Positive Parenting Program (Triple P) for Families of Adolescents With Type 1 Diabetes: A Randomized Controlled Trial of Self-Directed Teen Triple P

Francesca M. Doherty,1 BSc, PhD, CLINPSYD, Rachel Calam,1 MCLINPSYCHOL, PhD, AFBPS, and Matthew R. Sanders,1,2 BA, MA, DIPEDPSYCH, PhD

1School of Psychological Sciences, The University of Manchester, and 2Parenting and Family Support Centre, The University of Queensland

All correspondence concerning this article should be addressed to Dr Francesca Doherty, Clinical Psychologist, BAIS, Children’s Department, The Arches Centre, Westminster Avenue North, Belfast, BT4 1NS. E-mail: francescadoherty@hotmail.com

Received November 14, 2012; revisions received May 23, 2013; accepted May 24, 2013

Objectives Adolescents with type 1 diabetes (T1D) have shown improvements in glycemic control and family relations, via clinic-based family interventions. However, reach and clinician availability may be limited. We evaluated a self-directed intervention for this purpose. Methods Recruitment for a randomized controlled trial (RCT) occurred through national advertising with diabetes charities and conducted with online data collection. Parents of 11–17-year-olds with diabetes were randomized to usual care (n = 37) or intervention (n = 42) using computerized block randomization. The 10-week intervention comprised the Self-directed Teen Triple P workbook (10× 1 hr modules) plus chronic illness tip sheet. Primary outcomes of diabetes-related family conflict and parenting stress were assessed pre and post-intervention. Results Intention-to-treat analyses (n = 79) identified significantly improved diabetes-related conflict, but not parental stress, compared with usual care. Conclusions The preliminary findings suggest that this could be a useful way to expand intervention reach for this population.

Key words adolescents; adherence; children; chronic illness; diabetes; family functioning; family therapy; health behavior; parenting; parent–adolescent communication; parent stress; randomized controlled trial.

Improved glycemic control in Type 1 diabetes (T1D) is associated with decreased rates of both chronic and life-threatening complications in T1D [Diabetes Control and Complications Trial (DCCT, 1994)]. These findings led to guidelines aiming for optimum glycemic control with a mean blood glucose level (HbA1c) of ≤7.5% in adolescents with T1D (NICE, 2004). However, <20% of adolescents with T1D currently meet these guidelines (National Paediatric Diabetes Audit: NPDA, 2011). Hormonal changes and insulin resistance influence glycemic control (Amiel, Sherwin, Simonson, Lauritano, & Tamborlane, 1986); however, progression to greater self-care has been cited as a further key issue. When adolescents take responsibility for T1D self-management too early, they can make more mistakes in self-care and have poorer glycemic control (Wysocki et al., 1996). When parental involvement (and the significant challenges of meeting glycemic targets) does not concur with the adolescent’s desire for autonomy, this may lead to conflict or relationship stress. Family functioning has been shown to account for 34% of the variance in glycemic control, compared with only 10% for adherence (Lewin et al., 2006), indicating that improving on family functioning itself offers potential for producing indirect health benefits. Parent–adolescent communication (Wysocki, 1993) and diabetes-related conflict (Anderson et al., 2002) have been associated with T1D outcomes in cross sectional studies, and correlate with T1D self-management during adolescence (Laffel et al., 2003). Positive
communication between parent and adolescent is essential. This shared responsibility approach, facilitating developmentally appropriate independence to T1D management, can lead to better psychological adjustment and self-management in adolescents (Anderson et al., 2002).

Some randomized controlled trials (RCTs) of interventions have family components. Family relationships and communication improved using Behavioral Family Systems Therapy (BFST) for adolescents with T1D. When adapted to include T1D-specific components (BTST-D), there were significant improvements in family conflict and adherence, and glycemic control, with glycemic control effects maintained at 24-month follow-up (Wysocki et al., 2006; 2008). “WE-CAN manage diabetes,” a lower-intensity clinic-integrated behavioral intervention, also demonstrated significant cumulative improvement in HbA1c, especially among individuals aged 12–14 (Nansel, Iannotti, & Liu, 2012), although behavioral outcomes were not reported.

Four key issues stand out from recent research literature on adolescents with T1D and their families. (1) Several systematic reviews (e.g., Hampson et al., 2000) have highlighted that interventions with a sound theoretical basis demonstrate greatest potential. (2) Maintaining developmentally appropriate parent involvement and minimising parent–adolescent conflict are both crucial to help maintain good health during the early adolescent years (e.g., Ellis et al., 2008; Wysocki et al., 2008). (3) Tailoring interventions to address key condition issues enhances effects. Some interventions demonstrate improved family processes overall but when condition components are added, improvements in clinical issues such as adherence and glycemic control also occur (Wysocki, Greco, Harris, & White, 2000; Wysocki et al., 2006). (4) Given the numbers of adolescents struggling to attain glycemic control targets, and the relationship with family functioning, there is clear need for a wider reaching family intervention (with condition components) to support these families. Offering appropriate assistance via approaches other than face-to-face therapies could be efficient and cost effective (Glasgow & Osteen, 1992).

The Triple P Positive Parenting Program is a behavioral family intervention system based on social learning principles (Sanders, 1999). It has been developed as a public health model (Sanders, Markie-Dadds & Turner, 2012) that implements a multi-level approach designed for different levels of intensity, need, and age-group, with different delivery modalities (see Figure 1). The five levels of intensity are on a tiered continuum of increasing strength to maximize efficiency, contain costs, avoid over-servicing, and maximise population reach. Meta-analysis of the program identifies positive change in parent skills, child behavioral outcomes, and parent well-being, varying as a function of intensity (Nowak & Heinrichs, 2008).

The Teen Triple P workbook is a Level 4 self-directed family intervention based on a self-regulatory model designed to promote healthy teenage development. The self-directed condition involves 10 weeks of structured learning tasks with no therapist contact. An enhanced condition (self-directed + brief therapist telephone contact) increased module completion and successfully addressed a variety of common emotional and behavioral problems. Therapist contact was semi-structured with minimal prompts to encourage parents to problem solve using learned strategies (Stallman & Ralph, 2007). Although Triple P is generally successful in improving child behavioral outcomes, more than half of its parenting strategies focus on developing positive relationships and attitudes. It helps parents put learned parenting and relationship strategies into practice and enhances their skills.

The program also has a series of tip sheets, which accompany the workbooks. The tip sheets provide help on specific topics (e.g. eating habits, coping with anxiety, drinking alcohol), and signpost to relevant sections in the workbook to promote parental problem solving. Previous research illustrates that family environment predicts
adjustment more than diagnostic category (Stein & Jessop, 1989), and that many children live with psychosocial commonalities across a variety of chronic illnesses (Pless & Nolan, 1991). This presented researchers an opportunity to develop wide-reaching prevention and intervention strategies across childhood illnesses. A Triple P tip sheet was developed (Morawska & Sanders, 2010) to address common issues that families living with a chronic illness may face (e.g. Morawska, Stelzer, & Burgess, 2008).

The present study was an RCT aimed at testing the effectiveness of self-directed Teen Triple P combined with the “Chronic Illness” tip sheet to test whether this could benefit families of adolescents with T1D. The two primary hypotheses were that compared with usual care comparison that self-directed Teen Triple P would result in significantly lower levels of (1) diabetes-related family conflict and (2) parental stress. The three secondary hypotheses were that the intervention would significantly positively increase (1) parental perceptions of child’s behavior, (2) feelings about being a parent, and (3) parenting style.

Methods

Prior to the current study, feasibility was established through consultation with 16 families with a child with T1D attending a charity-run Diabetes UK care event. Families identified key themes of importance, which coincided with areas already included in the previous Chronic Illness tip sheet. Subsequently, parents then received the tip sheet for review and feedback. This resulted in two minor modifications.

Trial Design

The RCT was a national (UK) two-group parallel study with equal randomization. Participants were enrolled, following approval from the University’s Ethics Committee.

Sample Size

Expected parameters, such as effect size, standard deviation, or difference in values were unknown for primary outcomes, as this was the first study of its kind at this level of intensity. However, self-directed Teen Triple P “Enhanced” (plus brief therapist telephone contact) reports mainly large effect sizes on parent-reported child behavior (0.74, 0.96, and 1.14) and parenting outcome measures (0.58 and 1.12) (Stallman & Ralph, 2007). As these were secondary rather than primary outcome parameters, a conservative estimate of effect size was used. Therefore, sample size was calculated to detect an effect size of 0.7 at 80% power requiring 68 participants. A target of 80 participants (Time 2 completed) was set to allow for differences in motivation and effect size (previous sample not subject to free healthcare).

Participants and Settings

The research was co-ordinated from a University base, and was an internet-based study via the Web site www.diabetesandparenting.org.uk, allowing nationwide data collection. Recruitment took place via diabetes voluntary groups and charities. Advertisements were placed in Diabetes UK’s research Web site, their “Balance” magazine, and Facebook page, and the Juvenile Diabetes Research Foundation (JDRF) research Web site. Participants self-enrolled via the study Web site, or contacted the research team for a paper-based option.

Eligibility criteria for the study were parents (or primary care givers) of adolescents aged 11–17 years with T1D. The exclusion criteria were as follows: (1) the parent required reading assistance and did not have anyone who could help them, (2) their child had other additional significant health difficulties (well-controlled asthma or coeliac disease allowed), or (3) the parent or child had a mental health diagnosis. These exclusions were required, as individuals may need specific individualised support (for instance a Level 5, or equivalent intervention). Excluded parties were signposted to alternative services.

The first page of the Web site presented the participant information sheet. Individuals were then only able to proceed if they met criteria for the screening questions for inclusion/exclusion criteria. Once eligible individuals had completed the online consent form, they could take part in the baseline questionnaires. Participants chose a username and password to continue completion as required, and a status bar indicated progression. A unique code linked baseline and post-intervention data. Printed consent forms and questionnaires were available for participants not wishing to take part online.

Completion of online questionnaires (or printed option) was at a place and time of the participants’ convenience. Participants in the intervention group were posted the self-directed Teen Triple P intervention, which comprised a paper-based workbook and tip sheet. Participants completed this at their convenience. No prior training was required for either researcher or participant. All materials used were for the reading age of a typical 11-year-old. Participants did not receive any financial remuneration for taking part.

Randomization and Allocation Concealment

A computerised block randomization program ensured equal allocation of participants to one of two groups,
The Teen Triple P workbook is a self-directed behavioral family intervention, based on social learning principles used to help parents build on their existing skills and information to practice positive parenting. A self-regulatory model is the basis of the 18 core skills, which fall into four main categories of skill building: (1) increase positive parent–teenager relations; (2) increase desirable behavior; (3) teach new behaviors and skills; and (4) manage problem behavior. The workbook builds on weekly exercises to help the family use and implement the suggested strategies. Modules 1–3 cover goal setting, increasing desirable behavior and managing problem behavior, which includes the use of behavioral contracts and tools for monitoring change. Modules 4–6 encourage practice of these strategies, with guidance on how to review effectiveness and amend where necessary. Module 7 provides strategies on dealing with risky behavior, with modules 8–9 providing the opportunity to practice implementing the routines. Module 10 reviews progress over the course of the program, identifying strategies to maintain improvements and setting future goals. The tip sheet links the principles of Triple P to common themes that arise in chronic illness. It illustrates effective practical ways of how to apply the prevention and behavior management advice from the workbook to solve common issues. These include reasons for increased behavioral and emotional difficulties in chronic illness, prevention and coping advice for managing treatment routines, reducing family stress, helping siblings cope, and reducing anxiety.

Like the brief telephone contact in self-directed Teen Triple P “enhanced,” the tip sheet gave examples of how to problem-solve and signposts to relevant sections in the workbook. The workbook and tip sheet allowed for standardisation of the program, and operated on the principle of “minimally sufficient information.” To track program integrity, participants received a module checklist to record whether they had read the corresponding module. A programmable online text-messaging system (MeerCat-Communications, n.d.) sent participants weekly texts at a day and time of their choice. These were to act as a reminder to complete the module and corresponding checklist for that week, and as motivation for continued participation. Participants completed the online “Treatment Integrity” questionnaire at the end of the trial using the module checklist.

Outcomes
Participants self-reported all measures via the Web site www.diabetesandparenting.org.uk/support, or postal questionnaires (one participant).

Baseline Data
The Family Background Questionnaire (Sanders, Markie-Dadds, & Turner, 1999) collected baseline demographic information. It is a 16-item measure of demographic information including gender and age of the parent and the child, socioeconomic status, and level of education. Pre-intervention information collected participant contact details, address, email, and cell phone number to contact participants as previously specified and forward resources where relevant. Participants selected a day and time for their weekly text reminders. The T1D-specific information collected included date of diagnosis, parent-reported date/value of child’s most recent HbA1c, and child’s current treatment regime (insulin/pump therapy). The
parent-reported HbA1c could not reflect change as the trial was 10 weeks duration, but provided an indicator of baseline glycemic control.

**Baseline and Post-Intervention Data**

Missing data were minimised using a forced-choice questionnaire format, so participants would need to complete all items before moving to the next questionnaire.

Both groups completed the two primary and three remaining secondary outcomes at baseline and post-intervention. Primary outcomes concentrated on family conflict around diabetes-related tasks and parental stress in relation to caring for a child with an illness.

The updated and revised *Diabetes Family Conflict Scale* (rDFCS; Hood, Butler, Anderson, & Laffel, 2007) caregiver form contains 19 items on T1D-specific family conflict. It measures negative emotions around blood glucose monitoring, quality of life, and perceived parental burden from T1D management. Score range from 19–57, where high scores indicate increased conflict. It has good internal consistency ($\alpha = .81$) (Hood, Butler, Anderson, & Laffel, 2007).

*Paediatric Inventory for Parents* (PIP; Streisand, Braniecki, Tercyak, & Kazak, 2001) is a 42-item self-report measure of parental stress in relation to caring for a child with an illness. It records a score for both frequency and difficulty associated with each item. The frequency and difficulty scores were significantly correlated ($r = .81$, $p = .001$) in the sample. Multiplicity effects were minimised by combining the scores into one variable. Scores could therefore range from 84–420, where high scores indicated more frequent and more stressful events. Internal consistency for the PIP in T1D populations has been shown to be good for both scales, frequency: $\alpha = .94$, difficulty: $\alpha = .96$ (Streisand, Swift, Wickmark, Chen, & Holmes, 2005; Hilliard, Monaghan, Cogen, & Streisand, 2011).

Both groups completed the remaining secondary outcomes at baseline and post-intervention. These included parental perceptions of child’s behavior, feelings about being a parent, and parenting style.

*Eyberg Child Behavior Inventory* (ECBI; Eyberg & Robinson, 1983) is a 36-item measure on parental perceptions of their child’s behavior. Intensity scores range from 36–252, where high scores indicate behaviors that are more problematic. It has high internal consistency in children with T1D $\alpha = .92$ (Hilliard, Monaghan, Cogen, & Streisand, 2011), and has good test–retest reliability ($r = .86$) (Robinson, Eyberg, & Ross, 1980).

*Parenting Scale* (PS; Arnold, O’Leary, Wolff, & Acker, 1993) is a 30-item parental report measure of parenting style / discipline strategies. The total score calculated is an average of all 30 items. Total scores may range from 1–7, where high scores indicate less effective parenting strategies. It has adequate internal consistency ($\alpha = .84$), good test–retest reliability ($r = .84$), and reliably discriminates between parents of clinic and non-clinic children (Arnold et al., 1993).

*Parenting Sense of Competence Scale* (PSOC; Johnston & Mash, 1989) involves 16 items related to feelings about being a parent. Scores range from 16–96, where high scores indicate higher self-confidence in parenting skills. It shows a satisfactory ($\alpha = .79$) level of internal consistency (Johnston & Mash, 1989).

**Intervention Group Only**

Individuals in the intervention group received text reminders to read the weekly chapter and complete the module checklist (posted with Triple P resources). Participants then used the posted checklist to complete the online version at the end of trial as a measure of treatment integrity.

**Recruitment**

Recruitment took place over a five-month period, October 2011 to March 2012. To aid full data collection, participants who had not completed baseline data, received up to two reminder emails (1 week apart). Participants were considered non-completers if they did not respond to them. Ten weeks after participants completed baseline questionnaires, they received an emailed link to the Web site and instructions detailing how to access the next set of questionnaires. For the second set of questionnaires, participants received a text message that week as a prompt for questionnaire completion. Where required, participants received up to two extra emails/text reminders (1 week apart). All participants received reminder emails/texts regardless of group, unless they had already completed data.

**Statistical Analysis**

Data were checked for normality of distributions, outliers, or data entry errors before analyses, using SPSS 16.0. To identify any potential covariates that had not been sufficiently minimised by the randomization process, statistical analyses compared the groups at baseline on demographic variables. ANCOVAs were conducted with pre-intervention scores entered as covariates to control for variability at baseline, and post-intervention scores entered as dependent variables. The two primary outcomes were family conflict around diabetes-related tasks and parental stress in relation to caring for a child with an illness, as measured by the revised rDFCS and PIP, respectively. Secondary outcomes included parental perceptions of child’s behavior,
feelings about being a parent, and parenting style, as measured by the ECBI, PSOC, and PS. To manage missing data, an intention-to-treat “last observation carried forward” was undertaken, where the most recently observed outcome measure (baseline assessment) is assumed to hold for subsequent outcome assessments times (Lachin, 2000). This method helps minimise potential bias in the outcomes from differential dropouts. Finally, an exploratory correlational analysis of the intervention group explored the relationship between treatment integrity (number modules completed) and “percentage change” on outcome measures.

Results

Participant Flow

Figure 2 summarizes participants’ progress through the trial according to the CONSORT flow diagram for RCTs.
The study involved national advertising through diabetes charities media sources; therefore, the number of eligible participants was unknown. Of the 90 individuals who consented to take part, 82 (91%) completed baseline assessment. Time 1 completers (n = 82) and non-completers (n = 8) were compared on age, gender, and HbA1c of child. There were no significant differences. Two individuals were later excluded due to other significant mental health issues, and one was excluded as a non-UK resident (as this was beyond the scope of the ethical approval), leaving 79 participants.

Subject retention through the study was 68% (54 of 79 participants). There was greater attrition from the intervention group, 52% (22 of 42) compared with 86% (32 of 37) of the usual care comparison group completing Time 2 (post-intervention) questionnaires. Drop out by group was statistically significant ($\chi^2 = 10.58$, df = 1, $p = .001$). To test for attrition bias, Time 2 completers (n = 54) versus Time 2 non-completers (n = 25) were compared on all baseline demographics and Time 1 (pre-intervention) questionnaires, using $\chi^2$ and independent $t$ tests as appropriate. No statistical differences were noted across any variables. No study-related adverse events were reported.

### Baseline Data

Demographic characteristics of the families who participated are summarised in Tables I and II. Preliminary analyses checked whether randomization had produced comparable groups. There were no significant differences between baseline characteristics except for duration of T1D. The usual care comparison group had longer duration of T1D ($6.0 \pm 2.7$) compared with the intervention group ($4.3 \pm 3.8$), $t(74.29) = -2.36, p = .021$. However, analyses did not control for this variable because it was not a statistically useful covariate, as it had very weak correlations with all dependent variables. In addition, pre-intervention scores were already identified as suitable covariates to control for baseline differences on post-intervention outcome measures. All other factors were well balanced between groups, including HbA1c, parent/child age and gender, family composition, and insulin modality. The overwhelming majority of parents who participated were female, with only one participant (1.3%) in the total sample being male.

### Table I. Demographic Characteristics of Sample (n = 79): Median and Range, Means and Standard Deviations

<table>
<thead>
<tr>
<th></th>
<th>Intervention group (n = 42)</th>
<th>Usual care comparison (n = 37)</th>
<th>Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Child age (years)</td>
<td>Median 13</td>
<td>13</td>
<td>Man Whitney U, Z = -1.78, $p = .075$</td>
</tr>
<tr>
<td></td>
<td>Rangea 11–17</td>
<td>11–17</td>
<td></td>
</tr>
<tr>
<td>Parent completing measure age (years)</td>
<td>Median 43</td>
<td>44</td>
<td>Man Whitney U, Z = -0.73, $p = .466$</td>
</tr>
<tr>
<td></td>
<td>Rangea 29–57</td>
<td>31–54</td>
<td></td>
</tr>
<tr>
<td>HbA1c (%)</td>
<td>Mean, SD 8.62 ± 1.33 (70 mmol/mol)$^b$</td>
<td>8.34 ± 1.18 (67 mmol/mol)$^b$</td>
<td>$t(75) = 0.96, p = .338$</td>
</tr>
<tr>
<td></td>
<td>95% Confidence interval 8.19–9.04</td>
<td>7.95–8.73</td>
<td></td>
</tr>
<tr>
<td>Diabetes duration (years)</td>
<td>Mean, SD 4.30 ± 3.78</td>
<td>6.04 ± 2.73</td>
<td>$t(74.293) = -2.36, p = .021$</td>
</tr>
<tr>
<td></td>
<td>95% Confidence interval 3.13–5.48</td>
<td>5.13–6.95</td>
<td></td>
</tr>
</tbody>
</table>

*aMissing D.O.B. data meant that age could not be analyzed as a continuous variable. However, all participants had stated their child and own age (in complete years) at registration, which is quoted and analyzed accordingly.

$b$New IFFC reporting range of HbA1c in mmol/mol.
comparison group \((n = 37)\) would be retained in the analysis, as randomized, regardless of whether they withdrew or not. The purpose of the approach was to preserve balance of group characteristics achieved by randomization. Analysis was undertaken by original assigned group (intervention group vs. usual care comparison).

### Intervention Effects on Parent Outcomes

Intervention effects for primary and secondary parent outcomes are presented in Table III. All baseline and post-intervention data were checked for outliers, normality, homogeneity of slopes, and homogeneity of variance to meet the assumptions of ANCOVA. The data for rDFCS met all assumptions when three outliers were removed. Data for PS just failed to meet homogeneity of slopes assumption \((F(1,75) = 4.03, p = .048)\), so this outcome should be interpreted with caution. All remaining data met assumptions. There were significant effects for all covariates (pre-intervention score) and their retrospective dependent variable (post-intervention score). Primary outcome ANCOVA analyses showed that participants in the intervention group reported significantly less conflict \((rDFCS)\) post-intervention than parents in usual care \((F(1,73) = 7.52, p = .008\)**). However, no significant difference was found between groups on measure of parental stress \((PIP\) total).

ANCOVA analyses showed that change on all secondary outcome measures were significant. Decreased scores on ECBI and PS, and increased score on the PSOC all represented positive change. Participants in the

**Table II. Demographic Characteristics of Sample \((n = 79)\):**

<table>
<thead>
<tr>
<th>Measures</th>
<th>Intervention group ((n = 42))</th>
<th>Usual care comparison ((n = 37))</th>
<th>Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Child Gender</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>27 (64)</td>
<td>18 (49)</td>
<td>(x^2 = 0.20)</td>
</tr>
<tr>
<td>Female</td>
<td>15 (36)</td>
<td>19 (51)</td>
<td>(p = .161)</td>
</tr>
<tr>
<td>Parent completing measure (n)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>1 (2)</td>
<td>0 (0)</td>
<td>(x^2 = 0.89)</td>
</tr>
<tr>
<td>Female</td>
<td>41 (98)</td>
<td>37 (100)</td>
<td>(p = .345)</td>
</tr>
<tr>
<td>Family composition</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 Parent Family</td>
<td>27 (64)</td>
<td>26 (70)</td>
<td></td>
</tr>
<tr>
<td>Blended (1 stepparent)</td>
<td>5 (12)</td>
<td>3 (8)</td>
<td></td>
</tr>
<tr>
<td>Single parent</td>
<td>9 (21)</td>
<td>7 (19)</td>
<td>(x^2 = 0.45)</td>
</tr>
<tr>
<td>Other</td>
<td>1 (2)</td>
<td>1 (3)</td>
<td>(p = .929)</td>
</tr>
<tr>
<td>Insulin modality:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Injections</td>
<td>29 (69)</td>
<td>24 (65)</td>
<td>(x^2 = 0.16)</td>
</tr>
<tr>
<td>Pump therapy</td>
<td>13 (31)</td>
<td>13 (35)</td>
<td>(p = .693)</td>
</tr>
</tbody>
</table>

**Table III. Effects of Intervention on Outcome Variables, Baseline to Post-intervention**

<table>
<thead>
<tr>
<th>Measures</th>
<th>Pre (baseline)</th>
<th>Post</th>
<th>Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>95% Confidence interval for mean</td>
</tr>
<tr>
<td></td>
<td>95% Lower Upper</td>
<td></td>
<td></td>
</tr>
<tr>
<td>rDFCS(^a) ((n = 41/35))</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intervention group</td>
<td>25.98</td>
<td>5.22</td>
<td>24.33</td>
</tr>
<tr>
<td>Usual care comparison</td>
<td>26.26</td>
<td>4.95</td>
<td>24.56</td>
</tr>
<tr>
<td>PIP ((n = 42/37))</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intervention group</td>
<td>182.60</td>
<td>62.81</td>
<td>163.02</td>
</tr>
<tr>
<td>Usual care comparison</td>
<td>207.62</td>
<td>58.72</td>
<td>188.04</td>
</tr>
<tr>
<td>ECBI ((n = 42/37))</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intervention group</td>
<td>89.86</td>
<td>31.25</td>
<td>80.12</td>
</tr>
<tr>
<td>Usual care comparison</td>
<td>97.57</td>
<td>30.35</td>
<td>87.45</td>
</tr>
<tr>
<td>PS(^b) ((n = 42/37))</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intervention group</td>
<td>2.86</td>
<td>0.64</td>
<td>2.66</td>
</tr>
<tr>
<td>Usual care comparison</td>
<td>3.19</td>
<td>0.38</td>
<td>3.00</td>
</tr>
<tr>
<td>PSOC ((n = 42/37))</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intervention group</td>
<td>67.26</td>
<td>13.06</td>
<td>63.19</td>
</tr>
<tr>
<td>Usual care comparison</td>
<td>65.92</td>
<td>10.58</td>
<td>62.39</td>
</tr>
</tbody>
</table>

\(^a\)Three outliers removed.

\(^b\)Data just failed to meet homogeneity of slopes assumption \((F(1,75) = 4.03, p = .048)\).
intervention group reported significantly fewer disruptive behavior problems (ECBI) ($F(1,76) = 7.50, p = .008$), more productive parenting strategies (PS) ($F(1,76) = 4.40, p = .039$), and higher self-confidence in parenting skills (PSOC) ($F(1,76) = 8.05, p = .006$) post intervention than usual care comparison.

**Exploratory Analysis of Intervention Components**

Previous Triple P research identified that treatment integrity was maintained on a 66% completion rate (Sanders, Montgomery, & Brechman-Toussaint, 2000). Post-intervention, the sample had on average completed 65% (6.5 modules ± 3.6) suggesting an acceptable level of treatment integrity. Correlation analysis explored the relationship between number of modules completed compared with percentage change (on pre-post scores). Higher module completion was associated with increased self-confidence in parenting skills ($r = -.46, p = .03$), but no correlation was found on the other outcomes.

**Discussion**

This web-based RCT is the first study to report the outcome of a self-directed parenting intervention for T1D. Overall, the results provided preliminary support for the efficacy of this self-directed intervention for families of adolescents with T1D. It demonstrated significant positive change in one of two primary outcomes, and all the remaining secondary outcomes. The results provided support for the first hypothesis, that the intervention could reduce parent-reported T1D-related family conflict. This decreased significantly in the intervention group by the end of the program, whereas the usual care comparison group remained the same. However, the second hypothesis that the intervention would reduce parent-reported stress, as measured on the PIP, was not supported. This is perhaps surprising considering the increased parenting self-confidence reported in the treatment group. The PSOC scale assessed self-confidence using satisfaction and efficacy items. Findings from general parenting and other pediatric literature suggest that increased parent self-efficacy may decrease stress (Gruis et al., 2001; Kwok & Wong, 2000; Streisand et al., 2005), but this was not detected. Possible reasons why this was not observed include the following points. The finding may be due to other unmeasured moderating variables. For instance, increased parental support may have confounded any stress reduction effect. Secondly, the PIP is a generic questionnaire, which was not specifically developed for parents of children with T1D, although it has been successfully used in T1D and parenting studies from clinic-based samples (Hilliard, Monaghan, Cogen, & Streisand, 2011). Although not significant, a greater reduction of stress was reported in the intervention group. Therefore, the study may not have had sufficient power to detect meaningful change for this particular outcome at this intensity of intervention. As diabetes is a life-long condition, even small reductions in stress across time can be fruitful, and may have indirect health benefits for parents. Therefore, determining sample size from an arbitrary level of “change required” would be artificial. Therefore, future research should determine fresh sample size calculations from expected parameters for this outcome, where available in current literature. Finally, the data for this primary outcome measure differed considerably between groups on the baseline values. Therefore, future research may also consider stratifying groups by the baseline values in order to facilitate homogenous groups for comparison.

Parents in the intervention group also reported additional benefits on the secondary outcome measures. For instance, although baseline reports of child behavior were not in the “clinically elevated range” (ECBI Intensity score ≥ 131; Eyberg & Pincus, 1999), parents still reported significant improvements on this measure. In addition, feelings about being a parent, and parenting style (as reported in the PSOC, and PS respectively) showed significant positive change. This illustrates the significant positive outcomes in more general aspects of parent-adolescent relationships and behaviors that parents and families may benefit from. Although PS data should be interpreted with caution (due to minor violation of homogeneity of slopes assumption, $p = .048$), future data should be compared to see whether findings on this measure are consistent.

Certain limitations of the study should be noted. There may have been selection bias due to the recruitment method. Individuals involved with diabetes charities may be more actively involved in their child’s T1D care, and perhaps more receptive to self-directed intervention. Nonetheless, the national recruitment strategy provided an opportunity to assess effectiveness in a way that had not been attempted before, and demonstrated that families were interested in taking part. Online data collection has benefits of reduced cost and lack of geographical boundaries, but there are also potential biases with this method. For instance, it can limit the reach to participants who have internet access and experience. However, this study also offered paper-based advertising through magazines, and paper-based questionnaire completion if requested.

It was also noted that the study had differential attrition from the intervention group. Although dropout by group was statistically significant, no significant
differences between reports from Time 2 completers and non-completers were observed, suggesting there was minimal attrition bias. Intention-to-treat analysis ensured non-completers were retained in the analyses. Despite this conservative approach, the study had sufficient power to detect the anticipated effects for most outcomes. In statistical analyses, the 0.05 level was used to interpret significant findings. Given the number of analyses, this would increase the chance of reporting type I errors. However, considering that the reported changes were all in the hypothesized direction, that significant changes were reported across all but one variable, and the levels of significance were mainly \( p < .01 \), this would suggest that the findings are robust.

Although there was still sufficient power to detect change, given the differential attrition from the intervention group, acceptability and feasibility issues merit further discussion. A consumer acceptability study of self-directed Teen Triple P (Woodhead, 2012) identified that parents found Triple P resources acceptable and reported relatively strong intentions to participate. The study collected rDFCS scores, which were significantly related to the usefulness ratings of workbook captions, and as rDFCS scores increased, acceptability ratings became stronger. Therefore, although some refinement may still be required, it appears that the intervention is generally acceptable to parents. Unfortunately, technical issues with the Web site significantly delayed recruitment, resulting in the trial running over Christmas (one of the key factors identified as a potential barrier to completion in the feasibility exercise). In addition, 10 participants in the intervention group dropped out due to issues such as illness, bereavement, and time constraints (see Figure 2). The comparison group had no equivalent time commitment over this period, with the added incentive of receiving their Triple P resources if they came back to complete time 2 questionnaires. A more flexible trial design could have allowed completion at a time more convenient to the participant. For instance, extending time 2 data collection by a couple of weeks could offer a catch-up window for missed modules.

A trial may differ slightly to a real-world intervention, as parents may feel more obliged to complete the modules, or be subject to demand characteristics on self-report measures. However, the potential for ‘social desirability’ bias was minimised by excluding personal contact during the study. Contact was via standardised email, text, or online data collection. Although beyond the feasibility of the current project, future research may wish to consider information from additional sources, such as observations of parenting, or adolescent self-reports. In addition, homework collection may give richer information on how parents use the intervention and could verify self-reported data.

While the provisional findings are promising, they also need to be considered with the caveat that no further treatment control or attention control groups were in place. To increase power of the study, the focus had been on intervention and usual care control. Ideally, future research could include an attention control group. For instance, an alternative face-to-face intervention, such as Teen Group Triple P, or a briefer, information only control, such as a tip sheet. An attention control group would introduce partial blinding for participants, and may limit effect of potential demand characteristics. It may also help identify if dropout is due to higher demand placed on intervention groups. The current study experienced an average completion rate of seven modules (for self-directed + tip sheet + text reminders) compared with eight modules for “enhanced” condition (self-directed + brief therapist telephone contact) in previous study (Stallman, Ralph, & Sanders, 2005). This finding raises an interesting suggestion that even minimal contact like text messaging may be a useful way to motivate and help parents remember to complete. Although there was no intervention group without texts, given that it is an extremely cheap way of communication, and that messages can be preselected to be sent on days, dates, and times of choice it is a system that could be cost-effectively implemented.

To be viable as a widely used preventative approach, parenting programs need to be cost-effective. The RE-AIM framework enables a quantitative examination of the impact of an intervention, by examining its Reach, Efficacy, Adoption, Implementation, and Maintenance (Glasgow, Nelson, Strycker, & King, 2006). Overall, the study results suggest promise for the combination of the self-directed Teen Triple P and Chronic Illness tip sheet as a cost-efficient vehicle for wide delivery of a program for families with adolescents with T1D. The significant parent-reported findings of reduced conflict and additional benefits for parent–adolescent relationship are important, as they have been obtained through helping parents empower themselves, unlocking their strengths. The present article addressed the immediate effects of the intervention, and the durability of the reported intervention effects have yet to be confirmed. However, the positive post-intervention effects offer preliminary support for this approach. Effects on HbA1c have yet to be determined. Studies with capacity to implement an attention control group, and conduct follow-up of the intervention group over a longer period incorporating biological measures could test maintenance. This could enable both examination of the intervention
using the RE-AIM framework, and determination of actual impact the reduced conflict may have on glycemic control. Ascertaining adolescent self-report measures could add valuable extra information. For instance, if reduced diabetes-related conflict in the adolescent could have positive health benefits by indirectly influencing glycemic control.

**Acknowledgments**

Triple P resources were provided free of charge by Triple P International.

**Funding**

This study was supported by a small research grant as part of the University of Manchester Doctorate in Clinical Psychology (F.D.). The full research protocol can be made available on request.

**Conflict of interest:** F.D. and R.C. have no competing interests. M.S. is the founder and lead author of the Triple P - Positive Parenting Program, and is consultant to Triple P International. No author has any share or ownership in Triple P International.

**References**


MeerCatCommunications (n.d.). Retrieved from http://meercatsms.co.uk/


