Original Article

Effectiveness of a Parent Training Intervention for Children with Comorbid Autism Spectrum Disorder and Behavioral Problems in Alexandria, Egypt

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Abstract

Background: Parents of children with autism spectrum disorder (ASD) experience several negative psychological outcomes that are compounded by the presence of children's comorbid behavioral problems.
Objective(s): To evaluate the effectiveness of a culturally sensitive parent training intervention for children with comorbid ASD and behavioral problems in a clinic-based setting in Alexandria, Egypt.
Methods: A quasi-experimental study with non-equivalent groups (intervention, non-intervention, 46 each) was conducted targeting parents/caregivers of children aged ≥ 3 years with ASD and having at least one behavioral problem. The intervention group participated in a multi-component group intervention including psychoeducation, parent training and brief cognitive behavioral therapy. Both groups were assessed immediately after program completion (post-1) and 3 months later (post-2). Measured outcomes included caregivers' ASD related knowledge and emotional status, and children's behavioral problems, that were assessed using: ASD knowledge self-report questionnaire, The Arabic Version of Depression Anxiety Stress Scales, The Arabic Version of Strengths and Difficulties Questionnaire, and The Arabic Version of Home Situation Questionnaire for ASD.
Results: Positive effect of the program was evidenced by significant improvement on all outcome measures at post-2. The highest percentage mean change was reported in caregivers' anxiety symptoms (-63.64), followed by caregivers' depression symptoms, child's behavioral problems and caregivers' stress symptoms (-52.63, -45.64 and -38.18, respectively). ASD related knowledge recorded the least percentage mean change (18.18).
Conclusion: The current intervention provided evidence for the effectiveness of an Egyptian group-based parent-focused multi-component intervention in addressing educational and emotional problems of caregivers of children with comorbid ASD and behavioral problems.

Keywords: Parent training, ASD, multi-component intervention, behavioral problems, Egypt

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INTRODUCTION

Autism Spectrum Disorder (ASD) is a complex neurodevelopmental disorder that is characterized by social and communication deficits as well as repetitive and stereotyped behaviors that exist along a continuum of severity. [(1)] It has a lifelong devastating impact due to its early onset, life-long persistence with significant psychosocial impairment, and high rates of psychiatric comorbidities in the absence of effective treatments. [(2)]

Updated data by Zeidan et al. (2021) indicated that the global prevalence of ASD is approximately 1% with a male to female ratio of 4.2:1. [(3)] In Arab countries, reported prevalence rates varied widely from 0.014% to 4.7%. [(4)] In Egypt, the national screening of children between 1-12 years estimated an overall prevalence of children at high risk of ASD of 3.3%. [(5)] Another study by Yousef et al. (2021) reported 2.8% of preschool children in El-Sharkia Governorate were at high risk of ASD and the prevalence of ASD children fulfilling the diagnostic criteria according to the Diagnostic and Statistical Manual of Mental Disorders, fifth edition (DSM-5) was 5.4/1000. [(6)]

Research evidence has demonstrated that children and youth with ASD have commonly comorbid other mental health conditions including various emotional and behavioral problems, with estimated rates ranging from 49% up to 95%. [(7-9)] Kurzius-Spencer et al. (2018) indicated that more than 90% of children with ASD had at least one co-occurring behavioral problem

presenting mainly as inattention/hyperactivity, argumentative/oppositional behaviors, temper tantrums, aggression, abnormal fear responses and eating behaviors, as well as problems with sleeping and exhibited self-injury. [10] These behavioral difficulties complicate the management of ASD and are highly challenging for parents. [11] Therefore, the involvement of parents in the intervention approaches to management of behavioral problems in ASD has gained attention of researchers. [12]

A previous review by Oono et al. (2012), found evidence for effectiveness of parent mediated interventions in improving child development outcomes, but inconclusive results were related to child maladaptive behaviors and parents' stress. [13] Recent evidence, however, has provided strong support for the efficacy of parent training (PT) for disruptive behavior in children with ASD. [14,15] Furthermore, there are promising results of PT interventions regarding positive parent outcomes as reduced stress. [16] Nonetheless, it is still difficult to draw a definitive conclusion about their effectiveness and generalizability due to the high heterogeneity of studies. [17]

Despite, the emerging benefits of parenting interventions for children with autism and their parents, Egyptian studies providing evidence for effectiveness of these interventions doesn't exist. Therefore, our study aimed to evaluate the effectiveness of a culturally sensitive parent training intervention for children with comorbid ASD and behavioral problems in a clinic-based setting in Alexandria, Egypt.

METHODS

A quasi-experimental study with non-equivalent groups was conducted between December 2018 and August 2019 in the neurology out-patient clinic of the Specialized Children's Hospital (SCH) and the mental health clinic of the High Institute of Public Health (HIPH), Alexandria University.

Study sample

Eligible participants were parents/caregivers of children aged ≥ 3 years with ASD according to DSM-5 diagnostic criteria. Children had to have at least one problem behavior reflecting a disruptive or noncompliant behavior as reported by parents/caregivers on the Arabic Version of Home Situation Questionnaire for ASD. Also, they had no serious medical condition (as cancer) or severe psychiatric disorder other than ASD (as severe intellectual disability). Children with previous history of hospitalization due to severe forms of ASD or its comorbidities were excluded. Additionally, parents/caregivers with current or past enrollment in structured PT in the past year prior to the study were not included.

Sample Size and Sampling Methods

Considering the minimum clinically significant difference in the total score for behavioral problems in children with ASD of 4.23 points, with a SD between subjects of 0.23 points, [18] the minimum required sample was 45 parent/caregiver in each group (intervention and non-intervention groups), with a power of 0.80 and an α of 0.07. Sample size was calculated using G-power 3.1.9.4 software.

Parent/caregiver-child dyads fulfilling the study eligibility criteria were alternatively assigned to intervention and non-intervention groups till the predetermined sample is reached in each group. Full participants totaled 92 parents (46 intervention and 46 non-intervention).

Data collection methods

I. Recruitment phase: A predesigned structured interviewing questionnaire was used to identify parents fulfilling the eligibility criteria by collecting the following data:

- Demographic and socio-economic data of parent/caregiver-child dyads including child's data (age, sex, and school placement if any), and parent's/caregiver's data (age, sex, family size, education, occupation, income, marital status, and living arrangements).
- Psychiatric history of the child including ASD onset, medical and psychosocial treatments received, history of hospitalization, and history of other psychiatric conditions if any.
- Medical history of chronic diseases or physical disabilities.
- History of parents' enrollment in structured PT.

II. Assessment phase: Participants of both groups (intervention and non-intervention groups) were subjected to:

ASD knowledge self-report questionnaire: It comprises 15 items to assess parent's knowledge about nature of ASD, causes, needs of children with ASD and their families as well as common behavioral problems encountered, their reasons and management. The questionnaire was designed based on literature review by the first author. [19] Face validity was assessed by the rest of the research team. A panel of mental health experts were invited to ensure the content validity. Some modifications were made based on the feedback of the experts, until agreement on the final form of the questions was reached. The reliability of the questionnaire was assessed using the internal consistency of individual items and it was satisfactory (Cronbach's alpha =0.64). Scores of each item were either (1) for correct answer, or (0) for wrong or "I do not know" answers. The total score ranges from 0 to 15.

***The Arabic Version of Child Autism Rating Scale (CARS)*: [20]** CARS is a 15-item scale, widely used to assess autistic behaviors in children aged 2 years and older. It targets autism characteristics, such as relatedness to others, body use, object use, and verbal and nonverbal communication. Each item is rated on a scale from 1 (normal) to 4 (abnormal), with a total score ranging from 15 to 60. A higher total score represents more severe autistic behavior symptoms. [21]

***The Arabic Version of Strengths and Difficulties Questionnaire (SDQ Parent-form)*: [22]** SDQ is a brief behavioral screening questionnaire for children aged 3-16 years old, with several forms including parent one. It comprises 25 items; 5 subscales of 5 items each. Subscales are namely prosocial, conduct, hyperactivity, emotional and peer problem subscales. For each of the 5 subscales, the response to items can be 0 (not true), 1 (somewhat true), 2 (certainly true). The total score of each subscale ranges from 0 to 10. Total difficulties score is generated by summing scores from all the subscales except the prosocial subscale. The resultant score ranges from 0 to 40 and is counted as missing if one of the 4 component scores is missing. Total difficulties score of 17-40 indicates behavioral and/or emotional problems. [23]

***The Arabic Version of Home Situation Questionnaire for ASD (HSQ-ASD)*:** HSQ-ASD is used to assess the number and severity of behavioral problems in children with ASD in home situations. It consists of 27 items describing everyday home situations. Parents first endorse problem situations and then rate the degree of problem severity in each of the endorsed situations from 1 to 3. Parent ratings result in three scores: total number of problem situations; total score of problem severity; and average problem severity. [24] The Arabic version was adapted by conducting forward followed by backward translation. The face validity and content validity were assessed by the research team and a panel of mental health experts. The reliability of the questionnaire was assessed using the internal consistency of individual items (Cronbach's alpha = 0.88).

***The Arabic Version of Depression Anxiety Stress Scales (DASS-21)*: [25]** The DASS is a set of 3 self-report scales designed to measure the negative emotional states of depression, anxiety and stress in adults. Each of the three DASS scales contains 7 items. Individuals were asked to use 4-point severity/frequency scales (0-3) to rate the extent to which they have experienced each state over the past week. Scores for depression, anxiety and stress were calculated by summing the scores for the relevant items and multiplied by 2. Depression, anxiety and stress symptoms are identified at cutoff scores of 10, 8 and 15 respectively. [26]

III. Intervention phase: A multi-component parent-focused group intervention program including psychoeducation, parent training and brief cognitive behavioral therapy (CBT) was designed; the parent training component was based on the manual "Parent Training for Disruptive Behavior" designed by Bearss et al. [27] The intervention program had the following objectives:

1- To raise parents' knowledge and understanding regarding common behavioral problems in children with ASD.
2- To improve parents' skills to manage different behavioral problems in their children.
3- To improve parents' emotional status, i.e. to reduce depression, anxiety and stress symptoms.

Description of the program

Parents fulfilling eligibility criteria were assigned to two groups: an intervention group and a non-intervention group. Parents assigned to the intervention group were further divided into 4 groups. A total of 10 sessions were conducted for 11-12 intervention participants/each group on a weekly basis; 6 core sessions for behavior management of children with ASD, and 4 sessions of brief CBT. Each session lasted 60-90 minutes. Educational methods including illustrations, vignettes, role play with feedback, and practice activities were used to promote parental skill acquisition. Participants who missed a session were invited to come one hour prior to next week's session.

Program Content

Session 1: Introduction and knowledge about ASD.
Session 2: Behavioral principles.
Session 3: Prevention strategies and daily schedules.
Session 4: Reinforcement.
Session 5: Planned ignoring and compliance training.
Session 6: Functional communication training and teaching skills.
Session 7: Cognitive reappraisal / CBT approach to depressed mood.
Session 8: Communication /Problem solving skills.
Session 9: Stress identification and management.
Session 10: Generalization and maintenance, review of the program content and closure.

IV. Evaluation phase

Evaluation was carried out for both groups (intervention and non-intervention groups) twice; immediately after the program completion (post-1) and 3 months later (post-2) using SDQ, HSQ, DASS, and parents' ASD related knowledge to assess the following primary outcomes: children's behavioral problems, parents' ASD related knowledge, and parents' emotional status. No secondary outcomes were assessed in this study.

Statistical analysis

Data was analyzed using the Statistical Package for Social Sciences (SPSS version 21.0). All statistical

analysis was done using two tailed test and alpha error of 0.05 (p value). The statistical analysis included testing the shape of distribution using Kolmogorov-Smirnov Test. Data was presented with mean and standard deviation or median with range and percent to provide the descriptive statistics. Person's chi-square test (X^2) to identify the association between two categories and variables. Monte Carlo exact test and Fisher exact test (FET) were done as alternatives to Person's chi-square test if the test was not valid. Man-Whitney test (Z) was used for comparing the mean ranks of two independent groups, and Friedman test (X^2f) for comparing the mean ranks of repeated measures of the same group. Concerning the multivariate statistical analysis, linear logistic regression analysis was adopted to find the best fitting models that determines predictors of improvement in the intervention program outcomes concerning child's behavioral problems, and caregiver's emotional status (i.e. depression, anxiety, and stress).

Ethical considerations

Approval of the Ethics Committee of the High Institute of Public Health was obtained before conducting the study. The study was conducted in compliance with the International Guidelines for Research Ethics. An informed verbal consent was taken from all study participants after explanation of the purpose and benefits of the research. Voluntary participation was stressed upon, and intervention participants were free to withdraw from completing the study any time. Non-intervention participants were scheduled for PT sessions after study intervention program completion. Confidentiality was assured and maintained. There was no conflict of interest.

RESULTS

Participants' flowchart is illustrated in **Figure 1**. While no dropouts were recorded in the non-intervention group, nine participants from the intervention group dropped out due to inability to commit, lack of time, and the long distance. Dropouts were excluded from all statistical analyses.

Baseline data:

Characteristics of sampled children are displayed in table 1. The mean age of the sampled intervention children with ASD was 7.13±1.60 years compared to 6.56±1.83 years in the non-intervention group (Z=1.80, p=0.72). Male children outnumbered females in both intervention and non-intervention groups (58.7% and 93.5%, respectively), showing a statistically significant difference (X^2=15.29, p=0.00). There were no statistically significant differences between children with ASD in both groups concerning their clinical characteristics, including duration of illness (FET=3.77, p=0.28); severity of autistic behaviors (Z = 1.06, p=0.29); score on SDQ (Z=1.33, p=0.18); HSQ score (Z=0.37, p=0.71), history of comorbid psychiatric disorders (X^2= 0.04, p= 0.83), and history of chronic physical illness (X^2=0.08, p=0.78).

Table 2 shows baseline data of parents/caregivers of children with ASD in both groups. Although the majority of caregivers were mothers in both groups (73.9% for intervention and 95.7% for non-intervention groups), yet a statistically significant difference was revealed (FET=8.47, p=0.01). Other demographic and socio-economic base line data were matched between the two groups showing no significant difference. The mean age of caregivers of the intervention group was higher than that of the non-intervention group (39.87±10.80 versus 36.87±6.65 years, Z=1.14, p=0.25). Married mothers accounted for 82.6% of the intervention group compared to 95.7% of the non-intervention group (FET= 4.80, p=0.07). University graduates accounted for more than one third of the intervention group (37.0%) compared to about half of the non-intervention group (47.8%, FET=6.45, p=0.14). The highest percentage of the intervention group were housewives (73.9%) compared to 58.7% of the non-intervention group (X^2=2.38, p=0.12). Nearly 76% of the intervention group reported having "enough income" compared to 52.2% of the non-intervention group (FET=6.46, p=0.08).

Assessment of the intervention program:

Figure 2 shows the total mean difficulties scores of sampled intervention and non-intervention children with ASD on Strengths and Difficulties Questionnaire (SDQ) before and after the intervention program. The intervention group showed a steady statistically significant decline in their mean scores across time; it was 20.91±3.04 at baseline that decreased to 15.30±5.27 at post-1 and further dropped to 10.98±3.54 at post-2 (X^2f =69.53, p=0.00). On the other hand, the non-intervention group showed a statistically insignificant increase in their mean total problem scores (X^2f =2.51, p=0.28).

Regarding differences between the intervention and the non-intervention groups, there were statistically significant differences in favor of the intervention group at post-1 (Z=3.98, p=0.00) as well as post-2 (Z=7.60, p=0.00).

Figure 3 illustrates mean scores of sampled children on Home Situation Questionnaire (HSQ) before and after the intervention program. Among the intervention group, there was a statistically significant consistent decrease in number of reported behavioral problems in the home setting across time as evidenced by decrease in HSQ mean scores from 30.11±13.17 at baseline to 17.11±11.21 at post-1, and further drop to 14.11±10.86 at post-2 (X^2f = 47.61, p=0.00). On the other side, there was consistent increase in HSQ mean scores of the non-intervention group across time that

was also statistically significant (X^2f =14.99, p=0.00). Regarding differences between the intervention and the non-intervention groups, there were statistically significant differences in favor of the intervention group at post-1 (Z=5.88, p= 0.00) as well as post-2 (Z=6.82, p=0.71).

Figure 4 shows the level of ASD related knowledge of sampled caregivers of children with ASD (intervention and non-intervention groups) before and after the intervention program. The mean knowledge scores of the intervention participants increased significantly across time (10.51±2.00 at baseline, 12.23±1.80 at post-1, and 12.57±1.66 at post-2, X^2f = 29.35, p<0.001). The non-intervention group showed nearly similar mean knowledge scores across time without statistically significant difference (X^2f =2.38, p=0.30). Although, the non-intervention group showed statistically significant higher mean score compared to the intervention group at base line (Z=-2.50, p=0.012), the intervention group recorded statistically significant higher mean knowledge scores compared to the non-intervention group at post-1 and post-2 (Z=-2.07, p=0.038 and -2.67, p=0.008 respectively).

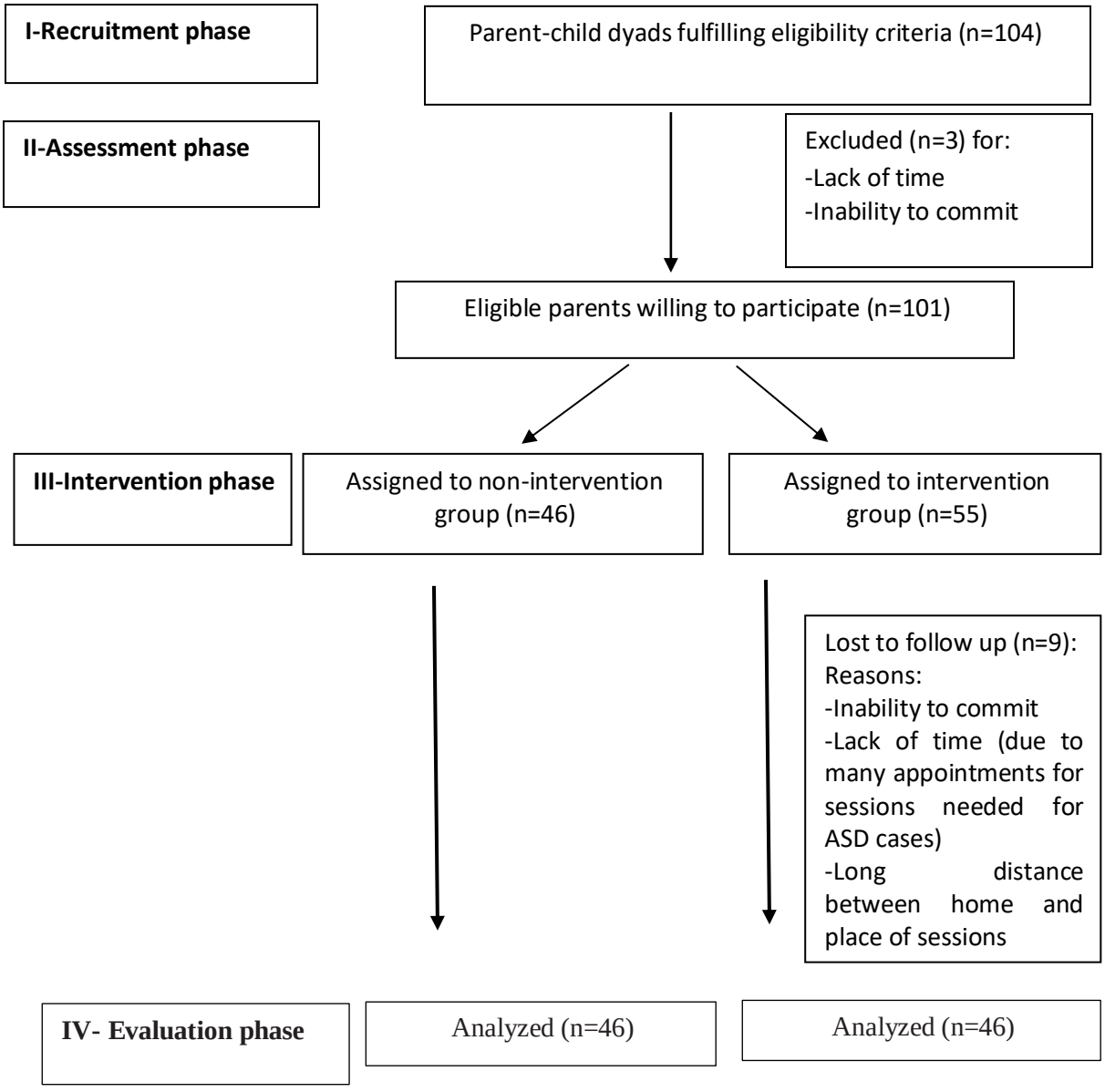

Figure 1: Flowchart of the study participants

Table 1: Baseline characteristics of sampled intervention and non-intervention children with ASD

Children's characteristics	Intervention (n=46), No. (%)	Non-intervention (n=46), No. (%)	Test of Significance (P)
Sex:			
Male	27 (58.7)	43 (93.5)	X^2= 15.29
Female	19 (41.3)	3 (6.5)	(0.00)*
Age:			
Range	5 - 11	4 - 11	Z = 1.80
Median	7.00	6.00	(0.72)
Mean ± SD	7.13±1.60	6.59 ± 1.83	
Living arrangements (with whom the child lives):			
Both parents			
Single parent	34 (73.9)	40 (87.0)	FET = 4.49
Relatives	8 (17.4)	6 (13.0)	(0.10)[c]
	4 (8.7)	0 (0.0)	
Duration of illness (years):			
1 –	2 (4.3)	6 (13.0)	
3 –	16 (34.9)	20 (43.5)	FET= 3.77
5 –	22 (47.8)	15 (32.6)	(0.28)[c]
7 - 9	6 (13.0)	5 (10.9)	
Severity of autistic behaviors (CARS score):			
Range			
Median	19 - 41	24 - 40	Z = 1.06
Mean ± SD	29.50	30.00	(0.29)
	29.57±6.46	30.89 ±4.50	
SDQ total score:			
Range	17 -30	14 - 28	Z = 1.33
Median	20.00	19.00	(0.18)
Mean ± SD	20.91±3.04	19.93±3.36	
HSQ score:			
Range	5 -58	12 - 61	Z = 0.37
Median	28.00	30.00	(0.71)
Mean ± SD	30.11±13.17	30.02±15.71	
History of comorbid psychiatric disorders:			
No			X^2= 0.04
Yes	23 (50.0)	22 (47.8)	(0.83)
	23 (50.0)	24 (52.2)	
History of chronic physical illness:			
No			X^2= 0.08
Yes	39 (84.8)	38 (82.6)	(0. 78)
	7 (15.2)	8 (17.4)	

X^2: Chi-square Test, FET: Fisher Exact Test, Z: Mann-Whitney test, [c] P value based on Mont Carlo exact probability, *P<0.05

Figures 5a-c demonstrate the mean scores of sampled caregivers of children with ASD on DASS before and after the intervention program. As shown in figure 5a, there was a statistically significant steady decrease in mean depression scores of the intervention group across time (X^2f =63.04, p=0.00), and a non-statistically significant increase among the non-intervention group (X^2f =3.79, p=0.15). The difference between the two groups were in favor of the intervention group at post-1 and post-2 (Z=5.24, 5.18 respectively, p=0.00).

As regards anxiety (figure 5b), there was a statistically significant decrease in mean anxiety scores in the intervention group throughout phases of assessment, (X^2f =41.04, p=0.00). On the contrary, the non-intervention group recorded nearly consistent mean anxiety scores throughout phases of assessment with no significant difference (X^2f =4.55, p=0.10). Likewise, findings on depression, the differences between the two groups were statistically significant at post-1 and post-2 assessments (Z=3.49, 4.99 respectively, p=0.00).

As for stress (figure 5c), a consistent statistically significant decrease in mean stress scores of the intervention group was evident across time (25.91±10.01 at baseline, 15.70±10.43 at post-1 and 16.65±11.65 at post-2, X^2f =40.75, p=0.00). Meanwhile, the change in mean stress scores of the non-intervention group was statistically significant across time, but in the counter direction (X^2f =10.38, p=0.01). Additionally, statistically significant differences were encountered between the two groups at post-1 and post-2 in favor of the intervention group (Z=5.61, 5.46 respectively, p=0.00).

As shown in table 3, significant improvement on the outcome measures of child's behavioral difficulties, caregivers' ASD related knowledge, depression, anxiety and stress measures three months after the program termination was evident. The highest change was reported in caregivers' anxiety symptoms

outcome (-63.64), followed by percentage mean changes in caregivers' depression symptoms, child's behavioral problems and caregivers' stress symptoms (-52.63, -45.64 and -38.18, respectively) and the least percentage mean change was recorded for ASD related knowledge (18.18).

Predictors of improvement in sampled intervention children's behavioral problems after the intervention program are displayed in table 4. The independent variables enrolled in the regression model were child's related factors including: sex, age, living arrangements (with whom the child lives), duration of illness, history of comorbid psychiatric disorders, history of chronic physical illness, as well as baseline number of reported behavioral problems, SDQ scores, HSQ scores, and CARS scores. In addition, caregiver's related factors included: age, mother's marital status, education and occupation, family size, family income, baseline and post-2 knowledge scores, and baseline depression, anxiety and stress scores on DASS. The table shows that being a female child (b= 0.57, p= 0.00), absence of history of comorbid psychiatric disorders (b= -0.02, p= 0.03), less number of reported behavioral problems (b= -0.48, p= 0.00), higher score of SDQ at baseline (b= 0.52, p= 0.00), younger age of caregivers (b= -0.04 p= 0.00), married mothers (b= 0.51, p= 0.00), higher family income (b= 0.26 p= 0.02), and higher score of knowledge scale at post-2 (b= 0.23 p= 0.01) predicted better improvement in children's behavioral problems. The fitted model explained 70.5% of the improvement in children's behavioral problems and was found to be statistically significant (F=8.48, p=0.00).

Table 2: Distribution of the sampled intervention and non-intervention caregivers of children with ASD according to their demographic and socio-economic characteristics

Demographic and socio-economic characteristics	Intervention (n=46), No. (%)	Non-intervention (n=46), No. (%)	Test of Significance (P)
Caregiver:			
Mother	34 (73.9)	44 (95.7)	FET = 8.47 (0.01)[c*]
Grand mother	8 (17.4)	2 (4.3)	
Aunt	4 (8.7)	0 (0.0)	
Age of Caregiver:			
25 -	15 (32.6)	17 (37.0)	FET = 3.09 (0.39)[c]
35 -	21 (45.7)	23 (50.0)	
45 -	3 (6.5)	4 (8.7)	
55 – 65	7 (15.2)	2 (4.3)	
Range	25 – 65	25 - 59	Z = 1.14 (0.25)
Median	39.00	35.50	
Mean ± SD	39.87±10.80	36.87±6.65	
Marital status of the mother:			
Married	38 (82.6)	44 (95.7)	FET = 4.80 (0.07)[c]
Widow	4 (8.7)	0 (0.0)	
Divorced	4 (8.7)	2 (4.3)	
Caregiver Education:			
Illiterate or read & write.	0 (0)	3 (6.5)	FET = 6.45 (0.14)[c]
Primary school	3 (6.5)	0 (0.0)	
Preparatory school	12 (26.1)	9 (19.6)	
Secondary school	14 (30.4)	12 (26.1)	
University or higher	17 (37.0)	22 (47.8)	
Caregiver Occupation			X^2 = 2.38 (0.12)
Housewife	34 (73.9)	27 (58.7)	
Employed	12 (26.1)	19 (41.3)	
Family income			
Not enough and borrow	3 (6.5)	9 (19.6)	FET = 6.46 (0.08)[c]
Not enough	6 (13.0)	8 (17.4)	
Enough	35 (76.2)	24 (52.2)	
Enough and save	2 (4.3)	5 (10.8)	
Family size:			
Range	3 – 6	3 - 9	Z = 0.93 (0.35)
Median	4.00	4.00	
Mean ± SD	4.30±0.96	4.24±1.18	

X^2: Chi-square Test, FET: Fisher Exact Test, Z: Mann-Whitney test, [c] P value based on Mont Carlo exact probability, *P<0.05

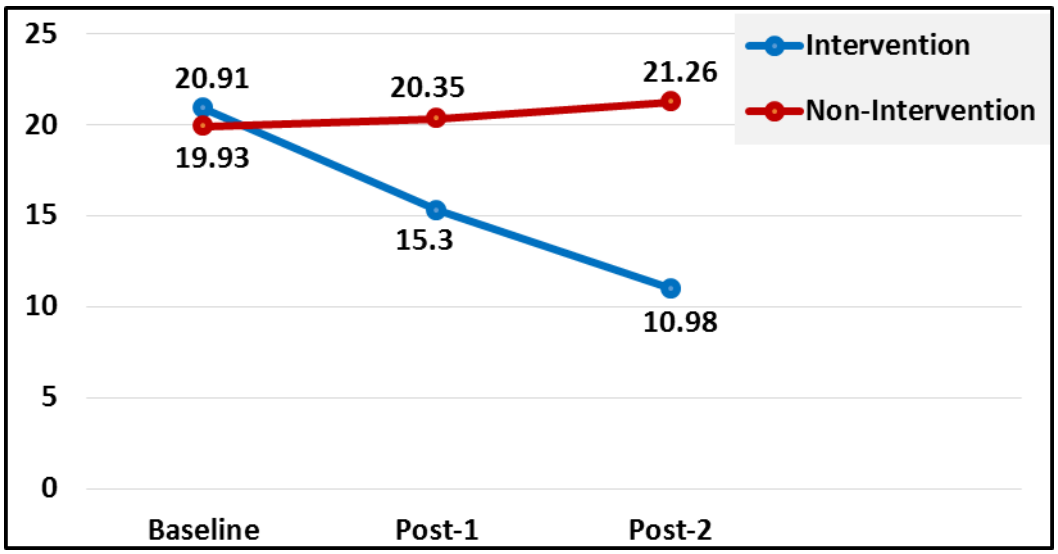

Figure 2: Total mean difficulties scores of sampled intervention and non-intervention children with ASD on SDQ before and after the intervention program

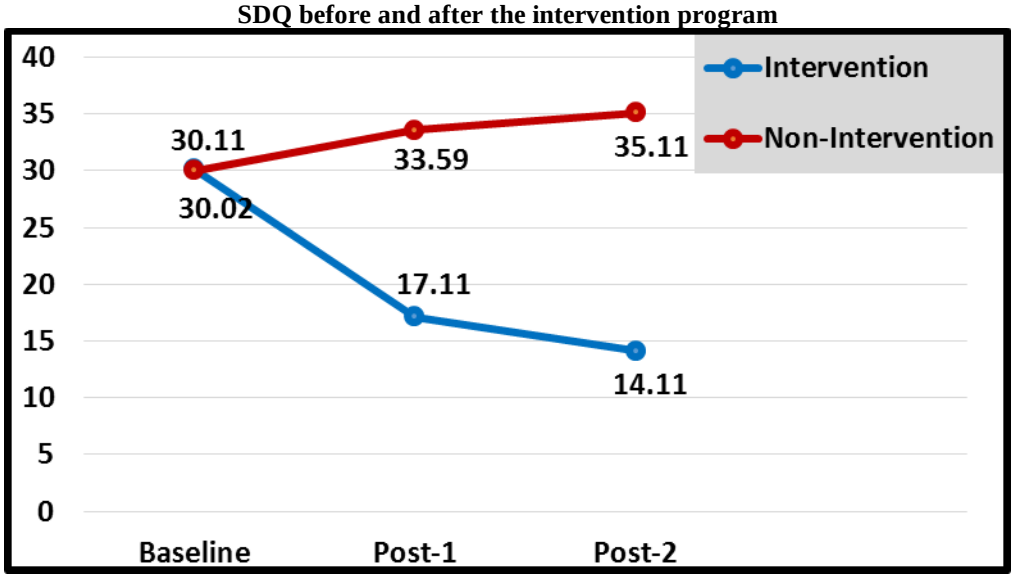

Figure 3: Mean scores of sampled children with ASD on HSQ before and after the intervention program

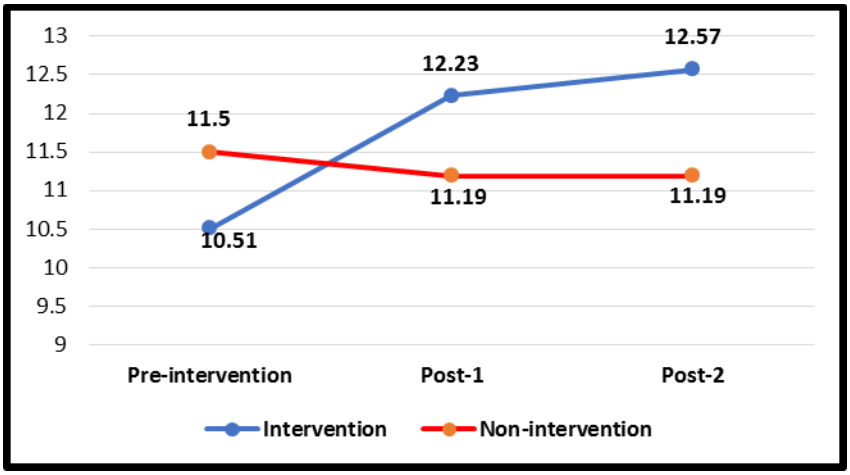

Figure 4: Mean scores of sampled caregivers on ASD related knowledge questionnaire before and after the intervention program

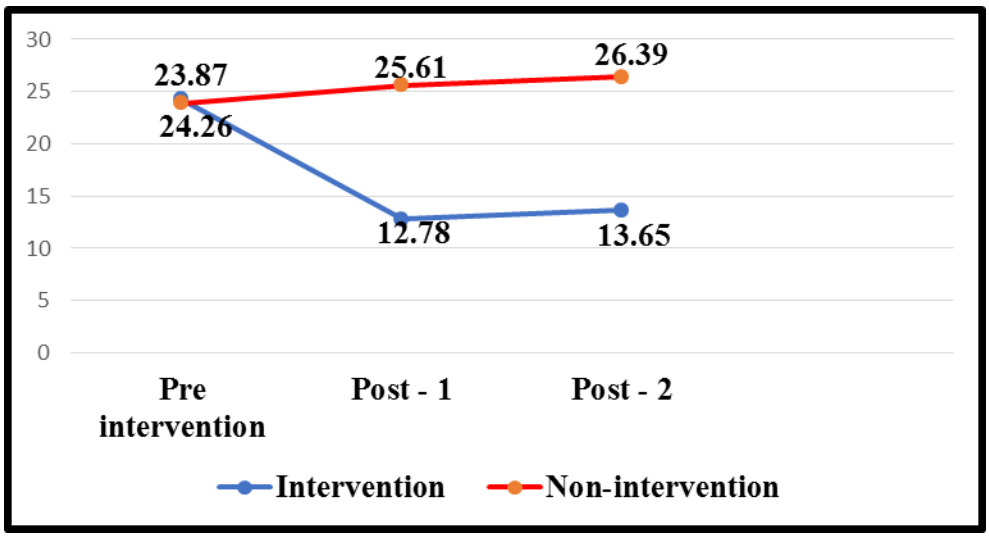

Figure 5a: Mean scores of sampled caregivers on Depression subscale of DASS before and after the intervention program

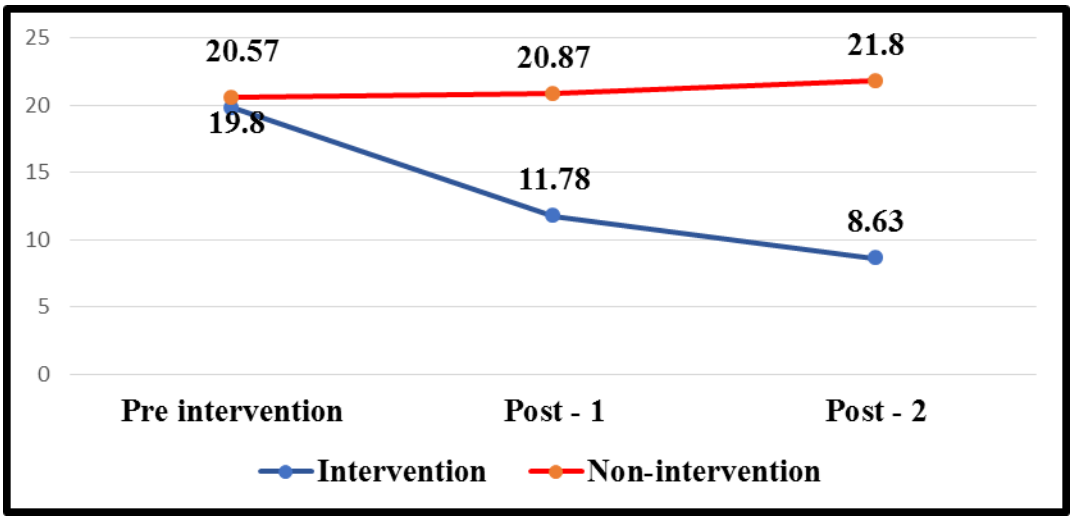

Figure 5b: Mean scores of sampled caregivers on Anxiety subscale of DASS before and after the intervention program

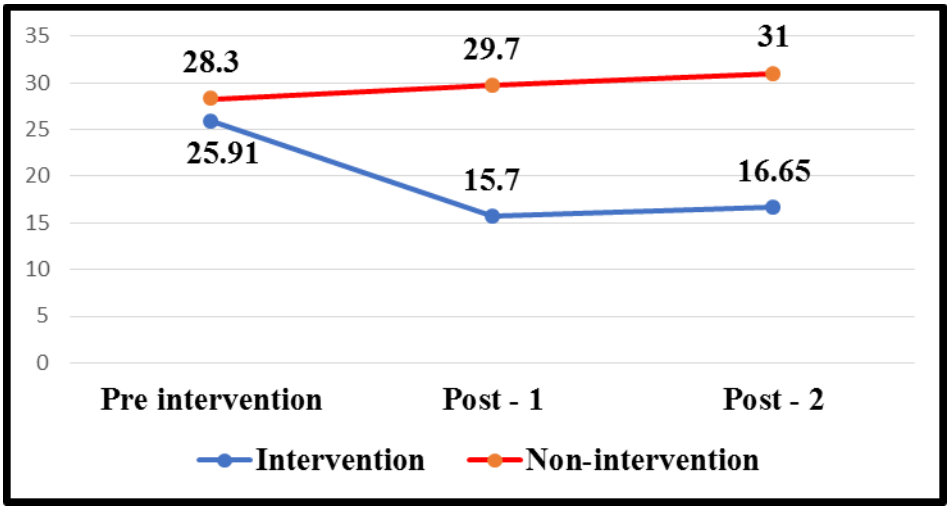

Figure 5c: Mean scores of sampled caregivers on Stress subscale of DASS before and after the intervention program

Table 3: Percentage mean changes in outcome measures of the intervention program among the sampled intervention children and caregivers before and 3 months after the intervention program

Intervention outcome measures	Percentage mean change [a]		
	Minimum	Maximum	Median
Behavioral problems [b]	-78.95	-23.08	-45.64
Knowledge [c]	-18.18	87.50	18.18
Depression [d]	-88.24	111.11	-52.63
Anxiety [d]	-100.00	90.00	-63.64
Stress [d]	-100.00	112.50	-38.18

[a] Percentage mean change = percentage mean difference between post-2 assessment and baseline, [b] Assessed using SDQ Parent-form, [c] assessed using an ASD knowledge self-report questionnaire, [d] assessed using DASS-21, Minimum and maximum change is based on the amount of change regardless the sign (+/-) which refers to the direction of change (positive/negative)

Table 4: Predictors of improvement in sampled intervention children's behavioral problems after the intervention program

Predictor (Independent variables)	b Coefficient	SE	P	95% confidence interval
Female sex	0.57	3.86	0.00	(21.59)- (67.76)
History of comorbid psychiatric disorder	-0.02	-2.17	0.03	(-26.49) – (-1.13)
Number of reported behavioral problems	-0.48	-4.45	0.00	(-13.80) – (-5.26)
Total score of SDQ at baseline	0.52	4.77	0.00	(3.52) – (8.58)
Age of caregiver	-0.04	-3.32	0.00	(-2.26) – (-0.56)
Marital Status of the mother	0.51	4.59	0.00	(18.24) – (46.32)
Family income	0.26	2.45	0.02	(2.05) – (19.86)
Total score of Knowledge scale at post-2	0.23	2.45	0.01	(0.27) – (2.41)
F=8.48, P= 0.00, R^2= 70.5%				

Table 5: Predictors of improvement in sampled intervention caregiver's emotional status after the intervention program

Predictor (Independent variables)	b Coefficient	SE	P	95% confidence interval
Depression				
Child's female sex	-72.24	29.24	0.02*	(-131.96) - (-12.53)
Duration of illness	17.31	7.07	0.02*	(2.87) - (31.76)
Marital status	-73.32	17.49	0.00*	(-109.04) - (-37.60)
Family size	14.25	6.13	0.03*	(1.74) - (26.76)
Mother education	24.06	9.45	0.02*	(4.76) - (43.36)
Mother occupation	74.08	20.07	0.00*	(33.09) - (115.06)
F=9.07, p=0.00, R^2= 81.9%				
Anxiety				
Child's female sex	-62.94	30.34	0.04*	(-124.91) – (-0.97)
CARS scores	2.70	1.23	0.04*	(0.19) – (5.21)
Marital status	-67.84	18.15	0.00*	(-104.91) – (-30.77)
Family size	21.04	6.36	0.00*	(8.06) – (34.02)
Mother education	32.94	9.81	0.00*	(12.91) – (52.97)
Mother occupation	54.44	20.83	0.01*	(11.90) – (96.97)
F=7.89, p=0.00, R^2= 79.8%				
Stress				
Child's female sex	-76.76	35.12	0.04*	(-148.48) - (-5.04)
Marital status	-60.16	21.01	0.01*	(-103.06) – (-17.26)
Family size	21.41	7.36	0.01*	(6.39) – (36.44)
Mother education	47.56	11.35	0.00*	(24.37) – (70.74)
Mother occupation	86.60	24.10	0.00*	(37.37) – (135.82)
F= 10.05, p= 0.00, R^2= 83.4%				

χ^2: Chi square test MC: Monte Carlo *t*: Student *t*-test FET: Fisher Exact test U: Mann Whitney test
*: Statistically significant at $p \leq 0.05$ # multiple response

Table 5 illustrates the predictors of improvement in sampled intervention caregiver's emotional status after the intervention program. Three models were designed for depression, anxiety and stress. The independent variables enrolled in the regression models were child's sex, age, duration of illness, CARS scores, baseline SDQ scores, caregiver's age, marital status of biological mother, family size, mother education and occupation, family income, post-2 knowledge scores, and baseline depression, anxiety and stress scores on DASS.

As regards depression, the table indicates that the fitted model explained 81.9% of the improvement in the

depressive symptoms and was found to be statistically significant (F=9.07, p=0.00). Female child (b= -72.24, p= 0.02), longer duration of illness (b= 17.31, p= 0.02), unmarried mothers (b= -73.32, p= 0.00), large family size (b= 14.25, p= 0.03), higher mother education (b= 24.06, p=0.02) and working mothers (b= 74.08, p= 0.00) predicted better improvement of depressive symptoms.

Regarding anxiety symptoms, having a female child (b= -62.94, p= 0.04), higher CARS scores (b= 2.70, p= 0.04), unmarried mothers (b= -67.84, p= 0.00), large family size (b= 21.04, p=0.00), higher mother education (b= 32.94, p= 0.00), and working mothers (b= 54.44, p= 0.01) predicted better improvement of anxiety symptoms. The fitted model explained 79.8% of the improvement on anxiety subscale and was found to be statistically significant (F= 7.89, p= 0.00).

Concerning stress symptoms, having a female child (b= -76.76, p= 0.04), unmarried mothers (b= -60.16, p= 0.01), large family size (b= 21.41, p=0.01), higher mother education (b= 47.56, p= 0.00), and working mothers (b= 86.60, p= 0.00) predicted better improvement of stress symptoms. The fitted model explained 83.4% of the improvement on stress subscale and was found to be statistically significant (F= 10.05, p= 0.00).

DISCUSSION

The current study provides evidence for the effectiveness of a group-based parent mediated multicomponent intervention in addressing some educational and emotional problems of caregivers of children with comorbid ASD and behavioral problems in terms of significant improvement in both child and caregiver studied outcomes.

Findings of the current research revealed significant improvement in behavioral problems of the intervention group at follow up (up to 3 months) with a recorded drop in symptom severity by 45.64%. Furthermore, the significant differences between the intervention and non-intervention groups in favor of the intervention group (at post intervention-1 and 2) challenge the temporal trend bias explanation of these effects and indicate that the observed effects reflect true changes rather than chance.

The beneficial effects of the current program on child's behavioral problems can't be attributed only to the behavior modification component but also to the inevitable outcomes of its multiple components and approaches that aimed as well to enhance caregivers' ASD knowledge and emotional status. Perhaps, the parallel evident improvement in other outcomes related to caregivers' emotional status and ASD-related knowledge lends support to this explanation. Moreover, improved child's behavioral problems of the intervention group were significantly predicted by improved caregivers' ASD knowledge. Despite the fact that the contribution of improved emotional status of participants to improvement in child outcomes couldn't be delineated on the regression model, yet the role of reduced negative emotions among caregivers in favoring better understanding of child's behavioral problems and how to manage in an effective way shouldn't be overlooked.

Other contributing factors for improved child behavior problems may be attributed to the program structure itself including; the modified and simplified content of the training program to suite cultural and educational backgrounds of participants as well as the group based structure of the program that provided the opportunity for participants to learn from each other, share and gain more experiences, motivate each other and help the group to function simultaneously as a social support group.

The positive effect of the present study on child's behavioral problems was coherent with some other studies as Postorino et al. (2017) who reviewed evidence of behavioral parent interventions (BPIs) for disruptive behavior in children with ASD and reported a moderate benefit with medium effect size. [14] Likewise, a systematic review and meta-analysis (2019) conducted to assess the efficacy of BPIs for disruptive and hyperactive child behavior in ASD showed a medium effect of BPIs on child disruptive behavior. [28] The significant heterogeneity in the effect of PT on disruptive behaviors across studies is likely due to differences in the age of children, sample size, treatment duration, number of PT sessions, number of treatment components included, and the control condition.

Concerning significant predictors for improvement in child's behavioral problem, the present study findings suggest that married caregivers, with enough income to meet their needs, having children with high behavioral symptom severity but with no comorbid psychiatric disorder other than behavioral problems were more likely to benefit from the PT program. Taking into account the limited application of PT in certain settings and for certain children and parents with specific socio-demographic characteristics.

In addition to child outcomes, findings of the present study indicated the effectiveness of the psycho-educational component of the intervention program, as evidenced by significant rise in the mean knowledge scores of the intervention group after program termination and at follow-up. Despite this improvement in the knowledge outcome, it recorded the least rate of change (18%) among other outcomes. This can be attributed to the fact that most of the intervention participants had satisfactory knowledge scores at baseline leaving limited room for improvement. Moreover, significant differences were found between the intervention and non-intervention groups at follow up in favor of the intervention group.

Similar results were reported by George and Sakeer (2015) in India, [29] and Ara and Chowdhury (2016) in Bengaladish. [30]

Evidence for improvement in caregivers' emotional status in our study was demonstrated by significant consistent decrease in depression, anxiety, and stress symptoms across time with a recorded drop rates of nearly 53%, 64% and 38% respectively. These changes further coincided with significant differences between the intervention and the non-intervention group in favor of the intervention group. In support, an RCT conducted by Iadarola et al. (2018) reported significant improvement in parental competence in management of child disruptive behavior and reduction in parent stress and strain following participation in PT program. [16] Moreover, a French study (2018) revealed drop in parent's level of depressive symptoms that was encountered only at post-treatment while stress reduction was significantly encountered after 3 months at follow up. [31]

The significant improvement in caregivers' emotional status in the current study could be attributed to the direct and indirect effects of the multiple components of the PT intervention. The effectiveness of interventions directly targeting well-being of parents of ASD children was documented in a narrative review of 13 studies, that included stress management and relaxation techniques, expressive writing, mindfulness-based stress reduction, and acceptance and commitment therapy. These treatments produced medium to large effect size with improvements in parenting stress and reduction in depression and anxiety symptoms. [32] In 2019, a systematic review of 22 studies was conducted to identify effective interventions to improve caregivers' emotional status of children or adults with ASD. Statistically significant outcomes were obtained for reducing parent stress (via mindfulness training) and improving parent style and satisfaction (via parent training and education). [33]

Indeed, the significant positive effect of the current PT intervention on caregivers' emotional status cannot be attributed only to its direct effect via the CBT component, but also to its indirect effects via the psychoeducation and behavioral management components. In support, research evidence has documented that the estimated effect size of BPIs in improving parental stress in ASD, [34] is generally smaller than that of interventions directly targeting parental well-being in ASD (e.g. mindfulness-based parent training). [32]

The direction of association between parental well-being and child's behavioral problems is still unclear. The current study indicated that the drop in child's SDQ scores at follow up was a significant predictor of improvement in caregivers' depression, anxiety and stress symptoms. However, no evidence regarding the role of improved emotional status of caregivers in prediction of improvement in the behavioral problems of ASD children could be delineated in the current study. In line with these findings, Lecavalier et al. (2018) revealed that child behavior change explained about 25% of the changes in parent stress scores. [34]

Findings of the present work indicated that parenting a female child coming from large family as well as being a single, working caregiver with higher education predicted better improvement of participants' depressive, anxiety and stress symptoms. As application and outcomes of PT would be affected by some family characteristics, there may be some families for whom PT may not be appropriate or less effective. Accordingly, it would be helpful to be aware of these family characteristics in order to provide the most effective services.

Limitations of the study

The evidence that can be derived from the results of this study should be interpreted in light of its strengths and limitations. Being a quasi-experimental study with no statistically significant differences between the control group and the intervention group at the beginning of the study regarding all studied outcome measures is one of the strength points of the current study. Another point of strength is the limited study exclusion criteria that allowed participation of children with ASD and their caregivers from diverse backgrounds.

Besides, the current study has several limitations that should be considered. The short duration of follow up for only 3 months probably limits the ability to predict the maintenance of acquired skills over time. Though standardized, valid tools were used to assess intervention outcomes, yet these measures relied completely on ratings of caregivers who were not blinded to treatment assignment. Furthermore, fathers' parenting experiences and benefits from the intervention could not be delineated as they were not represented among study participants.

CONCLUSION AND RECOMMENDATIONS

The current multi-component parent-focused intervention yielded significant improvements in child's behavioral problems, as well as caregivers' ASD related knowledge and emotional status which were evident up to 3 months after program termination. Meanwhile, the non-intervention group showed significant changes across time regarding increased perceived severity and impact of child behavioral problems and level of stress level by caregivers but in the counter direction. Considering these facts, one might suggest that early routine provision of this intervention to parents of children with autism not only could abort these negative

percussions on caregivers but also would improve caregiver's overall emotional status as well as child behavioral problems.

CONFLICT OF INTEREST

The authors have no conflict of interest to declare.

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