INPLASY PROTOCOL

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None declared.

The Effect of Physical Activity on Motor Skills Disorder of Children with Autism Spectrum Disorder: A Meta-Analysis

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Review question / Objective: **Meta-analysis was used to systematically investigate the improvement effect of physical activity on motor skills disorder in children with autism spectrum disorder (ASD), and to summarize the best exercise program. To obtain high-quality study results, the PICOS principles are usually relied upon to help complete the study design during the construction of the scientific question. That is, the target population (P) for evidence application is children with ASD; the intervention (I) is motor training such as aerobic, resistance exercise or combined exercise; the comparative measure (C) is other non-motor interventions; the outcome indicators (O) are improvements in gross motor ability, fine motor ability, and balance and coordination; and the type of evidence is a randomized controlled trial.**
Eligibility criteria: **Subjects included in the paper were required to be children with ASD diagnosed by an authoritative institution, with consistent pre-experimental characteristics; with a complete intervention program and accurate post-test results, and the type of study in the literature was a randomized controlled trial.**

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INTRODUCTION

Review question / Objective: **Meta-analysis was used to systematically investigate the improvement effect of physical activity on motor skills disorder in children with autism spectrum disorder (ASD), and to summarize the best exercise program. To obtain high-quality study results, the PICOS principles are usually relied upon to help complete the study design during the construction of the scientific question. That is, the target population (P) for evidence application is children with ASD; the intervention (I) is motor training such as aerobic, resistance exercise or combined exercise; the comparative measure (C) is other non-motor interventions; the**

outcome indicators (O) are improvements in gross motor ability, fine motor ability, and balance and coordination; and the type of evidence is a randomized controlled trial.

Condition being studied: Autism spectrum disorder (ASD) is a generalized neurodevelopmental disorder characterized by difficulties in social interaction, narrow interests and repetitive and stereotypical behaviors. There are about 2 million children with ASD in China, and the number is increasing by 200,000 every year. According to the Centers for Disease Control and Prevention, 1 in 44 children in the United States has autism. Because of its high incidence, it has become a major public health problem. In addition to typical features, studies have found that children with ASD have motor skills disorder of varying degrees, with the probability of 59%-80%. Moreover, studies have shown that motor function in children with ASD is closely related to verbal communication, adaptive behavior and social skills. The degree of motor skills disorder is significantly correlated with the degree of autism, and the gross and fine motor function can predict the severity of autism. The motor function of children with autism is positively correlated with their core symptoms. The key period for the formation of athletic ability and improvement of athletic quality is childhood. The development of motor function of children with ASD is worse than that of children of the same age, and this gap will be aggravated with the change of age. Therefore, improving motor function of children with ASD is particularly important for them and their caregivers.

METHODS

Participant or population: ASD Children.A systematic search and other sources resulted in the inclusion of 10 publications with a total of 12 studies and 451 samples of children diagnosed with ASD. The publication years of the included studies were 2016-2022, and the sample sizes of all included literature for analysis were selected at the time of outcome indicator measurement, with no significant differences in baseline values.The mean age of children with ASD was 7.4 ± 2.7 years, the mean intervention period was 10.7 weeks, the mean duration of each intervention was 50.2 minutes, and the mean frequency is 3.1 times/week, and the quality of the literature was above moderate.

Intervention: Motor training such as aerobic, resistance exercise or combined exerciseexercise interventions.

Comparator: Other non-motor interventions.

Study designs to be included: RCT.

Eligibility criteria: Subjects included in the paper were required to be children with ASD diagnosed by an authoritative institution, with consistent pre-experimental characteristics; with a complete intervention program and accurate post-test results, and the type of study in the literature was a randomized controlled trial.

Information sources: Under the premise of independent double-blind, 2 investigators systematically searched relevant journal papers in China National Knowledge Internet (CNKI), Wanfang Data Knowledge Service Platform, http://www.cqvip.com, Web of Science, PubMed, Scopus, Cochrane Library and EBSCO databases using a combination of subject terms + free words.

Main outcome(s): Exercise has a positive effect on the improvement of motor function in children with ASD. 3-6 years of age before school is the best period for exercise to improve motor dysfunction in children with ASD, and the intervention effect decreases with the age increasing. The duration of each exercise should be maintained at 60-70 minutes; the intervention effect of 1-3 times of low to medium frequency exercise on motor dysfunction of children with ASD is better than that of high frequency exercise; the improvement effect on motor functional

ability of children with ASD increases with the increase of exercise intervention period, and the exercise intervention is maintained at 12-24 weeks to achieve the ideal effect.

Quality assessment / Risk of bias analysis: The Cochrane Risk of Bias Assessment Tool is a tool commonly used by today's meta-analysis researchers for quality assessment of randomized controlled trials and is a feature unique to RevMan. This tool evaluates the risk of bias in six main areas: selection bias (random sequence generation and allocation concealment), implementation bias (blinding trial of investigators and subjects), measurement bias (blinding evaluation of study results), follow-up bias (outcome data integrity), reporting bias (selective reporting of study results), and other bias (other sources of bias), using for each indicator For each indicator, "low risk of bias", "unclear risk of bias", and "high risk of bias" were used. In this study, the quality of the literature was rated separately by two investigators . The overall methodological quality of the included literature was good.

Strategy of data synthesis: A meta-analysis of the included outcome indicators was performed using RevMan 5.4 software. Since different scales were used for motor function scores in different papers, the mean differences of the different measures could be combined in order to eliminate the effect of "units", so that the measures were expressed as combined standardized mean differences with 95% confidence intervals. Intervention effects were expressed as mean ± standard deviation. The I^2 and Q statistics were used to test for heterogeneity between studies. If there was no statistical heterogeneity between the results of the studies ($I^2 < 50\%$, $p > 0.10$), meta-analysis was performed using a fixed-effects model, and vice versa using a random-effects model for combined statistical analysis. If heterogeneity existed, subgroup or sensitivity analysis of the sources of heterogeneity was required, and the sources of heterogeneity were analyzed and treated to reduce heterogeneity. The impact analysis of publication bias was performed using Stata 17.0 software.Among the 12 studies included in this study, individual study measurement dimensions differed, and information on each measurement dimension needed to be combined in the process of data extraction. Due to their data presentation as continuous variables, they need to be converted according to the public announcement. Let the sample size of measurement mode A be N1, mean M1, and standard deviation SD1; the sample size of measurement mode B be N2, mean M2, and standard deviation SD2, then the combined sample size N=N1+N2, mean M=(N1M1+N2M2)/(N1+N2), and standard deviationSD=√(((N_1-1)SD_1^2+(N_2-1)SD_2^2+(N_1 N_2)/(N_1+N_2) (M_1^2+M_2^2-2M_1 M_2))/(N_1+N_2-1)) . If there are more than one dimension of data to be merged, the data of two of them will be merged first according to the above formula, and then the obtained data will be merged with the third dimension, and so on.

Subgroup analysis: (1) Analysis of the age subgroups of the subjects showed that the exercise intervention had a significant effect on the improvement of motor function depending on the age of the subjects, and the difference between the effects was not significant. Specifically, the effect size of motor function improvement in the 3-6 years old group was SMD=1.24, p6 years old group was SMD=0.84, p<0.05. (2) The subgroup analysis of the intervention time showed that the best improvement in motor functional capacity (SMD=1.27, P<0.05) of children with ASD was achieved with each exercise intervention of 60 to 70 minutes; while the effect of the exercise intervention of 45 to 60 minutes only reached a moderate effect size (SMD=1.42, P0.05).
(3) The subgroup analysis of the frequency of exercise intervention showed that there was a significant effect on the improvement of motor function from 1 to 3 times per week and above, and the effect of improvement of motor function from 1 to 3 times per week (SMD=0.89,P<0.05) was slightly higher than that of the group with more than 3 times per week

(SMD=1.17,P0.05); the improvement effect in the 9-11 week exercise intervention group (SMD=1.15, P<0.05) was slightly lower than that in the 12-24 week exercise intervention group (SMD=0.90, P<0.05).

Sensitivity analysis: To investigate whether heterogeneity across studies was caused by individual studies, this study conducted sensitivity analyses on motor interventions with high heterogeneity on overall motor function in children with ASD by excluding individual studies one by one for the combined effect. The study outcome included 12 studies, excluding any one study, and the combined results of the remaining studies (11) were not statistically significant (95% CI including 1), consistent with the original combined results (95% CI=0.55,1.37), indicating stable results.

Country(ies) involved: China.

Keywords: Physical Activity;Motor Skills Disorder; Autism Spectrum Disorder; Meta-Analysis.

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