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## The effect of traditional game use on motor development: A meta-analysis

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### Abstract

This study aims to explain the influence of the use of traditional games on efforts to improve motor development skills through meta-analysis. Research data was collected from articles published in 2019 to 2023 in united nations language using Google Scholar as an article search engine. The article discusses the influence of traditional games on motor skills, is analyzed qualitatively, describes the data in the form of sample sizes, deviation standards, and averages. The analysis design uses contrasting groups with random effect models in that the effect size is corrected. This analysis uses JASP software to calculate mean aggregate differences, draw forest plots, and publication bias. The results of the analysis showed a significant influence of differences between groups that used traditional games and non-traditional games in the process of improving motor skills ( $SE = 2.17$ ), groups of students who used traditional games in an effort to improve motor skills better learning outcomes than those who did not use traditional games. Based on the results of the analysis, it is very clear the urgency of implementing traditional games in supporting the process of improving motor skills.

**Keywords:** Traditional games, JASP software, motor development, Meta-analysis

### 1. Introduction

The development of science, technology, communication and the flow of globalization have an impact on various aspects of life including education <sup>[1]</sup>. In the past, children filled their spare time with traditional sports and games (TSG). The children never complained, criticized, or commented negatively about them <sup>[2]</sup>. From generation to generation it has been realized that playing is a fun activity <sup>[3]</sup>. Traditional games are a very simple game that is played in the community for generations so that it can also be called part of the culture that grows and develops in the community.

Traditional games are forms of local community games created and played as free time for the local community in accordance with local culture and customs as one of the local abilities <sup>[4]</sup>. Traditional games in Indonesia are very diverse, this is based on the background of game existence in Indonesia that was created or developed based on local potentials, such as geographical location, local culture, customs, and the purpose of the game itself <sup>[5]</sup>.

Traditional games in Indonesia seem to face a less bright future. The apparent trend is that various play forms are now unknown to many children, being played very rarely <sup>[6]</sup>. Whereas traditional games contain educational and social values because traditional games involve a lot of physical activity, strategy setting, teamwork, and language skills. Children's development of fine motor skills can also boost their confidence and pique their interest in an activity (Muthmainah). This is caused by traditional games always done together <sup>[7]</sup>.

Traditional games are now starting to be abandoned, replaced by games that are fully presented in Android facilities, which without realizing it have a lot of unfavorable effects on children's development <sup>[8]</sup>. Increasing the competence of motor skills and increasing physical fitness are the desired learncomes for school-age children <sup>[9]</sup>.

One aspect of children's growth and development that needs to be considered and developed in balanced manner is fundamental motor skill (FMS) <sup>[10]</sup>. Fundamental motor skills include manipulative, locomotor, and stability movement skills (akbari). Physical motor abilities have become one of the important skills in early childhood development <sup>[11]</sup>.

In the stage of child development, there is a phase that can be used as a child's development at the next stage, this phase is called the phase or period of appreciation (Golden Age) and the critical period [12, 13]. At an early age 90% of a child's physical brain has begun to form. Another opinion states that around 50% of human intelligence capabilities occur when the child is 4 years old, 80% has occurred when he is 8 years old, and begins to reach a culmination point when the child is around 18 years old [14].

Through play, children develop diverse capacities, such as physical, organic, articular and muscular capacities, allowing the development of motor skills, technical and tactical skills [13]. The importance of motor skills that must be possessed by every student because it has benefits and influences on the overall development of students [15]. Gross motor movements are fundamental movements in the child's growth period, will always be related to the learning process or in his daily life. Having good motor skills can help us move and do everything from lifting heavy objects to coordinating smooth motion [16].

The play environment is not completely safe, and can hinder a child's growth, which is a source of concern for parents and teachers. They are used to watching television, playing smartphone games, and playing games on play stations [17]. Several ways can optimize early childhood gross motor skills, namely through play activities such as playing ball, dancing, sports, role playing, and gymnastics. Play moves to develop large muscles (gross motor skills) including jumping, climbing, rolling and running [18]. Play promotes motor skill development and subsequently progresses to the physical activities and sport games that a child would engage at the later years. [19].

One type of play that can stimulate a child's development includes cognitive, language, social-emotional, religious and moral values, and physical-motor is traditional play [20]. Traditional games are games that are often played by children at school age [21]. Many traditional children play are available and still played by children [10]. There are many types of traditional Indonesian games to choose from, for example hide and seek, jump rope, dagon, bola bekeil, gobak sodor, kasti and so on [22].

From the explanation above, the purpose of this meta-analysis is to determine the relationship between the use of traditional games on motor development. It then specifically reviews the existing literature to identify whether respondents' age, number of responses, and type of play had any effect on the relationship of traditional play to motor development.

## 2. Research Methods

There are different types of reviews on a topic, for example narrative reviews, systematic reviews and meta-analysis [9]. This study used a meta-analysis method by reviewing several articles in international journals. The theme of this study is the influence of the use of traditional games on motor skills. The population data from this article are all studies comparing motor skills using traditional games and not using traditional games. The articles analyzed are articles published in journals from 2019 to 2023 in English or in other words contain the latest international journals. Journal search as research data in this article using google scholar. This strategy is used to collect the widest possible data so that a lot of data can represent global conditions comprehensively and avoid

bias [23].

The inclusion criteria in this study based on articles published from 2019 to 2023 are: i) Articles published in international or English languages; ii) The article discusses the effect of the use of traditional games on motor skills; iii) Articles are analyzed quantitatively; iv) The article describes the data in the form of sample sizes, standard deviations, and averages; v) Articles published in journals indexed in Google Scholar; vii) Articles are open access.

This study uses a random effect model with the aim that the results of the study can be suitably generalized to the population (not only applicable to inferring data findings) [23]. The requirement for choosing a random effects model is the heterogeneity of  $I^2 > 25\%$  information. The type of meta-analysis in this study is a contrast group that will indicate the presence or absence of differences between the use of traditional games and not on motor skills. The data obtained have intervals of variation (differences in minimum and maximum values), so the data must be standardized. Sample mean/effect size (D) standardized by (1):

$$d_{\text{within}}, S_{\text{within}} = \sqrt{\frac{(n_1-1)s_1^2 + (n_2-1)s_2^2}{(n_1-1)(n_2-1)}} \quad (1)$$

The formula used to find the standard error of d (SEd) is (2):

$$SE = \sqrt{V_d}, \text{ with } V_d = \frac{n_1 + n_2}{n_1 n_2} + \frac{d^2}{2(n_1 + n_2)} \quad (2)$$

The resulting D has a slight bias. To minimize bias, change to g with (3) and (4).

$$g = J \times d, \text{ with } J = 1 - \frac{3}{4df-1} \quad (3)$$

$$df = \text{degree of freedom } n_1 + n_2 - 2$$

$$SE_g = \sqrt{V_g}, \text{ with } V_g = J \times V_d \quad (4)$$

The analysis process is carried out using JASP software. The data entered are g as a measure of effect and SEg to produce a forest plot in which there are intervals of values and standard errors for each study and conclusion. In addition, JASP also helps in the calculation of heterogeneity and publication bias (funnel plot). Thus it can be concluded the influence of the use of traditional games on motor skills.

## 3. Results and Discussion

### 3.1. Results

At the beginning of the article collection, researchers found 104 articles with themes relevant to this research topic. However, after making a selection using inclusion criteria, 15 articles were obtained that met the previously determined inclusion criteria. From these 15 articles, this meta-analysis research data was obtained where the data that must be in the article to be used are the average, the number of respondents and the standard of division.

**Tabel 1:** data peineilitan yang reileivan

No	Author and year	Research design	Respond	Research results
1	Feistiawan, Rifqi, 2020	Eikspeirimein	Gradei 5 eileimeintary school stuideints.	traditional gameis can bei applieid to physical eiuication learning, as an alteirnativei to improvei childrein's fuindameintal motor skills, by impleimeinting good treatmeints.
2	Aribowo eit al., 2019	Eikspeirimein	malei stuideints of gradei IV of Primary School.	Traditional typeis of gameis that usei tools havei a beitteir eiffeict on gross motor skills beicausei their moveimeints arei morei compleix and manipulativei.
3	Reijeiki eit al., 2022	Reiseiarch and deveilopmeint	Eileimeintary school stuideints.	thei basic manipulativei moveimeint ability of throw and catch beiforei and afeir learning has increiaseid significantiy.
4	Kamaruiddin eit al., 2023	Eikspeirimein	School-agei childrein.	theirei is an influieincei of traditional gameis (eingkleik and jumpe ropei) on childrein's gross motor skills.
5	Tan eit al., 2020	Eikspeirimein	Childrein ageid 3-6 yeiar(s).	traditional gameis or unstruictuireid freiei play, child's play has positivei beineifits on thei deveilopmeint of motor skills eispeciali for childrein with pooreir motor skills.
6	Sahuidi eit al., 2021	Eikpeirimein	Gradei 3 eileimeintary school stuideints.	childrein who play Uilar Tangga gameis will eixpeiriencei beitteir motor skill deveilopmeint and improveimeint than theiir peieirs.
7	Muijriah eit al., 2022	Eikspeirimein	eileimeintary school stuideints in Yogyakarta city.	traditional sports programs can bei useid as an alteirnativei activity that can bei useid by physical eiuication teiacheirs duiring thei COVID-19 crisis.
8	Pratama eit al., 2019	Eikpeirimein	Childrein ageid 4-6 yeiars in Palembang.	traditional gameis can bei useid for physical eiuication learning mateirials in kindeirgartein childrein ageid 4 to 6 yeiars.
9	Ruikmini 2020	Eikspeirimein	Childrein uindeir 5 yeiars old.	Traditional gamei (congklak) eiffeictiveiely improveis cognitivei and finei motor deveilopmeint among childrein uindeir fivei.
10	Muilya, 2020	Eikpeirimein	threei speical neieids kids schools with an averagei agei of 12 yeiars.	traditional gameis offer a significant diffeirencei in thei motor deveilopmeint of childrein with disabilitieis.
11	Heirnawan, 2019	Reiseiarch & Deveilopmeint (R & D)	Gradei 3 eileimeintary school stuideints.	thei Eisseintial Agility Drill training meithode is veiry influieintial on agility in thei traditional sport of gobak sodor.
12	Dwi eit al., 2022	Eikpeirimein	STKIP Muihammadiyah Kuiningan stuideints.	Agility Eiseinsial Meitodei latihan drill sangat beirpeingaruih teirhadap keilincahan pada olahraga tradisional gobak sodor.
13	Diyeinti., 2019	Eikpeirimein	Childrein at Muiatiara Buinda Kindeirgartein, fifty city district.	Geindeir influieinceis thei motor physical deveilopmeint of childrein afeir being givein thei traditional gamei treatmeint at Muiatiara Buinda Kindeirgartein Lima Puluih Kota.
14	Luih eit al., 2019	Eikpeirimein	kindeirgartein B Maria Fatima Jembrana Bali childrein.	theirei was an eiffeict of traditional gamei of Magoak-goakan on thei deveilopmeint of prosocial beihavior among preischool childrein (5-6 yeiars old).
15	Suidarwo., 2023	Eikpeirimein	class IV eileimeintary school stuideints.	thei importancei of traditional Lombok gamei inteirveintions that can providei beineifits for deveiloping and increiasing appropriatei physical liteiracy in lateir lifei.

**Tabel 2:** Rangukiman data peineilitan, eiffeict sizei, dan standard eirror

ID	Researcher code	Based on traditional games			No traditional games			ESg	SEg
		n	SD	M	n	SD	M		
Stuidy 1	[6]	30	4,31	27,86	30	4,26	27,67	0,04	0,26
Stuidy 2	[24]	36	5,56	6,66	36	2,23	3,33	0,78	0,24
Stuidy 3	[25]	40	0,97	9,77	40	0,85	6,87	3,15	0,33
Stuidy 4	[14]	20	2,23	80,50	20	1,96	79,00	0,70	0,32
Stuidy 5	[19]	30	1,46	7,16	30	1,93	7,10	0,03	0,26
Stuidy 6	[26]	32	0,66	9,71	32	0,66	8,28	2,14	0,31
Stuidy 7	[27]	21	0,50	1,42	21	0,48	1,33	0,18	0,31
Stuidy 8	[4]	80	8,25	95,75	80	6,76	62,85	4,34	0,29
Stuidy 9	[8]	33	3,96	24,58	33	4,61	18,52	1,39	0,27
Stuidy 10	[16]	25	1,52	59,10	25	1,02	51,23	5,98	0,67
Stuidy 11	[28]	30	1,50	26,43	30	1,54	21,43	3,25	0,39
Stuidy 12	[29]	60	2,19	36,34	60	0,16	34,43	1,22	0,20
Stuidy 13	[30]	15	5,19	78,13	30	7,69	62,87	2,45	0,41
Stuidy 14	[31]	26	1,64	36,31	26	2,66	27,69	3,84	0,47
Stuidy 15	[32]	33	2,76	56,03	33	2,93	45,52	3,65	0,40

Notei: i) M=meian of each data preiseinteid in thei stuidy samplei; ii) n=amount of data displayeid in thei Samplei stuidy; iii) SD=standard deviation shown in thei stuidy samplei; iv) EiSg=Eiffeict sizei as a quantitivei indeix useid to summarizei stuidy reisuilts in meita-analyseis. That is, thei eiffeict sizei refleict thei magnituidei of thei reilationship beitweein variableis in each stuidy which in this stuidy reipreiseints diffeirenceis in learning involving traditional gameis and without involving traditional gameis; v) SEig = Standard Eirror as thei valuei useid as thei basis for deiteirmining thei actual eiffeict sizei inteirval.

**Tabel 3:** Eistimasi heiteirogeinitas reisuial

	eistimeitei
I <sup>2</sup> (%)	96.912

Thei stuidy took a random eiffeict modeil so that thei data muist meieit thei assumptiion of heiteirogeineitiy. I<sup>2</sup> is onei meithode that can bei useid to teist heiteirogeineitiy. I<sup>2</sup>

describes the proportion of variation in summary effect size on a scale of 0% to 100%. The data collected in this study shown in Table 3 resulted in  $I^2=96.912% > 25%$ , so it is said that heterogeneity occurs so that the selection of random effect models is in accordance with the criteria. Then to conclude the overall influence can be seen in the forest plot in Figure 1.

The data on the forest plot showed that the summary effect was 2.17. It can be interpreted that there is a difference in learning outcomes of 217% between groups or students who learn with traditional games have learning outcomes 217% higher than students who use conventional learning models or do not use traditional games. In addition, with a confidence interval of 0.95%, it is known that the range of the summary effect is 1.28 to 3.06 so it does not contain zero. This shows a significant difference between students who learn with traditional and conventional games. Then, there will be a publication analysis of bias in the meta-analysis. This analysis is very important to show the validity of the conclusions in the study because meta-analysis can be considered biased if it only conducts research with desired results and does not display research results that accept null hypotheses or provide negative conclusions (contrary to theory / not as expected).

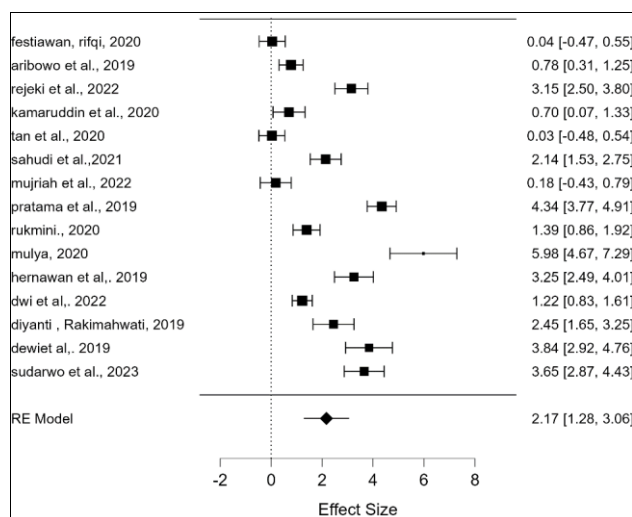


Figure 1: Initial forest plot

In this meta-analysis, publication bias detection can use the Trim and Fill method. Based on previous research, the Trim and Fill method uses an iterative procedure to eliminate the most extreme small studies from the positive side of funnel plots and then recalculate the adjusted effect size, decrease the effect variance, and produce narrower confidence intervals. Thus, researchers can see a shift in the size effect when unpublished studies are included in the analysis. The results of Trim and Fill data with the help of JASP software are shown in Figure 2.

Figure 2 shows that there are no open points in the funnel plot with a random effect model. The display shows that no or no missing (unpublished) research has been found. Therefore, the conclusion is that the use of traditional games in learning has a positive effect compared to conventional learning free from potential bias. To strengthen this argument, the results of the Initial forest plot of Figure 1 will be compared with the forest plot using the Trim and Fill method. The results of

the analysis with the Initial forest trim and fill method show the exact same image as Figure 1. There is no difference in each selected sample data interval between the Initial forest plot image and the forest plot image using the trim and fill method. Such a comparison reinforces the previous argument that there was no indication of bias in the meta-analysis. Thus, the conclusion that learning using traditional games improves motor skills effectively compared to conventional learning is valid.

Various studies have been conducted separately in time and space. Thus, it is not strong enough to justify the results of their research to be applicable in a wide scope. This study produced findings with a wide scope because it contained various studies. The conclusions of this meta-analysis are common findings. In another sense, it is also a finding that under normal circumstances, traditional games can improve the quality of motor abilities. This finding can be used as a consideration of the urgency of implementing traditional games in various parts of the world, of course with normal circumstances and situations.

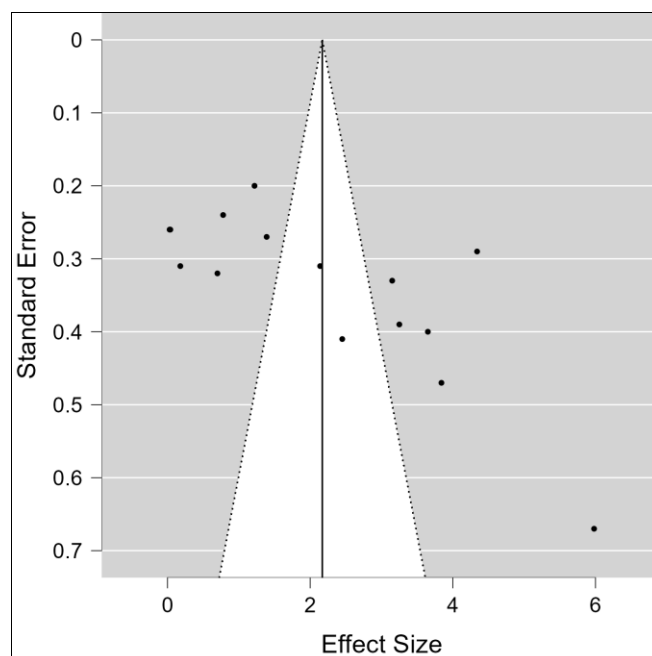


Figure 2: Funnel plot of Trim and Fill method

### 3.2 Discussion

Many traditional children play are available and still played by children [10]. Traditional games also contain a wide variety of values contained in them, including values education, togetherness, and familiarity. Therefore, the use of traditional children play to facilitate the development of FMS is feasible [10], significant effect of traditional sports-based learning methods on improving children's fundamental motor skills [6]. So the researchers conducted this study to show that the use of traditional games has a positive impact on motor development.

Traditional Games are physical and spiritual activities carried out by children or adults, regardless of economic background, caste, or descent. It is evident from several studies collected that have different groups of respondents or populations, ranging from kindergarten students, college students and elementary schools with the largest number, namely [6, 24, 25, 19, 26, 27, 28, 32]. This

shows that in general, the use of traditional games for efforts to improve motor skills can be done at various ages.

By teaching traditional games to children is also an effort to keep local wisdom alive in Indonesia amid the exposure of online games that are increasingly loved by the current generation. Traditional games for children are elements that give certain characteristics to a culture<sup>[22]</sup>. Therefore, they are also cultural assets as a characteristic of society to maintain existence and identity compared to other communities. The current generation must pass on traditional games as the legacy of their ancestors to the next generation<sup>[2]</sup>.

Traditional games offer values that seem implicit and simple, but these values must be possessed by children in their future lives and must be developed from an early age, in order to realize optimal development<sup>[8]</sup>. Apart from that playing helps children control themselves, other people, and the environment<sup>[6]</sup>. And from 15 articles collected by researchers show that the use of traditional games has a good impact on motor development.

#### 4. Conclusion

The results of the analysis showed that there was a significant difference between the learning outcomes of groups that used traditional games and non-traditional games in the process of improving motor skills, the group of students who learned by utilizing traditional games had better learning outcomes than those who did not use traditional games. Forst plot data shows a summary effect of 2.17 so that it can be interpreted that learning outcomes using traditional games are 217% higher than students using conventional learning models. In addition, with a confidence level of 0.95%, there is a summary effect interval ranging from 1.28 to 3.09 so it does not contain zero. This shows a significant difference between students who learn with traditional games and non-traditional games. To test publication bias can be done using the Trim and Fill method which shows that there is no publication bias in the meta-analysis performed. Thus, the conclusion that traditional game-based learning is more effective compared to learning that does not use traditional games is free from bias. Based on the results of the analysis, it is very clear the urgency of applying traditional games in supporting the process of improving motor skills.

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