El efecto del uso del modelo de educación deportiva en el desarrollo multidireccional de los estudiantes: un estudio de metaanálisis

The effect of the use of sports education model on the multi-directional development of students: A meta-analysis study

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RESUMEN.
En este estudio, se examinó el efecto del modelo de educación deportiva en las lecciones. Se recopiló un total de 54 datos de 39 estudios que cumplieron con los criterios de inclusión de 159 estudios. El número de muestra en el que se aplicó el modelo de educación deportiva y se aportaron los datos es de 3.655 personas. En los estudios examinados dentro del alcance del metaanálisis (uso del modelo de educación deportiva), la información y los hallazgos relacionados con las áreas de desarrollo multidimensional de los estudiantes son los subtítulos del estudio. Según los resultados de la investigación, el tamaño del efecto de utilizar el modelo de educación deportiva en el campo del desarrollo multidimensional es medio (d = 0,533). Se determinaron diferencias significativas por nivel educativo y año de publicación como resultado del análisis del moderador.

PALABRAS CLAVE.
Educación Deportiva, modelo, desarrollo multidimensional, metaanálisis, moderador.

ABSTRACT.
In this study, the effect of the sports education model in the lessons was examined. A total of 54 data belonging to 39 studies that comply with the inclusion criteria out of 159 studies were collected. The number of samples to which the sports education model is applied and the data is provided is 3.655 people. In the studies examined within the scope of meta-analysis (the use of sports education model), the information and findings regarding the students' multi-directional development areas are the subtitles of the study. According to the results of the research, the effect size of using the sports education model in the multi-directional development area is medium (d = 0.533). As a result of the moderator analysis, significant differences were determined for the education level and publication year.

KEY WORDS.
Sports Education, model, multi- directional development, meta-analysis, moderator.

1. Introduction.

Siedentop (1994) developed "Sports Education" in response to the lack of originality and meaningfulness of a technique-centered approach to sports in physical education. The primary goals of this pedagogical model are the development of talented, cultured and

Fecha de recepción: 06-11-2021 Fecha de aceptación: 21-11-2021
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International Journal of Educational Research and Innovation (IJERI), 18, 214-239
ISSN: 2386-4303 DOI https://doi.org/10.46661/ijeri.6338

enthusiastic athletes (Siedentop, Hastie, & Van der Mars, 2011). The philosophy of sports education is to provide opportunities for students to engage in sports in a more authentic way, to provide opportunities for students to fully learn about sports, and to provide students with important and interesting experiences (Van der Mars, Tannehill, Lund, & Tannehill, 2010).

The sports education model remains the most researched variant of all "second generation" pedagogical models (Ennis, 2014), and therefore there is strong evidence that it has the potential to achieve some of the learning goals (Hastie & Wallhead, 2016).

It has been observed that there has been a significant increase in studies conducted with the sports education model recently. In the literature, systematic review studies have been made for these studies in which the sports education model is used. In addition, in these studies, the outcomes of the teaching process (motor skill development, tactical knowledge and performance, social development, and student attitudes and values) of physical education were investigated (Alexander & Luckman, 2001; Chu & Zhang, 2018; Evangelio, Sierra Díaz, González Víllora. and Fernández Río, 2018; PA Hastie, de Ojeda & Luquin, 2011; Opstoel et al., 2020; Wallhead & O'sullivan, 2005).

Physical education is an important learning area that supports the multi-directional development of students in the creation of human characteristics expected from education in our age. However, this desired development does not occur spontaneously, the effective teaching provided by the teacher determines the sports experience of the students (Carpenter, 2010).

There is a consensus among scientists that learning can be classified into at least three areas as cognitive, affective and psychomotor in the context of physical education (Basch, 2011). The effectiveness of the use of sports education model and how students' experiences shape their multi-directional (cognitive, affective and psychomotor) development are a matter of curiosity. It is predicted that these studies using the sports education model affect students' cognitive, affective and psychomotor development areas at different levels. While some of the studies report that the use of sports education has a positive effect (Hastie, 1998; Koyuncuoğlu, 2015; Parker ve Curtner-Smith, 2005; Rocamora, González-Víllora, Fernández-Río ve Arias-Palencia, 2019) on cognitive, affective and psychomotor development, some others report the opposite (Çelen, 2012; Doydu, Çelen ve Çoknaz, 2013; Güçoğlu ve Savaş, 2020; Hastie, Calderón, Rolim ve Guarino, 2013).

With this study, it has been tried to give a comprehensive answer to the question of whether the theoretical goals and objectives of the sports education model have a practical counterpart, using the meta-analysis method. In addition, it is thought that the findings of the study will satisfy the curiosity of academics and researchers who have been working on this subject for a long time, especially physical education teachers. Research on the sports education model has been conducted for more than twenty years and many studies have been published on this subject. It can be seen that there is a need for a "meta-analysis study" that demonstrates the effect of the studies conducted by applying the sports education model and examines this effect in terms of various variables. In addition, this study is important in terms of reaching an opinion (synthesis) by compiling the results of the study conducted with the sports education model. In the study, the effect of using the sports education model on

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the multi-directional development of the students was examined. For this purpose, the characteristics thought to have an effect on the studies were determined by the researcher, and the following sub-problems were created in line with these characteristics:

- What is the general effect size and direction of this effect of using sports education model on students' multi-directional development?
- What is the effect size of the use of sports education model on students' cognitive development area and the direction of this effect?
- What is the effect size of the use of sports education model on the emotional development area of students and the direction of this effect?
- What is the effect size of the use of the sports education model on the psychomotor development area of the students and the direction of this effect?
- Other sub-aims are set below within the framework of multi-directional development and moderator analysis:
- In the literature about the sports education model, do students' education levels (primary school, secondary school, high school, university and mixed) have a moderator effect at the general effect level?
- In literature related to the sports education model, does the type of publication (postgraduate thesis and scientific article) of the studies have a moderator effect at the general effect level?
- In literature related to the sports education model, do the countries where the studies are conducted have a moderator effect at the overall effect level?
- In literature related to the sports education model, does the publication year of the studies have a moderator effect at the overall effect level?
- In the literature about the sports education model, does the sample numbers of the studies have a moderator effect at the overall effect level?

2.Method.

2.1. Study Design.

This study was created with the meta-analysis method. Meta-analysis is a method that collects many individual and independent studies on a specific topic and statistically re-analyzes their findings. The purpose of meta-analytical examination of experimental studies is twofold. One is to calculate the general effect size of the learning approaches used in experimental groups, and the other is to define the characteristics of the studies using the effect size (Cumming, 2012; Ellis, 2010; Petticrew & Roberts, 2006). In the individual studies that were included in this meta-analytical study using the sports education model, the effect on the multi-directional (cognitive, affective and psychomotor) development of the students is examined separately. In the study, data related to cognitive, affective and psychomotor development were used to determine the overall effect size for multi-directional development, and meta-analysis method was adopted to synthesize the data.

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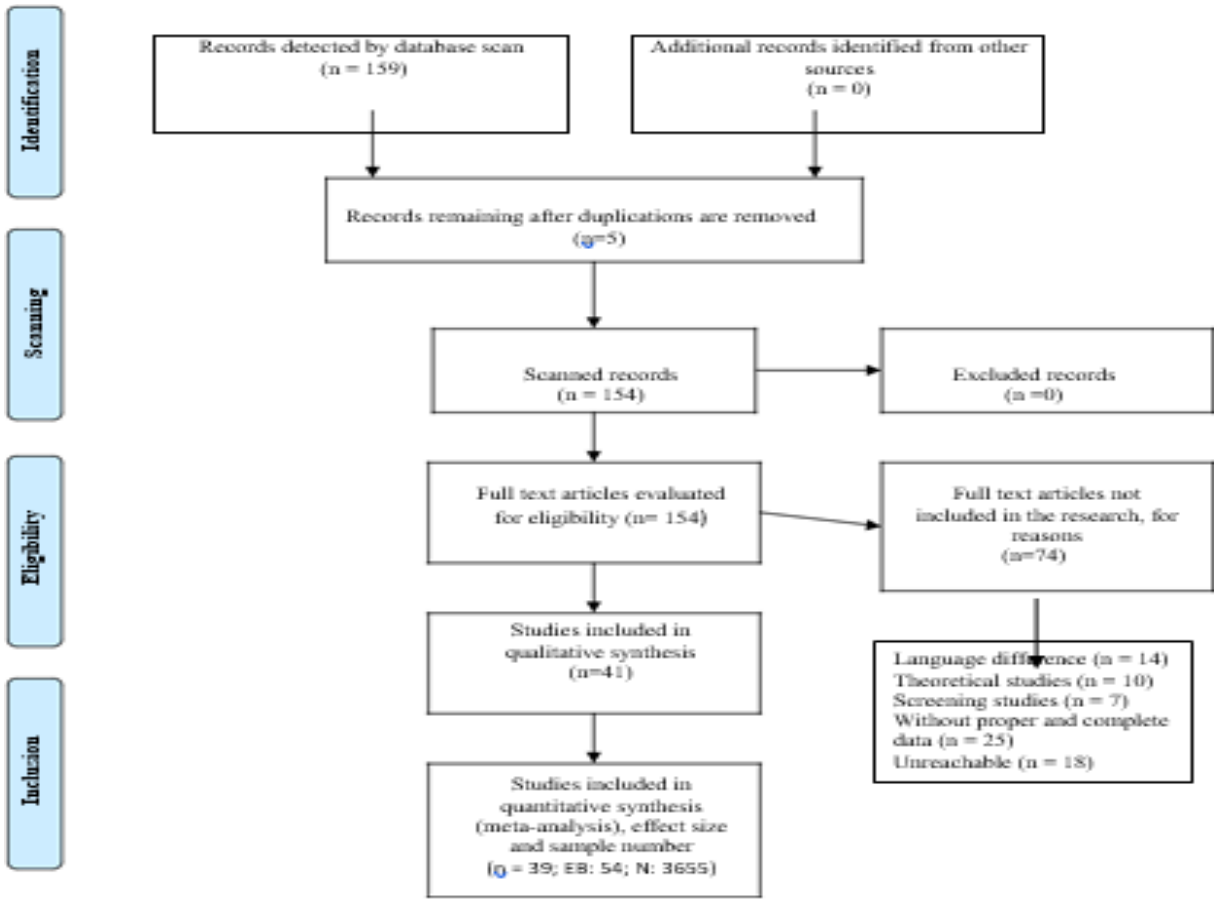

From: Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. PLoS Med 6(7): e1000097. doi:10.1371/journal.pmed1000097

Figure 1. *Flow Chart for Meta-Analysis Process According to PRISMA Guidelines*

The complete process of this review (PRISMA flowchart) is shown in Figure 1 (Moher at all, 2009). This meta-analysis study includes the studies conducted with the sports education model and focusing on its effect on the multi-directional development of students. The data collection process of the research started on "10 June 2018" and ended on "15 September 2020" and the complementary search was carried out in October 2020.

In order to reach the researches to be included in the study, words such as "sports", education, "model", "sports education", "sports education model", "sports education models", "physical education and sports education models" were used in Turkish. The keywords "sports", education, "model", "sports education", "sports education model", "sports education models", "physical education and sports education models" are used in English. Necessary searches were made in the databases of National Thesis Center, Academic (YÖK), Google Scholar (Scholar), Ulakbim EBSCO, EmeraldInsight, Science & Direct, SpringerLink, Taylor & Francis, ProQuest in both languages. In this context, 39 peer-reviewed academic journal articles and postgraduate theses were included in the meta-analysis. A total of 54 effect sizes

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were calculated for the cognitive, affective and psychomotor development areas from these studies. The effect size obtained was obtained by comparing the pre-test and post-test scores of the subjects in the experimental group or the scores of the experimental group and the control group. Studies included are indicated with an asterisk (*) in the references. In addition, in this meta-analysis, data from a total of 3655 subjects were used to synthesize cognitive, affective and psychomotor development domain scores with multi-directional developmental domains. Descriptive data of the studies are shown in Table 1 together with their characteristics.

Table 1. *Data on The Independent Variables of The Studies*

Author (s) and Year	Development Area	Country	Publication type	Application Level	Sampling Number	Year
Aka, 2014 b	Affective	Turkey	Thesis	University	82	2014
Aka, 2014 c	Psychomotor	Turkey	Thesis	University	82	2014
Arau´ jo ve diğ., 2015 a	Cognitive	USA	Article	Middle School	17	2015
Arau´ jo ve diğ., 2015 b	Psychomotor	USA	Article	Middle School	17	2015
Arıkan, 2020	Affective	Turkey	Article	High school	84	2020
Asma ve diğ., 2018 a	Cognitive	Turkey	Article	University	19	2018
Asma ve diğ., 2019 b	Psychomotor	Turkey	Article	University	19	2018
Cho, 2012	Psychomotor	USA	Article	Mixed	130	2012
Cuevas ve diğ., 2016	Affective	Spain	Article	Middle School	43	2016
Çelen, 2012 a	Cognitive	Turkey	Thesis	University	75	2012
Çelen, 2012 b	Affective	Turkey	Thesis	University	75	2012
Çelen, 2012 c	Psychomotor	Turkey	Thesis	University	75	2012
Doydu ve Çoknaz, 2013 a	Cognitive	Turkey	Article	Middle School	24	2013
Doydu ve Çoknaz, 2013 b	Psychomotor	Turkey	Article	Middle School	24	2013
Doydu ve diğ., 2013 c	Affective	Turkey	Article	Middle School	24	2013
Farias ve diğ., 2015 a	Cognitive	Portugal	Article	Primary school	24	2015
Farias ve diğ., 2015 b	Psychomotor	Portugal	Article	Primary school	24	2015
Farias, 2018	Psychomotor	Portugal	Article	High school	26	2018
Fernández-Río ve diğ., 2013	Affective	Spain	Article	High school	274	2013

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Fernández-Río, 2017	Affective	Spain	Article	High school	217	2017
Güçoğlu ve savaş, 2020 a	Cognitive	Turkey	Article	University	30	2020
Hastie ve diğ., 2009	Psychomotor	USA	Article	Primary school	23	2009
Hastie ve diğ., 2013 a	Cognitive	Portugal	Article	High school	56	2013
Hastie ve diğ., 2013 b	Psychomotor	Portugal	Article	High school	56	2013
Hastie, 1998 b	Psychomotor	USA	Article	Middle School	108	1998
Hernández-Andreo, 2020	Affective	Spain	Article	Middle School	52	2020
Kahraman, 2019 a	Cognitive	Turkey	Thesis	Middle School	39	2019
Kahraman, 2019 b	Psychomotor	Turkey	Thesis	Middle School	39	2019
Koyuncuoğlu, 2015 a	Cognitive	Turkey	Thesis	University	40	2015
Koyuncuoğlu, 2015 b	Affective	Turkey	Thesis	University	40	2015
Koyuncuoğlu, 2015 c	Psychomotor	Turkey	Thesis	University	40	2015
MacPhail ve diğ., 2008	Affective	Britain	Article	Primary school	50	2008
Mahadero ve diğ., 2015 a	Cognitive	USA	Article	Middle School	48	2015
Mahadero ve diğ., 2015 b	Affective	USA	Article	Middle School	48	2015
Méndez-Giménez ve diğ., 2015	Affective	Spain	Article	Middle School	78	2015
Meroño ve diğ., 2016	Affective	Spain	Article	Mixed	22	2016
Mesquita ve farias, 2012	Psychomotor	Portugal	Article	Primary school	26	2012
Parker ve Curtner-Smith, 2005 a	Cognitive	USA	Article	Middle School	20	2005
Parker ve Curtner-Smith, 2005 b	Psychomotor	USA	Article	Middle School	20	2005
Perlman ve caputi, 2016	Affective	USA	Article	Middle School	26	2016
Perlman, 2011	Affective	USA	Article	High school	94	2011
Perlman, 2012 a	Affective	Australia	Article	Middle School	25	2012
Perlman, 2012 b	Psychomotor	USA	Article	Middle School	69	2012
Perlman, 2013	Affective	USA	Article	High school	40	2010
Pritchard, 2008	Cognitive	USA	Article	High school	26	2008

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Pritchard, 2009	Psychomotor	USA	Article	High school	26	2008
Puente-Maxera, 2020 a	Psychomotor	Spain	Article	Primary school	34	2020
Rocamora ve diğ., 2019	Psychomotor	Spain	Article	Primary school	47	2019
Spittle ve Byrne, 2009	Affective	Australia	Article	Middle School	41	2009
Wallhead ve diğ., 2004	Affective	Britain	Article	High school	26	2004
Wallhead, 2014	Affective	USA	Article	High school	281	2014
Ward ve diğ., 2017 a	Cognitive	USA	Article	Primary school	166	2017
Ward ve diğ., 2017 b	Psychomotor	USA	Article	Primary school	166	2017
Wright, 2005	Affective	USA	Article	Mixed	398	2005

2.2. Selection Criteria for Included Studies.

The following criteria were used to include studies in meta-analysis:

- Studies should be postgraduate theses written in Turkish and English, and articles published in peer-reviewed scientific journals.
- Studies should be written with an experimental pattern.
- Sports education model should be applied to the experimental group in the studies, and the Sports education model should not be applied to the control group.
- The statistical information required to calculate the effect size (arithmetic mean, standard deviation or t-test, "F" test analysis results) should be included.
- The sample sizes of the experimental and control groups should be included in the studies.

2.3. Validity and Reliability of the Study.

The validity and reliability analysis results of all included studies were checked to ensure the validity and reliability of the current meta-analysis study. The purpose of the research and research questions will be prepared clearly and clearly in order to ensure validity and reliability. The analysis of the data collected to ensure the reliability of the study was evaluated by the researcher and an academic expert in the field of physical education and sports.

In the coding process, inter-rater reliability was tested using Cohen's Kappa statistics. As a result of the performed process, the inter-coder reliability index was found to be 0.787. The result between coders shows an almost perfect conformity (J. Cohen, 1960; Landis ve Koch, 1977; Viera ve Garrett, 2005). When the opinions of the evaluators differed, the study data were reviewed and a consensus was reached after the consultation processes. Afterwards, the Interrater reliability calculation was performed using the formula [consensus / (agreement

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+ disagreement) x 100] (Miles & Huberman, 1994) and the reliability was determined as 100%.

For publication bias, the funnel plot was visually examined and Orwin's Fail-Safe N was calculated. Figure 2 shows that most of the study data 54 are positioned symmetrically on both sides of the overall effect size and towards the top of the figure. In the absence of publication bias, the included studies will be symmetrically distributed on both sides of the Standardized Difference of Means (SOF) vertical line. If there were publication bias, most of the studies would have been placed on one side of the line and down (Borenstein, Hedges, Higgins, & Rothstein, 2009). Figure 2 shows that there is no publication bias for this meta-analysis.

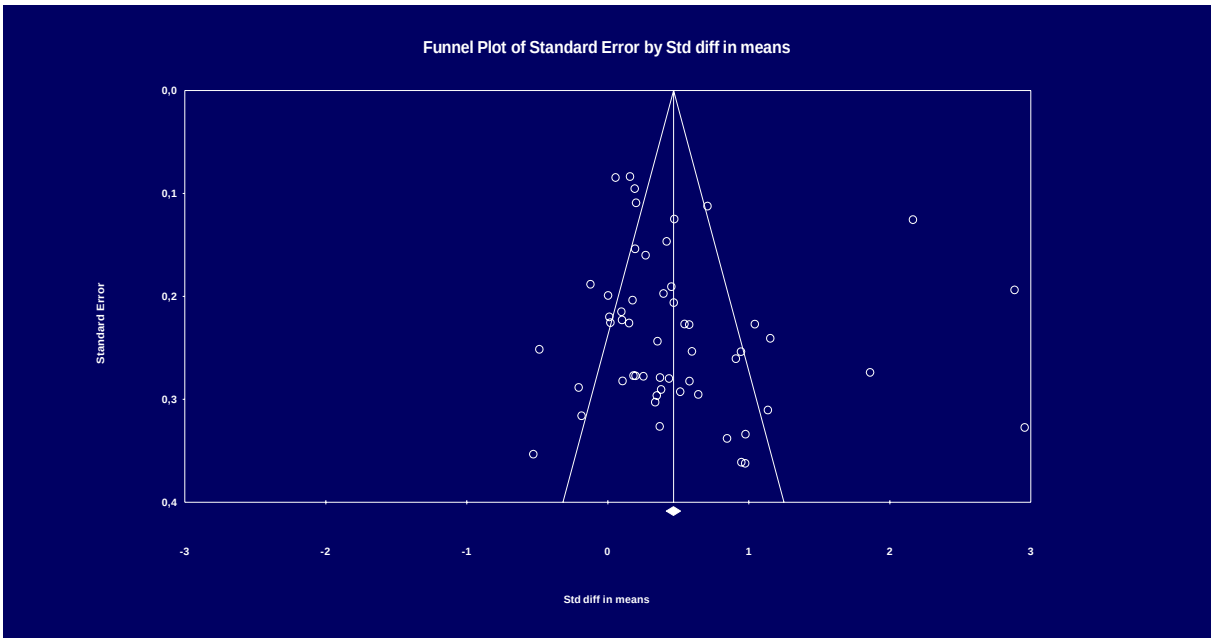

Figure 2. *Funnel Plot of Studies Including Effect Size Data Related to Sports Education Model.*

Orwin's Fail-Safe N was used to determine the number of missing studies in the meta-analysis as a measure of testing publication bias (Borenstein et al., 2009). For this study, Orwin's Fail-Safe N value was calculated as 4413. For this reason, 4413 more studies are needed to reduce the calculated value of 0.466 to the unimportant level of the combined effect size to 0.00 (zero). This number is almost 82 times higher than the number of studies included.

All 54 studies included in the current meta-analysis are accessible after rigorous research (qualitative, quantitative and theoretical) in all accessible library catalogs and digital databases on the subject. Accordingly, this shows that the current meta-analysis has no publication bias.

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3. Findings .

3.1. Compound Effect Size of the Use of Sports Education Model on Students' Multi-directional Development.

In addition to the general effect size of the study, the effect size scores calculated for the cognitive, affective and psychomotor development area, which subgroup analysis was performed and formed the multi-directional development scores, are given in Table 2.

As seen in Table 2, the overall effect size for the use of sports education model is 0.466 in the fixed effects model, while it is 0.530 in the random effects model. As seen in Table 2, the general effect size for the use of sports education model is 0.466 in the fixed effects model, while it is 0.530 in the random effects model. In addition, the cognitive domain fixed effects model effect size score was 0.545, while the random effects model score was 0.516; affective development domain fixed effects model effect size score was 0.374, while random effects model score was 0.399; psychomotor development area fixed effects model effect size score is 0.600, while random effects model score is 0.688.

Table 2. *Overall Effect Size and Effect Size Scores According to the Variability of Multi-directional (Cognitive, Affective and Psychomotor) Development Area*

Overall Effect Size and Development Areas	Study Number	Fixed Effects Model Effect Size (Cohen d)	Random Effects Model Effect Size (Cohen d)
Overall Impact Size	54	0,466	0,530
Cognitive	13	0,545	0,516
Affective	21	0,374	0,399
Psychomotor	20	0,600	0,688

Table 3 shows the effect sizes calculated for each of the included studies and the combined effect sizes in the fixed and random effects model with standard error, lower-upper limits calculated according to 95% confidence interval, z and p values for the effectiveness of the experimental effect.

As seen in Table 3, while 25 of 54 study data showed a statistically significant difference in favor of the experimental group ($p < .05$), no statistically significant difference was found for 29 study data ($p > .05$). The Standardized Mean Difference (SMD) for all 54 study data was calculated as 0.466 for the fixed effects model and 0.530 for the random effects model in favor of the experimental group. According to Cohen's (1998) classification, the effect size in the fixed effects model is low, while the effect size in the random effects model is medium. According to these effect sizes, it can be said that using the Sports education model can be an effective way to ensure the multi-directional development of students.

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Table 3. *Effect Sizes of Studies Included in the Study Towards Multi-directional Development*

Author(s) and Year	Effect Size (d)	Standard error	Varyans	Lower Limit	Upper Limit	Z value	p value
Aka, 2014 b	1,867	0,275	0,075	1,328	2,405	6,794	0,000
Aka, 2014 c	2,963	0,328	0,108	2,319	3,606	9,025	0,000
Arau´ jo ve diğ., 2015 a	0,981	0,363	0,132	0,269	1,692	2,701	0,007
Arau´ jo ve diğ., 2015 b	0,954	0,362	0,131	0,244	1,663	2,634	0,008
Arıkan, 2020	0,200	0,155	0,024	-0,103	0,503	1,292	0,196
Asma ve diğ., 2018 a	0,374	0,327	0,107	-0,267	1,016	1,144	0,253
Asma ve diğ., 2019 b	0,852	0,339	0,115	0,188	1,516	2,515	0,012
Cho, 2012	0,478	0,126	0,016	0,231	0,724	3,796	0,000
Cuevas ve diğ., 2016	0,103	0,216	0,047	-0,320	0,526	0,477	0,633
Çelen, 2012 a	0,915	0,261	0,068	0,403	1,427	3,500	0,000
Çelen, 2012 b	0,603	0,254	0,065	0,104	1,102	2,371	0,018
Çelen, 2012 c	-0,479	0,252	0,064	-0,974	0,015	-1,899	0,058
Doydu ve Çoknaz, 2013 a	1,141	0,311	0,097	0,531	1,751	3,666	0,000
Doydu ve Çoknaz, 2013 b	0,648	0,296	0,088	0,068	1,229	2,189	0,029
Doydu ve diğ., 2013 c	-0,200	0,289	0,084	-0,767	0,367	-0,692	0,489
Farias ve diğ., 2015 a	0,385	0,291	0,085	-0,186	0,956	1,321	0,187
Farias ve diğ., 2015 b	0,520	0,294	0,086	-0,055	1,095	1,771	0,077
Farias, 2018	0,441	0,281	0,079	-0,109	0,991	1,570	0,116
Fernández-Río ve diğ., 2013	0,061	0,085	0,007	-0,106	0,229	0,717	0,473
Fernández-Río, 2017	0,197	0,096	0,009	0,009	0,386	2,049	0,040
Güçoğlu ve savaş, 2020 a	-0,522	0,354	0,125	-1,216	0,172	-1,474	0,140
Hastie ve diğ., 2009	0,354	0,297	0,088	-0,229	0,936	1,190	0,234
Hastie ve diğ., 2013 a	0,457	0,191	0,037	0,082	0,832	2,389	0,017
Hastie ve diğ., 2013 b	-0,117	0,189	0,036	-0,488	0,254	-0,618	0,537
Hastie, 1998 b	2,891	0,195	0,038	2,510	3,272	14,857	0,000
Hernández-Andreo, 2020	0,401	0,198	0,039	0,013	0,790	2,026	0,043
Kahraman, 2019 a	0,157	0,227	0,051	-0,288	0,601	0,691	0,489
Kahraman, 2019 b	0,025	0,226	0,051	-0,419	0,468	0,109	0,914
Koyuncuoğlu, 2015 a	0,584	0,228	0,052	0,136	1,031	2,557	0,011
Koyuncuoğlu, 2015 b	0,550	0,228	0,052	0,104	0,997	2,416	0,016
Koyuncuoğlu, 2015 c	1,159	0,242	0,058	0,686	1,633	4,797	0,000
MacPhail ve diğ., 2008	0,008	0,200	0,040	-0,384	0,400	0,041	0,967

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Mahadero ve diğ., 2015 a	0,182	0,205	0,042	-0,219	0,583	0,890	0,373
Mahadero ve diğ., 2015 b	0,474	0,207	0,043	0,069	0,880	2,291	0,022
Méndez-Giménez ve diğ., 2015	0,274	0,161	0,026	-0,041	0,590	1,706	0,088
Meroño ve diğ., 2016	0,343	0,304	0,092	-0,252	0,938	1,129	0,259
Mesquita ve farias, 2012	0,586	0,283	0,080	0,031	1,141	2,068	0,039
Parker ve Curtner-Smith, 2005 a	0,983	0,335	0,112	0,327	1,639	2,936	0,003
Parker ve Curtner-Smith, 2005 b	-0,180	0,317	0,100	-0,801	0,441	-0,567	0,570
Perlman ve caputi, 2016	0,202	0,278	0,077	-0,343	0,747	0,728	0,467
Perlman, 2011	0,424	0,147	0,022	0,134	0,713	2,871	0,004
Perlman, 2012 a	0,111	0,283	0,080	-0,444	0,666	0,392	0,695
Perlman, 2012 b	0,951	0,255	0,065	0,452	1,450	3,736	0,000
Perlman, 2013	0,107	0,224	0,050	-0,331	0,546	0,480	0,631
Pritchard, 2008	0,377	0,280	0,078	-0,172	0,925	1,346	0,178
Pritchard, 2009	0,189	0,278	0,077	-0,356	0,733	0,679	0,497
Puente-Maxera, 2020 a	0,359	0,244	0,060	-0,120	0,838	1,468	0,142
Rocamora ve diğ., 2019	1,049	0,228	0,052	0,603	1,496	4,605	0,000
Spittle ve Byrne, 2009	0,017	0,221	0,049	-0,416	0,450	0,077	0,939
Wallhead ve diğ., 2004	0,259	0,279	0,078	-0,287	0,805	0,930	0,352
Wallhead, 2014	0,164	0,085	0,007	-0,002	0,329	1,939	0,053
Ward ve diğ., 2017 a	0,713	0,113	0,013	0,491	0,935	6,301	0,000
Ward ve diğ., 2017 b	0,207	0,110	0,012	-0,009	0,423	1,880	0,060
Wright, 2005	2,170	0,126	0,016	1,922	2,418	17,174	0,000
Fixed Effect	0,466	0,026	0,001	0,415	0,517	17,937	0,000
Random Effect	0,530	0,089	0,008	0,355	0,706	5,929	0,000

In Figure 3, the forest plot consisting of 54 study data and the data regarding the effect sizes in the experimental studies included are shown.

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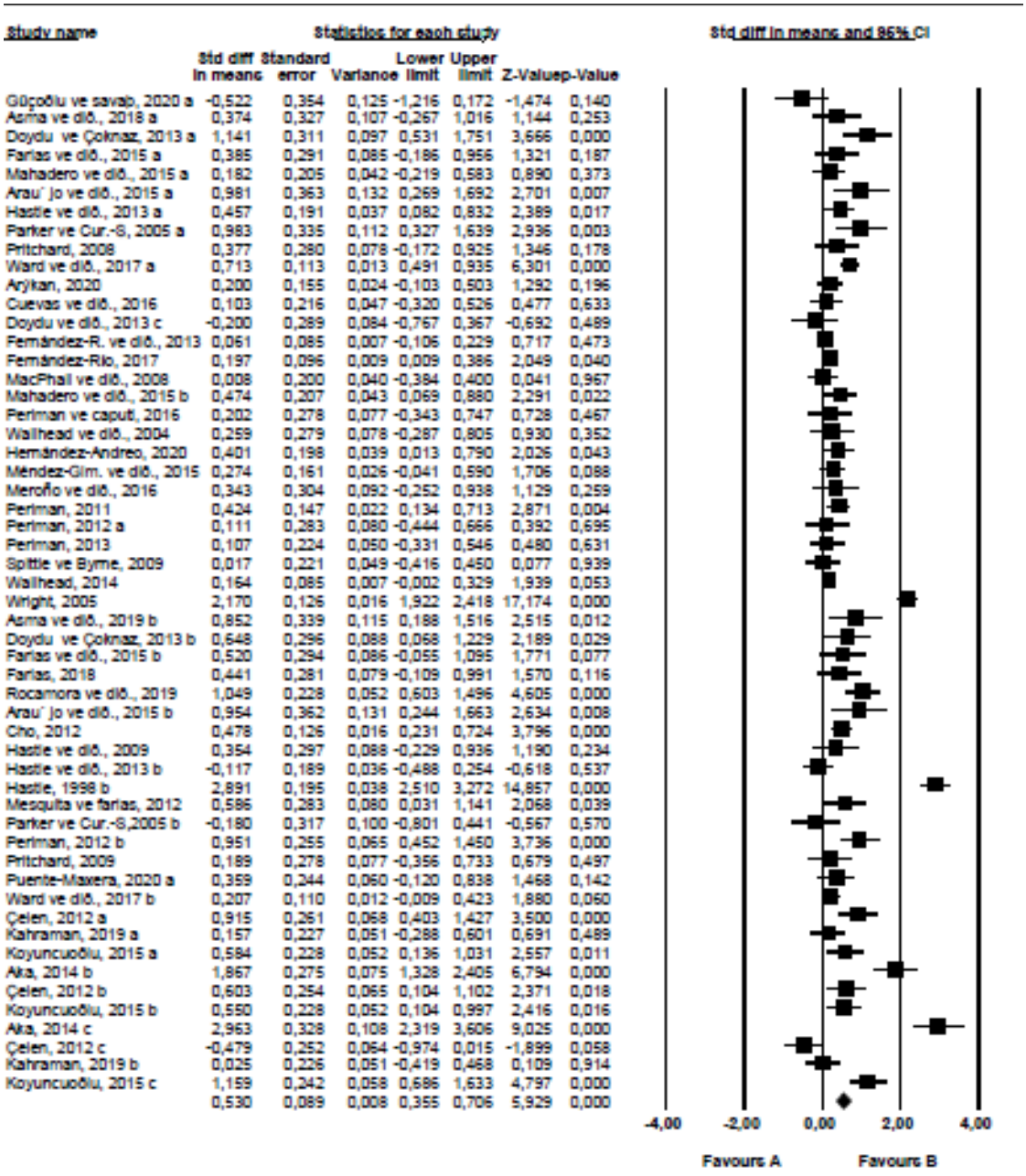

Meta Analysis

Figure 3. *Forest Plot in Fixed Effects and Random Effects Model of the Effect Sizes of the Use of Sports Education Model for Multi-directional Development*

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As seen in Figure 3, an over zero difference is observed in favor of the experimental groups. Considering the data on the effect sizes of the studies included in the study; It is seen that the smallest effect size value is-0.522 and the highest effect size value is 2,963. When the statistical results of effect sizes are examined in general, it is understood that 49 of 54 research data in total have positive and 5 of them have negative effects. The overall effect size standard error is very low and the confidence interval ranges from the lower limit of 0.415 to the upper limit of 0.517, indicating a significant effect. The data of 49 studies with positive effects have an effect in favor of the experimental groups in which the Sports education model was applied, and the data of 5 studies with negative effects in favor of the control groups in which the Sports education model was not applied.

At this stage, Q statistics (weighted sum of effect sizes) and p value were calculated to test the heterogeneity of the effect sizes of the included studies. In addition, an additional statistic I^2 was calculated showing the ratio of extra variance to total variance. Table 3 shows the results of this calculation.

Table 4. *The Heterogeneity Analysis Results of Effect Sizes for All Studies*

Heterogeneity			
Q-value	df (Q)	p- value	I^2
581,679	53	0,000	90,888

p<.05

In Table 4, it is seen that the Q value is statistically significant (Q = 581,679; p = 0,000) in terms of 0.05 significance level. This means that the studies are heterogeneous as the homogeneity hypothesis is rejected. The I^2 value (90,888%) indicates that the observed 91% variance is due to the true variance between studies. With 25%, the I^2 value indicates low heterogeneity, 50% medium heterogeneity and 75% and above high heterogeneity (Cooper, Hedges & Valentine, 2009). Therefore, homogeneity tests (Q and I^2) showed a statistically significant difference between studies in terms of effect sizes. As a result, the random effects model is more suitable for this meta-analysis and all calculations have been made using this model.

Borenstein et al. (2009) state that moderator analysis is required to determine possible causes of heterogeneity between studies. Therefore, analyzes were conducted on behalf of some moderators to discover the reasons for heterogeneity.

3.2. Moderators.

3.2.1. Education Level Moderator Analysis.

Effect sizes for the study data included in the study were calculated and the studies were compared according to education levels: primary school, secondary school, high school, university and mixed. The results of this comparison are given in Table 6.

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Table 6. *The Results of The Moderator Analysis with Random Effects Model in Terms of The Multi-Directional Development of Students at The Education Level*

Moderator (Education Level)	Number of Study (k)	Effect Size (d)	Standard error	Variance	Confidence Interval (95%) Lower Limit	Upper Limit	z	p	Q	Df (Q)	p
Primary school	9	0,460	0,115	0,013	0,235	0,684	4,010	0,000*	22,667	8	0,004
Middle School	19	0,530	0,185	0,034	0,167	0,893	2,859	0,004*	196,569	18	0,000
High school	12	0,180	0,041	0,002	0,100	0,260	4,412	0,000*	10,845	11	0,456
University	11	0,804	0,267	0,071	0,282	1,327	3,016	0,003*	104,814	10	0,000
Mixed	3	1,010	0,657	0,431	-0,278	2,297	1,537	0,124*	99,639	2	0,000
Between Groups									14,109	4	0,007*
Total	54	0,239	0,037	0,001	0,166	0,312	6,408	0,000*			

p < .05

It was understood that the effect size scores (d = 0.460) of the studies in which the sports education model was conducted with the students in primary school (k = 9) were low and showed statistically significant (z = 4.010, p <.05). It was determined that the effect size scores (d = 0.530) of the studies conducted with the students in secondary school (k = 19) were at medium level and showed statistical significance (z = 2.859, p <.05). It can be stated that the effect size scores (d = 0.180) of the studies conducted with the students in high school (k = 12) are weak and show statistical significance (z = 4.412, p <.05). It can be said that the effect size scores (d = 0.804) of the studies conducted with the students at the university (k = 11) are at a medium level and they show statistical significance (z = 3.016, p <.05). It is understood that the effect size scores (d = 1.009) of the studies conducted with students at mixed education level (k = 3) are close to a strong level and do not show statistical significance (z = 1,537, p> .05). Analysis results between groups revealed that the effect size scores of studies with different education levels in terms of multi-directional development were statistically significant (Q_{BG} = 14.109, sd = 4, p = 0.007).

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3.2.2. Publication Type Moderator Analysis.

Effect sizes for the study data included in the study were calculated and the studies were compared according to the type of publication: Postgraduate theses and scientific article. These comparison results are given in Table 7.

Table 7. *Results of Moderator Analysis with Random Effects Model in Terms of The Multi-Directional Development of Students of The Type of Publication*

Moderator (Publication type)	Number of Study (k)	Effect Size (d)	Standard error	Variance	Confidence Interval (95%) Lower Limit	Upper Limit	z	p	Q	df (Q)	p
Thesis	10	0,817	0,271	0,074	0,286	1,349	3,012	0,003*			
Article	44	0,468	0,095	0,009	0,282	0,654	4,937	0,000*			
Between Groups									1,475	1	0,225
Total	54	0,506	0,090	0,008	0,331	0,682	5,654	0,000*			

p < .05

It was understood that the effect size scores (d = 0.817) of the studies in which the sports education model was published as a thesis (k = 10) were at medium level and showed statistically significant (z = 3.012, p <.05). It was determined that the effect size scores (d = 0.468) of the studies published as scientific articles (k = 44) were close to medium level and showed statistically significant (z = 4.937, p <.05). Analysis results between groups revealed that the effect size scores of studies with different publication types in terms of multi-directional development were not statistically significant (Q_{GB} = 1.475, df = 1, p = 0.225).

3.2.3. Country Moderator Analysis of Studies.

The effect size for data to be included in the research work and studies have compared calculated according to the countries where they were: USA, Australia, UK, Spain, Portugal, Turkey. These comparison results are given in Table 8.

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Table 8. *The Results of The Moderator Analysis with Random Effects Model in Terms of The Multi-Directional Development of The Students for The Countries Where the Studies Were Conducted.*

Moderator (Country)	Number of Study (k)	Effect Size (d)	Standard error	Variance	Confidence Interval (95%) Lower Limit	Upper Limit	z	p	Q	Df (Q)	p
USA	19	0,668	0,182	0,033	0,310	1,025	3,662	0,000*			
Turkey	17	0,629	0,182	0,033	0,272	0,986	3,451	0,001*			
Spain	8	0,305	0,096	0,009	0,118	0,492	3,190	0,001*			
Portugal	6	0,338	0,123	0,015	0,098	0,578	2,758	0,006*			
England	2	0,094	0,162	0,026	-0,225	0,412	0,576	0,564			
Australia	2	0,052	0,174	0,030	-0,289	0,394	0,301	0,763			
Between Groups									10,848	5	0,054
Total	54	0,326	0,057	0,003	0,214	0,438	5,716	0,000*			

p < .05

It was understood that the effect size scores (d = 0.668) of the studies conducted in the USA (k = 19) with the sports education model were at medium level and showed statistically significant (z = 3.662, p <.05). In Turkey, (k = 17) made scores of studies of the effect size (d = 0.629) is moderate and it was determined that showed statistical significance (z = 3,451, p <.05). It can be stated that the effect size scores (d = 0.305) of the studies conducted in Spain (k = 8) are small and show statistical significance (z = 3.190, p <.05). It was determined that the effect size scores (d = 0.338) of the studies conducted in Portugal (k = 6) were small and showed statistical significance (z = 2.758, p <.05). It has been determined that the effect size scores (d = 0.094) of the studies conducted in England (k = 2) are weak and do not show statistical significance (z = 0.576, p> .05). It has been noticed that the effect size scores (d = 0.052) of the studies conducted in Australia (k = 2) are weak and not statistically significant (z = 0.301, p> .05). Analysis results between groups revealed that the effect size scores of studies conducted in different countries in terms of multi-directional development are not statistically significant (Q_{GB} = 10.848, sd = 5, p = 0.054).

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3.2.4. Meta-Regression Analysis Between the Publication Year of the Studies and the Students' Multi-directional Development Effect Size Scores.

Figure 4 and Table 9 show the results of the meta-regression analysis between the publication year and effect size changes of the sport education model use. As seen in Figure 4, the year of publication varies between 2006 and 2020, and the effect sizes vary between 0.60-1.20. The distribution of effect sizes shows a sharp negative slope.

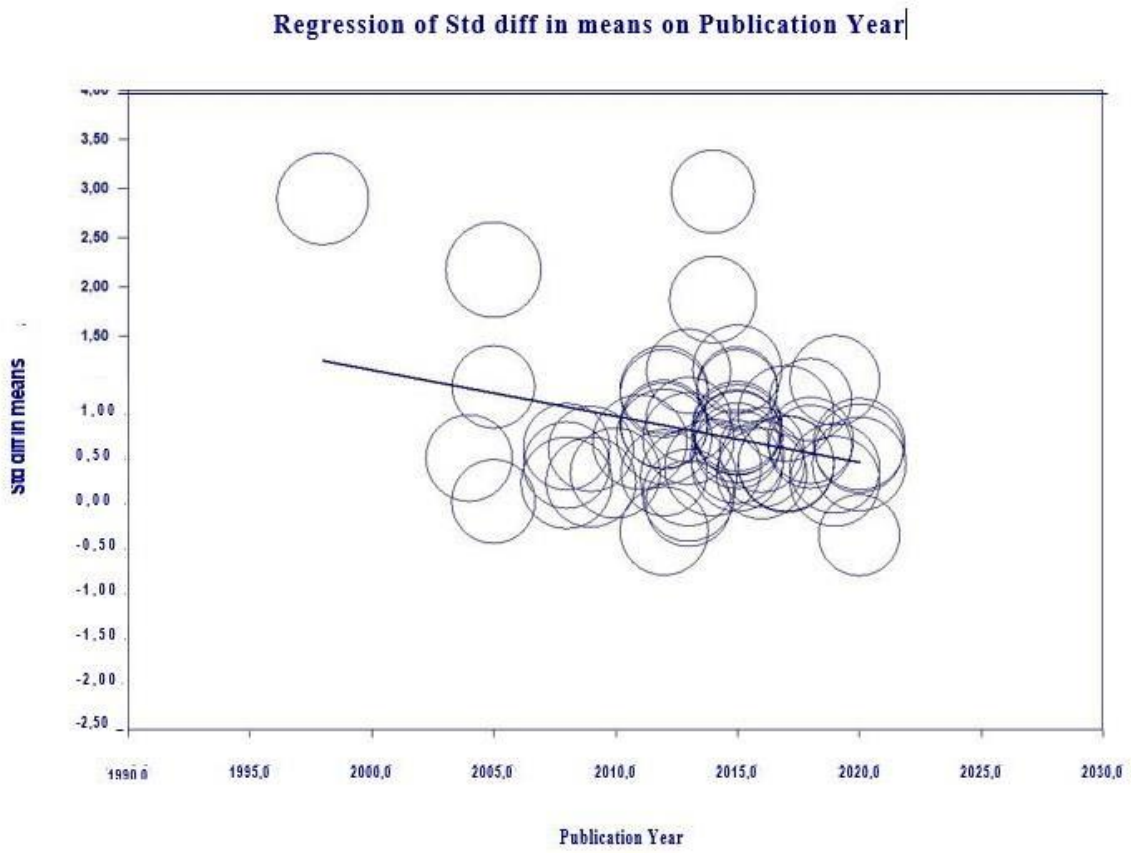

Figure 4. Meta-regression Analysis of Publication Year and Effect Sizes of Studies in The Random Effect Model.

Table 9 shows the regression coefficient as -0.0468 and it is statistically significant ($z = -2.68$, $p < 0.05$). Therefore, in experimental studies on the use of sports education model, it can be said that a one-unit (1 year) increase in the study year causes a 0.0468 decrease in the effect size. For this reason, it can be said that the statistically significant effect sizes are lower as the year of publication of the studies in which the sports education model is used.

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Table 9. Meta-regression Analysis of Publication Year and Effect Sizes in The Random Effect Model

Confidence Interval (95%)					
Regression Coefficient	Standard error	Lower Limit	Upper Limit	z	p
Publication Year -0,0468	0,0175	-0,0810	-0,0126	-2,68	0,0073
İntercept 94,7372	35,1397	25,8646	163,6098	2,70	0,0070

$p < .05$

3.2.5. Meta-Regression Analysis Between the Number of Samples in Studies and Students' Multi-directional Development Effect Size Scores.

Figure 5 and Table 10 show the results of meta-regression analysis between the sample size and effect size changes of the use of sports education model. As can be seen in Figure 5, the sample size varies between 0 and 100, and the effect sizes range between-0.50 and 1.50. As far as the relationship is concerned, the effect size distribution slopes close to zero.

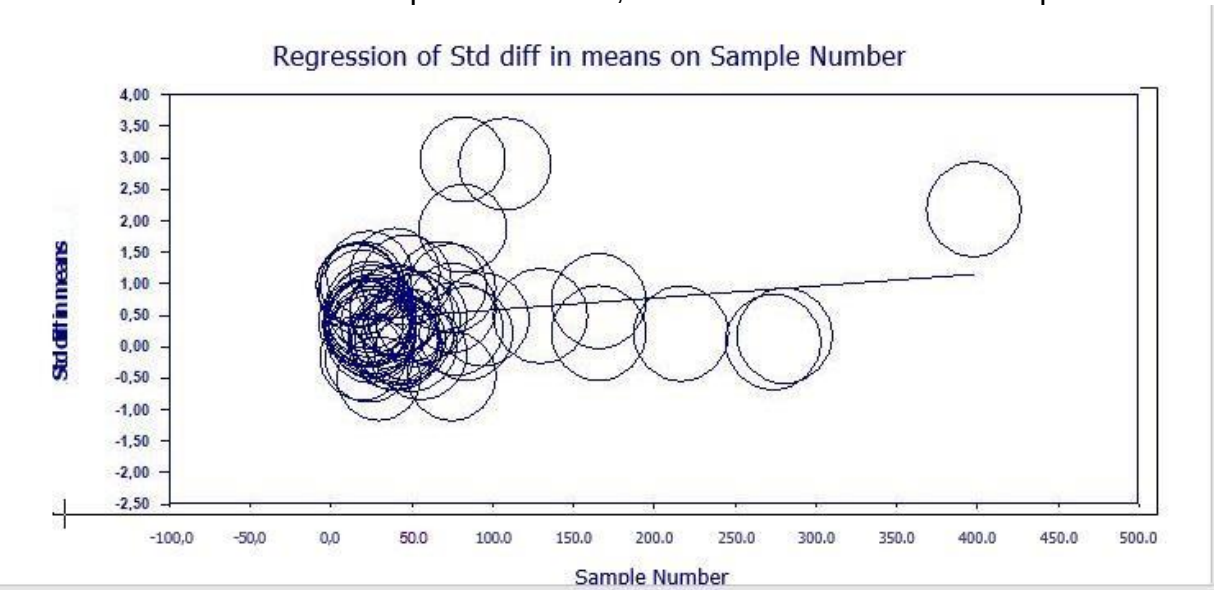

Figure 5. Meta-regression Analysis of Sample Numbers and Effect Sizes of Studies in The Random Effect Model.

Table 10 shows the regression coefficient as 0.0019, but it is not statistically significant ($z = 1.63$, $p > 0.05$). Therefore, it can be said that the number of samples does not have an effect on the multi-directional development of the students in the experimental studies that test the effect of the use of the sports education model on the multi-directional development of the students.

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Table 10. *Meta-Regression Analysis of Sample Number and Effect Sizes in Random Effect Model*

		Confidence Interval (95%)				
Regression Coefficient		Standard error	Lower Limit	Upper Limit	z	p
Sample Number	0,0019	0,0012	-0,0004	0,0042	1,63	0,1038
İntercept	0,3941	0,1234	0,1522	0,6360	3,19	0,0014

$p < .05$

4. Discussion.

This study aims to determine the multi-directional development of the studies using the sports education model by synthesizing the findings of the students' cognitive, affective and psychomotor development with the method of meta-synthesis. For this purpose, meta-analysis includes studies that report data on students' versatile (cognitive, affective and psychomotor) development using the sports education model.

While 49 of 54 studies that examine the use of sports education model in terms of the multi-directional development of students and meet the criteria for inclusion in meta-analysis, 49 received values in favor of the experimental group, while 25 of them differed statistically significantly ($p < .05$). The Standardized Mean Difference calculated for all 54 studies was found to be 0.47 in favor of the experimental group according to the fixed effects model and 0.53 according to the random effects model. In addition, in the subgroup analysis, cognitive development fixed effects model effect size was 0.545, while random effects model effect size was 0.515; Affective development fixed effects model effect size was 0.374, while random effects model effect size was 0.399; While psychomotor development fixed effects model effect size is 0.600, random effects model effect size is 0.688.

As a result of the heterogeneity test applied to test whether the included studies are homogeneous in terms of actual effect sizes, the Q statistic (581,679; $p = 0.000$) was found to be significant at the 0.05 level, which means that the effect sizes of the studies are heterogeneous. In addition, the estimated I^2 (90,888) value showed that approximately 91% of the observed variance was due to the actual differences between the effect sizes of the studies. As a result, it was decided that the random effects model was appropriate and all calculations were made using this model. Effect size according to the random effect model, Cohen et al. (2011), it is calculated as 0.53 in favor of the experimental group, which is equal to a medium level effect.

These results mean that the use of the sports education model has a moderate effect in increasing the multi-directional development of students. In addition, when considered in

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terms of development areas, it was determined that the greatest contribution of the use of the sports education model was in the field of psychomotor development (0.688).

The results of the analysis made for the educational level moderator were low (d = 0.460) at the primary school stage (k = 9) of the sports education model application carried out for the versatile development of students; middle school (k = 19) middle (d = 0.530); in high school (k = 12) poor (d = 0.915); revealed that it has a strong (d = 1.01) effect at the university level (k = 11) at the middle (d = 0.804) and at the mixed education level (k = 3). A statistically significant difference was found in the comparison between groups (with random effect model) to check whether the studies conducted for the multi-directional development of students differ in terms of their education level (Q_{BG} = 14.109, df = 4, p = 0.007).

The results of the analysis made for the moderator of the publication type, the sports education model application carried out for the versatile development of the students in the postgraduate theses (k = 10), the middle (d = 0.817); It has shown that it has an almost medium effect (d = 0.468) in scientific articles (k = 44). No statistically significant difference was found in the comparison between groups (with the random effect model) to check whether the studies conducted for the multi-directional development of students differ in terms of publication type (Q_{BG} = 1.475, df = 1, p = 0.225).

The results of the analysis made for the moderator of the country where the studies were carried out, the sports education model application carried out for the versatile development of the students in the studies conducted in the USA (k = 19), medium (d = 0.668) In studies in Turkey (k = 17), medium (d = 0.468); In the studies conducted in Spain (k = 8) small (d = 0.305); In the studies conducted in Portugal (k = 6) small (d = 0.338); In the studies conducted in England (k = 2) weak (d = 0.094); Studies conducted in Australia (k = 2) showed that it has a weak (d = 0.052) level of effect. No statistically significant difference was found in the comparison between groups (with the random effect model) to check whether the studies conducted for the multi-directional development of students differ in terms of countries (Q_{BG} = 10.848, df = 5, p = 0.054).

The results of the meta-regression analysis for the publication year of the studies conducted with the sports education model found a statistically significant difference (z = -2.68, p <0.05). The estimated regression coefficient (-0.0468) indicates that one year increase in the year of publication results in a significant decrease in the effect size of 0.0468. Thus, it can be said that as the publication year of the studies using the sports education model increases, the effect size scores for the multi-directional development of the students decrease.

The results of the meta-regression analysis regarding the sample size of the studies conducted with the sports education model revealed that the sample size did not have a significant effect (z = 1.63, p> 0.05). Considering the composite medium level effect size for all studies, it can be concluded that the use of the sports education model has an effect on the multi-directional development of the students regardless of the sample size.

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5. Conclusion.

As a contemporary teaching model, it is understood that the sports education model has a small and weak contribution to the multidimensional development of students. Other factors such as school culture and atmosphere, students' parents and the immediate environment of the school affect the learning process. Therefore, practices and principles related to the sports education model can be stretched with this understanding. Thus, it is predicted that this model will contribute more to the students.

6. Limitations and Recommendations.

The validity of the meta-analysis depends on the studies included in the analysis. The meta-analysis consists of studies published in Turkish and English on the application of the sports education model. The education level of the current meta-analysis sample, the type of publication of the study, the country in which it was published, the year of publication and the number of samples consisted of moderator analysis. As a result of the analysis, the level of heterogeneity is high. Despite these limitations, the current findings will provide important data for further investigation and application of the sport training model. At the same time, there is no time (year) limitation when collecting study data. The resulting heterogeneity was investigated by moderator analysis and being the first meta-analysis study on this subject constitutes the strengths of this study.

The following recommendations can be made for practitioners and researchers:

1) This research investigated the effect of using a sports education model on students' multi-directional (cognitive, sensory and psychomotor) development. Future research can examine the use of the sports education model in terms of students' development,
2) Since the studies on the sports education model are increasing day by day, a meta-analysis study on the same subject can be updated by adding new findings in the following years and provide comparison,
3) It can be suggested that a meta-analysis study on other teaching models used in the field of physical education and sports will contribute to the field.

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