Attention Deficit Hyperactivity Disorder (ADHD) remains one of the most common neurodevelopmental disorders in children with prevalence reaching 5%-9% in school-age children [1,2]. An adult with ADHD often struggle with the problem of disorganization, irritability, and sleep disturbance [3], therefore comprehensive and continuous management of ADHD is essential. The main therapeutic management of ADHD consists of pharmacotherapy and behavioural therapy which are shown to be effective [1]. However, the use of this medicine to control symptoms of ADHD sometimes face refusal from parents due to its side effects including appetite disturbance and growth retardation [4].

The proposed supporting therapies for children with ADHD is occupational therapy, a field which focuses on optimization of health and human potential through the use of occupation or activity. Some of the therapeutic methods in this field include sensory integration therapy, rhythmic therapy, occupational group therapy, cognitive-functional intervention and physical activity. Each of the methods are supported by sound theoretical basis, therefore considered has to be made as a part of standard ADHD management.

**Key Words:** Attention deficit hyperactivity disorder; Occupational therapy

**Abbreviations:** ADHD: Attention Deficit Hyperactivity Disorder; DSM: Diagnostic Statistic Manual; dACC: Dorsal Anterior Cingulate Cortex; DLPFC: Dorsolateral Prefrontal Cortex; OPC: Orbitofrontal Cortex; PFC: Prefrontal Cortex; SMD: Sensory Modulation Disorder; SDD: Sensory Discrimination Disorder

**LITERATURE REVIEW**

Methods for selection of studies

In this study, we collected publications by using the Google Scholar search engine using keywords Attention Deficit Hyperactivity Disorder and occupational therapy. From the search result, we included relevant studies focusing on clinical trial and case study of therapeutic methods. We also reviewed proposed occupational therapy methods for ADHD from occupational therapy textbook [5-10].

**Attention deficit hyperactivity disorder**

ADHD is a neurodevelopmental disorder characterized by a disturbance in focusing attention, hyperactivity, and impulsivity. Diagnostic criteria of ADHD are based on Diagnostic Statistic Manual 5th Edition (DSM-5) which consists of various sign and symptoms as a manifestation of attention deficit or hyperactivity/impulsivity or combination of both [11]. Manifestations of attention deficit include a lack of attention of details, short attention span, forgetfulness, got distracted easily and careless. The manifestation of hyperactivity includes increased movement in a situation that requires the person to stay still while the manifestation of impulsivity includes impulsive and intrusive action [12]. To be diagnosed with ADHD, the symptoms must appear on age 12 years old and must be apparent in two environments, for example, home and school [11].

There is no single causal factor for ADHD. In fact, the occurrence of ADHD is related to a combination of genetic predisposition and environmental influence. Several known factors related to ADHD are prenatal toxic exposure, prematurity, and mechanical prenatal disturbance. This combination of factors is believed to cause a malfunction in brain circuits that play roles in information processing including dorsal anterior cingulate cortex (dACC), dorsolateral prefrontal cortex (DLPFC), orbitofrontal cortex (OPC), and prefrontal cortex (PFC) [4].

Pharmacotherapy remains as a standard treatment for ADHD besides behavioural therapy [13], however, its inherent side effects hinder the patient’s compliance in consuming the drug (Figure 1).

**Ocational therapy methods for ADHD**

![A variety of tools and instruments used in sensory integration therapy in Dr. Soetomo General Hospital/Faculty of Medicine Airlangga University](image-url)

**Figure 1** A variety of tools and instruments used in sensory integration therapy in Dr. Soetomo General Hospital/Faculty of Medicine Airlangga University

Ocational therapy is an allied health profession focusing on activity as a means of therapy to improve functional activity [5]. There are numerous therapeutic methods recommended for ADHD based on occupational therapy principles, which include sensory integration therapy, occupational group therapy, rhythmic therapy, cognitive-functional intervention and physical activity.

**INTRODUCTION**

Attention Deficit Hyperactivity Disorder (ADHD) is one of the most common neurodevelopmental disorders in children with prevalence reaching 5%-9% in school-age children [1,2]. An adult with ADHD often struggle with the problem of disorganization, irritability, and sleep disturbance [3], therefore comprehensive and continuous management of ADHD is essential. The main therapeutic management of ADHD consists of pharmacotherapy and behavioural therapy which are shown to be effective [1]. However, the use of this medicine to control symptoms of ADHD sometimes face refusal from parents due to its side effects including appetite disturbance and growth retardation [4].

Occupational therapy has been proposed as one of supporting therapies which are proven to be beneficial for the management of ADHD [1]. The objective of this paper is to review occupational therapy methods for children with ADHD. It is essential for a psychiatrist to have a broad knowledge in supporting therapy options for ADHD, especially occupational therapy, to be able to integrate them into comprehensive management.

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Ocational therapy is an allied health profession focusing on activity as a means of therapy to improve functional activity [5]. There are numerous therapeutic methods recommended for ADHD based on occupational therapy principles, which include sensory integration therapy, occupational group therapy, rhythmic therapy, cognitive-functional intervention and physical activity.
Sensory integration therapy

Sensory integration is a theory which emphasizes the influence of sensory input processing toward human function and development [8]. Sensory integration is defined as a process to recognize, modulate, and differentiate sensation from the sensory system in order to produce targeted adaptive behavior. Sensory integration occurs since birth and provides a basis for an adaptive response which enables development of complex skill such as calculation, language, and emotional control. Disturbance in sensory integration, or sensory processing disorder, can cause a person unable to efficiently process sensory input and produce appropriate action [9].

Miller et al. [14] classify sensory procession disorder into three types: Sensory Motor Disorder (SMD) (i.e. problem in modulating sensory input), Sensory-based Motor Disorder (SBMD) (problem in motor performance related with sensory input), and Sensory Discrimination Disorder (SDDD) (problem in discriminating sensory input). Symptoms of ADHD are thought to be caused by sensory processing disorder, specifically sensory modulation disorder. Normally, sensory inputs are modulated in the brain by means of facilitation and inhibition so that the brain can perceive the sensory input at an appropriate level and respond to them accordingly. Failure in modulating the sensory input in the brain make children with ADHD unable to focus their attention, try to seek sensory input persistently, and unable to withhold respond. Sensory modulation disorder is further classified into sensory seeking type, sensory under responsive type, and sensory over responsive type.

In order to improve sensory integration and sensory processing disorder, sensory integration therapy is established by Anna Jean Ayres. Sensory integration therapy is based on five basic assumptions; they are neuroplasticity, motor organization, adaptive responses, and motor planning. Sensory integration therapy primarily provide stimulation for tactile, vestibular, and proprioceptive input which is considered essential for a person to interact effectively to his or her surrounding environment [15]. The main elements of sensory integration therapy consist of sensory stimulation, "just right" challenge, cooperation in choosing an activity, independent organization guidance, optimal stimulation support, play context creation, success optimization, physical safety, environment arrangement, and togetherness facilitation.

Sensory integration therapy is initiated with the assessment of sensory profile to identify the type of sensory processing disorder in a child with ADHD. Based on the sensory profile, the therapist and child decide activities that the child will do during sensory integration program. In each proposed activities, the therapist considers how it will help with the sensory processing disorder that the child has, what level of activities that the child need, and how the activities need to be modified to ensure that it provides appropriate sensory stimulation for the child [16].

The tools and instruments used in sensory integration therapy are classified into four categories: tactile tools (e.g. texture mat, brush, pillow), non-suspended moving equipment (e.g. balls in different sizes, scooter board, trampoline, drum), suspended moving equipment (e.g. stairs, hammock, sling bed) and motor planning tools (e.g. various toys and games) [15].

Rhythmic therapy

Proponents of rhythmic therapy believe that children with ADHD have a problem in the organization of motor function, especially in the timing of motor movement. The ability to arrange timing and rhythmicity of movement is considered important in various behavior’s, such as movement planning, sequencing of action, and cognitive function including focusing attention and academic performance. Furthermore, it is believed that rhythmic therapy can stimulate natural brain ability to retrieve its connection in the form of neuroplasticity. Therefore, specific training that addresses timing and rhythmicity of movement needs to be given to children with ADHD [7].

The basic principle of rhythmic therapy is that by training the brain to follow the organized rhythm, improvement of the attention control system and executive function can be achieved following improvement in brain synchronization and networking [17]. Rhythmic therapy can be given with help of instrument, for example with Interactive Metronome®, or by rhythmic activities.

Interactive Metronome® is a computerized instrument used to train timing and rhythmicity of hand and foot movement by the help of auditory cues [18]. Interactive Metronome® instrument consists of a computer, Interactive Metronome® software, two set of headphones, and two triggers which can detect contact in the form of gloves and flat plastic board [19].
Occupational group therapy

In general, the purpose of occupational group therapy is to help its participant to improve social participation through training of communication skills and daily activities [23]. Symptoms of ADHD often cause children unable to obtain optimal social skills and participate in social activities. Social participation, including formal and informal activities, is very important for children because it helps the children to develop various social skills, such as sharing things with others, cooperation, helping others, and conflict resolution [29].

Implementation of occupational group therapy can incorporate various occupational therapy methods in different sessions, for example, CogFun group therapy, physical activities group therapy, and rhythmic group therapy.

CONCLUSION

A variety of occupational therapy methods are proposed for children with ADHD, it is important for a psychiatrist to have the knowledge of these occupational therapy methods to be able to integrate them with standard therapy and form comprehensive management for ADHD. This review suggests that, despite existing supporting evidence, further research is required to establish the efficacy of occupational therapy methods. Therefore, care needs to be taken when incorporating these methods with standard therapy. Parents also need to be informed of the current evidence that supports each therapeutic method and has to receive education to monitor progress during therapy. This review is limited by studies selection methods and requires improvement in a future study.

REFERENCES