00	−3.932	0.000	−0.86
	BT	10	16.50			
MPS-Locomotor skills						
Run (points)	CON	11	7.41	−2.958	0.003	−0.65
	BT	10	14.95			
Gallop (points)	CON	11	13.45	−2.102	0.036	−0.46
	BT	10	8.30			
Hop (points)	CON	11	8.50	−2.039	0.041	−0.44
	BT	10	13.75			
Leap (points)	CON	11	8.18	−2.267	0.023	−0.49
	BT	10	14.10			
Jump horizontally (points)	CON	11	8.27	−2.375	0.018	−0.52
	BT	10	14.00			
Slide sideways (points)	CON	11	13.45	−2.198	0.028	−0.48
	BT	10	8.30			
MPS-Object control skills						
Strike ball (points)	CON	11	7.95	−2.389	0.017	−0.52
	BT	10	14.35			
Dribble ball (points)	CON	11	7.82	−2.590	0.010	−0.57
	BT	10	14.50			
Catch ball (points)	CON	11	7.45	−2.882	0.004	−0.63
	BT	10	14.90			
Run up and kick ball (points)	CON	11	7.91	−2.429	0.015	−0.53
	BT	10	14.40			
Overhand throw a tennis ball (points)	CON	11	8.41	−2.155	0.031	−0.47
	BT	10	13.85			
Underhand roll a tennis ball (points)	CON	11	14.18	−2.850	0.004	−0.62
	BT	10	7.50			

Note. MS: mood state; MPS: motor performance skills, CON; control; BT: blended teaching; ES: effect size, significance level at $p \leq 0.05$.

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Table 5. Differences in MS and MPS for males between CON and BT Group at post-intervention stage

Variable	Group	n	Mann-Whitney U Tests			
			Mean Rank	Z	p	ES
MS-Negative						
Anger (points)	CON	10	14.20	−2.874	0.004	−0.64
	BT	10	6.80			
Confusion (points)	CON	10	13.85	−2.653	0.008	−0.59
	BT	10	7.15			
Depression (points)	CON	10	14.00	−2.916	0.004	−0.64
	BT	10	7.00			
Fatigue (points)	CON	10	14.85	−3.440	0.001	−0.77
	BT	10	6.15			
Tension (points)	CON	10	15.25	−3.696	0.000	−0.83
	BT	10	5.75			
Vigor (points)	CON	10	13.60	−2.459	0.014	−0.55
	BT	10	7.40			
MS-Positive						
Enthusiasm (points)	CON	10	5.55	−3.767	0.000	−0.84
	BT	10	15.45			
MPS-Locomotor skills						
Run (points)	CON	10	6.60	−3.053	0.002	−0.68
	BT	10	14.40			
Gallop (points)	CON	10	7.00	−2.840	0.005	−0.64
	BT	10	14.00			
Hop (points)	CON	10	6.15	−3.349	0.001	−0.75
	BT	10	14.85			
Leap (points)	CON	10	7.40	−2.518	0.019	−0.56
	BT	10	13.60			
Jump horizontally (points)	CON	10	5.90	−3.587	0.000	−0.80
	BT	10	15.10			
Slide sideways (points)	CON	10	6.50	−3.116	0.002	−0.70
	BT	10	14.50			
MPS-Object control skills						
Strike ball (points)	CON	10	5.50	−3.883	0.000	−0.87
	BT	10	15.50			
Dribble ball (points)	CON	10	5.80	−3.644	0.000	−0.81
	BT	10	15.20			
Catch ball (points)	CON	10	6.75	−2.978	0.003	−0.67
	BT	10	14.25			
Run up and kick ball (points)	CON	10	6.70	−2.940	0.003	−0.66
	BT	10	14.30			
Overhand throw a tennis ball (points)	CON	10	6.20	−3.425	0.001	−0.77
	BT	10	14.80			
Underhand roll a tennis ball (points)	CON	10	6.80	−2.848	0.004	−0.64
	BT	10	14.20			

Note. MS: mood state; MPS: motor performance skills, CON; control; BT: blended teaching; ES: effect size, significance level at $p \leq 0.05$.

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Discussion

This study aims to improve MS and MPS in student-athletes both male and female through blended teaching.

In the first finding of this study, we observed that there was no significant difference in MS and MPS scores for male and female between BT and CON at baseline stage. But the second finding shows that there had differences in MS and MPS for male and female between these two groups after post-intervention. In addition, other findings from this study show that BT has a greater effect than CON for improving MS and MPS in both genders. This is because BT is a teaching innovation that was created to solve issues that often occur in full online learning. BT promotes a complex and more interesting teaching, namely applying a teaching system by combining online + offline sessions [50, 51], so that this strategy can be a powerful way to increase engagement and independence in learning [37].Other research reported that student-athletes with a low mood state category has slowly experienced positive changes in mood after participating BT group [12]. Likewise, research conducted by Zhao & Song [52], explained that BT has the potential to evoke enormous positive emotions in student athletes, thus they could more involved actively in the PE learning process. On the other hand, the results of this study are in line with and support the research of Lozano-Lozano et al [53], who reported that BT has proven to have the strength to improve mood state much better, which was shown by the behavior of student-athletes who were not easily angry and stressed, did not feel confused and tired, they even more active and enthusiastic in participating PE learning. BT has advantages for overcoming problems for student-athletes, for example softball subject matter in PE which was not optimally conveyed in online class sessions can be repeated and relearned in offline sessions [54]. In addition, online sessions often cause many obstacles and problems for student-athletes such as unclear explanations to the difficulty of learning sports skill in a small zoom meeting screen [9], then offline sessions (face to face) can be a solution and can overcome all of these problems [55, 56]. The results of the report from Dhawan's research (2020), reinforce the findings in this study, BT is the right educational tool for developing cognitive, affective and psychomotor student athletes to be better than before. Supporting previous studies on BT, Siddiqui, Soomro & Thomas [57], explained that BT has been shown to significantly improve several psychological aspects.

Other findings show that BT can positively increase MPS. This is because combining online and offline (BT) sessions can create a full motion learning experience. The integration of BT in PE class requires student-athletes to perform various movement tasks such as hitting the ball, (ii) throwing + catching to a wall, (iii) ladder steps side-ways, so that from this movement experience their MPS increases gradually. Likewise, the research by Kyriakidis et al [58], reported that the implementation of BT in the PE class could help student-athletes to have good javelin throwing skills. Basically, the main advantage of BT is collaborating face-to-face teaching and technology [59, 52, 60], thus creating a positive innovation in learning [38]. Taufik et al [61], reported that BT is a perfect learning model and can overcome the weaknesses that often arise in full online classes. Other studies are in line with this research reported that BT is a combination of face-to-face teaching and online instruction that can optimize the achievement of learning outcomes in schools [62]. Thuân, Thu & Quang [43], emphasized their findings, namely the presence of BT in PE is the right solution to replace full-online classes which could not produce optimal learning outcomes.

Lastly, the uniqueness and novelty of our findings is BT has proven provided a better effect than full-online teaching in increasing MS and MPS in student-athletes, both females and males.

Conclusions

This study highlights the importance of using BT in PE which has an impact on increasing the MS and MPS of student-athletes, both female and male. Even so, this mixed research still has limitations in terms of the number and scope of participants who come from only one junior high school in Indonesia. Therefore, it is recommended that future research needs to be carried out by adding a larger number of participants and coming from several schools in Indonesia or compare the results with other countries. This research contributes as important information for teachers, students, schools and stakeholders in the regions and the central government about the importance of using BT which is integrated into softball learning in PE class.

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