

Intervention Approaches for Children with Autism Spectrum Disorder (ASD) and Attention Hyperactivity Disorder (ADHD): Review of Research between 2013 and 2017

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Abstract

This review focusing on studies on autism spectrum disorder (ASD) and attention disorder hyperactivity disorder (ADHD), which consists of assessment and intervention on three main domains; neuropsychological (cognitive), social interaction and behavioral problems. Majority of the studies reviewed used non-randomized control studies which involves mostly children, some adolescence and few adults, who are diagnosed as either ASD, ADHD or ASD +ADHD. The outcome of these studies mostly shows positive results in improving autism symptom such as cognitive skills impairment, social interaction dysfunctions between child and parents and behavioral problem. Children with ASD that undergone occupational therapy using sensory integration needed less caregiver assistance during self-care and social activities. Pivotal Response Treatment (PRT) challenges the child to improve communication and increased parental self-efficacy. Social skills training (SST) promote social competence and friendship and decreasing feelings of loneliness. Animal companionship increases alertness and attention in human, which might promote enhance concentration and task persistence and promote calming effect in children suffering from ADHD. Mind-Body Therapies showed positive results in mental and emotional health and decreased in behavioral problems in children with ASD. In parent -mediated early intervention for children with ASD, children's language, adaptive skills and parents stress showed no significance change. Despite of small to medium improvement, there were little scientific evidence of effectiveness of each type of intervention that could be suggested as best suited therapy for children with ASD and ADHD. Therefore, it was suggested to have standardized training technique as a promising area for future research along with continuous monitoring is needed in the long term to see the results in these children.

Keywords: Autism spectrum disorder (ASD); Attention deficit and hyperactivity disorder (ADHD); Neuropsychological (cognitive); Social interaction; Behavioral problems

Introduction

Individual with Autism spectrum disorder (ASD) is defined as a neurodevelopmental disorder characterized by persistent deficits in reciprocal social communication and interaction as well as restrictive, repetitive stereotyped patterns of behaviour and interests [1-3]. While, Attention Deficiency Hyperactive Disorder (ADHD) have symptoms of inattention, hyperactivity and impulsivity [3].

Children with ASD have difficulty in understanding metaphorical or non-literal language, slower information processing, intellectual disability, as well as repetition of nonsense words [3,4]. These impairments undoubtedly influence their linguistic competence on object recognition and perception, and understanding of visuospatial relationship [3]. Children with ADHD, experience consistently deficit in their working memory, verbal comprehension difficulties and to sustained attention and response inhibition [3,5].

Irritability is the most primary presentation of children with autism spectrum [1], other behaviour and medical problems that requires clinical assessment social withdrawal, anxiety, rigid-compulsive disorder, depression, and high rates of sleep and gastrointestinal

problems [6]. Majority of children with autism spectrum disorder showed deficit in social cognition [5] whereby they have fewer reciprocal friendships and lower friendship quality, more isolated and have a less central position in social networks [7]. This social impairment causes difficulty for parents to communicate with them which later leads to frustrations [1]. According to Busch et al. [8], there is an also significant difficulty in social interaction and peer's impulsivity and hyperactivity seen in children with ADHD.

Methods

Search strategies and selection of criteria

The PubMed and Science Direct database were search using the keywords "autism" and "attention deficit hyperactivity disorder" combined with intervention on cognitive, behavioural and social. When the first keyword autism and attention deficit hyperactivity disorder was searched 5000 hits were obtained. When the word intervention was added, the results were decreased to 1700. All related issues mainly from ASD and ADHD (Journal of Child Psychology and Psychiatry), intervention study (Journal of Autism Developmental Disorders).

Data collection and analysis

A total of fifteen research articles from five countries were found via PubMed and Science Direct databases. The three main parameters were cognitive, behavioural and social. The specific parameters and the main findings of each article were closely examined for details such as authors, title of the research, country, year and sociodemographic, investigation's design, study setting, year of publication, sample and number sample were dissected and categorized accordingly. Most articles originated from America (n=6), United Kingdom (n=4), Netherlands (n=3), Australia (n=1) and Egypt (n=1).

Results

Demographic indicators

From 2013 to 2017, the number total population of respondents was approximately 2718. However, the number of total population was smaller than expected because some information was not stated in some literature – Table 1.

No	Country	Year	Title	Age (years) Mean(SD)	Gender (%) ratio	Ethnicity/Religion/Locality (%)
1	United Kingdom	2013	Parent-mediated early intervention for young children with autism spectrum disorders (ASD)	NA	NA	NA
2	Egypt	2017	Neuropsychological Performance of Egyptian Children with Autism Spectrum Disorder and Attention Deficit Hyperactivity Disorder	6-12 years ASD=7.35(2.09) ADHD=9.19(1.68) TD=9.14 (1.9)	Male=79.6% Female=20.4%	Egyptian=100%
3	United Kingdom	2017	Atypical Processing of Gaze and Faces Explains Comorbidity between Autism Spectrum Disorder (ASD) and Attention [Deficit Hyperactivity Disorder	8-15 years Normal=12.58(1.92) ADHD=11.94(2.36) ASD=12.52(1.76) ADHD +ASD=12.51(2.36)	Male only: Normal=80% ADHD=53% ASD=90% ADHD+ASD=92.3%	NA
4	Netherlands	2017	The Effect of Pivotal Response Treatment in Children with autism spectrum disorder: A non-randomized study with Blinded Outcome Measure	3-8 years Control=5.7(2.2) Pivotal Response Treatment=5.9(1.5)	Control: Male=76.9% Female=23.1% Pivotal Response Treatment: Male=90.9% Female=9.1%	NA
5	United Kingdom	2017	Randomized trial of a parent mediated intervention for infants at high risk for autism: longitudinal outcome to age 3 years	7-10 months Mean(SD)=NA	NA	NA
6	America	2014	An Intervention for Sensory Difficulties in Children with Autism: A Randomized Trial	4-7 years Occupational Therapy/Sensory Integration=71.35 (14.90) Usual care=72.33 (10.81)	NA	NA
7	Australia	2016	A Meta-Analytic Review of the Efficacy of Physical Exercise Intervention on Cognition in Individuals Autism Spectrum Disorder and ADHD	3-25 years Mean(SD)=NA	NA	NA
8	Netherlands	2016	Animal-Assisted Interventions for infants at high risk for Children with Attention Deficit/Hyperactivity Disorder: A Theoretical Review and Consideration of Future Research Direction	2-11 years Mean(SD)=NA	NA	NA
9	America	2016	Irritability and Problem in Autism Spectrum Disorder: A Practice Pathway for Paediatrics Primary Care	3-11 years Mean(SD)=NA	NA	NA
10	Europe	2017	Medical comorbidities in children and adolescents with	4-18 years Mean(SD)=NA	NA	NA

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11	America	2016	Are Autistic in Youth Meaningful? A Replication study in Non-Referred Siblings of Youth with and without Attention Deficit Disorder	6-18 years Without Autism Traits=10.6(3.2) With Autism Traits=9.9(3.4)	Male only: Without Autism Traits=51% With Autism Traits=73%	Caucasian=94% Non-Caucasian=6%
12	America	2016	Medical and Behavioural Correlated of Depression History in Children and Adolescents with Autism Spectrum Disorder	6-17 years Depressed group=9.4(2.7) Non-depressed group=11.9(2.7)	Depressed group: Male=84.8% Female=15.2% Non-depressed group: Male=82% Female=18%	Non-white: Depressed group=16.3% Non-depressed group=15.5% White: Depressed group=83.8% Non-depressed group=84.5% Hispanic: Depressed group=8.5% Non-depressed group=3.6% Non-hispanic: Depressed group=91.5% Non-depressed group=96.4%
13	Netherlands	2016	A group- Administered Social Skills Training for 8-12-Year-Old, high Functioning Children with Autism Spectrum Disorders an Evaluation of its Effectiveness Outpatient Treatment Setting	8-12 years Mean(SD)=NA	Male=90.4% Female=9.6%	NA
14	America	2017	Neuropsychological Characteristics of Children with Mixed Autism and ADHD	Years=NA ASD=10.9(3.6) ASD+ADHD=9.8(2.2)	NA	NA
15	America	2017	Autism and Mind-Body Therapies: A Systematic Review	NA	NA	NA
NA-Not available; TD-Typical development (normal child)						

Table 1: An overview of demographic indicators of the research articles according to country.

Age

The publications included several age ranges, from children as young as 10-16 years (n=277), young adults from 18 to 25 years (n=1955), general adults from 29 to 49 years (n=40) and elderly from 50 to 65 years (n=13). The most-researched group involved children, in whom ASD and ADHD is common.

Gender

The percentage of female respondents was between 9-20% (n=222) and for males was between 50-90% (n=1277) in 15 research studies in America, United Kingdom, Netherlands, Australia and Egypt.

Ethnicity, religion and locality

The respondents represented ethnic groups within the country were Egyptian, Hispanic/Latino and Caucasians, White and Non-whites. The sample recruited included young children (n=277), adolescent (n=1955) and adults (n=53) (Table 1).

Location

Mostly, non-randomized research study on ASD and ADHD were conducted in developed countries in which 13 articles had originated from America (n=6), United Kingdom (n=3), Netherlands (n=3) and Egypt (n=1).

Parameters

The psychological and behavioural studies of ASD and ADHD have been focused on measuring behavioural, followed by cognitive skills and social skills. Mostly, these studies were conducted in the recent years to investigate the effectiveness of the type of intervention applied on three main parameters; cognitive, social and behavioural in children and adolescence with ASD and ADHD. The main findings for each study are summarized in Table 2.

No	Author	Study design Study setting Year	Respondents	Sample (n=)	Parameters	Main findings
1	Oono et al. [9]	<ul style="list-style-type: none"> Reviewed article United Kingdom 2013 	Children	371	Social	Improved in understanding language comprehension and severity of autism

2	Elsheikh et al. [3]	<ul style="list-style-type: none"> • Longitudinal • Egypt • 2017 	Children	69	Cognitive	Impaired of cognitive skills in variant in ASD and ADHD
3	Groom et al. [2]	<ul style="list-style-type: none"> • Longitudinal • United Kingdom • 2017 	Children	35	Cognitive	Children with ASD and ADHD presented atypical gaze cue and face processing
4	Duifhuis et al. [12]	<ul style="list-style-type: none"> • Non- randomized study • Netherlands • 2017 	Children	24	Behaviour	Improvement in Autism symptoms
5	Green et al. [10]	<ul style="list-style-type: none"> • Longitudinal • United Kingdom • 2017 	Infants	54	Social	Increased in parental non -directiveness' with dyiad interaction
6	Schaaf et al. [11]	<ul style="list-style-type: none"> • Randomized - trial study • America • 2014 	Children	32	Behaviour Social	Improved in self-care and social skills
7	Beron et al. [13]	<ul style="list-style-type: none"> • Meta- analysis • Australia • 2016 	Children and adults	579	Cognitive	Improved small to medium effect of exercise on cognition
8	Busch et al. [8]	<ul style="list-style-type: none"> • Review article • Netherlands • 2016 	Infants	43	Social	Improved effect on several core symptoms
9	McGuire et al. [1]	<ul style="list-style-type: none"> • Review article • America • 2016 	Children	NA	Behaviour	PCP can be used to generate individualized treatment in children with ASD
10	Jet et al.	<ul style="list-style-type: none"> • Review article • Europe • 2017 	Children and adults	104	Behaviour	Children with ASD and ADHD commonly have neurology, immunology and gastroenterology disorder
11	Biederman et al.	<ul style="list-style-type: none"> • Longitudinal • America • 2016 	Non-referred siblings of proband with ADHD	491	Cognitive Behaviour Social	Autism Trait has higher levels of morbidity and dysfunction
12	Greenlee et al. [6]	<ul style="list-style-type: none"> • Cross - sectional analysis • America • 2016 	Children and adolescence	1272	Behaviour	Depression were common in high functioning older children
13	Deckers et al. [7]	<ul style="list-style-type: none"> • Longitudinal • Netherlands • 2016 	Children	52	Social	Greater improvement of social skills
14	Colombi and Ghaziuddin [5]	<ul style="list-style-type: none"> • Cross - sectional analysis • America • 2017 	Children	47	Cognitive Behaviour	Children with ASD + ADHD showed higher symptoms of anxiety, worse working memory and less empathy
15	Hourston and Atchley [4]	<ul style="list-style-type: none"> • Systematic review • America • 2017 	Children and adults	193	Behaviour	Improved in emotional health (anxiety and depression). Reduced physical aggression and disruptive behaviour

Table 2: An Overview of study design setting, year and sample that have assessed intervention approach on children with ASD and ADHD.

Discussion

Overall findings

There were several interventions have been studied to improve cognitive, behavioural and social disability for children with ASD and ADHD. These interventions were used to help children with ASD and ADHD to manage their symptoms and adjust themselves well in society.

In parent- mediated early intervention for children of ASD, parents received training from the therapist on how to manage their child's symptoms. According to an intervention reviewed [9], child with ASD outcomes such as understanding of language comprehension and severity of autism have improved within interaction between parent and child, while other important outcome; children's language, adaptive skills and parent stress showed no significance change. In a study, Green et al. [10] focussed on therapist-parent coaching model at mean 21 months and playtime at mean 22 months. However, therapist-parent coaching model showed no effect on parent or child, despite increased parent-therapist engagement. While, playtime intervention at mean 22 months showed improved parent responsiveness but no effect on child joint attention or social interaction.

An intervention study [11], was done to address the difficulty of processing and integrating sensory information in children with ASD by comparing treatment group (Occupational therapy using sensory integration) with usual care (motor intervention). The outcome of the results was found that the children in the treatment group needed less caregiver assistance during self-care and social activities compared to the usual care group.

Pivotal Response Treatment is to teach children responding to many learning opportunities and social interaction at the same time increase their motivation to communicate. PRT focuses on motivation, self-initiation, self-management and improvement in reduction of behavioral problem. The outcome PRT is accepted to challenge the child to improve communication and increased parental self-efficacy [12].

Studies done on parent-mediated intervention [6], focused on therapist-parent coaching model at mean 21 months and playtime at mean 22 months. However, therapist-parent coaching model showed no effect on parent or child, despite increased parent-therapist engagement. While, playtime intervention at mean 22 months showed improved parent responsiveness but no effect on child joint attention or social interaction.

The Physical Exercise Intervention, meta-analysis based on a random-effects model studied by Beron et al. [13], may be beneficial to individuals with learning difficulties and those with ADHD or ASD. Study conducted by Craft (1) reported that 1-10 min of stationary cycling does not produce cognitive benefits on working memory performance in 31 children with ADHD. While in the study by Kang et al. [13] reported improved cognitive performance, such as divided attention and working memory in children with ADHD following a series of aerobic exercises. Another study by Anderson-Hanley et al. [13] investigated the effect of gaming system on aspects of Executive Functioning (EF) and stereotype behaviour for 20 minutes in 22 adolescents with ASD. As a result, there was an improvement in an EF task reflecting working memory and in ADHD, exercise have benefits on inhibitory and memory functions but showed less clear on set shifting performance for both ASD and ADHD [13].

An Animal-Assisted Intervention for ADHD was designed to promote improvement in human physical, social, emotional and cognitive functioning (thinking and intellectual skills), by providing opportunities for motivational, educational, recreational and therapeutic benefits to enhance QoL. Studies showed that animal companionship increases alertness and attention in human, which might promote enhanced concentration and task persistence and promote calming and de-arousing effects in children suffering from ADHD. Apart from that, animal assisted therapies facilitate social learning, which enhances socio-emotional development and often results in improved social functioning [8].

Skills training (SST) in one of the intervention that can be applied to facilitate socialization in children with ASD which promote social competence and friendship, while decreasing feelings of loneliness. This intervention was expected to instil newly acquired social skills in social situation at home and in school. The results revealed that children's feeling of loneliness did not change to the same degree as their improvement in social skills [7].

A systemic reviewed research articles on Mind-Body Therapies (Mindfulness-based therapies) by Hourston and Atchley [4], covers a wide range of practises that connect between the mind, body and health, such practices were meditation, mindfulness, yoga t'ai chi, Nei Yang therapy and Acceptance and Commitment Therapy. These interventions showed positive results in mental and emotional health, and decreased in behavioural problems in children with ASD. According to Chan et al. [4], Nei Yang Gong (Dejian), a movement-based therapy showed improvement in self-control. By practising yoga, there were improvement in imitation behaviour, receptive skills and self-injurious, while meditation and mindfulness practices have decreased physical aggression, reduced disruptive behaviour and showed improvement for depression [4].

Methodological issues and challenges for future research

The major problem in the most studies was that there is no standardized method in assessing cognitive, social and behavioral of children with ASD and ADHD. In similar study, researcher used different method to determine the same domains; cognitive, social and behavioral in children of ASD and ADHD. As results, different types of method were used, gave variant outcome for similar parameters in ASD and ADHD. The numbers of samples used in certain research were small; therefore it was difficult to generalize the outcome of the results for the specific population. Thus, it is suggested to use a larger sample sizes to better define profiles of individuals with ASD and ADHD and identify effective pharmacological and behavioral intervention, to validate the neuropsychological assessment (NEPSY) and to compare the neuropsychological performance of children of ASD, ASD+ADHD. Several studies have made modification to the mind-body therapies did not report whether the modification such as using visual instead of lengthy words in giving instructions and shorter intervention were useful and sufficient for people with ASD. These studies also did not include qualitative method which can be useful for future research to get information on how to improve the delivery and reception of body-mind therapies for people with ASD in future research. Body-mind therapies were taught to children with ASD and their parents and as well as adults with ASD. Therefore, it was suggested to have standardized training technique as a promising area for future research, because this intervention was applied in schools, clinics and by parents at home.

Limitation

The articles which have been reviewed were lack of resources on the specific intervention studies for ASD and ADHD. Certain study has lack of validated instruments to measure change in sensory -motor factors for children with ASD within 10-week intervention period; while other studies had modest sample size which was difficult to get precise estimation of mechanism analysis. In the Pivotal Treatment (PRT), the therapist was only available in one location which could be bias in the studies.

Conclusion

The review highlights the needs of more research on neuropsychological (cognitive) studies to distinguish the characteristic between ASD and ADHD, using a standardized method for assessment. Majority of the research studies from Asia and Europe countries covers intervention of modification on social interaction between child and parent and improvement in behavioral on children with ASD and ADHD. In assessing behaviour and social characteristic, it is difficult to differentiate the diagnosis between ASD and ADHD, because their characteristic is similar among them. However, the intervention studies, such as physical exercise, animal assisting, mind-body therapies, social skills training on these parameters shows improvement in children with ASD and certain morbidity in ADHD. In spite of positive results of body-mind based intervention seen in both children and parents, there were little scientific evidence on the effectiveness of each type of this intervention that could be suggested as the best suited therapy for children with ASD. Therefore, empowering knowledge on ASD and ADHD via animated video intervention can be beneficial to both the parents and their child.

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