A comparative analysis of two online behavioural training programs for parents of children with autism spectrum disorder

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Abstract

Background: Children with autism spectrum disorder (ASD) commonly experience significant behavioural challenges that interfere with their ability to participate in valued family routines. Behavioural interventions, including parent training, have been demonstrated to be effective in building children's skills and resolving difficult behaviour. These interventions, however, have been plagued by inaccessibility, high attrition, and parental non-adherence. Recent approaches engage parents as active problem-solvers and provide more flexible ways to participate via technology.

Method and materials: In this study, we evaluated two online behavioural parent training (BPT) programs entitled Teaching Routines (TR) and Practiced Routines (PR), designed to improve child behaviour during family routines. We employed a mixed-model repeated measures, randomised comparison group design. 192 families were randomly assigned across the two groups. Measures included family quality of life, parenting stress, mindful parenting, parenting knowledge and child behaviour. The TR group was self-directed and focused on teaching behavioural parenting skills. The PR group was facilitated by a parent educator and in addition to teaching behavioural parenting skills incorporated mindfulness practices.

Results: Between group experimental results showed statistically significant improvements in parenting knowledge for the PR group in comparison to the TR group. Within group quasi-experimental results showed significant improvements for both groups across different sets of family, parent, and child outcomes.

Conclusions: Implications for online behavioural parent training programs that focus on embedding behavioural interventions into natural family routines are discussed.

Keywords: autism spectrum disorder; family routines; behavioural parent training; online parent training; mindfulness practice

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Introduction

Children with autism spectrum disorder (ASD) typically display social-communication differences and rigid and repetitive patterns of behaviour and/or interests (American Psychiatric Association, 2013). Because of these difficulties, it is common for children with ASD to engage in problem behaviour such as aggression (Hartley, Sikora and McCoy, 2009; Kanne and Mazurek, 2011) and experience significant deficits in adaptive skills (Park, Yelland, Taffe and Gray, 2012). Child problem behaviour and skill deficits can impact the entire family system. Families often struggle through or forego valued daily routines (Lee, Harrington, Louie and Newschaffer, 2008). Families also commonly experience social isolation due to behavioural challenges (Byrne, Sarma, Hendler and O'Connell, 2018). Additionally, parents of children with ASD report higher levels of stress than other parents, with problem behaviour and stress mutually escalating over time if untreated (Neece, Green and Baker, 2012; Totsika, Hastings, Emerson, Lancaster and Berridge, 2011). Faced with child behavioural difficulties, parenting stress, social isolation, and an inability to engage in activities, families of children with ASD are at greater risk for undesirable physical and mental health conditions (Cantwell, Muldoon and Gallagher, 2014). Given all of these issues, it is imperative to investigate interventions that support and empower parents and improve family routines.

Behavioural approaches

There is a robust literature base demonstrating that interventions rooted in applied behaviour analysis (ABA) have strong effects in increasing adaptive behaviour and reducing problem behaviour for children with ASD (National Autism Center, 2015). ABA is commonly associated with individualised therapy provided by behavioural therapists. ABA therapy can produce significant improvements in child behaviour, but also can be costly (Buescher, Cidav, Knapp and Mandell, 2014; Rogge and Janssen, 2019) and is plagued by practitioner shortages (Behavior Analysis Certification Board, 2015). Additionally, individual ABA therapy is almost exclusively focused on child outcomes (Gould, Dixon, Najdowski, Smith and Tarbox, 2011), with limited systematic training or support for parents (Love, Carr, Almason and Petursdottir, 2009). In these circumstances, intervention may not build capacity or align with families' needs and circumstances (McLaughlin, Denney, Snyder and Welsh, 2012).

ABA also can be delivered via behavioural parent training (BPT). BPT has been shown to be effective when parents participate fully and generalise learned skills (Michelson, Davenport, Drezke, Barlow and Day 2013; Reyno and McGrath, 2006). Unfortunately, research has demonstrated this is not always the case, with parental attrition in BPT being about 50% (Chacko et al, 2016). Poor parental adherence with BPT may be related to a variety of factors, including the nature of the curriculum and how it is delivered (Black and Therrien, 2018). Additionally, parents may fail to adopt practices that are misaligned with their preferences and routines (McConnell, Parakkal, Savage and Rempel, 2015).

Positive behavioural support (PBS) has emerged as an approach that explicitly emphasizes caregiver engagement and contextualized ABA (Dunlap et al, 2017; Hieneman and Fefer, 2017). PBS is a collaborative approach to designing and implementing proactive strategies, teaching of replacement behaviours, and reinforcement-based methods that fit naturally in family routines. Studies have demonstrated that PBS has resulted in significant improvements in child behaviour and is highly acceptable to families (Lucyshyn et al, 2015). Although some manualised PBS BPT programs (eg Durand and Hieneman, 2008) have been developed, their use is not widespread.

Online training

Families may experience a wide variety of barriers to accessing training including geographical location, lack of transportation, and competing life demands (Ingersoll, Shannon, Berger, Pickard and Holtz, 2017; Lindgren et al, 2016). As a result, researchers have evaluated methods to train parents using online formats. Most of this research has focused on training parents to implement behavioural procedures such as functional communication training (Machalicek et al, 2016). There is growing evidence that telehealth interventions can be as effective as in-person treatments (eg Blackman et al, 2019). Telehealth treatments, especially when delivered to groups, however, are not free from challenges such as scheduling and technology barriers associated with synchronous online meetings.

Self-directed online training programs may provide parents with more flexible and sustained access to evidence-based interventions because parents are able to access content in their own time. Although

online programs have the potential to reach numerous families and could help overcome some of the aforementioned barriers, there remains a need to evaluate different BPT approaches and delivery formats. Self-directed and individualised telehealth interventions may have their advantages, yet there may be benefits to connecting parents together online for education and informal social support (Nieuwboer, Fukkink and Hermanns, 2013).

Addressing parenting stress

Stress may interfere with parents' ability to fully or consistently implement behaviour support plans (Singh et al, 2014). There has been increased attention in the literature evaluating approaches to ameliorate stress for parents of children with ASD. Mindfulness-based interventions that guide participants to cultivate a non-judgemental awareness of the present moment and their parenting intentions are gaining promise (Bazzano et al, 2013; Kabat-Zinn, 2003; Neece, 2014). Mindfulness practices (eg deep breathing, difusing thoughts) may help parents be more attentive to events happening around them and within them, reducing reactivity during interactions with their children (Jones, Hastings, Totsika, Keane and Rhule, 2014).

Mindfulness training, such as the Mindfulness-Based Stress Reduction (MBSR) program, has successfully been applied to parents of children with developmental disabilities, resulting in decreased parenting stress and increased quality of life (Bazzano et al, 2013), as well as decreases in child hyperactivity (Neece, 2014). Dykens et al (2014) compared parent–mentor delivered MBSR to a Positive Adult Development (PAD) program rooted in positive psychology practices for mothers of children with developmental disabilities. No differential treatment effects were found between the two groups, with both treatments showing advantageous outcomes. Mothers in the MBSR group, however, showed significantly greater improvements in depression and anxiety symptoms, as well as improved sleep and life satisfaction. As opposed to cognitively-oriented strategies, mindfulness strategies may be particularly useful for parents dealing with child challenging behaviour, as immediate physiologic relaxation processes are targeted and strengthened. Further, parent training models that combine PBS and mindfulness are emerging. For example, Singh and colleagues (2014) examined the effects of mindfulness-based positive behaviour support for three mothers of adolescents with ASD and found reductions in mothers' stress and adolescents' problem behaviour. BPT programs that empower parents to support their children's behaviour within natural family routines and help parents overcome logistical and emotional barriers to intervention are essential for families of children with ASD.

The current study

The current study represents an extension of Pennefather et al (2018), a quasi-experimental pilot study that combined ABA, Acceptance and Commitment Therapy (ACT), and optimism training for parents of children with ASD. The purpose of the current study was to expand and refine the procedures of Pennefather et al (2018) to create a program titled Practiced Routines. Specifically, PBS replaced ABA principles and mindfulness replaced ACT and optimism training. Additionally, we evaluated another online BPT program, for a total of two programs. Both programs employed ABA principles within the context of family routines. The first program, titled Teaching Routines (TR), was a self-directed program, and the second program, titled Practiced Routines (PR), was facilitated by a parent educator with small groups of parents. We sought to answer the following questions: (a) for families of children with ASD, is an online parent training program that includes a professional facilitator and mindfulness training effective at improving family quality of life, parenting stress, parenting style, parenting knowledge, mindful parenting and child behaviour in comparison to an online parent training program that is self-directed; (b) is the online parent training program that includes a professional facilitator and mindfulness training associated with improvements in family quality of life, parenting stress, parenting style, parenting knowledge, mindful parenting and child behaviour; (c) is the online parent training program that is self-directed associated with improvements in family quality of life, parenting stress, parenting style and knowledge, mindful parenting and child behaviour; and (d) how do the participating parents rate and view their satisfaction with the online parent training program in which they participated?

Method

We employed a mixed-model repeated measures, randomised comparison group design to evaluate the PR and TR programs, examining changes over time both between and within the programs, assessing whether there were improvements in each program. These programs are commercially available to families of children with autism and other disabilities, but lacked empirical evidence of their effectiveness. Using

this design, we sought to evaluate whether the self-directed (TR) program would be effective as a stand-alone intervention, or whether facilitation and integration of mindfulness would further enhance outcomes for participants. All research was conducted online.

Participants

Participants were recruited nationally throughout the United States. Eligible parents had to: (a) have access to necessary technology (ie computer with camera and microphone, high-speed internet connection, and a mobile device with current operating system); and (b) speak English. Parents had to have at least one child who: (a) had a medical diagnosis or special educational eligibility of ASD; (b) was between 3 and 8 years old; (c) lived in the home of the participating parent; and (d) engaged in challenging behaviour that interfered with at least one family routine. Eligible participants completed informed consent online. Parents were assigned to either the PR or TR condition using block randomisation.

Table 1 displays demographic data for parents and children collected at pre-test (prior to start of the intervention), by condition. A total of 156 parents completed post-test upon finishing the intervention (77 in PR and 79 in TR), and 145 completed follow-up (73 in PR and 72 in TR), which was an overall attrition rate of 7% (5.2% in PR and 8.9% in TR). The participants consisted of primarily White, educated mothers. Children were on average 5.9 years old and mostly male.

Table 1: Participant demographic information by group

	Practiced Routines	**Teaching Routines**
	(N = 77)	**(N = 79)**
Parent characteristics		
Sex (female)	75 (97.4%)	76 (96.2%)
Sex (male)	2 (2.6%)	376 (3.8%)
Race		
White	56 (72.7%)	66 (83.5%)
Black or African American	13 (16.9%)	5 (6.3%)
Other	8 (10.4%)	7 (10.2%)
Age in years – M (SD)	37.4 (5.8)	36.1 (5.5)
Education level		
High school or some college	30 (39.0%)	40 (50.1%)
Bachelor's degree or higher	47 (61.0%)	39 (49.9%)
Employment status (employed)	52 (67.5%)	40 (50.1%)
Child characteristics		
Sex (male)	59 (76.6%)	64 (81.0%)
Age in years – M (SD)	5.9 (1.8)	5.9 (1.8)
Autism symptoms* (SD)	31.5 (7.1)	31.9 (7.8)

** Note. Child autism spectrum disorder symptoms sum scores are presented as total scores and range from 15 to 60.*

Measures

To evaluate changes over time both within and between programs, we assessed family quality of life, parenting stress, parenting practices, parenting knowledge, and child behaviour (adaptive and maladaptive) using parent report measures. Additionally, at follow-up we examined parents' use of and satisfaction with the programs. These measures are described below.

Quality of life

The Family Quality of Life survey (FQOL; Summers et al, 2005) is a 25-item measure for families raising a child with intellectual or developmental disabilities. The measure includes domains of parenting, emotional wellbeing, physical/material wellbeing, and disability-related supports. It uses a 5-point scale with responses ranging from (1) very dissatisfied to (5) very satisfied, producing a total score which is the average rating across the items, with higher scores indicating greater perceived quality of life. In the current study we used the mean FQOL scores for analyses, which demonstrated excellent internal reliability (alpha = .91 at pre-test).

Parenting stress

The Parental Stress Scale (PSS; Berry and Jones, 1995) was developed to assess stress of parenting. It contains 18 items representing both positive and negative parenthood components, and uses a 5-point Likert scale, with higher scores indicating greater stress. In the current study, it demonstrated strong internal reliability (alpha = .90 at all three time points) so all analyses used parents' mean scores.

Parenting practices

The Parenting Scale (PS; Arnold, O'Leary, Wolff and Acker, 1993) is a 30-item scale, comprising three sub-scales (ie laxness, over-reactivity and verbosity), that measures dysfunctional parenting within discipline situations. A 7-point semantic differential-type scale identifies a parenting 'mistake' on one side, with the more effective parenting behaviour anchoring the other side. Higher scores reflect dysfunctional styles of parenting (ie average non-clinical scores are 2.6, whereas clinical populations average 3.1).

Mindful parenting

The Bangor Mindful Parenting Scale (BMPS; Jones et al, 2014) is a 15-item instrument designed to measure parental mindfulness across five domains: observing, describing, acting with awareness, nonreactivity, and non-judgement. A 4-point frequency scale is used ranging from '0 – Never' to '3 – Always'. For the current study, we used the overall means for both the PS (alpha = .77 at pre-test) and BMPS (alpha = .85 at pre-test).

Parenting knowledge

To measure parental knowledge, we developed a 20-item multiple choice/true-false test (alpha = .47 at pretest). The test included multiple choice items related to principles of ABA and routine-based intervention strategies, as well as five questions on mindfulness practice because that content was included in the PR program. The results of the knowledge test were summarised by the number of items answered correctly.

Autism symptoms

Parents rated the severity of their child's autism symptoms using The Childhood Autism Rating Scale – 2nd Edition (CARS-2; Schopler, Van Bourgondien, Wellman, and Love, 2010). The CARS-2 is a 15-item instrument that uses a 4-point Likert-type scale ranging from '1 – age appropriate' to '4 – severely abnormal' with a total score range of 15 to 60. Half scores are possible. The scale was used to assess the severity of the children's autism symptoms. It was not used as a screening tool, as their eligibility was determined based on a medical or educational diagnosis. A raw score ≥30 is indicative of autism symptoms, with scores between 30 to 36.5 falling in the mild to moderate range, and scores between 37 to 60 considered in the severe range. The CARS-2 has good internal reliability (alpha = .94) and test-retest reliability (kappa = .64).

Child behaviour

This was measured with the Strengths and Difficulties Questionnaire–Parent Report (SDQ-P; Goodman, 1997), and the Short Form of the Scales of Independent Behaviour-Revised (SIB-R; Bruininks, Woodcock, Weatherman and Hill, 1996). The SDQ is a 25-item parent-report version of a behavioural screening questionnaire. It assesses both positive and negative behaviours in the following domains: conduct problems, inattention-hyperactivity, emotional symptoms, peer problems, and pro-social behaviour, using a 3-point Likert-type scale ranging from '0 – not true' to '2 – certainly true'. The current study analysed means of the total difficulty scale of the SDQ (alpha = .80 at pre-test) which ranged from 0 to 50, as well as the internalising and externalising sub-scales which each ranged from 0 to 25, with higher scores indicating more behavioural problems.

The SIB-R Short Form is a 40-item scale that measures 14 areas of adaptive behaviours and 8 areas of maladaptive behaviours. The adaptive behaviours are developmentally sequenced and are rated on a 4-point Likert scale measuring the extent to which the behaviour occurs. Maladaptive behaviour categories include hurtful to self, hurtful to others, destruction to property, disruptive behaviour, unusual or repetitive habits, socially-offensive behaviour, withdrawal or inattentive behaviour, and uncooperative behaviour, with each rated on 5-point Likert scales evaluating both their frequency and severity. The scores fall into categories ranging from normal (+10 to -10) to very serious (-41). The current study analyzed the total adaptive (alpha = .92 at pre-test) and maladaptive behaviours (alpha = .90 at pre-test) sub-scales of the SIB-R. Higher positive scores (ranging from 0 to 120) on the adaptive sub-scale indicated more adaptive behaviours and higher negative scores (ranging from 10 to -70) on the maladaptive sub-scale indicated more maladaptive behaviours.

Consumer satisfaction

Consumer satisfaction was evaluated using a 9-item, 6-point Likert scale asking about the participants' use and satisfaction with the programs. The consumer satisfaction items were combined into a single measure with strong internal reliability (alpha = .93). Responses to open-ended questions in the consumer satisfaction instrument were subjected to a thematic analysis by two separate reviewers. The responses were analysed by compiling topics and identifying emergent themes using inductive content analysis. Two authors worked independently to develop core themes and then met to review their lists. Conflicts were discussed until consensus was reached.

Design

To examine differences between the groups we employed a between-groups randomised comparison group trial design to examine post-test and follow-up differences, using pre-test scores as a covariate. To evaluate changes within each group we used a quasi-experimental repeated-measures design to examine changes from pre-test to post-test and pre-test to follow-up. Additionally, we examined the effect sizes for all significant outcomes, specifically eta squared (η^2) for the experimental between groups analyses and Cohen's d for the within group analyses. For η^2, effect sizes of .01, .06, and .14 represent, respectively, small, medium, and large effects; while for Cohen's d the values are .2, .5, and .8 (Cohen, 1992).

Participants were sent a pre-test approximately one week prior to accessing the Learning Management System (LMS), which housed both programs. Parents were notified as to which group they were randomly assigned upon completion. Participants were sent a post-test six weeks after completing the pre-test, and the follow-up was sent four weeks after they had completed the post-test. Honorarium cheques in the amount of $50 were mailed within four weeks of each survey completion. Participants who did not attend any PR sessions were not sent the post-test or follow-up assessments. The CONSORT diagram (*Figure 1*) shows participant recruitment and retention.

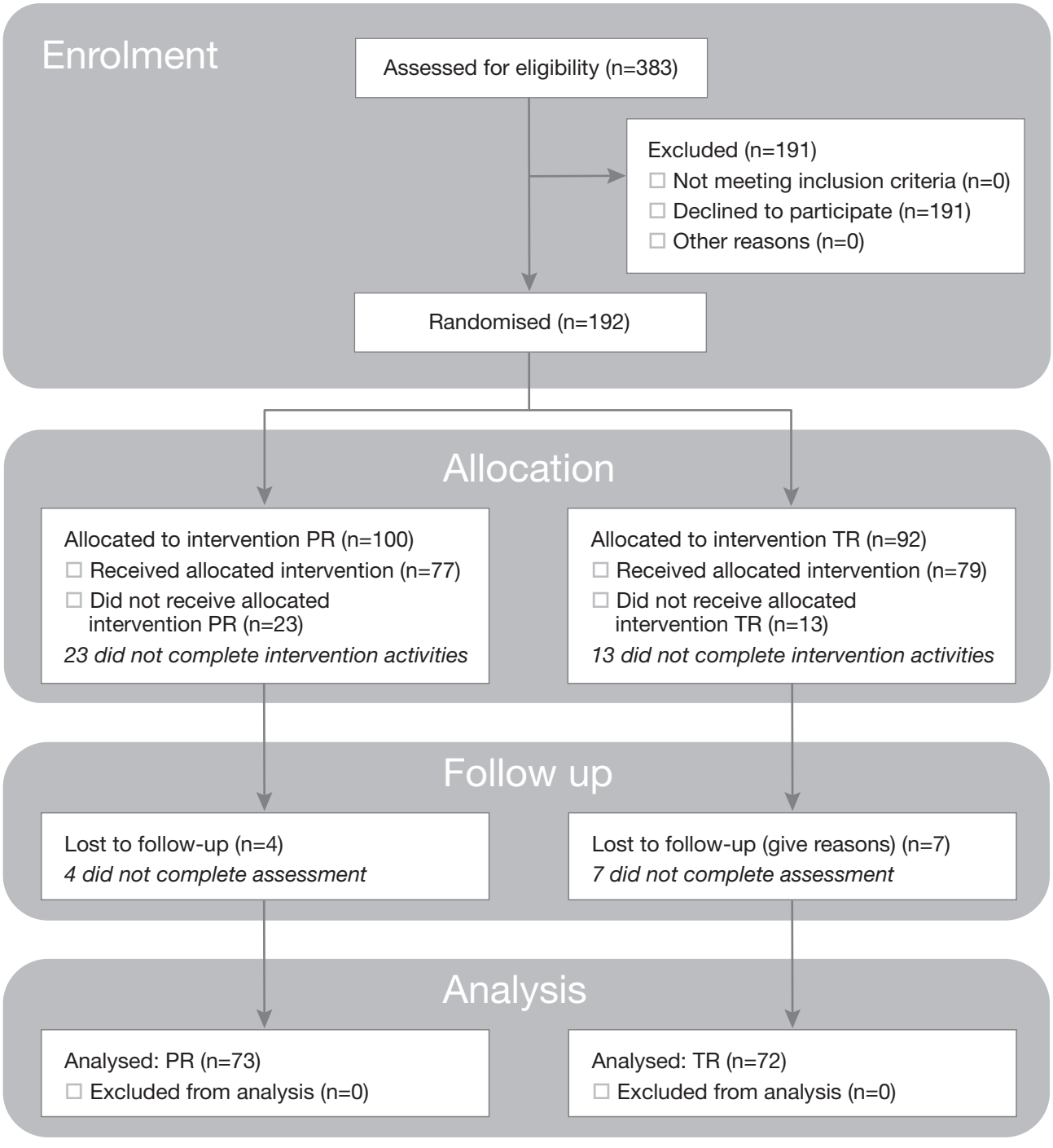
Program descriptions

Both programs focused on ABA within the context of typical family routines. The content guided parents to identify target routines and behaviours of concern, learn about the patterns that may be affecting their children's behaviour, and develop strategies to prevent problems, teach skills, and manage access to reinforcement. The LMS courses were divided into modules that included videos, written summaries of each video, fillable forms, and other exercises to guide parents through activities to support the intervention process with their children, as well as resource materials including links to relevant websites. Parents were expected to complete homework for each module. Parents were given access to the courses for the duration of the study and technical support was available. *Table 2* summarizes the features of each of the programs.

Teaching Routines

Teaching Routines was entirely self-directed. The program included eight modules with videos for each ranging from three to five minutes in duration. The topics were antecedent-behaviour-consequence method, creating task analyses, antecedent-based strategies, communication, reinforcement, teaching methods, and overcoming obstacles. Participants were assigned six activities using fillable forms and provided with additional resources including examples, a glossary of terms, and a list of websites. No feedback was given to the parents apart from the automated completion responses. The participants were given access to the TR LMS for the duration of the study, but post and follow-up assessments were completed at six and ten weeks (ie the same as the PR condition).

Figure 1: CONSORT flow diagram for enrollment of family participants in study



Practiced Routines

Practiced Routines was a facilitated program. It was organised into four modules that included a total of seven videos ranging from 3 to 13 minutes each. The topics overlapped with those in the TR program, but included more explicit information on function-based strategies, as well as mindfulness practice.

Table 2: Content of online parent training program

Practiced Routines (PR)

1. Preparing for course
    - Introductions ('About us')
    - ABCs & mindful parenting
    - Homework checklist

2. Goals and patterns
    - Recording behaviour
    - Identifying patterns (ABCs)
    - Tracking progress

3. Creating a plan
    - Proactive strategies
    - Teaching skills
    - Managing consequences
    - Routine-based plan

4. Making it work
    - Putting plan in place
    - Ongoing application

5. Additional resources
    - Positive behavioural support
    - Mindfulness practice

Teaching Routines (TR)

1. Introduction to program
2. ABC method
3. Creating a task analysis
4. Setting up the environment
5. Communicating clearly
6. Giving consequences
7. Putting teaching plan in action
8. Overcoming obstacles
    - Glossary
    - Reliable websites

Participants were assigned six fillable forms, and provided with supplemental data collection tools. Additional resources focused on mindfulness and PBS within family routines. Eighteen brief guided audio meditations were available to participants via the Practiced Mind™ mobile application. The meditations focused on bringing the parents' awareness to both internal and external experiences and helping them act intentionally.

When participants were assigned to PR, they were grouped based on their availability and assigned to one of five parent educators. Parents were encouraged to attend a brief 'tech check' (via WebEx) to test their computer (eg webcam, video) and internet connection. The parent educators contacted participants prior to and between three weekly online meetings via email or phone, not exceeding a total of 10 minutes per participant to check on their progress and respond to questions. The online meetings were held using WebEx video conferencing software with small groups of parents (M = 3.7; range = 1 – 5) per cohort. They lasted between 90 minutes and two hours, with most approaching two hours. Meetings were organised using PowerPoint™ presentations and session guides. A technology support specialist was available during the meetings for assistance.

Treatment integrity

Because TR was self-directed, it was not necessary to evaluate treatment integrity beyond ensuring that the participants were able to log on to the platform and access all resources consistently. Specific provisions, however, were implemented in PR to ensure that the parent educators were consistent in delivery. Parent educators were masters and doctoral level professionals experienced in behavioural intervention with children with ASD and their families. They were provided with training that involved selected readings on positive behavioural support and mindfulness, review of the LMS resources, and instruction on facilitating the sessions and using the online meeting system and LMS.

Fidelity checks were conducted for 34% of the sessions. The fidelity checklist, presented in *Table 3*, included items on content and parent participation. Fidelity for content ranged from 90–100% (M = 99%). Fidelity for participation ranged from 53–100% (M = 94%). Interrater reliability was conducted for 38% of sessions assessed by a second observer. Reliability was evaluated on an item-by-item basis, dividing the number of agreements by agreements plus disagreements and multiplying by 100 to obtain a percentage. Reliability was 87.5% for the content and 97.5% for participation.

Table 3: Sample session fidelity checklist for PR program

Fidelity checklist – session 2

Cohort #: ..... Date:.....

Parent educator: ..... Time: .....

Observer: ..... Primary reliability (circle one)

Indicate participant initials: P1 ..... P2 ..... P3 ..... P4 ..... P5 .....

	Session content/activities	Completed?
1	Reviewed goals for the session, within overall program	☐ Yes ☐ No
2	Reviewed guidelines for participation, as needed	☐ Yes ☐ No
3	Facilitated sharing on homework assignments (ie goals, tracking, ABC recording, mindfulness practices), getting input from participants: ☐ P1 ☐ P2 ☐ P3 ☐ P4 ☐ P5	☐ Yes ☐ No
4	Reviewed framework for analysing patterns surrounding behaviour	☐ Yes ☐ No
5	Guided participants to summarize patterns, as well as perceptions: ☐ P ..... ☐ P ..... ☐ P	☐ Yes ☐ No
6	Provided overview of features of a routine-based plan, function-based interventions and relevant strategies, and broader supports	☐ Yes ☐ No
7	Shared videotaped examples of strategies to include in a plan	☐ Yes ☐ No
8	Guided participants to develop strategies for their routine-based plan (ie proactive, teaching, management, support), sharing examples: ☐ P1 ☐ P2 ☐ P3 ☐ P4 ☐ P5	☐ Yes ☐ No
9	Discussed overcoming habits associated with automatic parenting through mindfulness practices	☐ Yes ☐ No
10	Guided participants through the practice of creating breathing space, offering an opportunity for reflection: ☐ P ..... ☐ P ..... ☐ P	☐ Yes ☐ No
11	Guided participants through the practice of detaching from thoughts, offering an opportunity for reflection: ☐ P ..... ☐ P ..... ☐ P	☐ Yes ☐ No
12	Reviewed components of routine-based plan	☐ Yes ☐ No
13	Reviewed homework assignment, directing to LMS for resources	☐ Yes ☐ No

Table 4: Parental self-report and child reports for Practiced Routines: descriptive and paired t-test results for pre-test–post-test and pre-test–follow-up.

	Pre-test	**Post-test**	**Follow-up**	**Pre-post**	**Pre-follow-up**
Instrument	M (SD)	M (SD)	M (SD)	t-test	t-test
Family and parent variables					
Family quality of life	3.92 (0.5)	3.99 (0.5)	4.09 (0.5)	-1.64	-3.20**
Parental stress	2.36 (0.6)	2.25 (0.6)	2.31 (0.6)	2.88**	2.00*
Parenting scale	2.83 (0.5)	2.77 (0.6)	2.72 (0.6)	1.12	2.04*
Mindful parenting	2.09 (0.4)	2.06 (0.4)	2.13 (0.4)	0.78	-1.27
Parent knowledge	12.69 (2.7)	14.52 (2.70)	15.09 (2.5)	-5.39***	-6.87***
Child behaviour					
Total difficulties (SDQ)	20.29 (5.6)	19.27 (5.2)	18.11 (5.4)	2.62*	5.05***
Internalising (SDQ)	8.78 (3.5)	8.26 (3.3)	7.63 (3.3)	2.30*	3.90***
Externalising (SDQ)	11.51 (3.3)	11.01 (3.1)	10.48 (3.5)	2.01*	4.10***
Maladaptive (SIB-R)	-21.30 (12.4)	-20.35 (13.0)	-17.21 (12.1)	-1.01	-2.21***
Adaptive (SIB-R)	62.94 (15.1)	65.56 (15.4)	66.18 (16.5)	-3.12**	-3.94***

Note. *$p < .05$. **$p < .01$. ***$p < .001$. t is $p < .10$. Scales of Independent Behavior Revised (SIB-R) maladaptive behaviour are totals of negative behaviours ranging from -70 (very serious) to 10 (normal). SIB-R adaptive behaviour scores are presented as total scores and range from 0 to 120.

Dosage was measured as the percentage of components (eg videos, forms, supplemental resources) accessed by the participants.

Data analysis

To address the between-group RCT hypotheses predicting differential change in outcome measures between conditions over time we used analysis of covariance (ANCOVA) models that allow for examination of cross-sectional effects and mean adjusted outcomes. The ANCOVA models (adjusted for pretest scores) were used for analyses of change in the outcome measures at post-test and follow-up. Changes within each group were evaluated over time within condition using repeated-measures t-tests. The normality of all outcome measures was examined within each group with all having acceptable levels of skewness (all below 0.7) and kurtosis (all below 1.0), with no outliers (George and Mallery, 2016).

Results

There were no statistical differences in dosage by condition (p = .511). In PR, parents opened 85.5% (SD = 21.9%) of videos, fillable forms, and other items in the LMS. In TR, parents opened 82.5% (SD = 31.4%) of these items. The study results included statistical between and within group comparisons of pre-test, post-test, and follow-up administrations of the standardised assessments, as well as the knowledge check. In addition, we analysed the responses to the consumer satisfaction questionnaire.

Table 5: Parental self-report and child reports for Teaching Routines: descriptive and paired t-test results for pre-test–post-test and pre-test–follow-up

	Pre-test	**Post-test**	**Follow-up**	**Pre-post**	**Pre-follow-up**
Instrument	M (SD)	M (SD)	M (SD)	t-test	t-test
Family and parent variables					
Family quality of life	3.71 (0.6)	3.86 (0.6)	3.98 (0.6)	-3.15**	-3.49***
Parental stress	2.69 (0.6)	2.61 (0.7)	2.61 (0.6)	1.57	1.30
Parenting scale	2.98 (0.6)	2.85 (0.6)	2.83 (0.6)	3.00**	3.03**
Mindful parenting	1.94 (0.4)	1.99 (0.4)	2.05 (0.5)	-1.49	-5.59*
Parent knowledge	12.35 (2.5)	13.37 (2.4)	13.49 (2.5)	-3.55***	-3.56***
Child behaviour					
Total difficulties (SDQ)	22.28 (6.4)	21.00 (5.6)	19.82 (6.1)	3.05**	5.83***
Internalising (SDQ)	10.16 (3.9)	9.51 (3.8)	8.94 (3.7)	2.64**	4.45***
Externalising (SDQ)	12.11 (3.6)	11.49 (3.2)	10.88 (3.6)	2.34*	4.16***
Maladaptive (SIB-R)	-22.65 (11.6)	-21.76 (12.5)	-18.08 (12.9)	-0.87	-3.02**
Adaptive (SIB-R)	62.46 (16.8)	63.87 (16.2)	66.10 (15.8)	-1.95	-3.87***

Note. *$p < .05$. **$p < .01$. ***$p < .001$. t is $p < .10$. Scales of Independent Behavior Revised (SIB-R) maladaptive behaviour are totals of negative behaviours ranging from -70 (very serious) to 10 (normal). SIB-R adaptive behaviour scores are presented as total scores and range from 0 to 120.

Between groups

There was a statistically significant condition effect for parent self-report for knowledge, with the parents in the PR group showing greater knowledge than the parents in TR group at both post-test (p = .002; η^2 = .064), and follow-up (p's = .001; η^2 = .092), with a medium magnitude of effect at both times. There were no significant effects at either post-test or follow-up for quality of life (p = .81 and .98), parental stress (p = .13 and .18), parenting behaviours (p = .40 and .99), and mindful parenting (p = .39 and .76). There were no significant condition effects on parent-reported child behaviours at post-test or follow-up on the total SDQ (p = .60 and .63), SDQ internalising (p = .65 and .47), SDQ externalising (p = .88 and .89), SIB-R maladaptive (p = .81 and .73), and SIB-R adaptive (p = .25 and .57).

Within groups

Tables 4 and 5 display the paired t-test results for the PR and TR conditions, respectively, for pre-test–post-test and pre-test–follow-up within group analyses.

Posttest

The quasi-experimental within-group evaluation of the change between pre-test and post-test in each condition showed that the PR group improved on parental stress (p = .005; d = .84) and parenting knowledge (p = .001; d = .63), with a large and medium magnitude of effect, respectively. PR group scores on dysfunctional parenting (PS) decreased from 2.98 to 2.85 to 2.83 at pre-test, post-test, and follow-up, moving closer to the non-clinical range. Parents reported improvements in their children's behaviours on the total SDQ (p = .011; d = .29) and on internalising (p = .024; d = .25)

and externalising (p = .048; d = .22) sub-scales, with a small magnitude of effect for each measure. Parents also reported improvements in children's overall adaptive behaviours on the SIB-R (p = .003; d = .36), with a small magnitude of effect. Adaptive behaviour scores improved from 62.94 to 65.56 to 66.18, but remained within the limited range of functioning. The PR group's maladaptive behaviour scores from pre-test to post-test did not show statistically significant improvement (p = .47) but did so at follow-up (p < .001). The PR group also did not show significant improvement at post-test in quality of life (p = .11), parenting behaviours (p = .27), and mindful parenting (p = .44).

The TR group showed improvements on quality of life (p = .002; d = .36); parenting behaviours (p = .002; d = .35); and parenting knowledge (p = .001; d = .40), with a small magnitude of effect. The scores on dysfunctional parenting (PS) decreased from 2.98 to 2.85 to 2.83, moving closer to the non-clinical range. They also reported improvements in child behaviour on the SDQ total scale (p = .003; d = .33), as well as the internalising (p = .01; d = .28) and externalising (p = .022; d = .56) sub-scales, with the magnitude of effect ranging from small to medium. The TR group did not show significant improvement in parenting stress (p = .12) and mindful parenting (p = .44). The TR group also did not show significant improvement on the SIB-R for maladaptive (p = .39) and adaptive (p = .06) behaviours.

Follow-up

The quasi-experimental within-group evaluation of the change between pre-test and follow-up in each condition demonstrated that the PR group improved at follow-up on quality of life (p = .002; d = .39); stress (p = .05; d = .13); parenting behaviours (p = .05; d = .24); and knowledge (p = .001; d = .96), with the magnitude of effect ranging from small to large. They reported improvements in their children's behaviour on the total SDQ (p = .001; d = .55) as well as on the internalising (p = .001; d = .44) and externalising sub-scales (p = .001; d = .45); and on the adaptive behaviours (p = .001; d = .45) and maladaptive behaviours, (p = .001; d = .47) of the SIB-R. All scores showed a moderate magnitude of effect. The PR group did not show significant change on mindful parenting (p = .21).

The TR group showed improvements on quality of life (p = .001; d = .49); parenting behaviours (p = .003; d = .32); parenting knowledge (p = .001; d = .47); and mindful parenting (p = .001; d = .35), with a magnitude of effect ranging from small to moderate. They reported improvements in their child's total behaviours on the total SDQ (p = .001; d = .68), and on the internalising (p = .001; d = .49) and externalising sub-scales (p = .001; d = .52); as well as improvements on adaptive behaviours (p = .001; d = .60) and maladaptive behaviours (p = .001; d = .46) on the SIB-R. All scores showed a moderate magnitude of effect. They did not change significantly on parenting stress (p = .20).

Consumer satisfaction

In response to the consumer satisfaction questionnaire, the parents in both groups rated the programs positively. However, satisfaction with the PR program was significantly higher (p = .045) in general, and specifically on items related to overall satisfaction with the quality of the program, access to information about parenting a child with ASD, plan to use the teaching strategies, and a desire for more training in the format offered. In response to the open-ended questions, parents in both groups indicated that they liked the content and variety of resources provided, as well as the flexibility of participating online and on their own time. The PR group appreciated being able to connect with other parents and get feedback from their parent educators (whereas these elements were suggested as additions by the TR parents), as well as the problem-solving process that allowed them to apply ABA principles with greater creativity. Time and technology issues were reported as a challenge for parents in both groups and the PR parents suggested meeting more frequently, but for shorter durations. Reviews on mindfulness practices in the PR condition were mixed, with some parents noting that component as highly preferred and others suggesting that it could be omitted or addressed in a separate program.

Discussion

The study evaluated the PR and TR online behavioural training programs across five family and parent outcome measures and four child behaviour outcome measures. In regard to between group effects, the PR group showed greater improvements in parenting knowledge. Parents' satisfaction ratings of the PR program also were significantly higher. For the other outcome measures, there were no significant differences in outcomes between the programs. This result is interesting given the robust nature of the PR curriculum and facilitation provided by the parent educators. It is possible that parents in the study would have benefitted from any training program given their lack of previous access. Another hypothesis is that the PR program was more complex and demanding than the TR program, thereby evening out the impact.

The feedback parents offered in the consumer satisfaction questionnaire appears to support these possibilities. The responses to the open-ended questions provided insight regarding why parents reported significant gains, as well as possible drawbacks of the programs. Parents reported liking the content, resources, and flexibility of both programs. They valued strategies that were relevant to their needs and fit within their routines. Parents in PR enjoyed opportunities to connect with one another and receive feedback from the parent educator, but also reflected on scheduling challenges and other concerns.

Combining the facilitated program with online meetings and mindfulness practices in PR may have increased the demands of that condition, in comparison to the simpler TR program. Some of the participants found the PR program to be complex and suggested that the mindfulness component would be better taught separately. Moreover, there were technology challenges, such as participant difficulty in joining the online meetings, low bandwidth causing compromised streaming, and occasional hanging and freezing.

In regard to within group effects, compared to the pre-test condition, both the PR and TR programs were associated with improvements in six out of ten family, parent, and child outcome measures at post-test, and nine out of ten of these outcomes at follow-up, albeit not the same sets of outcomes at the two time points. The magnitude of these within-group effects ranged primarily from small to medium. There were some measures on which only the PR group had significant change, but not statistically different than the TR condition and vice versa. Both groups showed improvement in parent knowledge and child behaviour at both administrations. PR improved in parental stress at the post-test and follow-up, and in family quality of life (FQoL) and parenting behaviours at follow-up. TR improved in FQoL and parenting behaviours at both administrations, and mindful parenting at follow-up. Parent knowledge was higher for the PR group, but that would be expected given the difference in the content of the programs. Child behaviour improved for both groups, with scores on the general maladaptive index improving from the moderately serious to marginal range.

Limitations

The most significant limitation of this study was that it was underpowered for a content comparison study. Another significant limitation is that the study did not include a business-as-usual condition, which limits our ability to make causal statements about the effects, due to possible confounds. Because both programs demonstrated significant changes over time, the between condition comparisons demonstrated small effect sizes, which resulted in non-significant directional effects. We must acknowledge that the sample for the study was predominantly White, educated parents, which limits the generalisability of the results. In addition, the measures were exclusively parent-reported, meaning that parental opinions may have been influenced merely by participating in the instructional programs.

It also is difficult to tease out which of the components and features within each program contributed to the participant outcomes. This study assessed different modes of delivery (ie self-directed versus facilitated via online meetings) as well as different content (ie emphasis on function-based interventions and the inclusion of mindfulness practices in the PR program). Even with these significant limitations, the study still offers some insight regarding online parent training.

Implications of findings

This study demonstrated that accessible online training may benefit families by increasing parent knowledge, skills, and efficacy – thereby improving the behaviour of children with ASD. Providing BPT in this way could act as a supplement for families who are not receiving adequate services (McIntyre and Zemantic, 2017). The ability of parents to learn principles and adopt strategies with limited support is important. The study demonstrated that parents can be taught to be effective problem-solvers, thereby taking a more active role in behavioural intervention practices that can work within their typical daily routines. As has been demonstrated in recent studies (Dunlap, Strain, Lee, Joseph and Leech, 2018; Durand, Hieneman, Clarke, Wang and Rinaldi, 2012; Fettig and Barton, 2014), this approach to BPT is likely more sustainable than those that create an overreliance on direct intervention by therapists.

In contrast to much of the clinical research and practice on mindfulness which requires extensive meditative practice (Bazzano et al, 2015; Neece, 2014), we demonstrated that mindfulness strategies can be woven into routine-based behaviour support plans. Although there were no statistically significant differences in mindful parenting outcomes in the between-group comparisons, and from pre-test to post-test and follow-up for the PR group in the within-group comparisons, there is some evidence that mindfulness training was associated with a beneficial effect for the PR group. The quasi-experimental, within-group analyses showed that the PR group, and not the TR group, experienced significant improvements in parental stress from pre-test to post-test and follow-up. Given the interrelationship between mindfulness and stress reduction, this is a promising finding (Cachia, Anderson, and Moore, 2016).

Future directions

Future studies should address the methodological limitations of this study. It also would be helpful to tease out different methods of delivery of online BPT to evaluate which approaches or components are most accessible and sustainable, and have the greatest impact on quality of life.

Online BPT programs could be integrated within systems of care. A tiered and responsive approach to helping families of children with ASD that includes self-directed and facilitated interventions provided either individually or in groups, depending on the children's and families' needs and circumstances, would improve the quality and accessibility of services (McCart, Wolf, Sweeney, Markey and Markey, 2009). With this type of training, parents of children with ASD could access evidence-based information more readily, becoming empowered to take a more active, effective, and sustainable role in supporting their children.

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