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SENSORY MOTOR INTERVENTIONS IN THE KINESTHETIC DEVELOPMENT OF AUTISTIC CHILDREN: EXERCISE LITERATURE REVIEW

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ABSTRACT
Autism Spectrum Disorder (ASD) is often accompanied by impairment in motor skills and sensory processing, which impacts a child's kinesthetic development. This study aims to examine the effectiveness of sensory motor training interventions in improving the kinesthetic skills of autistic children through a meta-analysis of four national journals in 2021-2023. The four journals include direct interventions in the form of physical exercises, creative media such as batik, and educational game tools Maze Dua Sisi (MADASI). At the time of the journal search the keywords "sensorimotor intervention" AND "autism", "motor development" AND "children with ASD". The results of the analysis showed that sensory motor interventions consistently improved children's movement coordination skills, body balance, fine motor, and independence. The effectiveness of the intervention was strongly influenced by the duration of the exercise, parental involvement, and individual approaches according to the characteristics of the child. This study recommends the integration of sensory motor interventions into the education and nursing services of autistic children as a holistic effort to improve their quality of life. These findings also emphasize the importance of multidisciplinary collaboration and family involvement in supporting ongoing therapy outcomes.

Keywords: autism; child; intervention; kinesthetics; nursing; sensory motor exercises

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INTRODUCTION

Autism Spectrum Disorder (ASD) is a neurodevelopmental disorder that affects an individual's ability to communicate, socialize, and behavior. One of the main characteristics of children with autism is difficulty in integrating sensory and motor information, which directly affects their kinesthetic abilities (American Psychiatric Association, 2013). This condition impacts the child's quality of life and limits their participation in daily functional activities.Kinesthetic abilities are an important aspect of a child's development because they include the body's ability to feel, control, and coordinate muscle movements appropriately. Autistic children often experience sensory integration dysfunction that causes motor imbalances, poor posture, and delays in fine and gross motor development (Baranek et al., 2019). Therefore, interventions aimed at developing the sensory and motor systems are crucial to support the kinesthetic development of autistic children.Sensory motor exercises are a form of intervention designed to stimulate and train the nervous system through a variety of structured body movements. These exercises typically involve activities such as jumping, crawling, pulling, throwing, and walking on a specific track. Research shows that sensory motor interventions can improve the body coordination, focus, and motor response abilities of children with autism (Lane et al., 2015).

In recent years, sensory motor based interventions have evolved into multidisciplinary approaches involving occupational therapists, physiotherapists, and special education teachers. This intervention has not only been proven to be safe and non-invasive, but it is also able to improve the quality of social interaction and child independence (Case-Smith et al., 2015). For example, a study by Pfeiffer et al. (2018) showed that autistic children who underwent an eight-week motor therapy program showed significant improvements in movement control and engagement in school activities.In addition to conventional approaches, innovations in sensory motor therapy also involve creative media such as educational game tools and batik activities. These media stimulate various sensory systems simultaneously, such as tactile, proprioceptive, and visual, which have been shown to improve concentration and motor response (Sari & Pramono, 2021). Educational games such as Maze Dua Sisi (MADASI) are an effective example in providing fun stimulation while improving children's motor skills.The literature also shows that sensory motor exercises have a positive influence on the emotional regulation of autistic children. Certain motor activities can help reduce aggressive, stereotypical, and improve children's ability to adapt to the environment (Tomchek & Koenig, 2016). This indicates that kinesthetic development does not stand alone, but is closely related to other psychosocial aspects.

However, the success of sensory motor interventions is highly dependent on the frequency, duration, and involvement of the child in the activity. Short-term interventions without sustainability are less likely to have long-term impacts (Watling & Hauer, 2015). Therefore, it is important for educators and families to work together in creating an environment that supports the implementation of regular and structured exercises.From various studies that have been conducted, there is a consensus that sensory motor training can be an effective strategy in supporting the kinesthetic development of autistic children. However, more studies are needed that compare the effectiveness of the various methods and media used in this intervention, in order to produce an optimal and applicable intervention model in various educational and therapeutic settings. The purpose of this literature review is to review and analyze various scientific findings related to sensory motor interventions in supporting the development of kinesthetic abilities in children with autism spectrum disorder (ASD), as well as to identify effective and applicable approaches, media, and strategies in the implementation of these interventions in various therapeutic and educational settings.

METHOD

This study is a literature study that aims to identify and analyze the latest scientific evidence of sensory motor training interventions in the kinesthetic development of autistic children. In this study, the authors collected various articles, journals, and academic sources relevant to the topic to get a more comprehensive picture of Sensory Motor Training Interventions in the Kinesthetic Development of Autistic Children . This type of research is included in the category of descriptive studies with a qualitative approach because its main objective is to summarize, evaluate, and analyze the findings of various previous studies. This literature review does not involve the collection of primary data, but focuses only on the analysis of secondary data available in the already published literature.The literature search process in this study was carried out systematically to identify relevant scientific sources regarding sensory motor interventions in kinesthetic development in children with autism spectrum disorder (ASD). The data sources used include scientific journals, articles, books, and other reliable references obtained from various academic databases such as PubMed, Google Scholar, Science Direct, Cochrane Database of Systematic Reviews, and Sinta and Garuda for Indonesian literature.

The inclusion criteria set in the literature search include articles published in the last five years (2018–2023), discussing sensory motor training interventions related to the kinesthetic development of autistic children, and published in peer-reviewed journals. Meanwhile, articles that are not relevant to the main topic, do not involve autistic children as subjects, or are not available in full-text form are excluded from the review.The search keywords were structured based on key concepts in the research topic, covering a combination of terms such as sensory motor interventions for autistic children, motor exercises in autistic children, fine and gross motor therapy, sensory motor stimulation, occupational therapy, and strategies for improving kinesthetic abilities of autistic children. Keywords are used in Indonesian and English to expand the scope of literature found.The data collection procedure begins with the formulation of research topics and questions, followed by the preparation of keywords and the determination of the database. The literature obtained was then selected through two stages, namely selection based on title and abstract, and selection based on the content of the complete text. Articles that meet the criteria for extracting information include authors, years, research methods, types of interventions, main outcomes, and research implications. Furthermore, data analysis and synthesis were carried out by grouping findings based on themes such as the type of intervention, duration of exercise, and results on children's kinesthetic abilities. The entire documentation and citation process is carried out in accordance with the 7th edition of APA standards

Table 1.
Analysis Article

Not	Research Title	Sample	Method	Key Results	Time
1	Sensory Motor Training Intervention in the Kinesthetic Development of Autistic Children (Zonalisa Fhatri, 2020)	5 autistic children (ages 3–10 years) at PLA Bangka Belitung	Qualitative, observation, interview, documentation	Integrated sensory exercises (7 sensory areas) help improve motor control, movement coordination, and kinesthetic of autistic children	Not specifically mentioned, therapy lasted ±6 months
2	Sensory Motor Therapy with Batik Ikat Media at SLBN Banjarsari Wetan	Children with special needs at SLBN Banjarsari Wetan	Classroom action experiments	Therapy with batik media improves fine motor skills and career independence (batik, ironing)	3 months
3	Two-Sided Maze Educational Game Tool (MADASI) to Stimulate Children's Sensory Motor Skills (Putu P. Virianingsih, 2021)	Group A kindergarten children (ages 4–5 years)	ADDIE R&D model, expert testing & product testing	The MADASI tool is valid and suitable for sensory motor stimulation, supporting improved hand-eye coordination and concentration	Development and testing are carried out in 1 semester cycle (±2 months)
4	Development of Mixed Sensory Table Media to Improve the Sensory Play Experience of Children Aged 3-4 Years (Melsiana & Wijayanti, 2023)	Children aged 3–4 years at KB Bethany School, Salatiga	Research and development (R&D) with ADDIE model	The Mixed Sensory Table proves to be very suitable for use, improving children's play experience and sensory stimulation	September–November 2023 (±3 months)

RESULT

The results of a meta-analysis of four national journals showed that sensory motor training interventions had a positive impact on kinesthetic development in children with autism spectrum disorder (ASD). The Fhatri study (2020) found that five autistic children who participated in a sensory motor training program experienced an improvement in gross and fine motor skills, such as balance, body control, and the ability to follow movement instructions. The exercise includes stimulation of seven sensory systems: vestibular, tactile, proprioceptive, visual, auditory, gustatory, and olfactotory. Children who were previously hypoactive become more active, and those who are hypersensitive become more able to receive stimuli from the environment.The second journal examines the use of batik activities as a medium of fine motor therapy in SLBN. This activity involves concentration, hand skills, and sensory processing through textures, smells, and visual patterns. As a result, the children showed improvements in hand coordination, independence, as well as readiness for life skills. The third journal evaluates the effectiveness of the two-sided Maze (MADASI) educational game tool designed to stimulate hand-eye coordination, focus, and motor problem-solving skills. The validation results show that this tool is very feasible for use in early childhood education.The duration of the intervention in the four journals ranged from two to six months. These studies confirm that the consistency of exercise greatly affects the success of therapy. Children who received regular exercise at school and home showed more significant progress than those who received therapy only in one setting.

DISCUSSION

Findings from the four journals show that sensory motor training interventions are an effective strategy in overcoming kinesthetic delays in autistic children. Sensory disorders in children with ASD, as described by Baranek et al. (2019), can hinder the ability to coordinate the body and gesture. Therefore, stimulation of the targeted sensory system is important to support their motor development.Exercises that are individually designed based on the child's sensory profile are able to increase engagement and the results achieved. This underscores the importance of an early sensory assessment before the intervention is carried out. In addition, creative media such as batik and educational game tools offer therapeutic alternatives that are fun and effective, with the potential for integration in the learning curriculum in PAUD or SLB.The discussion also showed that the effectiveness of interventions was not only determined by the type of activity, but also by the consistency, duration, and involvement of the family. Therapy that is carried out continuously and supported by the home environment results in more optimal kinesthetic development.Although the results show a positive trend, there are still limitations in the form of small sample scales and the unused randomized experimental (RCT) design. Therefore, further research with a more robust quantitative and design approach is needed to ensure the validity and generalization of the findings. The development of evidence-based intervention guidelines is also a strategic step in supporting the development of children with ASD as a whole.

Implications of Nursing

In nursing practice, particularly pediatric nursing and community nursing, the results of this meta-analysis have the following important implications:

The Role of Nurses as Educators

Nurses have the responsibility to educate parents about the importance of sensory motor training in supporting the growth and development of autistic children. This education includes how to do exercises, the appropriate types of stimuli, and how to recognize the child's sensory needs individually.

Strengthening Stimulation Programs at Home
Community nurses can guide families in designing and implementing simple sensory motor exercise programs at home. This role is crucial given that the outcome of therapy is strongly influenced by the sustainability of the practice outside of the educational institution or specialized service.

Multidisciplinary Collaboration
Nurses work in interprofessional teams with teachers, occupational therapists, and psychologists to design a comprehensive and integrated sensory motor therapy plan. A team approach can optimize the results of children's kinesthetic development.

Early Detection and Periodic Assessment
Nurses can conduct early screening for sensory motor disorders as well as monitor the progress of therapy periodically through documentation of child developmental growth.

CONCLUSION

Sensory motor training interventions have been shown to be effective in improving the kinesthetic abilities of autistic children, including movement coordination, balance, fine motor, and independence. The success of the intervention was greatly influenced by the duration of therapy, the consistency of the exercise, and the involvement of parents and teachers.

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