

Analysis of Studies on Motor Development Test and Physical Measurements in Pre-School Children between 2009-2019

ECESU ÖZCAN¹, MEHMET GÜLLÜ²

¹Munzur University, Sport Sciences Faculty, Tunceli, Turkey.

²Inonu University, Sport Sciences Faculty, Malatya, Turkey.

Correspondence to: Res. Assist. Ecesu Özcan, Email: ecesuożcan@munzur.edu.tr, Tel: +905330936023

ABSTRACT

Aims: The purpose of the present study is to conduct the content analysis of the international articles focused on the tests and physical measurements of the motor development of pre-school children and thus, to determine the trends in these articles between 2009-2019.

Method: The articles were subjected to content analysis to analyse the articles to cover the descriptive information about the identity of the articles, the topic and publication year of the articles, methods and data collection tools, samples and data analysis methods used in the articles and discussion and results and suggestions sections of the articles. The collected data were interpreted on the basis of percentages and frequencies presented in tables and graphs.

Results: According to the analysis of the data, the highest number of publications has been made on the applications physical activity programs. In the studies, the most frequently used data collection tools are physical measurements (motor test, anthropometric tests etc.). The motor tests and physical measurements were found to be the accelerometer.

Conclusions: As a result, the research findings have drawn attention to the preference of physical activity program applications in preschool children, the intensity of studies for the 3-5 age group and the intensity of the accelerometer data collection tool.

Keywords: pre-schoolers, motor development test, physical measurement.

INTRODUCTION

Movement, an essential ingredient of our lives, is an inclusive action. Movement in the early childhood period is based upon motor skills (i.e. basic motor skills) like jumping, running, throwing and catching¹. Motor skills are the building blocks for more advanced movement and are a basic need for children to meet their curiosity, learn new things, get to know the world and continue their lives². The development of motor competence in early childhood affects the child, depending upon the child's growth and maturity characteristics. Over this time, motor abilities of children develop significantly and at the end of this period, they are able to use these abilities to accomplish their goals. In preschool years (3-5 years), gross motor skills (GMS) and fine motor skills (FMS) play an integral role in the development of children's movement patterns and therefore it is a critical period especially for GMS development^{3,4,5}. Gross motor skills include large muscle activity, while fine motor skills include fine-tuned movements. When children get older, their fine motor skills improve as well⁶. When the studies on motor development conducted in the last 10 years using different training programs, motor tests and physical measurements are examined, it is seen that various programs and play activities applied together with these tests and measurements have an effect on the general development of children and especially on their motor development^{7,8,9,10,11}. When the extant research in the literature was examined, it was seen that content analysis studies were conducted that cover all gross and fine motor skills in preschool children and include the examination of certain programs but not any training and intervention programs^{12,13,14}. In the literature, there is no detailed content analysis study covering the effects of all training and intervention programs, motor tests and various physical measurements.

The study carried out is the first content analysis in its field by examining the motor development tests and physical measurement researches in preschool children. Detailed examination of the studies in the literature will help us to identify the subjects that have been densely emphasized and the subjects with less literature, and to identify the subjects that need more research and need to be focused on.

METHODS

Data Analysis Method: In this study, the content analysis method was used to examine studies on motor development tests and physical measurements for preschool children. As stated by Cohen, Manion and Morrison, content analysis is also defined as the process of summarizing and specifying the elementary contents of the written information and the messages it contains¹⁵. Content analysis, which is frequently used in the field of social sciences, can be defined as a systematic, repeatable technique in which some words of a text like books, book chapters, letters, historical documents, newspaper titles and articles are summarized with smaller content categories by using a coding based on certain rules. The data which was obtained through interviews, observations or documents are analyzed in four stages in content analysis: (1) data coding, (2) finding codes, categories and themes, (3) organization of codes, categories and themes and (4) definition and interpretation of findings^{16,17}. In this study, coding was made according to the screening and selection criteria determined in the first stage and various themes were reached in this context. After this stage, the data were organized, grouped according to themes, and when appropriate, the data were digitized and presented. Finally, the findings obtained were interpreted.

Screening and Selection Criteria: Some screening and selection criteria were determined by the research to determine the articles to be used in the study. While performing the screening, the first criterion adopted was to use the following key words: “pre-school”, “motor development”, “gross motor”, “fine motor” to conduct the related screening in the Google Scholar, Web of Science, Medline and Pubmed databases. The second criterion adopted was to include only the international studies (international articles). In this way, a total of 91 studies were reached. Within the scope of the present study, a content analysis table was prepared by the researchers in order to examine the studies on motor development tests and physical measurements for preschool children in the field of international sports science in the last 10 years. Many variables in the content analysis table were used as data collection tools, as the studies conducted in line with the obtained data would be compared. By comparing the articles tabulated by each researcher, it was checked whether the same articles were reached by different researchers. At the end of this study, different articles were checked again and it was decided on the basis of the criteria whether they would be included in the study or not. In this way, the reliability and internal validity of the study were tried to be established. A total of 91 articles determined according to the pre-determined criteria were examined in terms of "research method, data collection tool, sample type, sample size, data analysis method and research subject.

RESULTS

In the findings section of the study, there are the analyses of the studies in terms of different variables and the findings obtained. Study findings were analyzed on the basis of research questions. In this regard, findings related to the distribution of the articles according to publication type, the distribution of the articles across the years, the distribution of the articles according to the research method and design, the distribution of the articles according to sample and sample size, the distribution of the article across the ages of pre-school children, the distribution of the articles according to the subject being studied and according to suggestions and discussion are presented in this section.

It is found that 9 (9.89%) of the studies were carried out based on mixed method and 82 of them (90.11%) based on quantitative method. 63 researches (69.23%) of the studies were conducted as quantitative non-experimental research while 16 researches (20.88%) were conducted as quantitative experimental research and 9 (9.89%) as mixed design research. This shows that a large majority of the studies were conducted as quantitative non-experimental research.

Table 1. Data Collection Tools

As can be seen in Table 1, seven different data collection tools were used in studies on motor development test and physical measurement in preschool children, and the most frequently used data collection tools were physical measurement tools (65.68%). When Table 2a is examined, it is seen that there is a need for studies that include interview type (3.39%), information form (1.27%), and

documents (1.69%) regarding motor development tests and physical measurements in preschool children.

Fig. 1. Motor Development Tests and Physical Measurements

As can be seen in Figure 1, while the tests and measurements most frequently used include accelerometer 43 (41.75%), the least frequently used include M-ABC, KMS 3-6, PTB, PDMS-2 and KTK 1 (0.97%).

Samples and Sample Sizes: When the distribution of the age groups of the pre-school children included in the studies is examined, it is seen that the age groups used the least in the studies were found to be 4 and 5 year olds 9 (1.10%). When the age groups of the pre-school children included in the samples of the studies are examined, it is seen that the age group used most frequently is 3-5 year olds 28 (30.77%).

Table 2. Data Analysis Methods

According to these findings, other analysis method from among the descriptive statistics methods, frequency/percentage analysis method 20 (86.78%), from among the predictive statistics methods, Factor analysis method 1 (0.34%), were used the least. In qualitative analysis methods, there weren't any studies entitled 'other'. Accordingly, mean / standard deviation analysis method 64 (21.69%) from the descriptive statistical method, the correlation 33 (11.19%) from the predictive statistical methods, the anova / ancova analysis 33 (11.19%) and the content analysis 1 (0.34%) from the qualitative statistics methods and the descriptive analysis 1 (0.34%) methods are seen to be used frequently by the researchers.

Motor Development Tests and Physical Measurements:

Table 3. Motor Development Tests and Physical Measurements

Table 1. Data Collection Tools

Data Collection Tools	(f)	(%)
Interview	8	3.39%
Questionnaire (Including open and closed ended questions)	48	20.34%
Observation (Researcher observation, audio recording, video recording)	15	6.36%
Information Form	3	1.27%
Document Analysis	4	1.69%
Others	3	1.27%
Physical Measurement Tools (Motor test, anthropometric test, accelerometer, etc.)	155	65.68%

Table 2. Data Analysis Methods

Method Explanation	Analyses	(f)	(%)
Descriptive	Frequency/Percentage	20	6.78%
	Mean/Std Dev.	64	21.69%
	Graphical Display	26	8.81%
	Other	23	7.80%
Predictive	t-test	24	8.14%
	Regression	23	7.80%
	Correlation	33	11.19%
	Non-Parametric Tests	16	5.42%
	Factor Analysis	1	0.34%
	MANOVA/MANCOVA	4	1.36%
	ANOVA/ANCOVA	33	11.19%
	Other	27	9.15%
Qualitative	Descriptive Analysis	1	0.34%
	Content Analysis	1	0.34%

When Table 3 is examined it is seen that in pre-school children the most studied the subject by the researchers is physical activity program application 45

(19.6%). The subjects found to be least studied by the researchers include motor delay, demographic distribution and features and leisure activity 2 (1.71%).

Table 3. Motor Development Tests and Physical Measurements

Subjects	(f)	(%)
Physical Activity Program Application (physical activity measurements, physical activity programs)	45	38.46%
Motor Skill Performance	12	10.26%
Gender-Based Differences	5	4.27%
Intervention Program Application (educational programs, intervention programs)	5	4.27%
Seasonal Differences	3	2.56%
Familial Relations	7	5.98%
Demographic Distribution and Features	2	1.71%
Anthropometric Features (body mass index and body fat)	7	5.98%
Environmental Factors	3	2.56%
Motor Skill Competence Tests	18	15.38%
Social Behaviour	3	2.56%
The Number of Steps	4	3.42%
Leisure Activity	2	1.71%
Motor Delay	2	1.71%

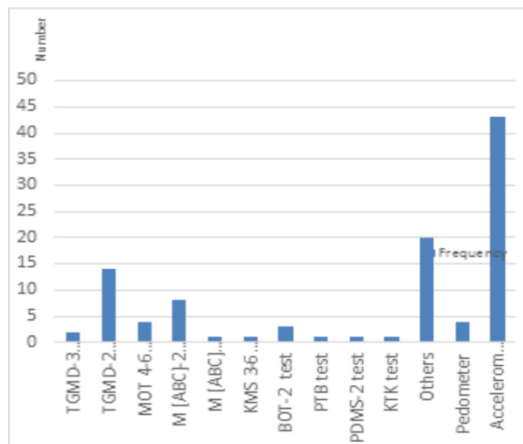


Fig. 1. Motor Development Tests and Physical Measurements

DISCUSSION

In this study, international studies on motor development tests and physical measurements in preschool children between 2009 and 2019 were examined from various angles. The identity of the examined studies was made by categorizing the research method, data collection tool, sample type, sample size, data analysis method and research subject. The findings of the categories determined for each research identity in the study are discussed one by one and discussed below and suggestions are made.

In the articles examined, it is seen that the quantitative method is the most preferred research method. Again, it is seen that mostly quantitative non-experimental research design is used in these articles. It can be said that the intensive use of this pattern is due to the focus on observational physical measurement studies. Apart from these reasons, the researchers may have preferred not to study experimental studies. It is because in experimental methods, the generalizability of the results to other situations is found to be poor due to the fact that the studies are carried out in controlled environments. Another reason for the high number of quantitative studies can be

explained by their ease of use, easy sampling and quick data collection. However, in related studies involving motor development tests and physical measurements in preschool children, quite a limited number of mixed studies have been conducted, and it has been observed that qualitative studies are not included at all. Therefore, since qualitative and mixed research methods provide the opportunity to examine the underlying causes of the problems in more depth, the more widespread use of these research methods will add depth to international research on motor development tests and physical measurements in preschool children¹⁹.

Another important result reached in the analyzed articles is that physical measurement (motor test, anthropometric test, accelerometer, etc.) data collection tools were used in the studies. It is seen that the survey method is used the most after this data collection tool. Physical measurement tools (motor test, anthropometric test, accelerometer, etc.) may have been preferred more because of their positive feature, which is used to collect reliable and objective information from the participants, and because they are more advantageous than other studies due to their concrete data focus. The most used motor tests and physical measurements by the researchers in the articles are the accelerometer 43 (41.75%) and the least preferred one is the TGMD-3 2 (1.94%) test.

When the sampling age groups are categorized in the study, it is seen that the study is mostly conducted on the sample group between the ages of 3-5 (30.77%). The least studies are conducted on 4 and 51 (1.10%) age groups.

As a result of the research, it has been found that the data analysis methods used in the published articles are mostly descriptive analysis, variance and relational analysis.

CONCLUSIONS

As a result, the research findings have drawn attention to the preference of physical activity program applications in preschool children, the intensity of studies for the 3-5 age group and the intensity of the accelerometer data collection tool. With the intensive use of the accelerometer data collection tool, it can be said that more emphasis is placed on physiological competence and physiological measurements rather than the level of motor competence in the literature.

REFERENCES

1. Robinson LE, Veldman SLC, Palmer KK, Okely AD. A ball skills intervention in preschoolers: The champ randomized controlled trial. *Medicine & Science in Sports & Exercise*. 2017; 49(11); 1.
2. Clark JE, Metcalfe JS. The mountain of motor development: A metaphor. In J. E Clark, J Humphrey (Eds.). *Motor development: Research and reviews*, Vol. 2 (pp. 163–190). Reston, VA: NASPE; 2002.
3. Stodden DF, Goodway JD, Langendorfer SJ, Robertson MA, Rudisill ME, Garcia C, Garcia LE. A developmental perspective on the role of motor skill competence in physical activity: An emergent relationship. *Quest*. 2012; 60, 290-306.
4. Hardy LL, King L, Farrell L, Macniven R, Howlett S. Fundamental movement skills among Australian preschool children. *Journal of Science and Medicine in Sport*. 2010; 13: 503–508.

5. Tomaz SA, Jones RA, Hinkley T, Bernsteina SL, Twine R, Kahn K, Norris SA, Draper Gross CE. Gross motor skills of South African preschool-aged children across different income settings. *Journal of Science and Medicine in Sport*. 2019; 22: 689–694.
6. Sveistrup H, Schneiberg S, McKinley PA, McFadyen BJ, Levin MF. Head, arm and trunk coordination during reaching in children. *Experimental Brain Research*. 2008; 188: 237–247.
7. Mostafavi R, Ziaee V, Akbari H, Haji-Hosseini S. The effects of spark physical education program on fundamental motor skills in 4-6 year-old children. *Iran J Pediatr*. 2013; 23(2): 216–219.
8. Qi Y, Tan S, Sui M, Wang J. Supervised physical training improves fine motor skills of 5-year-old children. *Rev Bras Med Esporte*. 2018; 24: 1.
9. Robinson, L. E., Webster, E. K., Logan, S. W., James, W. A., & Barber, L. T. (2012). Teaching practices that promote motor skills in early childhood settings. *Early Childhood Education Journal*, 40(2), 79-86.
10. Trost SG, Kerr L, Ward DS, Pate RR. Physical activity and determinants of physical activity in obese and non-obese children. *Int J Obes*. 2018; 25(6): 822.
11. Jones RA, Riethmuller A, Hesketh K, Trezise, J. Promoting fundamental movement skill development and physical activity in early childhood settings: A cluster randomized controlled trial. *Pediatric Exercise Science*. 2011; 23(4): 600-15 DOI: 10.1123/pes.23.4.600
12. Logan, S.W., Robinson, L.E., Wilson, A.E., & Lucas, W.A. (2012). Getting the fundamentals of movement: a meta-analysis of the effectiveness of motor skill interventions in children. *Child: care, health and development*, 38(3),305-315.
13. Capelle AV, Broderick CR, Doorn NV, Ward RE, Parmenter BJ. Interventions to improve fundamental motor skills in preschool aged children: A systematic review and meta-analysis. *J Sci Med Sport*. 2017; 20(7): 658-666.
14. Wick K, Leeger-Aschmann CS, Monn ND, Radtke T, Ott LV, Rebholz CE, Cruz S, Gerber N, Schmutz EA, Puder JJ, Munsch S, Kakebeeke TH, Jenni OG, Granacher U, Kriemler S. Interventions to promote fundamental movement skills in childcare and kindergarten: A systematic review and meta-analysis. *Sports Me*. 2017; 47(10): 2045-2068.
15. Cohen L, Manion L, Morrison K. *Research methods in education* (6th ed.). London and New York, NY: Routledge Falmer; 2007.
16. Eysenbach G, Köhler C. How do consumers search for and appraise health information on the world wide web? Qualitative study using focus groups, usability tests, and in-depth interviews. *Bmj*. 2002; 324(7337): 573-577.
17. Miles MB, Huberman AM. *Qualitative data analysis: An expanded sourcebook*. Beverly Hills, CA: Sage Publications, Inc.; 1994.
18. Creswell, J. W. (2012). *Educational research: Planning, conducting, and evaluating quantitative and qualitative research* (4th ed.). Boston, MA: Pearson.
19. Silverman D. *Doing qualitative research: A practical handbook*. London: SAGE Publications; 2013.