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Parentworks-Spectrum: A Pilot Randomised Controlled Trial of a Brief Integrated Parent Mediated Intervention for Young Children with Autism

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Abstract

Background: Parent mediated interventions (PMIs) have been supported as efficacious for children with autism spectrum disorder (ASD) and may improve the diagnostic features of ASD as well as common comorbid disorders (e.g., externalising problems). Despite this, many PMIs are lengthy, highly specialised, incur significant financial costs, and are not readily accessible for families. This study investigated the efficacy, acceptability and feasibility of ParentWorks-Spectrum, a 12-session PMI.

Method: A pilot Randomised Controlled Trial was conducted with parents (N = 26) of children with an ASD diagnosis aged 2-5 years 11 months. Families were randomised to a wait list control group (WL; n = 12) or an intervention group (PWS; n = 14). The intervention was originally delivered face-to-face and then transferred to tele-health due to the COVID-19 pandemic.

Results: With regards to primary outcomes, mothers in the PWS group reported a significantly lower intensity of parent-reported child disruptive behaviours at post-assessment relative to parents in the WL group. Statistically significant group differences were not observed for parent-reported child social and communication skills or parent levels of stress. With regards to secondary outcomes, mothers in the PWS group reported higher levels of self-perceived competence and efficacy in parenting post-assessment relative to parents in the WL group. Overall, parent reports indicate that the intervention is considered acceptable.

Conclusion: These results provide initial support for the efficacy of ParentWorks-Spectrum as a brief, parenting program for improving disruptive behavioural difficulties and parenting in families of young children with autism.

Keywords: Autism Spectrum Disorder; Parent Mediated Interventions; Disruptive Behaviours.

Introduction

PMIs have received growing support as efficacious interventions for children with ASD. Research has demonstrated the potential range of benefits to both core autism symptoms and associated externalising behavioural difficulties following PMIs. These include, but are not limited to, improvements in children's social and communication skills [1] in addition to improvements in behavioural difficulties and parent stress. Despite this progress, there is a continued need to develop and examine the efficacy of PMIs that integrate and address core areas of need for children with ASD and their families. Evidence suggests that PMIs are particularly efficacious

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and beneficial when: 1) delivered early in development when behavioural and neuroplasticity is high [2]; 2) implemented within the child's natural environment with parents [3]; and 3) feasible in terms of cost and duration of delivery [4,5]. There are three central tenets that are consistent with this approach, as follows:

First, research indicates that young children with ASD may experience high rates of externalising behavioural difficulties often referred to as disruptive behaviours (e.g. tantrums, non-compliance, aggression, repetitive behaviours), with some studies reporting prevalence as high as 50% [6-8]. These behaviours are often stable over time and may blend with core features of ASD [9, 10]. Furthermore, comorbid externalising behavioural difficulties predict higher levels of parent stress and distress over and above the core ASD symptoms, adaptive functioning and cognitive abilities of children diagnosed with ASD [11-14] and predict increased impact upon quality of life and family functioning [15].

Second, it has been shown that PMIs focusing on enhancing parent-child interactions and parental responsiveness to children's social communication skills, can have sustained benefits on ASD symptoms [16-18]. Although current autism interventions can be resource-intensive in terms of time and cost, there is emerging evidence that low intensity interventions can be effective with PMIs of 9-18 sessions resulting in improvements in social communication [16, 19] and behavioural difficulties [20] Iadarola [21]. Thus, brief PMIs can demonstrate benefits across multiple areas for children with ASD and their parents.

Third, there is an increased need to integrate and examine the efficacy of strategies that support parent wellbeing within PMIs for parents of children with ASD [22]. Research demonstrates higher prevalence rates of mental health disorders including anxiety and depression, and stress [23-26], and partner discord [27-29] for parents of children with ASD. Parents of children with ASD may also experience lower levels of perceived efficacy and competence in their parenting [30] and lower parental quality of life [31]. There is some indication that parent stress may impact the effectiveness of intervention with lower levels of parent reported stress being associated with improved adaptive functioning and intervention outcomes for children with ASD [32].

A brief integrated PMI that integrates strategies to address core diagnostic characteristics of ASD and behavioural difficulties whilst concurrently addressing the broader needs of parents has the potential to overcome numerous challenges related to existing clinical practice. Research indicates that many of the interventions currently available in Australia lack empirical support and are resource intensive [33, 34]. Furthermore many evidence-based interventions cannot be easily disseminated, are not readily available to families living in rural or remote regions, can only be administered by accredited health practitioners or are inaccessible due to finite financial resources and time [35, 36].

This study reports on the first pilot randomised controlled trial (RCT) to establish the feasibility and preliminary efficacy for ParentWorks Spectrum (PWS), a novel, integrated, time-limited PMI for young children with autism and their families. Families will be randomized to intervention (PWS) or Wait list (WL). Feasibility is defined as evidence that the intervention is acceptable to families of young children with ASD and that the content of the manual can be delivered in a consistent manner across families. Efficacy is defined as a statistically significant reduction in parent reported child behavioural difficulties and improvement in child social and communication skills and parental wellbeing and competence. There were four key hypotheses: 1) PWS was anticipated to be acceptable to participating families with high rates of retention (>85%) and high parent satisfaction in the intervention group; 2) the PWS group would demonstrate significantly lower levels of intensity, and frequency of parent-rated child externalising behaviours relative to the WL group at post-assessment; 3) the PI group would demonstrate significant improvements in parent-reported social and communication skills relative to the WL group at post-assessment; 4) parents in the PI group would demonstrate reductions in reported stress related to parenting and inter-parental discord relative to parents in the WL group at post-assessment

Methodology

Design

Recruitment for this RCT took place from May 2019 to December 2020 at the University of Sydney Child Behaviour Research Clinic. Site specific ethical approval was obtained through the University of Sydney Human Research Ethics Committee and Clinical Trial Governance (project number: 2018/716). All research procedures were conducted in accordance with the ethical standards of Helsinki as revised in 2013. Written informed consent was obtained from a parent or legal guardian prior to inclusion in the study. Participants who met eligibility criteria completed a pre-randomisation assessment (baseline) referred to hereafter as pre-assessment. Following the completion of the pre-treatment assessment, families were randomly allocated to either the PI group or WL group using a balanced block randomised sequence [37]. Families randomised to the PI group then commenced the 12-week intervention and families randomised to the WL group underwent a wait time of 12-weeks. After 12-weeks, families from both groups completed a post-treatment or post-waitlist assessment hereafter referred to as post-assessment with a clinician who was blind to the treatment status of the participants (refer to supplementary materials). Figure 1 shows the CONSORT recruitment flowchart for this study. Detailed procedure and modifications to study design due

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to the COVID-19 pandemic are presented in Supplementary Material (See S1-S2). This study was registered with the Australian New Zealand Clinical Trials Registry (ANZCTR): 12618001866291.

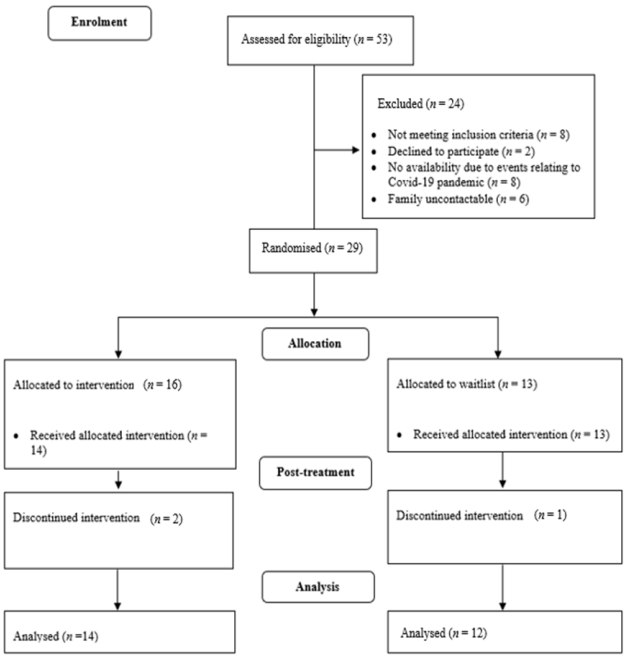

Figure 1. CONSORT recruitment flowchart depicting screening, pre-assessment, randomisation, and post-assessment

Participants

Participants were 26 families with a child aged between 2-5 years 11 months with a pre-existing autism diagnosis. Eligibility criteria: (1) Children aged between 2- 5 years 11 months years diagnosed with autism at baseline; (2) Parents were comfortable completing questionnaires and treatment sessions in English; (3) Parents were seeking assistance in managing child behaviours; (4) Parent(s) lived in Sydney and were able to attend 12 consecutive weekly sessions; (5) Child did not have a severe comorbid developmental delay (DQ <35); (6) Child did not have a major medical disorder that would impact engagement in the intervention; (7) Family was not currently involved in legal issues including child custody disputes; (8) Family was not currently participating in another parenting intervention/research trial.

Sociodemographic and diagnostic characteristics of children and parents participating in the study are summarised in Table 1. One parent enrolled in the intervention and was the informant on all outcome measures. The primary respondents in this study were exclusively female (mothers). Children in both groups had a mean of 4 years of age with 85.7% boys in the PWS group and 92.3% in the WL group. Subclinical and clinical levels of comorbid anxiety, oppositional defiant disorder, and attention deficit hyperactivity disorder were assessed using the clinician-administered Diagnostic Interview Schedule for Children, Adolescents and Parents [38].

Table 1: Participant Sociodemographic Information and Child Diagnostic Characteristics

Variable	ParentWorks-Spectrum (n = 14)						Wait list (n = 12)					
	n	M	Range	SD	Freq	%	n	M	Range	SD	Freq	%
Child age (years)	14	4.07	2-5	1.07			12	4	3-5	0.82		
Child gender (male)	14				12	85.7	12				12	92.3
Child's ethnicity	14						12					
Caucasian					9	64.3					6	46.1
East Asian					1	7.14					4	30.6
South Asian					2	14.2					1	7.7
African American					1	7.14					1	7.7
Aboriginal/Torres Strait Islander					1	7.14					0	0
Hispanic/Latino					0	0					1	7.7
Child diagnoses												
ASD severity rating	14	5.21	5-6	0.42			12	5.08	5-6	0.27		
ODD severity rating	14	4.43	0-6	0.76			12	3.83	0-6	1.19		
ADHD severity rating	14	2.57	0-4	1.98			12	1	0-4	1.8		
Anxiety severity rating	14	1.57	0-5	2.31			12	1.33	0-5	1.96		
Child medication	14						12					
Antidepressant					1	7.14					0	0
Stimulant					2	14.2					1	7.7
Antipsychotic					2	14.2					2	15.3
Parents participating in program	14						12					

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Both					10	71.4					7	53.9
Mother only					4	28.6					6	46.1
Marital status	14											
Married/defacto					13	92.8					11	84.6
Separate/divorced/single					1	7.14					2	15.4
Mother's education level[a]	13						11					
Year 12 or equivalent					1	7.14					0	0
TAFE/Diploma					3	21.4					3	23.1
Undergraduate Degree					8	57.1					5	38.5
Postgraduate Degree					1	7.14					4	30.8
Father's education level[a]												
Year 12 or equivalent					1	7.14					1	7.7
TAFE/Diploma					3	21.4					5	38.5
Undergraduate Degree					8	57.1					5	38.5
Postgraduate Degree					1	7.14					0	0
Mother's mental health[b]	13											
Depression/anxiety					8	57.5					8	61.6
Father's mental health[b]	13											
Depression/anxiety					8	57.5					5	38.5
Household income[c]	12						11					
41-100K					1	7.7					1	7.7
101-130K					2	14.3					4	30.8
131-160K					3	21.4					3	23.1
More than 160K					6	42.9					3	23.1

Note: ODD = oppositional defiant disorder/conduct disorder; ASD = autism spectrum disorder; ADHD = attention deficit hyperactivity disorder. a Did not disclose n = 1 (PWS group) n= 1 (WL group); b Parent's self-reported mental health concerns c Responded "prefer not to say" n = 2 (PWS) n = 1 (WL group)

Clinician Training and Treatment Integrity

Families across both groups were treated by the author of this study (a registered psychologist), three clinical psychologists, a registered psychologist and five provisionally registered psychologists undertaking postgraduate training in clinical psychology. All clinicians treating on the trial received training in the intervention and research protocol in addition to individual and group supervision throughout the duration of the treatment program by senior clinical psychologists specialising in the treatment of childhood disorders. Clinicians were required to document the percentage of core intervention components implemented.

Measures

Primary outcomes

Eyberg Child Behaviour Inventory

The ECBI (39) is a 36-item parent-report measure of externalizing behaviour in children aged 2 to 16 years. The intensity scale was used to assess the frequency of child behaviour problems. Scores > 131 are considered within the clinically significant range. The ECBI demonstrates high test retest reliability (>.75) and internal consistency (>.90) for the intensity scale and has been used in ASD parenting intervention studies [39] [40] [41] [42] [43]. Internal consistency in the current sample was excellent for the intensity scale $\alpha = 0.92$.

Parenting Stress Index Fourth Edition Short Form

The PSI-SF [45] is a 36-item measure parent-report measure. The total score was used to capture the overall level of stress experienced by parents. The scale has been used widely with parents of children with ASD including intervention research (e.g.,41) and has good internal consistency for general distress ($\alpha = 0.86$), parenting distress ($\alpha = 0.83$), child demanding ($\alpha = 0.79$) and difficult child ($\alpha = 0.83$) subscales [46]. The PSI-SF has good test-retest reliability ($r = 0.84$) for total stress score [45]. Scores of 15-80 indicate normal levels of stress, 81-90 indicate high levels of stress, 91-100 indicate clinically significant levels of stress. Internal consistency was good in the current sample for total PSI-SF scores ($\alpha = 0.85$).

The Social Responsiveness Scale

The SRS [47] is a 65-item parent-rated scale for measuring the severity of ASD symptoms in children from 3 to 18 years of age. The total score was used as an overall indicator of children's social and communication skills, assessing domains of communication, social interactions and repetitive

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and stereotyped behaviours and interests. The SRS has been utilised extensively in ASD intervention studies [48] and has been found to have high internal consistency (α=0.95) [47]. Internal consistency for the total score was good α = 0.85 in the current sample.

Secondary outcomes

Acceptability

Information regarding treatment acceptability was collected through a parent self-report questionnaire post-assessment (see Supplementary Material S3), retention rates and parent engagement ratings completed after each session.

Diagnostic Interview Schedule for Children, Adolescents and Parents (DISCAP)

The DISCAP-5 [38] is a structured diagnostic interview system administered by a clinician to make DSM-5 diagnoses, and was used to conduct a comprehensive diagnostic profile and symptom severity for each child in the present study at pre- and post- assessment for anxiety (separation anxiety, generalised anxiety and anxiety disorder not otherwise specified) attention deficit hyperactivity disorder, and oppositional defiant disorder (See Supplementary Material S3). Blind checks were conducted by a secondary multidisciplinary team to examine the reliability of diagnoses made by clinicians. Kappa agreement for diagnoses was high for the current sample ($\varkappa$ =.83).

Parenting Sense of Competency

The PSOC [49] is a 16-item questionnaire measuring parents' satisfaction and efficacy in parenting. A higher total score indicates a higher level of self-reported satisfaction and efficacy in parenting. The internal consistency reported for this scale is good (α ≥ 0.75) [49].

Parenting Scale

The PS [50] is a 30-item measure of parenting style that separates dysfunctional parenting into three subscales: over-reactivity (authoritarian, irritable), laxness (permissive, inconsistent) and hostility (harsh physical and verbal discipline). Internal consistency is good for Laxness (α = 0.82), over-reactivity (α = 0.83) and hostility (α > 0.78) scales [51]. This scale has been used within ASD intervention studies (e.g., [43]).

Parent Problem Checklist

The PPC [52] is a 16-item validated measure of inter-parental conflict (e.g., over childcare, discipline strategies, parenting) and teamwork in couples who operate as parenting teams [53]. The problem score will be used as an indicator of the number of disagreements between parents. A total of 5 or greater indicates clinically significant levels of disagreement over parenting.

Table 2: Mean scores for parent and child outcomes across groups at pre and post intervention/wait list assessments

Measure			Pre		Post				
	Group	*n*	*M*	*SD*	*M*	*SD*	*F*	*P*	η^p2
ECBI									
Intensity	PWS	13	145.38	21.67	119.85	23.85	9.81	0.005	0.309
	WL	12	132.67	39.56	136.42	31.18			
SRS									
Total	PWS	14	86.86	14.81	79	12.58	1.72	0.202	0.07
	WL	12	79.42	20.26	77.42	23.15			
PSI-SF									
Total	PWS	14	119.29	22.62	106.64	22.44	0.005	0.942	0
	WL	12	113.17	13.71	102.33	21.7			
DISCAP									
ODD	PWS	14	4.43	0.756	1.57	1.74	7.56	0.01	0.247
	WL	12	3.83	1.19	2.75	1.81			
ADHD	PWS	14	2.57	1.98	2.71	1.81	0.694	0.413	0.029
	WL	12	1	1.8	1.67	1.87			
Anxiety	PWS	14	1.57	2.31	0.5	1.21	0.343	0.564	0.015
	WL	12	1.33	1.96	0.67	1.55			
PSOC	PWS	14	62.46	15.75	71.54	11.43	10.32	0.004	0.33
	WL	12	60.88	7.5	63	6.8			

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Parenting Scale									
Laxness	PWS	13	3.56	0.827	3.22	0.62	0.084	0.775	0.004
	WL	12	3.61	0.333	3.29	0.41			
Over Reactivity	PWS	14	4.01	1	3.47	0.8	0.193	0.665	0.009
	WL	12	3.85	0.429	3.62	0.51			
Hostility	PWS	13	3	1.04	2.51	0.98	4.37	0.048	0.166
	WL	12	3.75	0.504	3.59	0.59			
SDQ Total	PWS	14	20.36	3.6	15.9	4.18	11	0.003	0.325
	WL	12	18.58	5.23	18.7	3.57			
PPC	PWS	12	6.92	4.8	5.08	3.05	0.004	0.837	0.002
	WL	12	2.58	2.58	3.08	2.74			

Strengths and Difficulties Questionnaire

The SDQ [54] is a 25-item validated measure of comorbid child behavioural difficulties (hyperactivity, emotional problems, peer problems, and conduct problems) and has been used in ASD intervention studies (e.g., [55]). The Total Difficulties score will be used to provide an overall indication of behavioural difficulties as reported by mothers (clinical cut-off > 18). The SDQ Total Difficulties score has demonstrated good internal consistency ($\alpha \geq 0.75$) [56] [57].

Treatment as usual intervention Hours

Mothers completed TAU hours pre and post treatment/ wait list including: 1) the type of therapy, 2) discipline of the person delivering therapy, 3) number of hours attended per week.

Intervention

The 12-session intervention titled ParentWorks-Spectrum draws from the theoretical foundations and evidence-based intervention components of PMIs for ASD, and Integrated Family Intervention (IFI) for externalising disorders [58]. IFI is a brief parenting intervention that integrates the core components of social learning-based interventions for conduct problems (e.g., positive reinforcement of appropriate behaviour; limit-setting) with modules targeting additional needs in the family system (e.g., parent self-care; partner support strategies). It has been supported in research with complex presentations of emotional and behavioural problems in children aged 2 to 16 years and has been adapted into a range of formats (see 59). The current intervention is a 12-session parent mediated integrated intervention delivered to parents over 12 weeks (12x 1-1.5 hour 1:1 session per week with a trained clinician) that provides parents with specific strategies (See Supplementary Material S4) to reduce behavioural difficulties, support child social and communication skills and parent wellbeing. Intervention strategies were implemented with parents using handouts, through role plays and feedback.

Statistical analysis

The trial was registered with a minimum target sample size of N=27 to detect a medium effect size. We achieved N= 26 and sensitivity analysis conducted using G*Power version 3.1.9.7 [60] et confirmed with that we were able to detect a medium effect size (F =.28) with the current sample at a significance criterion of $\alpha = .05$. Analyses of Covariance (ANCOVA), with post-assessment scores as the dependent variables and pre-assessment scores as covariates were conducted as a rigorous test of intervention effects by group for primary and secondary outcomes [61]. Analyses were conducted using SPSS partial eta squared .01 (small effect size), .06 (medium effect size), .14 (large effect size) in accordance with Cohen [62]. Table 2. shows mean scores. Secondly, the Reliable Change Index [63] was calculated to determine the clinical relevance of any improvement and/or deterioration from pre to post intervention for participants on primary outcomes. RCI values greater than 1.96 standard error of measurement between pre-post treatment outcomes indicated a clinically significant and clinically meaningful change as shown in Table. 3.

Results

Preliminary analyses

Equivalence of groups

A One-way ANOVA was conducted to examine the equivalence of families randomised to PWS and WL at pre-treatment for sociodemographic variables and child diagnostic characteristics. There was a significant group difference for level of pre-diagnostic severity of ADHD wherein the PWS group showed higher levels of ADHD at pre-assessment, $F(1,25) = 4.38$, $p = .047$. Including pre diagnostic severity of ADHD as a covariate made no difference to outcomes on the primary measures, thus all analyses and means presented are without the use of this covariate.

Checking assumptions of the data

All pre- and post-assessment variables were checked for assumptions of ANOVAs analyses (64). A Shapiro-Wilk test of normality indicated that all variables were normally distributed across both groups at pre and post assessment time points ($p > .05$).

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Table 3: Reliable Change in primary outcome measures

	Improvement[a]			Deterioration[a]	
Measure	**Group**	**n/n**	**%**	**n/n**	**%**
RCI > 1.96					
Clinical Significance					
ECBI	PWS	9/14	64.3	0/14	0
	WL	0/12	0	7/12	58.3
SRS	PWS	5/14	35.7	0/14	0
	WL	2/12	16.6	1/12	8.3
PSI-SF	PWS	9/14	64.3	1/14	7.1
	WL	4/12	33.3	0/12	0

Note. RCI was calculated by dividing the magnitude of change between pre and post treatment scores for each participant by the standard error of the difference between the two scores. RCI > 1.96 is considered statistically significant.

a Deterioration refers to scores that reflected increased severity and/or symptoms as calculated by RCI. Improvement refers to scores that reflected reductions in severity and/or symptoms as calculated by RCI.

Primary outcomes

Eyberg Child Behaviour Inventory

On the ECBI Intensity scale scores, mothers in the PWS group reported a significantly lower frequency of problem behaviours at post-assessment relative to mothers in the WL group $F(1,22) = 9.81$, $p = .005$, $\eta p2 = .309$ indicating a large effect size. With regards to RCI values, 9/14 participants in the PWS group demonstrated reliable improvement (RCI > 1.96) on the ECBI Intensity scale from pre to post assessment relative to 0/12 in the WL group.

Social Responsiveness Scale

The difference between groups on the SRS total scores was not significant $F(1,23) = 1.72$, $p = .202$, $\eta p2 = .070$. With regards to RCI values, 5/14 participants in the PWS group demonstrated reliable improvement (RCI > 1.96) on the SRS total scale from pre to post treatment relative to 2/12 in the WL group.

Parent Stress Index- Short Form

The difference between groups on the PSI-SF total scores was not significant $F(1,23) = .005$, $p = .942$, $\eta p2 = .000$. With regards to RCI values, 9/14 participants in the PWS group demonstrated reliable improvement (RCI > 1.96) on the total scale from pre to post treatment relative to 4/12 in the WL group.

Secondary outcomes

Attrition rates

The attrition rates were 12.5% (n = 2) and 7.69% (n = 1) for the PWS and WL groups respectively. Attrition was defined as participants discontinuing participation either after commencing the intervention or during the waitlist period for the respective group.

Treatment Integrity

Implementation of core treatment components varied from 50-100% for families participating in the PWS group (M = 93%).

Acceptability

Information regarding acceptability of the treatment were obtained through a parent self-report questionnaire. Mothers in the PWS group either responded 3 (mostly) or 4 (very much) to the 14 items (M = 3.4). One adverse event was reported (See supplementary materials S5).

Treatment as Usual

Parent reported treatment-as-usual (TAU) hours were analysed using a mixed-design ANOVA to determine the effects of time and group in addition to interaction effects. Results revealed no significant main effect of time $F(1,18) = 0.020$, $p = .889$, $\eta p2 = .001$ or the time by group interaction $F(1,18) = 0.00$, $p = 1.00$, $\eta p2 = .000$, indicating that TAU hours remained stable across time and did not differ between groups.

DISCAP ratings

Children in the PWS group were rated lower in severity of ODD diagnoses relative to the WL group at post-assessment $F(1,23) = 7.56$, $p = .011$, $\eta p2 = .247$ indicating a large effect size. The difference between groups for ratings of ADHD was not significant $F(1,23) = .694$, $p = .413$, $\eta p2 = .029$. The difference between groups for ratings of anxiety was not significant $F(1,23) = .343$, $p = .564$, $\eta p2 = .015$.

Parent Self efficacy and Competence

Mothers in the PWS group reported higher levels of self-perceived competence and efficacy in parenting on the PSOC total scores post-assessment relative to mothers in the WL group $F(1,21) = 10.32$, $p = .004$, $\eta p2 = .330$ indicating a large effect size.

Parenting Scale

Mothers in the PWS group reported lower levels of

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hostility on the PS relative to mothers in the WL group $F(1,22) = 4.37$, $p = .048$, $\eta p2 = .166$ indicating a large effect size. The difference between groups was not significant for mothers' reported levels of laxness $F(1,25) = .084$, $p = .775$, $\eta p2 = .004$ and over reactivity $F(1,25) = 1.93$, $p = .665$, $\eta p2 = .009$.

Parent Problem Checklist

The difference between groups was not significant on the PPC $F(1,21) = .004$, $p = .837$, $\eta p2 = .002$.

Strengths and Difficulties Questionnaire

Mothers in the PWS group reported lower scores on the Total Difficulties scale on the SDQ relative to mothers in the WL group $F(1,23) = 11.08$, $p = .003$, $\eta p2 = .325$ indicating a large effect size.

Discussion

This study was the first RCT to test the effects of ParentWorks-Spectrum, a brief integrated PMI, in a sample of children diagnosed with autism and behavioural difficulties. In addition to supporting the feasibility and acceptability of the intervention, results indicated significant reductions in child behavioural difficulties, according to both parent reports and blind clinician ratings, in addition to improved parent competence and self-efficacy. With regards to primary outcomes, mothers in the PWS group reported a significantly lower intensity of parent-reported child disruptive behaviours at post-assessment relative to parents in the WL group. Statistically significant group differences were not observed for parent-reported child social and communication skills or parent levels of stress. With regards to secondary outcomes, mothers in the PWS group reported higher levels of self-perceived competence and efficacy in parenting post-assessment relative to parents in the WL group. While conclusions regarding treatment effects should be considered preliminary due to the status of this investigation as a pilot study, these findings are promising, nonetheless.

As a pilot RCT, the first aim of the study was to examine the feasibility and acceptability of ParentWorks-Spectrum among parents who have a young child with autism. High rates of retention and parent responses on a satisfaction questionnaire, support Hypothesis 1. This indicated clear evidence for the acceptability and feasibility of this novel model of intervention among parents.

Further aims were to examine treatment effects on child behavioural difficulties, child social and communication skills, and parental wellbeing. With regards to parent reported child behavioural difficulties, there were significant group differences with moderate effect sizes across mothers' ratings on the ECBI intensity scale and SDQ Total Difficulties score post-assessment with mothers in the treatment group reporting a lower frequency of behavioural difficulties relative to the wait list group. Furthermore, a significantly higher proportion of mothers' scores on this scale in the PWS group relative to the WL group demonstrated reliable changes on the RCI providing further support for Hypothesis 2. These findings are consistent with previous parenting interventions for young children with autism demonstrating reductions in child behaviour difficulties following intervention [20, 31, 65] and provide support for the conclusion that treatments do not need to be extensive to support children with ASD and comorbid behaviour difficulties and their parents. Although not all children with ASD will display high rates of externalising behaviours, when present comorbid behavioural difficulties are associated with poorer treatment outcomes [21, 66], difficulties with social and emotional functioning [6, 67] and higher levels of parent stress [11, 12]. Furthermore, for pre-school aged children with ASD, understanding their behavioural profile has been found to be a critical factor in successful transition primary school and hence should be an important intervention target for this population [68].

The findings of the RCT did not support Hypothesis 3. A statistically significant difference was not detected between groups in maternal reports of the level of child social and communication skills as evidenced by the total score on the SRS. Intervention effects following PMIs with regards to child social and communication skills vary within the literature however, treatment effects tend to be smaller and take longer to emerge for these areas relative to changes in behavioural difficulties [69]. For example, Ginn et al. (2017) did not find a significant intervention effect on the SRS total following an 8-session behavioural intervention but did report a significant group difference for the social awareness subscale. Research indicates that a more targeted intervention, different outcome measures, or treatment dose, may be required for changes in social and communication skills to be observed [3,70]. It is important to note that intervention effects related to social and communication skills may be influenced by a number of factors including the developmental and/or cognitive delays that often accompany an ASD diagnosis and the length of the treatment and follow up period and the heterogeneity of ASD.

With regards to Hypothesis 4, there was partial support that the current intervention is effective in improving parent outcomes. Despite a significant body of research indicating a bi-directional relationship between child behavioural problems and parent stress, findings from the RCT did not produce significant group differences for parent stress through parents reports of the total PSI-SF. There may be a few reasons for this finding. Firstly, there is evidence to suggest that a number of factors other than those addressed by the current intervention may contribute to parent stress such as a recent ASD diagnosis [71], the severity of child symptoms [12] and the presence and severity of developmental difficulties [72]. Secondly, the short form of the PSI-SF does not encapsulate variables that contribute to parent stress related

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to parenting a child with ASD [46]. It is interesting to note that a parenting intervention conducted by Ginn et al. (2017) reported significant treatment effects on the reduction of child behavioural difficulties but not for parent stress on PSI-SF post intervention. This is an important priority for future research to address as there is an increased need to include effective parent support strategies in existing interventions for children with ASD that are founded upon parents' ability to engage in responsive, calm and consistent parenting [19]. Despite not observing significant group effects for parent stress, maternal reports of depression and anxiety symptoms were significantly lower for mothers in the treatment group relative to mothers in the WL group demonstrating some efficacy for the intervention in supporting parent wellbeing, parent sense of competence and self-efficacy were significantly improved in the intervention group relative to the WL group indicating that the acquisition of parenting skills, associated behavioural difficulties and parent self-care assisted mothers in feeling more confident in their parenting abilities.

In relation to parenting practices, although the current study only found a significant between group difference for hostility, with the PWS group demonstrating a significant reduction relative to the WL group, parenting behaviours form an important component of parent mediated interventions and warrant further investigation. There is an increasing number of studies reporting reductions in child behaviour difficulties in children with ASD and concurrent reductions in parent over-reactivity, laxness and verbosity [42-43]. Despite this, little is known about the potential mediating effect that these parenting behaviours have on reducing disruptive behaviours in children with ASD. Previous RCT studies demonstrating reductions in these parenting behaviours (e.g., Tellegen & Sanders, 2014; Whittingham et al., 2009) suggest that parenting plays a significant role in reducing disruptive behaviours in children with ASD. This has been well established in children with externalising behavioural difficulties without ASD and is an area that requires further research in the treatment of ASD [73]. Changing parent behaviour may be the first integral stage to longer lasting positive change in supporting the development of skills for young children with ASD.

Several methodological issues need to be considered. Firstly, a more robust RCT with a larger sample size is required to provide a more rigorous examination of intervention effects and potential moderators of treatment change. The inclusion of a 3- or 6-month follow-up assessment would have allowed the long-term sustainability of reported treatment effects to be examined. Secondly, given that the parents had a high socio-economic status, and all children had moderate to severe externalising behaviours in the current study, the generalisability of the treatment remains unclear. Families participating in the current study may have had less barriers to treatment engagement and higher rates of engagement than is typical of the general population. Another limitation of this research was the reliance on maternal reports for treatment outcomes and the absence of standardised measures of children's cognitive abilities and developmental status. Future studies should aim to examine the potential intervention effects in a broader sample of children and families with varying levels of externalising behaviours and socio-economic status. Given that parent synchrony, responsiveness and mutual shared attention are associated with improvements in children's social and communication skills [74], it would be beneficial to operationalise these variables in future research. Future research should also aim to include measures from multiple informants including teachers and both parents/caregivers involved in caring for their child.

Conclusion

In summary, the reported parent and child outcomes of this study provide preliminary empirical support for a brief integrated, family focused approach to parent mediated interventions for young children with ASD and their families that addresses child behavioural difficulties, social and communication skills and parent wellbeing within the one treatment. The findings of this research suggest that behavioural difficulties are an important treatment target for children with ASD and their families. The findings presented in this study can be used as a platform to further develop and refine this intervention into a treatment that is easily implemented and disseminated to families in real world clinical settings

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Ethical information

Parents provided written informed consent prior to participating in this study approved by the University of Sydney Human Research Ethics Committee (project No. 2018/716).

Declaration of Competing Interests

The author(s) declare no potential competing interests with respect to the research, authorship, and/or publication of this article.

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