REVIEW ARTICLE

The Effectiveness of Parent-mediation-communication-focused Method on Improving Receptive and Expressive Language in Autism Spectrum Disorders Symptoms: A Systematic Review and Meta-analysis

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Abstract

Background: One of the core symptoms of Autism Spectrum Disorder (ASD) is social communication deficits. Joint attention (JA) is broadly used as a main component in receptive and expressive language. Parent-mediated communication-focused treatment (PACT) is a JA treatment for children with ASD. This systematic review and meta-analysis aimed to assess the effectiveness of the PACT method on improving receptive and expressive language in ASDs symptoms.

Methods: A comprehensive search of databases was performed to find relevant studies published from 1990 to September 26, 2023. The researchers included only English randomized controlled trials of PACT for children with ASD (≥18 years old). Studies were excluded if they reported only qualified information and results on the efficacy or inefficacy of the intervention and did not include a control group.

Results: The results of the Hedges g study showed that PACT had a very large effect (Hedges g=0.846 95%CI: 0.075, 1.616, P=0.031) on synchronous parent act, a small effect (Hedges g=0.186 95%CI: -0.082, 0.455, P=0.174) on adaptive behavior, a medium effect (Hedges g=0.505 95%CI: 0.288, 0.722, P<0.001) on child's initiations,,a small effect (Hedges g=0.091 95%CI:-0.097, 0.279, P=0.343) on expressive language and finally a small effect (Hedges g=0.079 P=0.410) on receptive language.

Conclusion: These findings may lead clinicians to use PACT along with other intervention methods, which show promising impacts on the improvement of language. This approach may help children with ASD to develop a more efficient interaction with their parents and simultaneously a better language development.

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Keywords: Autism spectrum disorder, Parent mediation communication focused treatment, Speech and language rehabilitation, Developmental language disorders

Introduction

The incidence of Autism Spectrum Disorder (ASD) continues to rise. The most recent estimate of the Centers for Disease Control and Prevention in 2023 was 1 in 36 (with the previously released rate of 1 in 44 in 2021).[1] Core symptoms of those in the spectrum can be categorized by communicational, behavioral, and social communication deficits.[2] Social communication skills involve different aspects of a child's interaction with the environment, yet some components can be more crucial for speech and language development. Joint attention, as an example of the forementioned components, refers to a triadic relationship between oneself, other people, and objects,[3] which is broadly used as a main component in the development procedure of receptive and expressive language. Many individuals on the spectrum suffer from language impairments, which could be a result of the incompetent joint attention factor in the development of earlier years.[4]

Two types of joint attention have been distinguished: (a) responding to joint attention (RJA), and (b) initiating joint attention (IJA), while both must be competent for the aim of language development.[3] With the pivotal role of joint attention for the development of language skills in typically developing children, a variety of researchers have studied intervention approaches targeting JA skills;[4] approaches which may be generally categorized as behavioral or developmental, depending on their underlying theoretical framework. Some intervention programs may incorporate a combination of developmental and behavioral approaches depending on the underlying theoretical framework.[5]

For the category of incorporation of combined approaches, we can provide examples, such as Paparella and Freeman's study (2015). In this study, intervention approaches were classified into two categories: developmental and a combination of behavioral and developmental approaches. The first category includes Parent-mediated Communication-focused Therapy)PACT), Focused Play time Intervention (FPI), and Joint Attention Mediated Learning (JAML); the second category includes Interpersonal Synchrony (IS), Reciprocal Imitation Training (RIT), and Joint Attention and Symbolic Play/Engagement and Regulation treatment (JASPER).[3] This study suggests that a combination of behavioral and developmental (second category) methods is generally more effective for improving joint attention skills. Although JASPER and RIT appear to be more effective than other methods using a combination of behavioral and developmental approaches, in general, it seems to matter less which specific approach is used; rather, it might be the matter of direct targeting of skills through behavioral methods, including modeling, shaping, and prompting, along with contingent responses to children's attention and ideation, which facilitate changes.[5] On the other hand, developmentally based treatments such as PACT follow a developmental hierarchy of graded social and communication skills related to reciprocal social, pre-linguistic, pragmatic, and linguistic development, all of which are assumed to be impaired in ASD. Programs of this type have been shown to facilitate the development of both pre-linguistic and communication skills, which underpin the emergence of meaningful language, including both receptive and expressive language.[6]

Although developmental approaches have been proven to be effective in several RCTs, the effectiveness of each intervention remains controversial. For instance, Parapella indicated that two of the interventions, PACT and FPI, did not elicit the expected treatment effects on social communication or language. The third intervention, JAML, however, improved both children's ability to respond to joint attention initiated by adults and their receptive language.[3] Nevertheless, the efficacy of PACT is not denied only by this study, and more studies have shown promising results with this intervention approach.

On the topic of categorizing intervention approaches targeting JA skills, we can go by another means. Based on whose role is more emphasized, approaches can be categorized as clinician- or parent-focused intervention methods. With the noticeable increase in the prevalence of ASD and how the costs of clinician-based treatment methods can affect families by the estimates of The Global Burden of Disease.[7, 8] Moreover, on the benefits of non-specialist approaches, we must accentuate the important role of family and the natural environment in enhancing the maintenance and generalization of any approach used. Hence, non-specialist-mediated interventions for autism have demonstrated promising effectiveness across a range of outcomes for both children and their caregivers.[9]

PACT is a developmental-oriented, parent-directed, and video-aided intervention that is moderated and matched to the parental style. The intervention mainly targets social interaction and communication impairments in children with autism, and subsequently, joint attention and language components.[10] The PACT study tested an intervention which aimed at enhancing both parent-child communication and the social and language development of the child on the spectrum of autism. This approach aims to help parents adapt their communication style to their children's impairments and respond to their children with enhanced sensitivity and responsiveness. There is a focus on increasing shared attention through eye gaze, sharing, showing, and giving. Parents are encouraged to use language

tailored to their child's level of understanding. Parents are also introduced to strategies for facilitating child communication and participation, such as action routines, repeated verbal scripts, elaborations, pauses, and teasing.[11]

As reported, PACT has been tested in several RCTs on different populations of children with ASD. In 2019, Naveed et al. conducted a systematic review on the efficacy of non-specialist treatment methods, and the results demonstrated effectiveness across a range of outcomes for children with autism and their caregivers;[9] however, there has been no review specifically illustrating the effectiveness of PACT, indicating the need for a review of RCTs using this model. Moreover, the efficacy of this intervention program on specified outcomes, such as language components and joint attention, has not been studied correspondingly. Therefore, the present study aimed to conduct a systematic review and meta-analysis of the efficacy of PACT in children with ASD. The strength of the present review is that it only recorded the efficacy of PACT and did not include other kinds of ASD interventions.

Methods

Protocol

To describe this systematic review, we used the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) checklist and flow chart.

Systematic Search

Comprehensive search was done for works in PubMed, Embase, Scopus, and Web of Science published from 1990 to September 26th, 2023. The titles and abstracts were searched for the following terms: ("autism spectrum disorder" OR "autistic disorder" OR "autism" OR "ASD" OR "autistic children") AND ("parent mediated" OR "communication focused treatment" OR "communication focused") AND ("randomized controlled trial"). Reference lists of eligible studies were manually searched to find additional studies that may not have been found in the reference search. Then, it was entered into EndNote X9 software (Clarivate, Philadelphia, PA, USA) for the screening process

Inclusion and Exclusion Criteria

The inclusion criteria of the included studies were clinical trial studies (RCT) for children with ASD (over 18 years). Interventions were conducted through parent mediation and focused communication. In addition, articles in English were included. Studies were excluded if they reported only eligible information and results related to the effectiveness or ineffectiveness of the intervention; the study did not have a control group, lacked any essential information, or contained unextractable or untransformable data; or the full text of the article was not available even after contacting the authors.

Data Extraction

Eligible articles were reviewed by two independent investigators (AR and GHR), and if there was a disagreement about matching the articles with the inclusion and exclusion criteria, the third reviewer (SED) resolved it based on consensus discussion. The following data were extracted: author names; year of publication; sample size; mean age; prelinguistic and linguistic test designs; ASD diagnosis scales; parent-related information and tests; and statistical indexes of the efficacy of the intervention.

Risk of Bias

To assess and control the quality of retrieved articles, we applied a checklist developed by the Joanna Briggs Institute.[12] This tool consists of eight questions with answers restricted to yes, no, unknown, and not used. Finally, we used ROBVIS to visualize bias risk assessments.

Statistical Analysis

Comprehensive Meta-Analysis (CMA) version 2.0 software was used to analyze the results. The effect size was estimated using Hedges g and 95% confidence interval (CI) for the effect size of the ASD treatment method by comparing the before and after outcomes in two intervention and control groups and then combined with a fixed effects model. To evaluate the heterogeneity in the study, we used the Chi-squared test (with $P<0.1$) and the I2 statistic (I2 value >50%). Sensitivity analysis and subgroup analysis were used to find the source of heterogeneity. Also, the regression-based Egger test was used to statistically evaluate the evidence of small study effects among the included trials.

Results

The total number of articles included in the study based on the search in databases was 339, and after removing the duplicates, 195 articles remained. After checking the titles of the articles and their abstracts, we deleted 182 articles, and finally, by checking the text of the articles, we deleted 8 articles due to the study design. Finally, 4 articles were reviewed. The inclusion of articles in the study is presented in PRISMA Figure 1, and Table 1 provides information about the included articles. Additionally, Figure 2 displays information regarding the quality of the studies.

Adaptive Behavior

According to the review of the articles, 2 studies investigated adaptive behavior.[13, 14]

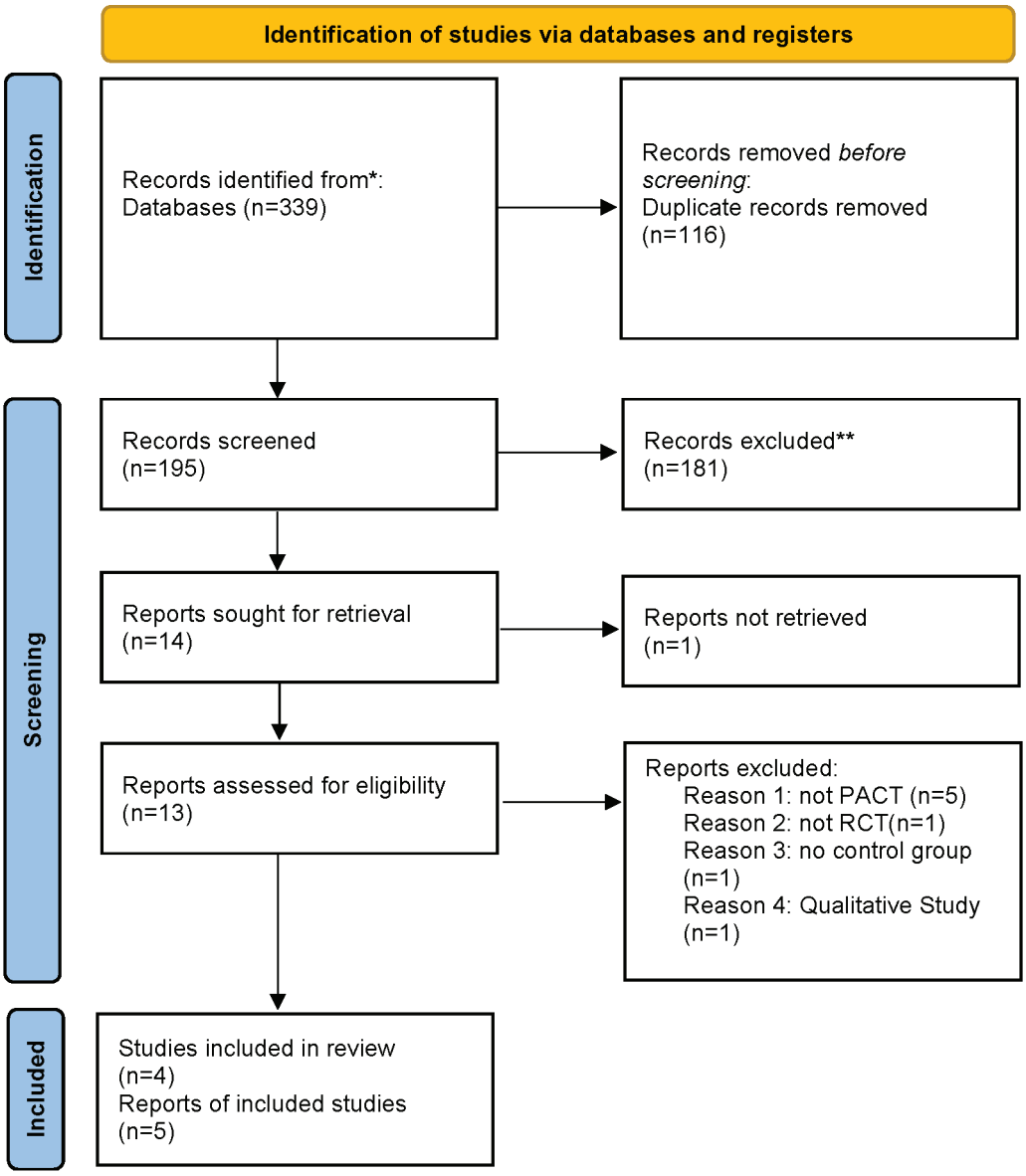


Figure 1: Flowchart illustrating the article selection process following Preferred Reporting Items for Systematic Reviews and Meta Analyses (PRISMA) guidelines (Drawn by the authors)

Table 1: Detailed Characteristics of the Studies Included

Authors [year]	Country	Sample Size	Sample size (intervention/control)	Male/ Female	Age	Treatment intervention
Oosterling et al, 2010	Netherlands	67	36 Intervention Group / 31 Control Group	52 Male / 15 Female	35.2 months Intervention Group / 33.3 months Control Group	Focus Parent Training
Green et al, 2010	United Kingdom	152	77 Intervention Group / 75 Control Group	138 Male / 14 Female	24 – 60 months (mean age of 45 months)	PACT (Preschool Autism Communication Trial)
Rahman et al, 2014	United Kingdom	65	32 Intervention Group / 33 Control Group	53 Male / 12 Female	2 – 9 Years	PASS (Parent-Mediated Intervention for Autism Spectrum Disorder in South Asia)
Pickles et al, 2016	United Kingdom	152	77 Intervention Group / 75 Control Group	138 Male / 14 Female	44.7 months Intervention Group / 45 months Control Group	PACT (Preschool Autism Communication Trial)
[Follow Up of Pickles]		121	59 Intervention Group / 62 Control Group	111 Male / 10 Female	127.3 Intervention Group / 127.2 Control Group	

PACT: Preschool Autism Communication Trial; PASS: Parent-Mediated Intervention for Autism Spectrum Disorder in South Asia

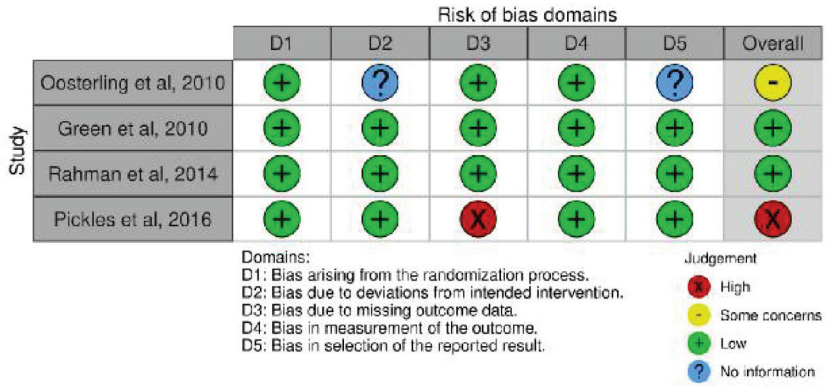
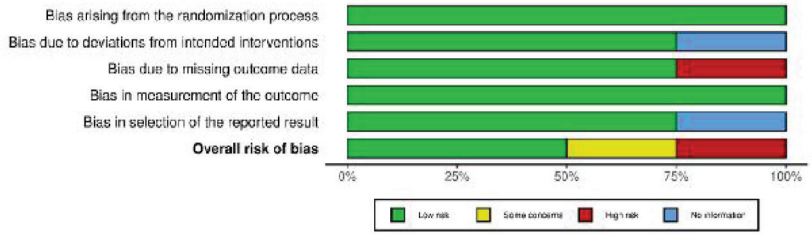


Figure 2: Bias risk assessments (Drawn by the authors using RoB tool)



The method of measurement in one study was Vineland Adaptive Behavior Scale (VABS) adaptive behavior composite standard score, and in another study, it was Parent-rated adaptive behavior. Using the fixed model, Hedges g=0.186 (95%CI: -0.082, 0.455, P=0.174) and the heterogeneity in this study was (I^2=0.000, P=0.674) (Figure 3).

Child's Initiations

Three articles were examined regarding the child's initiations.[13-15] They were conducted on the number of communications in which children were initiators; also, parent-child interaction: child initiations, and child didactic initiations were investigated. Using the fixed model, Hedges g=0.505 (95%CI: 0.288, 0.722, P<0.001) (Figure 4), and heterogeneity in this study was (I^2=0.000, P=0.645). Regarding publication bias, we did not see evidence of its existence in our study (Egger test=1.178, P=0.734). The sensitivity analysis is also shown in Figure 5. There was no significant difference in the effector values after removing each of the studies.

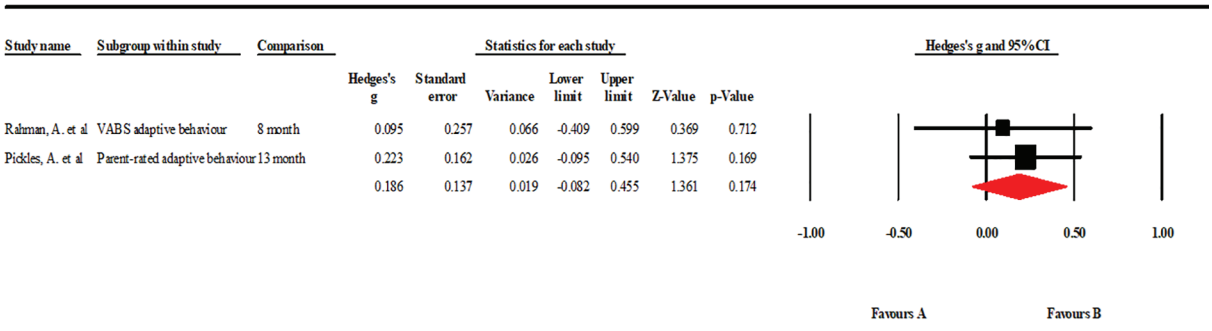


Figure 3: Forest diagram of Hedges g Adaptive Behavior and 95%Confidence interval (Drawn by the authors using CMA)

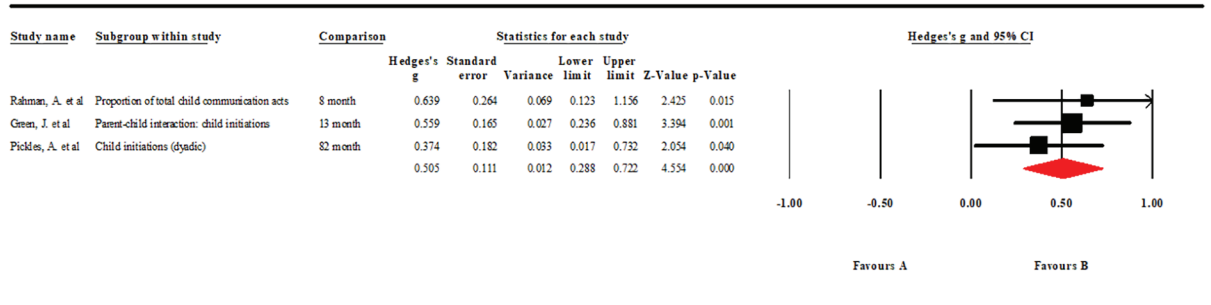


Figure 4: Forest diagram of Hedges g Child's initiations and 95%Confidence interval (Drawn by the authors using CMA)

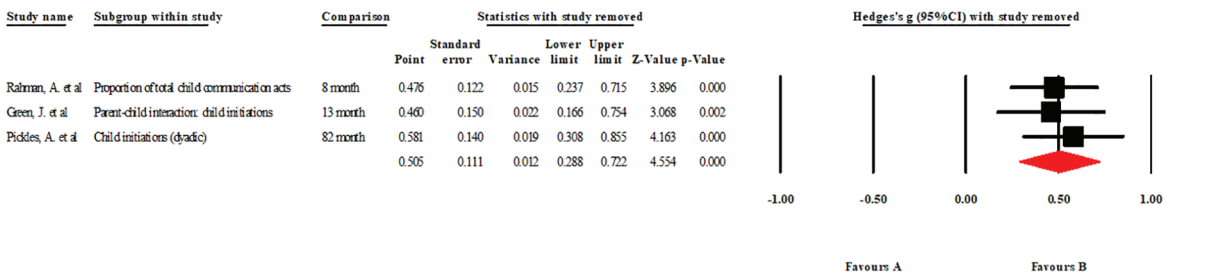


Figure 5: Sensitive analysis in child's initiations study (Drawn by the authors using CMA)

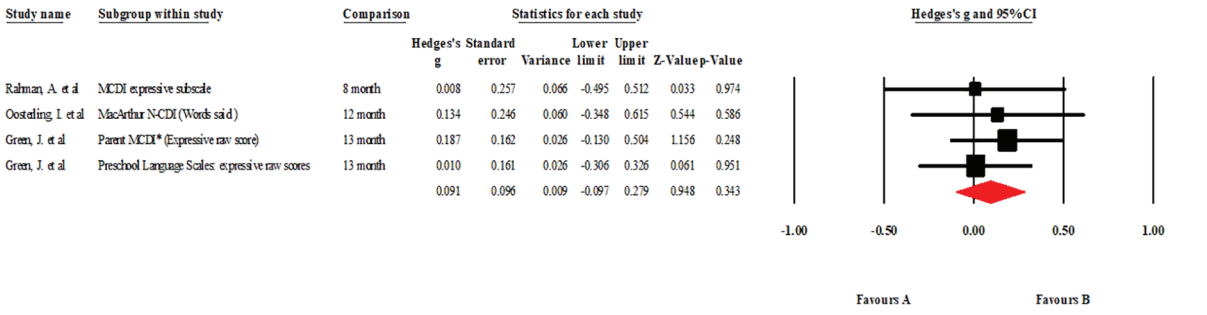


Figure 6: Forest diagram of Hedges g Expressive-language and 95% confidence interval (Drawn by the authors using CMA)

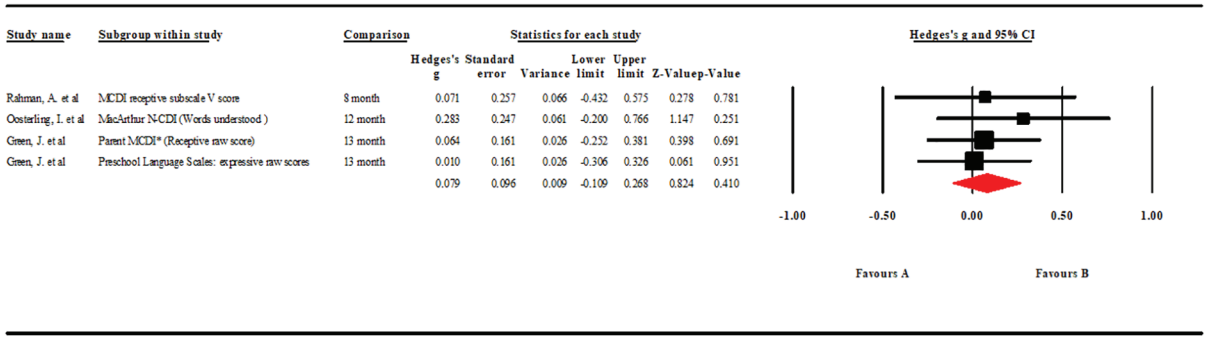


Figure 7: Forest diagram of Hedges g Receptive language and 95% Confidence interval (Drawn by the authors using CMA)

Expressive Language

About expressive language, four studies[13, 15, 16] was examined in the form of MacArthur Communicative Development Inventory (MCDI) expressive subscale, MacArthur Dutch version of the MacArthur Communicative Development Inventory (MacArthur N-CDI), Preschool Language Scales: expressive raw scores, and Parent MCDI (Expressive raw score). Hedges g=0.091 (95%CI: -0.097, 0.279, P=0.343) and I2=0.000, P=0.864 (Figure 6). Also, we did not see any evidence of publication bias in the study (Egger test=-0.327, P=0.838). Sensitivity analysis also did not show a significant difference in the exclusion of each study.

Receptive Language

Similar results were observed in the case of receptive language as well as expressive language. In this section, by entering 4 studies,[13, 15, 16] MCDI receptive subscale V score, MacArthur N-CDI (Words understood), Preschool Language Scales: expressive raw scores, and Parent MCDI (Receptive raw score) indicators were examined. Hedges g difference between the intervention and control group was small (0.079 and P=0.410) as shown in Figure 7. Heterogeneity was not observed (I2=0.000, P=0.831). There was also no evidence of publication bias (Egger test=1.499, P=0.315). Sensitivity analysis also did not show a big difference in the effect size by removing each study.

Synchronous Parent Act

3 studies with indicators The proportion of parental communications with the child that were synchronous (utterances that acknowledged,

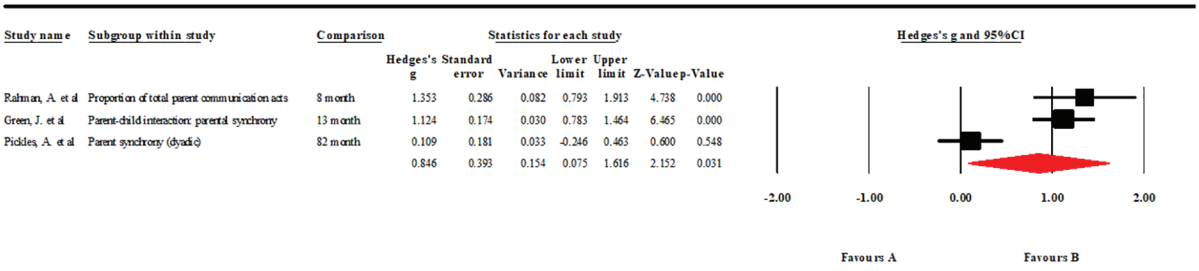


Figure 8: Forest diagram of Hedges g Synchronous parent act and 95% Confidence interval (Drawn by the authors using CMA)

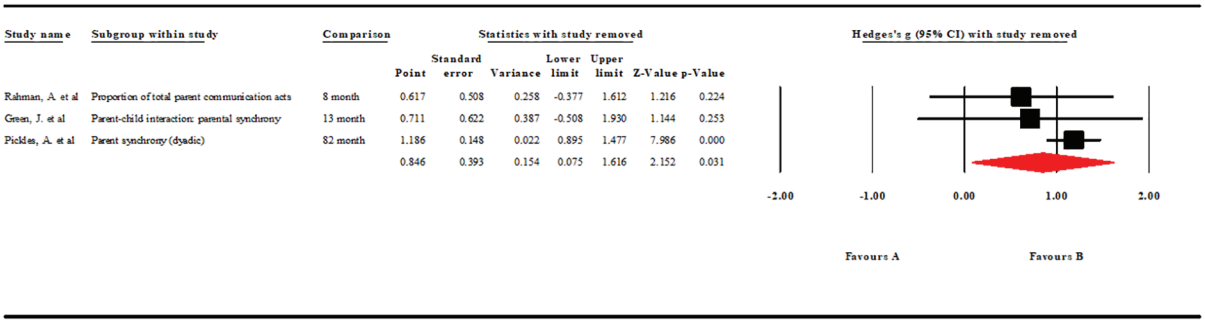


Figure 9: Sensitive analysis in Synchronous parent act study (Drawn by the authors using CMA)

confirmed, or reinforced the hild's focus, play, actions, thoughts, or intentions).[13-15] The results of the Hedges g study showed a very large 0.846 (95%CI: 0.075, 1.616, P=0.031) (Figure 8) and I^2=90.766, P<0.001. We did not observe evidence of publication bias (P=0.722). Sensitivity analysis showed that the exclusion of Pickleset al.'s study[15] could affect the results, and the exclusion of this study could increase the value of Hedges g to 1.186 (Figure 9).

Discussion

Notably, studies demonstrated that using JA training led to improvement of social communication and vocalization in individuals with ASD. Various interventions in the pre-linguistic communication phase apply to improve social communication and vocalization in individuals with ASD. These interventions attempt to elicit vocal production, vocal imitation, and eventually speech. Literature suggests that activities most likely to serve the mentioned functions are imitation, play, and joint attention.[4]

The PACT program, as a JA training in social-cognitive precursors to communication and language,[17] targets core impairments in shared attention, communication, intentionality, and pragmatics that are thought to underlie the abnormal developmental and language pathways of children with ASD.[6] Randomized clinical trial (RCTs) approaches have been implemented to investigate the effectiveness of parent mediation communication methods on improving JA and following that vocalization of children with ASD. In the present study, totally 4 investigations met the criteria mentioned above. Overall, the included studies ranged from two-month to more than 24-month interventions. The selected studies had reported only the quantity of improvement in five symptoms, and the results have been achieved across reviewed RCTs in assessment of directly adaptive behavior, child's initiations, composite language scores, and separately for expressive language, language comprehension and synchronous parent act.

Systematic reviews of parent-mediated interventions which had evaluated the social communication development included various kinds of ASD early interventions.[18, 19] These reviews did not focus on PACT effectiveness, and this limitation is important to show PACT effects on decreasing symptoms of children with ASD, specifically their language.

The findings of the present study showed the changes in synchronous parent act after presenting PACT. Similar to this finding, other parent education programs, such as focused playtime intervention, also increase synchronous parent act.[20] These findings suggest when the parents increase their comments and statements about activities and incidents which the child has focused on, it may lead to an increase in the synchronous responses.[21] However, PACT showed a medium effect on children's initiations. Moreover, the small effect of refinement was reported about adaptive behavior, receptive language, and expressive language. These findings may suggest applying PACT with other interventions that aim other impaired domains, such as imitation and play and also other JA interventions to lead to increased social communication and

vocalization in individuals with ASD.[4]

Conclusion

The present investigation is the first systematic review and meta-analysis which evaluated the effect of PACT on ASD symptoms, specifically children with ASD's language abilities. The results demonstrated small changes in receptive and expressive language. These findings may cause the clinicians to use PACT along with other intervention methods which show promising impacts on the improvement of language. This approach may help children with ASD to develop a more efficient interaction with their parents and simultaneously a better language development.

Authors' Contribution

ShE conceptualized and designed the study and was a major contributor in writing the manuscript. AR & GR contributed to the acquisition of the articles' data regarding the efficacy of PACT in children with ASD and drafted the manuscript. MV designed the search strategy and performed the analysis. All authors critically revised the manuscript for important intellectual content. All authors read and approved the final manuscript.

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Conflict of Interest: None declared.

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