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THE INFLUENCE OF VISUAL OCULOMOTOR ABILITIES, BALANCE AND POSTURAL CONTROL ON THE PRAXIS ABILITIES OF ATYPICAL CHILDREN AGED 7-12 YEARS

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Abstract

The main problems in dyspraxia are problems in coordination patterns and motor skills that require skills and rhythmic movements (motor skills). The foundation of children's motor skills is visual oculomotor abilities as a function of visual perception which is able to influence the midline position of the body so that children are able to achieve a position of static balance (balance) and also dynamic balance (postural control). The aim of this research is to analyze the influence of the three motor skill foundations on praxis events in atypical school-aged children. The research was conducted on 102 samples of children aged 7-12 years at the Asya Therapy Center Mojokerto. Samples were taken at simple random and divided into 2 groups, namely the case group (n=54) and the control group (n=48). The research design uses a case control study where researchers analyze the risk of praxis problems in terms of the influence of visual oculomotor factors, balance and postural control. Data analysis used logistic regression analysis which showed a significant value of 0.000 (0.000<0.05) so that from these results it can be seen that visual oculomotor factors, balance and postural control have a significant influence on praxis problems in atypical children aged 7-12 year. Apart from that, from the results of calculating the ods ratio, it was found that the highest ods ratio value was owned by the control ability.

Keywords: dyspraxia; visual oculomotor; balance; postural control; praxis

INTRODUCTION

Praxis problems in children, often called dyspraxia or better known as DCD (development Co-ordination Disorder), are in the spotlight in several developed and developing countries. Based on results from WHO (World Health Organization), the prevalence of dyspraxia problems in children aged 5-11 years reaches 5% - 6% (in children aged 7 years 1.8% are diagnosed with severe

developmental coordination problems and 3% with possible problems light developmental coordination). A comparison of the incidence rates in men and women shows a ratio of between 2:1 and 7:1 (American Psychiatric Association & Association, 1994). Meanwhile, based on data from the dyspraxia foundation, it is stated that around 5% school age children experience praxis problems and 2% of them are more severely affected (Andersen-Warren, 2023).

The characteristics of children with dyspraxia shown at elementary school age include children's difficulties in reading and writing activities, children's difficulties in carrying out gross motor activities that require rhythmic skills (throwing, catching, kicking the ball, jumping and jumping activities), children's difficulties in carrying out motor activities. smooth (the writing is not neat or even illegible), children's difficulties in maintaining focus and concentration when studying, children's difficulties in understanding simple commands and multilevel commands, children's difficulties in adapting patterns to their environment and children's difficulties in the problem solving process (van Jaarsveld et al., 2016).

If we look at praxis problems in the digital 5.0 era, it shows that children's activities are mostly spent in static positions. Static positioning and a lack of motor activity in children cause weak motor skills and coordination in children so that it can indirectly affect children's praxis abilities (Condon, 2000). Static positioning patterns have a big influence on children's visual conditions, including children's visual oculomotor abilities. Visual Oculomotor Ability is the ability of visual perception to control the position and movement of the eyeballs so that they can focus when observing an object (de Brouwer et al., 2021).

Visual oculomotor ability is an important aspect of body coordination and movement abilities. Apart from that, this ability also plays an important role in understanding the body midline and body balance patterns when standing still (balance) or moving (postural control). Balance is a person's ability to maintain a postural position in the midline of the body in both stationary and moving conditions (Osoba et al., 2019).

The balance system is the most important aspect for regulating head movements, which contributes to maintaining an upright body posture. This balance system involves a number of reflex pathways that are responsible for carrying out compensatory movements and adjusting body position (Oster & Zhou, 2022). If a child experiences incoordination in the coordination of visual oculomotor abilities, balance and postural control, this will affect his understanding of the midline of the body so that it will indirectly affect his praxis abilities (Lane et al., 2019). In this study, researchers reviewed the influence of the foundation of children's motor skills, namely visual oculomotor abilities as a function of visual perception which is able to influence the midline position of the body so that children are able to achieve a position of static balance (balance) and also dynamic balance (postural control). Analysis of visual oculomotor abilities, balance and postural control in the group of dyspraxia children and the control group is expected to provide an overview of the influence of these three abilities on praxis abilities in school-aged children (7-12 years). Elementary school age children (7-12 years) are a transition period for children from abstract thinking to the concrete operational stage, namely learning something by understanding objects or direct situations (Istiqomah & Suyadi, 2019).

RESEARCH METHODS

This research is an observational analytical study with a case control study design by comparing case groups and control groups based on their exposure status.

This research was conducted on 102 children from 121 populations with an age range of 7-12 years who were carried out randomly. The research subjects were divided into two, namely the case group (n=54) and the control group (n=48). The research was conducted for 5 days with a quota of 20 research subjects per day.

The test materials provided are the test components of the EASI Scorring Test which consist of the ideational praxis test (EASI 3:Pr.I), visual oculomotor test (EASI 8: OC&Pr.OC), balance test (EASI 6: Balance), and control test postural (EASI 5: PC). The Praxis Ideation assessment component is seen from several aspects, including Tally of Ideas (Variation of movements), speed (speed of finding ideas) and complexity (complexity in carrying out movements). In the EASI 8 examination there are 24 test items, consisting of 6 items on the ocular pursuit function, 4 items on the ocular stabilization function, 4 items on the ocular quick localization function, 8 items on the ocular praxis function and 2 alignment items (Lane, Mailloux, Schoen, Bundy, May-benson, et al., 2019).

The balance examination (EASI 6: Balance) consists of 12 balance test items and 2 alignment test items. The examination was carried out twice with a gap of around 10-20 minutes (Lane et al., 2019).The postural control examination consists of 7 PC Prone Extention Position test items, 7 PC Supine Flexion Position test items, 1 head Lag item, 2 PC on ball items, 1 PC robot arms item, 3 PC reaching items and 2 alignment test items (Schaaf et al., 2012). After the test is carried out, the resulting data is input into the EASI Scorring Program (ESP), where the data is then processed and the percentile results are obtained. The resulting scoring is -3 to 3 where the criteria that are said to be within normal limits is a score between -1 to 1 (no problems). At a value less than -1, the child is interpreted as being in the atypical hyporeactive category, while a value greater than 1 is interpreted as the child being in the atypical hyperreactive category.

RESULTS AND DISCUSSION

This research was attended by 102 children aged 7-12 years with the highest distribution at the age of 11 years, namely 31 people (30.4%) and the lowest distribution at the age of 7 years, namely 5 people (4.9%). The research subjects who were male were 53 people (51.96%) and the research subjects who were female were 49 people (48.04%). The number of subjects based on the presence or absence of praxis problems as well as grouping them into the case group (atypical children) was 54 people (52.9%) and the control group (typical children) was 48 people (47.1%). When taking the ideational praxis test (EASI 3: Pr.I), several research subjects showed difficulty in interpreting the ideas put forward. For example, when you are ordered to cosplay as an animal. They verbally name the animal they will imitate but do not execute complex movements that describe the animal in question. From this test it can be seen that the subject in question experiences dyspraxia.

The number of research subjects who did not have visual oculomotor problems was 45 people (44.1%) and those who had visual oculomotor problems were 57 people (52.94%) consisting of 29 people who experienced praxis problems, 28 people did not experience praxis problems. Examination of children's ideational praxis abilities using the EASI test 3: Ideational praxis (Pr:I) contains a test of children's ability to develop ideas when they play a role using their hands, body and objects around them. Where this test relies on the child's motor skills (kinesthetic factors). Over the past two decades numerous studies have shown that eye movements are controlled and regulated to support accurate hand and body movements. The movement learning process involves the integration of sensory information about the movement target before, during, and after the movement and then deciding which movement to perform and when and where to move (de Brouwer et al., 2021).

When a child is given an object and then the Tester stimulates the child to initiate the object, the first thing the body does is create an image of what will be done to the object. Eyeball movements (visual oculomotor skills) focus on objects by responding to low velocity eyeball movement patterns and slow movements. Children with visual oculomotor problems (visual pursuit) show eyeball responses that tend to be hyperreactive or even hyporeactive. With such oculomotor visual conditions, it will affect the speed of movement initiation and variations in movement initiation (Collins et al., 2021).

The number of research subjects who had balance problems was 62 people (60.8%) and research subjects who did not have balance problems were 40 people (39.2%). From the results of the regression test regarding the influence of balance on the praxis abilities of atypical children aged 7-12 years, a significant value was obtained for the balance variable (X2) of 0.003. This value is smaller than the research alpha value ($0.003<0.05$) or it can be said that hypothesis is accepted. This means that balance has a significant effect on praxis problems in atypical children aged 7-12 years.

Balance is influenced by neuromuscular and proprioceptive processes (Guler et al., 2021). Postural stability can be interpreted as an adequate response to center of mass (COM) problems caused by distractions in the body, motor activity or conscious interaction with the environment (Ludwig et al., 2020).

The balance test component in EASI 6: Balance includes body posture when standing in various positions and support. Standing posture is controlled by the integration of sensorimotor processes to maintain the BOS (Base of Support) with various supports. However, such control depends on the interaction of biomechanical constraints (e.g. size and strength), dynamics (e.g. direction and magnitude of movement), movement strategy (e.g. ankle control, hip control, stride, etc.), and previous experience (Conner et al., 2019).

The number of research subjects who had postural control problems was 34 people (33.3%) and research subjects who did not have postural control problems was 68 people (66.7%). During the process of somatosensory maturation and changes in biomechanical parameters related to growth, stability and postural control undergo a continuous adaptation process. The central nervous system learns and optimizes both functions during the child's maturation process, with somatosensory integration playing an important role. Therefore, perception and control of body position are key factors (Ziegler et al., 2019). The postural control system is a coordination mechanism of three systems, namely visual, vestibular, and proprioception. These three functions are integrated with each other in the brain stem and cerebellum, and then by the cerebral cortex to correct and maintain the stability of body posture through movement responses that involve the work of tonic muscles, so that the coordination and cooperation of this system produces good posture control (Shams et al., 2020). The literature describes age dependence in relation to stability control, for example in the Center of Pressure (COP) reduction process during maturation. Postural control involves stable and active postural adaptations in which body segments are aligned perpendicular to each other and is an important basis for the prevention of postural deficiencies. Therefore changes in postural stability, or more precisely in COP oscillations, become apparent when adapting active postures or when these postures worsen (Ludwig et al., 2020).

In the postural control test using EASI 5: postural control (PC) includes supine lying, prone lying, knelling, standing and sitting on the ball. In these five positions, research subjects were asked to maintain the COP position of the body so that a balance pattern could be achieved while or while moving. This ability is needed to provide continuity and endurance for the body during daily activities which are dominated by praxis abilities. With stable body postural control, integration of the somantosensory system which is the basis of motor skills can be achieved well. From the results of the regression test regarding the influence of postural control on the praxis abilities of atypical children aged 7-12 years, a significant value was obtained for the postural control variable (X3) of 0.001. This value is smaller than the research alpha value (0.001<0.05). This means that postural control abilities have a significant effect on praxis problems in atypical children aged 7-12 years. Apart from that, the exposure value for postural control has the highest value compared to balance and visual oculomotor abilities, namely 5.724. This means that children who have postural control problems have a high risk of experiencing praxis problems.

Table 1 Table of Influence on Visual Oculomotor, Balance and Postural Control on Children's praxis Ability

Omnibus tests of model coefficients				
		Chi-square	Df	Sig
Step 1	Step	24.761	3	.000
	Block	24.761	3	.000
	Model	24.761	3	.000

This significant value is smaller than the research alpha value (0.000<0.05) or it can be said that hypothesis is accepted. This means that visual oculomotor abilities, balance and postural control have a significant influence on the occurrence of practical problems in atypical children aged 7-12 years.

CONCLUSION

There is a phenomenon that researchers pay attention to when conducting research and data analysis. In the visual oculomotor function test of children, there was a phenomenon in some children who had no praxis problems but had low visual occulomotor scores. If we review the history, there is a habit of exposure to gadgets for more than 1 hour per day. Therefore, further research is needed regarding this phenomenon.

BIBLIOGRAPHY

American Psychiatric Association, A. P., & Association, A. P. (1994). Diagnostic and statistical manual of mental disorders: DSM-IV (Vol. 4). American psychiatric association Washington, DC.

Andersen-Warren, M. (2023). Living with dyspraxia: A personal perspective. Dramatherapy, 02630672231184783.

Collins, L. McCormick, D. (2021). Vagus nerve stimulation induces widespread cortical and behavioral activation. Current Biology, 31(10), 2088–2098.

Condon, F. V. M. (2000). Teaching to transform: Nonviolence and literacy. State University of New York at Albany.

Conner, B. C. Crenshaw, J. R. (2019). The cross-sectional relationships between age, standing static balance, and standing dynamic balance reactions in typically developing children. Gait & Posture, 73, 20–25.

de Brouwer, A. J. Spering, M. (2021). Functional use of eye movements for an acting system. Trends in Cognitive Sciences, 25(3), 252–263.

Guler, O. Bianco, A. (2021). Effects of functional strength training on functional movement and balance in middle-aged adults. Sustainability, 13(3), 1074.

Istiqomah, H., & Suyadi, S. (2019). Perkembangan Fisik Motorik Anak Usia Sekolah Dasar Dalam Proses Pembelajaran (Studi Kasus Di Sd Muhammadiyah Karangbendo Yogyakarta). El Midad, 11(2), 155–168.

Lane, S. J. Schaaf, R. C. (2019). Neural foundations of ayres sensory integration®. Brain Sciences, 9(7), 153.

Ludwig, O. Fröhlich, M. (2020). Neuromuscular performance of balance and posture control in childhood and adolescence. Heliyon, 6(7).

Osoba, M. Y. Lalwani, A. K. (2019). Balance and gait in the elderly: A contemporary review. Laryngoscope Investigative Otolaryngology, 4(1), 143–153.

Oster, L. M., & Zhou, G. (2022). Balance and vestibular deficits in pediatric patients with autism spectrum disorder: An underappreciated clinical aspect. Autism Research and Treatment, 2022.

Schaaf, R. C. Benevides, T. (2012). Occupational therapy using sensory integration to improve participation of a child with autism: A case report. The American Journal of Occupational Therapy, 66(5), 547–555.

Shams, G. Rather, R. A. (2020). The impact of the magnitude of service failure and complaint handling on satisfaction and brand credibility in the banking industry. Journal of Financial Services Marketing, 25, 25–34.

van Jaarsveld, A. … Haefele, L. (2016). Sensory processing, praxis and related social participation of 5-12 year old children with Down syndrome attending educational facilities in Bloemfontein, South Africa. South African Journal of Occupational Therapy, 46(3), 15–20.

Ziegler, Y. Carlson, K. (2019). Suppression of FOXM1 activities and breast cancer growth in vitro and in vivo by a new class of compounds. NPJ Breast Cancer, 5(1), 45.