THE UNIVERSITY OF QUEENSLAND

AUSTRALIA

Telephone-supported versus self-directed delivery of an online parenting program:

Outcomes, mediators and moderators of change

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BPsyc (Hons)

A thesis submitted for the degree of Doctor of Philosophy at

The University of Queensland in 2016

School of Psychology

Abstract

Despite the availability of high quality, evidence-based parent training programs, research suggests that many parents that might benefit from support do not access it. The potential for web-based parenting programs to increase the reach and availability of parenting support is enticing, however relatively few online parenting programs are available and only a small number of randomised studies have so far been conducted exploring their efficacy.

Chapter 1 of this dissertation summarises the available literature underlying the current state of web-based parenting support, and provides an introduction to the Triple P—Positive Parenting Program and the recently developed Triple P Online program, used in a randomised controlled trial that forms a focus of this thesis. A rationale is provided for the research questions at the centre of this thesis, including exploring whether brief, regular practitioner support improves outcomes when combined with a web-based parenting intervention, whether measured baseline characteristics, such as participant sociodemographic status, interact with treatment condition to moderate intervention efficacy, and an endeavour to both identify and test hypothesised causal mechanisms.

Chapter 2 describes a multisite randomised controlled trial aiming to test the additive benefit of regular, brief clinical telephone consultations provided as an adjunct to Triple P Online. One-hundred and eighty-three participants were randomly assigned to access the online program either on their own, with support from an allocated practitioner who provided up to eight telephone consultations on a weekly basis, or to a computer-use-as-usual control group. Across the 16-week period of online program access, participants in the clinically-supported group engaged in about 4 telephone consultations on average, with a mean call duration of approximately 20 minutes. Intervention effects and program completion rates were significantly improved for these parents when compared to those completing the program without therapist involvement.

Chapter 3 describes a process of content analysis used to identify a various theoretically-derived putative mechanisms of parenting change thought to be causally associated with parenting outcomes during participation in Triple P. Drawing on the experience of Triple P practitioners, mechanisms were ranked for perceived importance, and distilled to eleven key domains through factor analysis, with processes such as positive therapeutic relationships, actively implementing positive parenting strategies, and the development of a positive parent-child relationships rated as having high perceived importance for parenting change. These findings align with prior research, with therapeutic support shown to be a key process for improving outcomes and program engagement in other web-based and self-directed treatments, however no direct comparison have yet been conducted comparing the effects of a self-directed online parenting program with a practitioner-supported model.

Chapter 4 is a follow-up study further exploring the mediating and moderating influence of pre-treatment and intervention-induced change processes, drawing on information from the extant literature as well as findings from Chapter 2. Baseline levels of parental depression is posited as a possible moderator of program engagement and intervention outcomes due to its possible adverse effects on parents' motivation to engage with an online program, particularly when no practitioner support or follow-up is provided. This chapter also explores the hypothesised mediating influence of parental self-efficacy and use of positive parenting strategies on reductions in dysfunctional parenting. Baseline depression is then added as a moderator to the mediation model to determine whether mediation effects are conditional on depressive symptomatology.

Finally, Chapter 5 provides a general discussion of the research findings presented in this dissertation, including the overarching limitations of the research and its implications and contribution towards forming a better understanding of how online parenting support can be effectively delivered within a minimally sufficient framework.

<u>Declaration by author</u>

This thesis is composed of my original work, and contains no material previously published or written by another person except where due reference has been made in the text. I have clearly stated the contribution by others to jointly-authored works that I have included in my thesis.

I have clearly stated the contribution of others to my thesis as a whole, including statistical assistance, survey design, data analysis, significant technical procedures, professional editorial advice, and any other original research work used or reported in my thesis. The content of my thesis is the result of work I have carried out since the commencement of my research higher degree candidature and does not include a substantial part of work that has been submitted to qualify for the award of any other degree or diploma in any university or other tertiary institution. I have clearly stated which parts of my thesis, if any, have been submitted to qualify for another award.

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<u>Publications during candidature</u>

Published peer-reviewed journal articles

Sanders, M.R., Kirby, J.N., Tellegen, C.L., & **Day, J.J.** (2014). The Triple P-Positive Parenting Program: A systematic review and meta-analysis. *Clinical Psychology Review*, 34, 337-357. DOI: 10.1016/j.cpr.2014.04.003

Brief reports

Sanders, M.R., Kirby, J.N., Tellegen, C.L., & **Day, J.J.** (2013). A systematic review and meta-analysis of The Triple P-Positive Parenting Program: A Brief Report. The Parenting and Family Support Centre, University of Queensland.

Conference presentations

Day, J.J. (2016). Triple P Online: Exploring the role of practitioners. Presented during the symposium *Supporting families to complete parenting programs online: Learnings from Triple P Online evaluations* at the 18th Annual Helping Families Change Conference. Banff: Canada.

Day, J.J. (2015). The impact of brief telephone-delivered practitioner support on the outcomes of an online parenting intervention. Presented during the symposium *Triple P Online: New findings, new programs* at the 17th Annual Helping Families Change Conference. Amsterdam: The Netherlands.

Day, J.J. (2014). The role of brief practitioner support in online parenting interventions: Does telephone support improve outcomes in Triple P Online? Presented during the symposium *Triple P Online in action: Four current trials across the globe* at the 16th Annual Helping Families Change Conference. Sydney: Australia.

Kirby, J.N., Tellegen, C. L., & **Day, J.J.** (2014). Towards a public health approach to parenting support: A systematic review and meta-analysis of the Triple P—Positive Parenting Program. Symposium presented at the 16th Annual Helping Families Change Conference. Sydney: Australia.

Day, J.J. (2013). Parenting help in a digital age: Practitioner-supported Triple P Online for vulnerable families. Paper presented at the 15th Annual Helping Families Change Conference. Los Angeles: America.

Day, J.J. (2012). Development of a brief measure to assess mechanisms of change within a web-based behavioural family intervention. Paper presented at the 35th Australian Association for Cognitive and Behaviour Therapy (AACBT). Gold Coast: Australia.

Day, J.J. (2012). Exploring the efficacy of practitioner-supported Triple P Online for families facing adversity: A web-based randomised controlled trial. Paper presented at the WA Triple P Conference (Dept of Education, Dept for Communities). Perth: Australia.

<u>Publications included in this thesis</u>

No publications included

Contributions by others to the thesis

My principle advisor Professor Matthew R. Sanders contributed towards the conceptualisation and design of the overall program of research presented in this dissertation, as well as methodological advice and editorial contributions towards a number of in-preparation manuscripts which have been formatted for inclusion in this body of work. Professor Sanders is also mentioned in Chapter 3 for his contribution towards refining an initial set of items for inclusion in a survey of Triple P practitioners; primarily advice regarding their face validity and theoretical relevance.

My secondary advisor Associate Professor Alina Morawska also contributed by providing editorial advice regarding manuscripts being prepared for publication, as well as general advice around methodology, statistical analyses, and reporting of results.

Statement of parts of the thesis submitted to qualify for the award of another degree

None

Acknowledgements

If I'm honest, there is a small part of me that did not think I would ever make it to the acknowledgements section of my thesis. So it is with great relief and thankfulness that I pause to reflect on the many people that have made this PhD journey possible, even enjoyable.

I first need to thank my beautiful family. Brigitta, without your enduring support I would not have made it to the end of this road. It has been a long and at times arduous journey for you, and for your patience and perseverance you will always have my gratitude. To think that when we started this, we were young, fresh, and childless. Now… well let's just say having two kids in the middle of a PhD did not help with the energy levels! You are beautiful and encouraging and my best friend. Thank you for putting up with your eternal student of a husband.

To Elka and Reuben, you are the funniest little people I know, and I love you dearly. Elka, thanks for being patient with daddy while I finished my "big project". You don't really understand it yet, but one day I hope this might encourage you to pursue big things even when they are hard. Reuben, you constantly make me smile. I can't wait to hang out with you more and see you grow.

Mum and Dad, I would not be here if it wasn't for you. Literally. But all that aside, you are both so inspiring. Thank you for teaching me to be kind and compassionate, to not be afraid of working hard, to persevere, and to always think of others. Somehow you both just keep on going, and your example has shown me that many things are possible when you put your mind to it. Most of all, your loving relationship is the greatest example of all, thank you for that.

Many, many thanks to my advisory team Matt Sanders and Alina Morawska. Matt, your ability to see the big picture is inspiring. I love how excited you get when we talk about research findings or new research ideas. Thank you for your guidance, direction, inspiration, and always being willing to squeeze in a meeting despite all the travels and often hectic schedules. I look forward to more opportunities for collaboration in future. Alina, your wealth of knowledge, attention to detail, research experience and approachability have been an invaluable resource. I honestly don't know how you find the time to do everything and still be a great mum. Thank you for your last-minute meetings and proof-readings, and providing such insightful and constructive feedback. I also would like to extend my thanks and gratitude to Karen Turner, partly for your contribution towards the development of Triple P Online, but even more so for your friendship, support and advice over the years. Thank you.

Special thanks to my past and current PhD student colleagues, including James, Cassie, Sabine, Agnès, Agnes, Aditi, Lauren, Cheryl, Mingchun, John, Jess Ahern, Jess Bartlett, Kathryn, Grace, Fiona, Emina, Sharon, and Mandy. I hope I haven't forgotten anyone. You are an amazing bunch of friends and have incredible skills, talent and knowledge. I love our office and will miss working in such a great environment. If I can get there, anyone can! Also a special shout-out to

James Kirby. I'm pretty sure I would have submitted this thesis six months ago if it wasn't for all our chats over coffee.

To all the staff of the PFSC, you have been so supportive and encouraging, and I hold each and every one of you in the highest esteem. To the many research assistants and psychology interns within the PFSC that freely contributed their time towards making this research happen, thank you so much. I hope you benefitted from your involvement as much as I did.

Of course I could not finish without thanking the many families and Triple P practitioners that participated in these research projects. Your contribution is greatly appreciated, and this research would not be possible without you. Thank you all. In particular, thanks to Carmel Wilkinson and all the staff at Parenting WA; your contribution made this research project possible, when it would otherwise not have been. You were all so easy to work with and incredibly patient with me as we sorted out long-distance administrative issues.

Lastly, to my Creator who has given so much, thank you.

This thesis is dedicated to Elka Charlotte and Reuben Friedrich

Keywords

parenting, web-based intervention, behavioural family intervention, Triple P—Positive Parenting Program, technology-assisted intervention, self-directed intervention, eTherapy, randomised controlled trial, mechanisms of change, treatment moderators

Australian and New Zealand Standard Research Classifications (ANZSRC)

ANZSRC code:

      170106, Health, Clinical and Counselling Psychology, 70%

      111704, Community Child Health, 15%

      111714, Mental Health, 15%

Fields of Research (FoR) Classification

FoR code:

      1701, Psychology, 70%

      1117, Public Health, 30%

Table of Contents

List of Figures & Tables

List of Abbreviations used in the thesis

AFF: Affect-focused item for practitioner survey

ANZCTR: Australian New Zealand Clinical Trials Registry

BEH: Behaviourally-focused item for practitioner survey

CBT: Cognitive behavioural therapy

COG: Cognitively-focused item for practitioner survey

CONSORT: CONsolidated Standards Of Reporting Trials

CONT: Contextual (social/environmental) item for practitioner survey

CUAU: Computer-use-as-usual (refers to the RCT non-active control condition)

DASS: Depression, Anxiety, Stress Scale

DASS D: Depression, Anxiety, Stress Scale, Depression subscale

ECBI: Eyberg Child Behaviour Inventory

ECBI I: Eyberg Child Behaviour Inventory, Intensity scale

EFA: Exploratory Factor Analysis

F1 – F11: Factor 1 – Factor 11

M: Mean

NB: Negative binomial (model)

PAI: Parental Anger Inventory

PDR: Parent Daily Report

PPC: Parent Problem Checklist

PS: Parenting Scale

PS T: Parenting Scale, Total scale

PTC: Parenting Tasks Checklist

PTC B: Parenting Tasks Checklist, Behaviour scale

RCT: Randomised controlled trial

RQI: Relationship Quality Inventory

SD: Standard deviation

SE: Standard error

SEM: Structural equation model/modelling

SES: Socio-economic status

T1: Time 1 (pre-intervention assessment)

T2: Time 2 (post-intervention assessment)

T3: Time 3 (follow-up assessment)

TPOL: Triple P Online (refers primarily to the randomised self-directed treatment condition)

TPOLe: Triple P Online enhanced (refers to the randomised practitioner-supported treatment condition)

TPPN: Triple P Provider Network

Chapter 1

Web-based parenting programs: An overview of the field and current research questions

There is a well-established link between negative, coercive and ineffective parenting behaviours, and the development of social, emotional and behavioural problems in children. The lack of warm, positive family relationships, inflexible or inconsistent discipline such as reinforcing inappropriate behaviours or ignoring prosocial behaviours, and coercive parenting styles such as being over-reactive or hostile, are all associated with poorer outcomes for children and can lead to an increased likelihood of problems in later adolescence (e.g. Collins, Maccoby, Steinberg, Hetherington, & Bornstein, 2000; Patterson & Reid, 1984; Rutter, 1985; Webster-Stratton & Taylor, 2001).

Significant theoretical and empirical evidence has demonstrated that children's developmental trajectories can be influenced through behavioural family interventions targeting modifiable parenting factors (e.g. Biglan, Flay, Embry, & Sandler, 2012; Forehand, Jones, & Parent, 2013; Patterson, DeGarmo, & Forgatch, 2004; Sanders, 2012). However, even when available, it seems relatively few parents access evidence-based parenting support (e.g. Sanders et al., 1999). Telephone interviews conducted with more than 4000 Australian families found about one-third reporting their child aged 12 or less had demonstrated emotional or behavioural problems during the last 6 months, while 9% of children were reported to display defiant behaviours consistent with a diagnosis of Oppositional Defiant Disorder (Sanders, Markie-Dadds, Rinaldis, Firman, & Baig, 2007). Only about one quarter of parents reporting such problems had consulted a professional in the last 12 months, and similar numbers reported having participated in some form of parent education program. More recently, an epidemiological study conducted in Australia found that approximately 14% of 4-11 year olds met criteria for a diagnosis of an anxiety disorder, major depressive disorder, attention deficit hyperactivity disorder, or conduct disorder (Lawrence et al., 2015), while about two-thirds of the responding parents reported that their support needs regarding their child were unmet or only partially met. Similarly, many Western countries are faced with rising rates of preventable cases of child maltreatment and neglect, which has serious economic and public health implications (Fang, Brown, Florence, & Mercy, 2012; Jones et al., 2013), yet there remains a widespread and pervasive disconnect between the need for quality parenting intervention and the limited reach of current parenting support options (Prinz & Sanders, 2007). A number of barriers may contribute to the generally low uptake of parenting services, including limited time or scheduling conflicts, lack of motivation, social influences, and resistance stimulated through fear of stigmatisation, or beliefs that the intervention is unlikely to be helpful or is unnecessary (Spoth, Redmond, Hockaday, & Shin, 1996; Spoth, Redmond, & Shin, 2000). Additionally, other parents

that might benefit from services are often unable to access traditional face-to-face programs due to long wait-lists, or limited availability of local services, particularly in rural and remote settings (Elgar & McGrath, 2003).

As highlighted by Sanders and colleagues (e.g. Foster, Prinz, Sanders, & Shapiro, 2008; Sanders & Morawska, 2006; Sanders, 2010), the widespread adoption of a comprehensive public health approach to parenting is an important step towards making parenting support universally accessible and improving child and family outcomes at a population level. The Triple P–Positive Parenting Program (Sanders, 2012) is a system of behavioural family interventions derived from cognitive behavioural principles and social learning theory, and which adopts a public health approach to the development and dissemination of parenting support through a tiered structure, with five intervention levels of increasing intensity and narrowing focus that aim to provide parents with the minimally sufficient amount of support needed (see Sanders, 2012 for a comprehensive overview of the Triple P system). At its core, the program aims to promote healthy developmental trajectories in children through the prevention of social, emotional and behavioural problems, by targeting dysfunctional and coercive parenting styles such as harsh or inconsistent discipline, as well as promoting increased parental competence and confidence. Other known benefits include improved family relationships and reductions in parental depression and stress, thereby addressing many of the risk factors that contribute towards or maintain poorer developmental outcomes in children (Biglan et al., 2012; Collins et al., 2000). A number of meta-analyses have demonstrated the program has a robust empirical basis as both a universal and targeted program, with effects seen across families with diverse needs, and through a broad range of delivery modalities and intervention intensity (e.g. de Graaf, Speetjens, Smit, de Wolff, & Tavecchio, 2008a, 2008b; Nowak & Heinrichs, 2008; Sanders, Kirby, Tellegen, & Day, 2014).

In accordance with the adoption of a public health to parenting support, Triple P has embraced the notion of low intensity options to increase the reach, availability and choice of evidence-based parenting programs for consumers. Low intensity and self-directed approaches to treatment and prevention have been steadily gaining popularity over the last few decades as viable alternatives to more traditional forms of face-to-face psychological treatment (Bennett-Levy et al., 2010). While low intensity approaches to intervention can occupy a range of mediums (e.g. web-based programs, self-help books, downloadable podcasts, in-person) and delivery formats (e.g. brief seminars or discussion groups, written self-help materials, therapist-guided support), all derive from common goals such as increasing consumer choice, providing greater levels of flexibility, requiring less time to complete, and packaged as self-paced or bite-sized supports.

Within Triple P, low intensity options include Level 2 seminars and discussion groups, Level 3 Primary Care (four therapist-led sessions), and written self-help materials designed to

mirror the program intensity and scope of content delivered through standard Level 4 face-to-face programs (Markie-Dadds, Sanders, & Turner, 1999). Additionally, novel research trials evaluating the effects of viewing a publicly-aired six-week television series ("Driving Mum and Dad Mad"), documenting the experiences of families attending Triple P (Calam, Sanders, Miller, Sadhnani, & Carmont, 2008), have found positive outcomes, although this is not a disseminated resource within the core Triple P framework.

More recently, an eight-module Level 4 web-based program (Triple P Online; Turner & Sanders, 2011) has been developed in response to increasingly widespread internet access and parent-reported preferences for information and support obtained through the internet (e.g. Metzler, Sanders, Rusby, & Crowley, 2012; Walker, Im, & Vaughan, 2012).

The evidence for low intensity and web-based psychological treatments

Digital and web-based psychological interventions encompass a broad scope of technologies and treatment approaches. These range from static, informational websites that provide basic education or advice requiring minimal user participation, through to more comprehensive and structured web-based programs which may be self-directed or include some degree of therapist guidance (Barak, Klein, & Proudfoot, 2009). Digital communications including email, real-time chat or videoconferencing may be harnessed for online counselling or 'e-therapy', while online forums have been used to emulate group psychotherapy processes or facilitate peer social support (Hall & Bierman, 2015; Richardson & Simpson, 2015). In addition, emerging technologies such as virtual reality, where users can participate in therapeutic activities through simulated, immersive digital environments, also hold promising potential as new and innovative approaches to psychological treatment (e.g. Amichai-Hamburger, Klomek, Friedman, Zuckerman, & Shani-Sherman, 2014).

The internet provides an ideal platform for the delivery of comprehensive interventions such as Triple P which draw on cognitive-behavioural and social learning principles. Hallmarks of many web-based programs are that they focus on practical, skills-based learning and employ structured techniques and systematic exercises, with concepts clearly communicated through video, audio, text, or creative combinations of these (Anderson, Jacobs, & Rothbaum, 2004). Modern advances in web browsers, user interfaces, and capabilities of handheld devices provide a suitable platform for engaging and persuasive design elements including interactive and engaging activities (e.g. quizzes, online questionnaires), automated feedback and reminders that can be tailored to the user, as well as tools and metrics that allow researchers and potentially therapists to monitor and track clients' progress towards goals (e.g. Barak & Grohol, 2011; Bennett & Glasgow, 2009; Cavanagh & Shapiro, 2004; Pagliari et al., 2005). Accordingly, there has been a burgeoning interest in the

delivery of online interventions within the broader field of psychotherapy and mental health care (Andersson, Carlbring, Ljótsson, & Hedman, 2013; Marks & Cavanagh, 2009). Web-based interventions targeting a range of mental health care challenges, which have historically been managed through face-to-face therapies, have shown promising results. Studies have found online interventions can be effective for depression and anxiety (e.g. Charova, Dorstyn, Tully, & Mittag, 2015; Griffiths, Farrer, & Christensen, 2010), phobias and panic disorders (e.g. Carlbring, Furmark, Steczko, Ekselius, & Andersson, 2006; Klein et al., 2009; Titov, Andrews, Choi, Schwencke, & Mahoney, 2008), post-traumatic stress (e.g. Bolton & Dorstyn, 2015), alcohol abuse (e.g. Blankers, Koeter, & Schippers, 2011), eating disorders (e.g. Schlegl, Bürger, Schmidt, Herbst, & Voderholzer, 2015), and chronic pain management (e.g. Berman, Iris, Bode, & Drengenberg, 2009), among others (see L'Abate, 2015 for a review). One comprehensive meta-analysis of 69 articles published up to March 2006, summarising data from 92 empirical studies, found that overall, internet-based interventions had effect sizes ranging from very small to very large (-0.10 to 1.68), with an average effect size of 0.53 (Barak, Hen, Boniel-Nissim, & Shapira, 2008). Fourteen of these studies reported a direct comparison of an online treatment program with a similar face-to-face intervention, finding that the average weighted effect size for online treatments was not significantly different to that found in face-to-face treatment (ES = 0.39 and 0.34 respectively). Additionally, a more recent meta-analysis comparing therapist-guided internet-based cognitive behavioural therapy (CBT) against traditional face-to-face CBT also found no difference in overall treatment effects (ES = -0.01) between the two conditions (Andersson, Cuijpers, Carlbring, Riper, & Hedman, 2014). This suggests that for many users, online approaches may be as effective as face-to-face treatments, while other research has found that users typically rate high levels of satisfaction with web-based interventions (e.g. Griffiths & Christensen, 2006).

Although mounting evidence indicates the internet is an effective platform for the dissemination of low intensity psychological interventions, so far only a handful of empirical trials have explored outcomes of online parenting programs. Even fewer studies have addressed important research questions regarding online parenting support, such as identifying the mediating or moderating factors that predict preference, motivation, adherence and outcomes. There is a need for further investigation of such questions, as research suggests the internet is becoming an increasingly preferred source of information and support for parents. For example, a recent consumer preference study (Metzler et al., 2012) found that low intensity, self-directed formats, including television, the internet, and written materials, were rated as the most preferred format for receiving parenting information, over and above more intensive methods such as professional consultations, home visits, and parenting groups. Similarly, a review by Hall and Bierman (2015) found that roughly half of the parents interviewed within various studies reported a preference for

accessing advice through the internet (Rothbaum, Martland, & Jannsen, 2008; Walker et al., 2012). It warrants mentioning that parents with higher income or who were more socio-economically privileged reported being more likely to use or prefer online approaches, suggesting that consideration of the 'digital divide' is needed. That is, parents' use and access to online parenting support may be influenced by their socio-economic status or ethnic group (Plantin & Daneback, 2009), although findings are not always consistent in this regard (Sarkadi & Bremberg, 2005). While an in-depth study of the digital divide is outside the scope of the present research agenda, it is worth noting that parents within low- and middle-income countries in particular may be less likely to prefer web-based support over other alternatives, possibly due to poorer computer literacy or limited access (e.g. Mejia, Calam, & Sanders, 2014). Implications regarding the generalisation of findings presented throughout this thesis are discussed further in Chapter 5.

It is not surprising that many of the advantages of low intensity approaches described earlier, such as flexibility and self-paced learning, may be particularly appealing to parents. Accessing parenting information and support from the comfort of the home, at a time that suits the parent, with no need to organise child care, and without the perceived stigma that may accompany help-seeking, has considerable potential to overcome some of the barriers that contribute to generally low uptake of parenting programs. There are myriad parent-focused websites publicly available that contain educational material, general parenting advice, and in some cases discussion forums to foster peer learning and support (e.g. Na & Chia, 2008; Plantin & Daneback, 2009), and which are generally well-received by parents (Hall & Bierman, 2015). Parents also commonly congregate through social media, such as Facebook, to share parenting ideas, ask for advice, and receive support from others, although the benefits and adverse effects of these practices are still not clear. For example, increased frequency of posting after the birth of a child may be associated with higher levels of maternal stress, while receiving positive comments from family and close friends may increase satisfaction with the parenting role (Bartholomew, Schoppe-Sullivan, Glassman, Kamp Dush, & Sullivan, 2012). In light of potentially conflicting advice arriving from multiple online sources, many internet-connected parents may lack the discernment needed to appropriately judge the quality, accuracy or trustworthiness of the information they receive (Rothbaum et al., 2008).

Triple P Online is an effort to address the lack of empirically-supported parenting information available online, through the adaptation of an existing evidence-based program into an easily accessible and engaging online format. The following sections describe the Triple P Online intervention in more depth, review recent empirical findings regarding the use of online parenting programs, and conclude with an overview of the research questions that constitute the central aims this thesis.

Triple P Online: Program characteristics and empirical evidence

Triple P Online is an eight-module program adapted from existing Level 4 Triple P interventions. The program introduces key concepts of positive parenting, with modules covering the following topics: (1) What is positive parenting?; (2) Encouraging behaviour you like; (3) Teaching new skills; (4) Managing misbehaviour (5) Dealing with disobedience; (6) Preventing problems by planning ahead; (7) Making shopping fun; and (8) Raising confident, capable kids. The content of each module is commensurate with topics covered during sessions in Level 4 Group and Standard Triple P programs. For example, in Module 2 (*Encouraging behaviour you like*), parents are introduced to concepts such as quality time, descriptive praise, and giving positive attention contingent on desired behaviours. In Module 3 (*Teaching new skills*), strategies such as incidental teaching and behaviour charts are discussed, while Modules 4 and 5 (*Managing misbehaviour* and *Dealing with disobedience*) cover strategies such as planned ignoring, giving clear, calm instructions, logical consequences, quiet time, and time out.

The program features video-based learning to teach new skills and concepts, as well as interviews with real parents describing their parenting experiences, guided, interactive activities, downloadable resources such as templates for reward charts or behaviour monitoring forms, a dynamically-generated workbook which allows users to review, track, and save their progress through the program, and optional user-initiated facilities for setting up technology-assisted program reminders (e.g. SMS, email). Users are encouraged to set and review goals for change, with prompts and reminders throughout to assess their progress, and are also encouraged to think about high-risk situations by combining strategies and principles learned throughout the program into a cohesive prevention plan.

Figure 1.1 shows two screenshots taken directly from the program. Figure 1.1a displays the resource selection screen, where parents can access downloadable resources that have been unlocked by completing the relevant module, while Figure 1.1b is an in-progress screenshot of a user completing a module. Users are required to progress sequentially through each module in order to unlock the following one. Locked and unlocked modules are displayed horizontally at the top, with locked modules denoted by a 'greyed-out' tab. Sections within the current module are displayed vertically down the right, and must also be completed in order. Most sections begin with a short 1-2 minute video to introduce an idea, and which must be watched all the way through in order to proceed to the next activity. Once a module has been completed the user can return to that module at any time, and jump to any section of interest to re-watch the video or complete the exercises. The goal is to ensure users progress sequentially through the program so that material is presented in a similar fashion to the face-to-face variants of Level 4 Triple P; for example, prior to introducing strategies for managing misbehaviour, the key principles of positive parenting are

discussed along with strategies for encouraging desirable behaviour and teaching children new skills.

One caveat to note is that the screenshots reflect the pilot version of the Triple P Online program which was developed using Adobe Flash. This version was only accessible from desktop computers and laptops. The program has since received major updates to better harness modern technologies (e.g. HTML5) and responsive design principles, which allow parents to access the program from a broader range of devices such as tablets and mobile phones. However, these screenshots are reflective of the version of the program used for the randomised controlled trial discussed in Chapters 2 and 4, and so have been included here for consistency. The potential implications of limited device access for the trial are discussed further in Chapter 5.

So far there are three published efficacy trials (Love et al., 2016; Sanders, Baker, & Turner, 2012; Sanders, Dittman, Farruggia, & Keown, 2014) and one predictor paper (Dittman, Farruggia, Palmer, Sanders, & Keown, 2014) exploring Triple P Online outcomes. The foundational trial of the program, conducted in 2012 by Sanders and colleagues (Sanders, Baker, et al., 2012), recruited parents of children aged between two and nine ($M = 4.7$) with elevated levels of disruptive behaviour. One-hundred and sixteen parents participated in the trial, randomly allocated to an intervention group or an internet-use-as-usual control condition. The intervention consisted of a 12-week period of access to the Triple P Online program, although program access was continued until 6-month follow-up assessment. Families were assessed using self-report measures at baseline, immediately post-intervention, and at six-month follow-up for levels of child behaviour problems, dysfunctional parenting styles, parenting confidence, parental anger, adjustment difficulties (e.g. depression, anxiety, and stress), and levels of partner conflict over parenting. Independent observations of parent-child interactions were also conducted with a randomised sub-sample consisting of half the participants.

Regarding program engagement, overall 43% of parents had completed all eight modules by 12-week post-assessment, with an increase to 47% by 6-month follow-up. The average time taken for total completion of the program was 5.9 hours. At post-intervention, the treatment group demonstrated significant improvements on measures of child behaviour problems, dysfunctional parenting styles, parenting confidence, and parental anger responses relative to control, with these changes largely maintained at follow-up. Parent-reported levels of disruptive child behaviour, lax parenting, and self-efficacy were also more likely to move into the normal range by post-assessment for treatment participants, while a delayed effect was found for observed child behaviour, parental stress, and partner conflict, with significant improvements seen at follow-up assessment but not post-assessment. Consumer satisfaction was rated highly ($M = 68.55$ out of a possible 91), with 88% of participants at least 'satisfied' with the program.
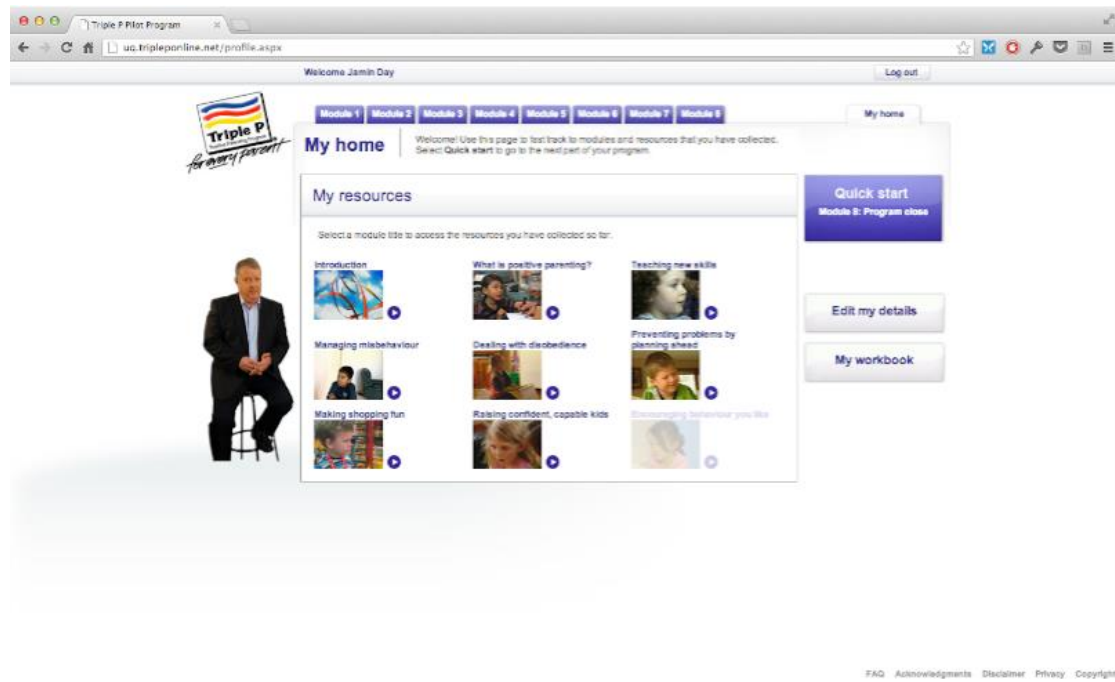
Figure 1.1a: Screenshot of the resource selection screen from Triple P Online
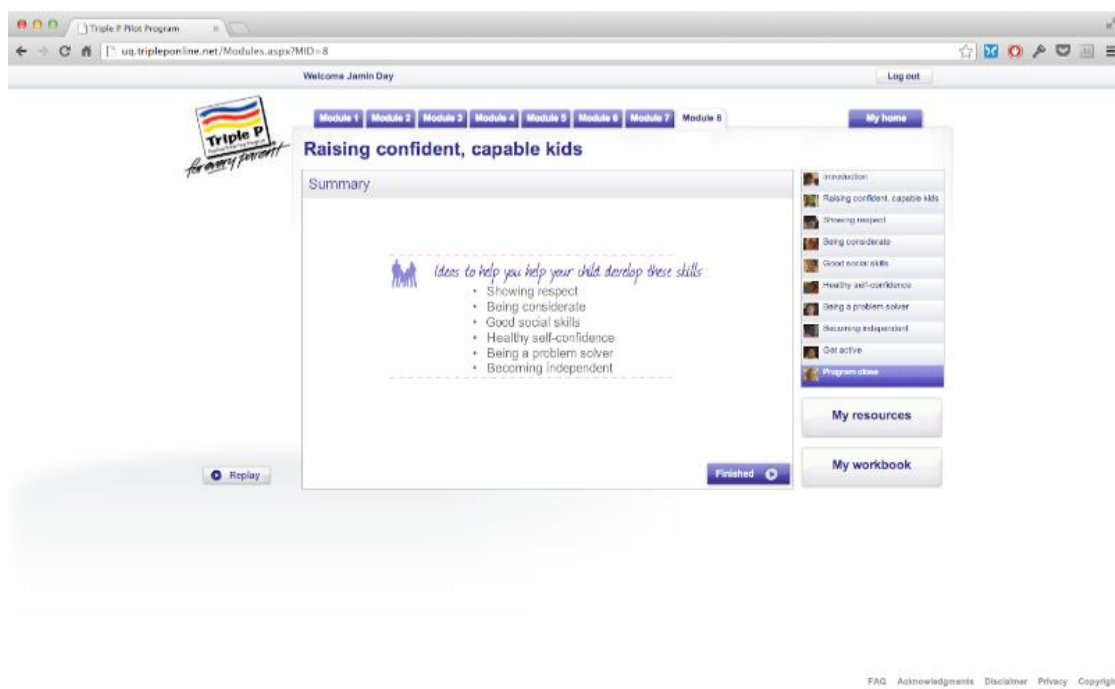
Figure 1.1b: Screenshot of a user progressing through a Triple P Online module

Support mechanisms in this study included a check-up by the research team at week two and again at week five to make sure there were no technical issues preventing access, and to ensure parents were aware of program features. Additionally, those that had not logged in to the program for a period of three weeks or longer received reminder emails and telephone calls. However,

contact was brief (approximately five minutes), not provided on an ongoing, regular basis, and did not include any clinical or therapeutic advice.

A second study conducted in 2014 by Sanders and colleagues (Sanders, Dittman, et al., 2014) employed a non-inferiority design to compare outcomes from Triple P Online with the "Every Parent's Self-Help" workbook (Markie-Dadds et al., 1999), a self-directed Triple P intervention also commensurate with Level 4 Triple P program variants such as Standard or Group Triple P. The self-directed workbook has been demonstrated to have good efficacy in prior trials (Sanders, Markie-Dadds, Tully, & Bor, 2000; Sanders & Morawska, 2006), and has been shown to produce long-term outcomes similar to face-to-face Triple P programs (Sanders, Bor, & Morawska, 2007).

In the non-inferiority trial, 193 families were randomly allocated to receive Triple P Online or the self-directed workbook, and were assessed at baseline, post-intervention and six-month follow-up using both mother and father self-report measures of child disruptive behaviour, dysfunctional parenting, parent confidence, quality of the parent-child relationship, risk of child maltreatment, parental anger, relationship quality, and parent adjustment. Apart from relationship quality, mother-reported outcomes showed significant short-term improvements across scales for both intervention conditions, and while there was a lower response rate for fathers, findings were largely similar though with no short-term changes on risk of child maltreatment, anxiety or stress. Relationship quality was not found to improve at post-assessment for either parent, and showed some declines at follow-up, suggesting relationship problems may be better served with more intensive, therapist-led interventions. Most positive changes were maintained or further improved at follow-up for fathers, and likewise for mothers although there was an increase between post-assessment and follow-up on measures of dysfunctional parenting styles, conflict between partners over parenting, and parental anger, suggesting some of the initial gains were not strongly maintained long-term. However, the central hypothesis that online delivery of parenting support would not be inferior to the more well-established self-directed workbook was supported, with effect sizes for group comparisons on primary outcomes falling within the designated non-inferiority cut-off range. Furthermore, consumer satisfaction was rated high and was statistically equivalent for both conditions ($M = 67.34$ and $M = 68.66$ for mother-reported satisfaction with the workbook and online programs respectively).

A secondary study of outcomes from this trial, analysing predictors of treatment success for parents in the online condition (Dittman et al., 2014), found that the number of online modules completed significantly predicted disruptive child behaviours at post-intervention (for both mothers and fathers) and post-intervention ineffective parenting (for mothers only). Additionally, baseline levels of disruptive child behaviours (for fathers) and ineffective parenting (for mothers) predicted

their respective post-intervention scores, while the initial quality of the parent-child relationship also predicted disruptive child behaviour problems at post-intervention for mothers. This study represents the first to explore sociodemographic characteristics and baseline difficulties as predictors of outcome within a web-based parenting program, an area that deserves further attention due to its implications for the inclusion of online programs into existing family and health services. However, in the absence of a non-active control condition it was not possible to demonstrate whether the effects of treatment were moderated by any of these predictors.

More recently, Love et al (2016) published findings from an uncontrolled trial evaluating the feasibility of Triple P Online with highly vulnerable parents recruited through community agencies in Los Angeles. One-hundred and fifty-five parents met eligibility criteria and were randomised to one of two cohorts to receive the intervention. Analysis of sociodemographic characteristics and family history indicated the majority of parents experienced a number of risk factors associated with poorer parenting and risk of child maltreatment. For example, about three-quarters earned an annual income of less than $15,000; more than a third had been incarcerated, just under a third were being treated for drug or alcohol abuse; and almost a quarter had experienced the removal of a child because of previous maltreatment. In order to maximise engagement and incentivise participation, an adaptation of the program using social media and gaming features was developed. Social media enhancements included an online community discussion board where parents could post questions or discuss their experiences and 'like' other people's posts, which importantly was moderated by an accredited Triple P facilitator who would provide feedback, respond to questions, praise and encourage parents' efforts, and monitor discussions for content. Parents adopted a virtual identity through an anonymous avatar to ensure privacy and encourage user posting. Gaming features included extrinsic incentives such as earning 'badges' for progressing through the program, or as a tool used by the online facilitator to reward and encourage parents' efforts through discussion board postings. Significant improvement was seen on key outcomes at six-month follow-up assessment, including severity of disruptive child behaviours and child emotional problems, dysfunctional parenting (over-reactive and lax parenting) and parental stress.

Such outcomes are promising, particularly given the demographic characteristics of the sample and the presence of multiple associated risk factors associated with a lower likelihood of benefitting from parenting interventions (Lundahl, Risser, & Lovejoy, 2006). Furthermore, overall satisfaction with the program and adjunctive components (discussion board posting, badges) was generally high. While some parents in the trial were able to access the program from a computer or internet-connected mobile device (e.g. mobile phone or tablet), partner agencies were also set up with appropriate desktop computers to allow parents that did not have internet access to still use the program, with a research assistant engaged to provide in-person technical support and

troubleshooting to those utilising agency facilities. About a quarter of parents relied solely on these facilities for program access.

In summary, these trials demonstrate that Triple P Online has potential as an efficacious, self-directed intervention, with preliminary evidence suggesting program use leads to better outcomes than no intervention. Outcomes also appear to be comparable to those attained through an offline, self-directed workbook-based version of Triple P, which has a more robust evidence-base and has been shown to produce long-term outcomes similar to face-to-face Triple P programs (Sanders, Bor, et al., 2007). Additionally, with appropriate support scaffolding and community and agency engagement, and with concessions made for limited internet access, Triple P Online has appeal as an effective low intensity intervention approach even for very vulnerable parents.

Beyond Triple P Online: Other web-based parenting programs

The Triple P Online studies described above add to an emerging evidence-base supporting web-based approaches as the primary delivery mechanism for parenting interventions. A recent meta-analysis of online parenting programs (Nieuwboer, Fukkink, & Hermanns, 2013), and a more recent systematic review of digitally-delivered parent training interventions (Breitenstein, Gross, & Christophersen, 2014) describe a small but informative collection of empirical studies conducted so far which investigate the use of Triple P Online and other web-based parenting interventions. In the meta-analysis by Nieuwboer and colleagues (2013), nineteen studies published between 1998 and 2010 focusing on web-based or Internet-supported parenting programs were identified, of which twelve were empirical studies (ten randomised controlled trials and two uncontrolled trials). These studies were coded for methodological and demographic characteristics, as well as the types of online technologies and support mechanisms utilised. Programs varied in terms of intended targets, with some designed for specific parent groups (e.g. first-time parents, low-income parents, foster parents), childhood conditions (e.g. children with cancer, children with disabilities), or other specific focuses (e.g. drug abuse in adolescent girls), while three studies reported findings from preventative or early-intervention programs aligned with a public health approach towards parenting support. Parenting outcomes targeted by the interventions included aspects of behaviour, attitudes, and parenting knowledge, with an aggregated overall large effect size (small-to-medium after accounting for uncontrolled studies). As might be expected, effect sizes were smaller overall in the three trials adopting a broader, public health type approach (Bert, Farris, & Borkowski, 2008; Na & Chia, 2008; Sanders, Calam, Durand, Liversidge, & Carmont, 2008), than for those targeted towards specific parent groups or conditions. Four of the interventions were self-directed and unguided, one included parent-initiated email consultations, while three programs provided regular, intensive consultations with a therapist through telephone or videoconferencing software. Overall,

the authors found that unguided programs produced good outcomes on parenting knowledge, whereas parenting attitudes and behaviour change showed more improvement in programs with a support component. None of the studies included a direct comparison between supported or unguided delivery.

The systematic review by Breitenstein, Gross, and Christophersen (2014) identified a total of eleven papers published since 2000, describing nine parent training interventions delivered through various digital methods (e.g. web-based, CD-ROM, television). Six of these reported an intervention containing a primarily web-based component, including the foundational trial of Triple P Online described earlier (Sanders, Baker, et al., 2012). Medium effect sizes were found overall on both child and parent outcomes. Again, the authors noted a lack of studies systematically examining the added value of practitioner guidance in terms of program adherence, satisfaction, and outcomes.

Current research directions

Reflection on the extant literature on web-based parenting support highlights two key areas that are so far under-explored. First, no parenting studies have yet conducted a direct comparison of a standalone, self-directed web-based parenting program versus a comparable program delivered with practitioner-support, to determine whether important outcomes such as child behaviour, parenting styles or attitudes, program engagement, and program satisfaction are influenced to a greater degree or lesser degree. Second, there is a paucity of research investigating factors that contribute to treatment outcomes in web-based parenting support, such as moderator or mediator analyses to better understand the pathways of change or predictors of treatment success through this delivery modality. These are explored further below.

The case for practitioner involvement in online parenting programs

One common limitation often encountered within the broader field of internet-based psychological treatments is the issue of high rates of dropout, usually early into treatment or even before the user has engaged with the content at all (Christensen & Mackinnon, 2006; Melville, Casey, & Kavanagh, 2010). This phenomenon is particularly prevalent when programs are undertaken without any practitioner contact or support, as well as with open access websites freely available to the public (e.g. Christensen, Griffiths, & Farrer, 2009). Some participants likely drop out of online programs because of early treatment gains (Ritterband, et al., 2009), however others may find the program does not meet their expectations, become unmotivated or lose interest, or experience frustration due to technical barriers or unintuitive interfaces (Eysenbach, 2005). However, the topic of adherence in web-based parenting intervention has so far received little attention.

Recent research provides convincing evidence that even brief levels of practitioner involvement during otherwise self-administered, web-based intervention is likely to significantly improve both treatment adherence (Mohr, Cuijpers, & Lehman, 2011) and efficacy (Palmqvist, Carlbring, & Andersson, 2007; Spek et al., 2007), which suggests that enhancing adherence may be an important goal. Findings from recent evaluations of Triple P Online suggest a likely dose-response relationship between module completion and outcomes (Dittman et al., 2014), and this aligns with findings from evaluations of other web-based psychological treatments (Donkin et al., 2011, 2013) as well as self-help workbook-based parenting interventions (e.g. Hahlweg, Heinrichs, Kuschel, & Feldmann, 2008). Such research focusing on offline approaches to parenting self-help (e.g. bibliotherapy), offers many parallels to web-based parenting support, while providing a richer history of comparison studies to draw on. For example, in a comprehensive review examining the evidence supporting the use of self-help parenting interventions for the treatment of children with behavioural disorders, O'Brien and Daley (2011) identified 11 studies that explored self-help parenting interventions delivered either digitally or via written materials, with multiple studies reporting findings from trials using the Triple P "Every Parent's Self-Help Workbook" (Markie-Dadds et al., 1999). The authors noted that use of the workbook as a parenting intervention generally led to greater levels of reductions in child behaviour problems and improvements in parenting style at post-intervention than wait-list control participants, intervention effects were enhanced when combined with regular, brief therapist contact (approximately 20 minutes per week or less), and changes were generally maintained at follow-up assessment (Connell, Sanders, & Markie-Dadds, 1997; Hahlweg, Heinrichs, Kuschel, & Feldmann, 2008; Markie-Dadds & Sanders, 2006a, 2006b; Morawska & Sanders, 2006; Sanders et al., 2000). Additionally, client satisfaction was reportedly higher when therapist contact was included (e.g. Sanders et al., 2000), and attrition was generally lower (e.g. Morawska & Sanders, 2006).

The importance and benefits of therapist contact in an online parenting program are not yet well established. One recent, novel study compared outcomes of a Parent Management Training intervention, delivered online and with varying levels of practitioner contact (Rabbitt et al., 2016), with assessments focusing on differences in treatment outcomes, therapeutic relationship, intervention adherence, and acceptability. The first treatment condition, called 'Full Contact', was designed to mimic usual face-to-face procedures, however utilized videoconferencing as the contact medium instead of support being delivered in-person. The second condition, called 'Reduced Contact' replaced these live, videoconference-based interactions with pre-recorded video footage. Parents in both conditions were able to call or email their therapist at any time outside of the sessions. The authors found no difference on treatment outcomes, adherence, and even therapeutic alliance between conditions, while the main differences of note were for levels of consumer

acceptability, with users in the Full Contact condition perceiving the intervention as more acceptable. This suggests there may be a non-linear relationship between the amount of therapist contact time and various indices of treatment outcome, however to better understand such a relationship, a baseline measure of no-support is needed as a comparison.

The potential moderating role of parental depression

Beyond the role of therapist support, the literature is otherwise largely inconsistent regarding predictors of dropout and outcomes in web-based interventions. In a recent systematic review of predictors of adherence to online treatments, Beatty and Binnion (2016) found that half the studies reviewed showed no association between baseline symptom severity and adherence. Of the remaining studies, roughly half reported higher adherence rates when users had less initial difficulties, while a similar number found higher initial difficulties led to greater adherence. In another review of adherence to online treatments, Melville et al (2010) found that people with less severe initial psychological difficulties may be more likely to drop out, possibly due to lower levels of motivation to continue with the program. However, no relationship was found between baseline depression and dropout in the studies they reviewed. Conversely, Christensen et al (2009) found that in online treatments for depression, less severe baseline levels were associated with higher levels of program adherence, albeit they acknowledge findings that participant reminders are likely necessary to achieve acceptable completion rates (Clarke et al., 2005).

This lack of consensus between studies likely stems from the wide variation in conditions targeted by treatment, as well as program characteristics, support mechanisms implemented, and definitions of outcome and adherence that were used. Unfortunately, it provides little guidance for investigations into predictors of outcome within the context of web-based parenting programs. However, one area of potential impact is parental depression. In a qualitative study of users of an online depression treatment program, difficulties with motivation, concentration, low self-esteem, and apathy were raised as barriers to engagement (Schneider, Sarrami Foroushani, Grime, & Thornicroft, 2014), particularly in the absence of support where greater levels of intrinsic motivation are likely needed (Mohr et al., 2011). The potential implications for online parenting treatments are noteworthy. Prior parenting research has found no evidence of initial parental depression mitigating against benefits of face-to-face parenting interventions in terms of externalising child behaviour problems (Beauchaine, Webster-Stratton, & Reid, 2005) or dysfunctional parenting (McTaggart & Sanders, 2007), while higher depression was associated with poorer outcomes in prior, unguided self-directed Triple P research (Morawska & Sanders, 2006), suggesting it warrants further exploration as a potential moderator of online treatment outcomes for parents particularly when no further support is provided.

Exploring the mechanisms of parenting change through web-based intervention

Finally, understanding the mechanisms of change that occur during participation in parenting interventions is another important research goal. Identifying the mechanisms at work provides insight into which components of intervention delivery have the most potential to effect change, and may assist program developers to maximize program effectiveness by culling or minimizing less effective practices, strengthening core components, and highlighting areas where greater flexibility of delivery can be incorporated so that interventions can be tailored most effectively (Kazdin, 2007; Kraemer, Wilson, Fairburn, & Agras, 2002).

So far, prior mediation studies have largely focused on examining the link between parenting changes and child behaviour improvements (e.g. Beauchaine et al., 2005; Forehand, Lafko, Parent, & Burt, 2014; Gardner, Hutchings, Bywater, & Whitaker, 2010). Triple P draws on established theoretical frameworks such as cognitive, behavioural and social learning principles in conjunction with self-regulation models (Sanders & Mazzucchelli, 2013; Sanders, 1999), however the causal pathways and processes responsible for parenting improvements, defined here as reductions in dysfunctional parenting behaviours, are still not well understood. Key theoretical mechanisms, based on self-regulatory processes, include parental self-efficacy, personal agency, independent problem solving, and self-sufficiency (Karoly, 1993), while other cognitive and affective domains have been posited, such as changes in parenting knowledge, attributions, expectations and beliefs, and emotional regulation (Sanders & Morawska, 2005). Prior mediation studies using Triple P are informative and have provided some support for causal hypotheses, such as the link between self-efficacy and parenting stress (Hartung & Hahlweg, 2011), and between parenting competence and reductions in dysfunctional parenting styles (McTaggart & Sanders, 2007). However, the relative importance of these putative processes is not clear, nor whether similar mediating processes will be evident during participation in an online program, or if self-directed versus practitioner-supported delivery work through different mechanisms.

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Aims and overview of this thesis

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The aim of this thesis is to present a program of research designed to begin addressing some of the research questions just described. Ultimately, the goal is to extending our understanding of how web-based parenting support can best help families. Chapters 2, 3 and 4 of this thesis are included as modified versions of manuscripts currently being prepared for submission as publications. They are modified where necessary to suit the flow and narrative of this thesis, but otherwise follow typical conventions for reporting empirical trials, with background, methodology, results and conclusions presented in each.

Chapter 2 describes a three-group randomised controlled trial (RCT) that forms the centrepiece of this thesis. This RCT explores the additive benefit of brief, regular telephone consultations when provided as an adjunct to Triple P Online, with a self-directed condition and non-active control condition, assessed at pre, post and 5-month follow-up. Treatment outcomes covering a range of parent and child domains are described, as well as program engagement and satisfaction. We return to this RCT in Chapter 4, but first make a slight deviation in Chapter 3 which reports on findings from an exploratory factor analysis of content analysis and consumer feedback work designed to elicit further information on putative mechanisms of parenting change that take place within Triple P. Survey findings are reported from more than 500 accredited Triple P practitioners worldwide who responded to a set of items derived from careful analysis of Triple P resources in an effort to distil a wide range of theoretically-relevant mechanisms of change to a smaller, more testable subset. By drawing on the experience and expertise of Triple P practitioners, putative mechanisms were ranked for perceived importance, with 11 key domains identified through factor analysis.

Chapter 4 returns to the primary RCT introduced in Chapter 2, to report on secondary analyses of mediators and moderators. The goal of these follow up analyses were to further understand the processes of change at work within an online parenting intervention, and determine whether it was possible to explain treatment differences beyond simply whether practitioner support was provided. First, parental depression is posited as a possible moderator of program engagement and intervention outcomes. Second, a small set of putative mechanisms aligned with both the theoretical underpinnings of Triple P, and derived from the consumer feedback work described in Chapter 3, are analysed through mediation analyses. Parental depression is further explored as a potential moderator of these mediation analyses through conditional indirect effects.

Finally, Chapter 5 provides a general discussion of the research findings presented throughout this thesis, along with a discussion of the limitations in the program of research, clinical implications, and suggestions for further research.

Chapter 2

A randomised controlled trial of the efficacy of Triple P Online with and without telephone support

With web-based psychological treatments becoming increasingly popular as viable alternatives to traditional face-to-face methods of delivery, researchers have continued to turn their attention towards uncovering the mechanics that influence program engagement and treatment success (e.g. Bennett & Glasgow, 2009; Bennett-Levy et al., 2010). Triple P Online (Turner & Sanders, 2011) is a recent addition to the Triple P—Positive Parenting Program, a tiered, multilevel system of behavioural family intervention (Sanders, 2012), which adopts current web-based technologies with the goal of making evidence-based parenting support more accessible to parents. Previous trials have demonstrated the efficacy of the program as a primarily self-directed intervention (Sanders, Baker, et al., 2012; Sanders, Dittman, et al., 2014), and with a moderated social-networking component targeting extremely vulnerable parents in a US context (Love et al., 2016). Currently though we know relatively little regarding the moderators of treatment success or factors that might influence program engagement and its impact on outcomes. The current research aims to build on research exploring the efficacy of Triple P Online by addressing a fundamental question: what is the differential impact of providing brief, regular clinical support as an adjunct to the online program?

One common limitation found in trials of web-based interventions is that many online programs suffer from high rates of participant dropout or attrition, often quite early into treatment (Christensen & Mackinnon, 2006; Eysenbach, 2005). This is particularly prevalent for unguided and open-access web-based programs, where users are unsupported through the intervention (e.g. Christensen et al., 2009). Additionally, participants may cease engaging with a program for a range of reasons, such as technical barriers, usability or design issues, unmet expectations or dissatisfaction, or they have simply gained the benefits they were looking for and feel no need to continue using the program (Bennett-Levy et al., 2010; Eysenbach, 2005).

Within the broader field of web-based cognitive behavioural therapy for conditions such as depression and anxiety, the benefits of guided delivery over self-directed treatment have been well established, with a number of published trials and reviews describing increased treatment adherence and better outcomes (e.g. Andersson et al., 2013; Mohr et al., 2010). In the context of online parenting programs, to our knowledge no studies have yet performed a direct comparison between self-directed and practitioner-supported versions of an online parenting program, however positive outcomes have been achieved with clinical support provided through diary feedback (Enebrink, Högström, Forster, & Ghaderi, 2012) and moderated parenting forums (Love et al., 2016).

The primary aim of this study was to address this gap by comparing the effects on program engagement and child, parent and family outcomes when Triple P Online is offered as a practitioner-supported intervention versus a completely self-directed program. We decided to implement a weekly clinical telephone consultation model for the current trial based on the ubiquity of telephone access for most parents, the success of the model in other trials (e.g. Carlbring, Bohman, et al., 2006), and because telephone consultations have been shown to improve outcomes for self-directed Triple P in an offline context when provided as an adjunct for participants using the "Every Parent's Self-Help Workbook" (Morawska & Sanders, 2006).

We hypothesized that relative to a computer-use-as-usual control condition, parents within the two active intervention conditions (both provided with access to Triple P Online) would show significant improvement on primary outcomes targeted by the program, namely reductions in the frequency and severity of child behaviour problems and coercive parenting practices, as well as associated secondary outcomes including increases in parenting confidence, less parental depression, stress and anxiety, reductions in anger towards their child, improved quality of partner relationships, and less conflict with their partner around parenting. It was also hypothesised that parents receiving practitioner support would show significantly greater improvement on primary outcomes than parents in the self-directed condition, better program engagement based on completing more modules, and would report higher levels of satisfaction.

Furthermore, prior parent intervention research has shown that some types of family adversity or certain parent characteristics may be linked with poorer levels of engagement in parent training interventions, including factors such as high levels of conflict with a partner, parental depression and stress, lower levels of formal education, and being a single parent (Morawska & Sanders, 2006). Similar factors have also been associated with higher levels of child social, emotional or behavioural problems (e.g. Zubrick et al., 2005), as well as higher rates of attrition in other web-based interventions (e.g. Christensen et al., 2009; Eysenbach, 2005). Conversely, a recent trial of Triple P Online (Love et al., 2016) delivered to two cohorts of very vulnerable parents in a US context not only demonstrated significant improvements on child behaviour problems and coercive parenting, but with 36% and 51% of parents from the two cohorts completing all modules, completion rates compared favourably to reported levels of typical attendance at face-to-face parent training sessions (Breitenstein et al., 2014). These results give further weight to findings from consumer feedback studies that suggest parents find the notion of parenting support delivered via the internet preferable to most other formats, regardless of family background or circumstance (Metzler et al., 2012). As such, a secondary goal of the current study was to expand our knowledge of the suitability of Triple P Online for a wide range of families by exploring whether the program

is effective when recruiting a targeted population of parents currently experiencing additional stressors, or family characteristics typically linked with lower program attendance.

Method

Registration and ethics

This trial was registered on the Australian New Zealand Clinical Trials Registry (ANZCTR), registration number ACTRN12614000672651. Approval to conduct the research was granted by the Behavioural and Social Sciences Ethical Review Committee at the University of Queensland, #2012000186.

Design

The study followed a 3 (group: self-directed TPOL [TPOL] vs. TPOL enhanced with practitioner support [TPOLe] vs. computer-use-as-usual [CUAU]) x 3 (time: pre-intervention [T1], post-intervention four-months after initial login [T2], five-month follow-up [T3]) randomized design.

Participants in the enhanced intervention group were allocated a practitioner from one of two sites. The first site was the Parenting and Family Support Centre (PFSC) at the University of Queensland (UQ). Practitioners from the PFSC consisted of one registered psychologist, 12 provisional psychologists completing the Master of Clinical Psychology program at UQ, and one Triple P-accredited research assistant. PFSC practitioners were required to attend weekly supervision sessions with a registered clinical psychologist who was an accredited Triple P practitioner.

The second site was Parenting WA, of the Department of Local Government and Communities in Western Australia (WA). Parenting WA is a free community service aimed at providing information, support and referral services to parents, carers and grandparents living in WA. The service offers telephone counselling as a primary mode of support to parents. Support staff received clinical supervision through local management as needed, and additionally were encouraged to undertake regular peer-assisted supervision. There was no financial reimbursement for Parenting WA's involvement in this research.

All practitioners involved in the study were trained and accredited in at least one Level 4 variant of the Triple P system. Practitioners were allocated to families who were located within the scope of their usual service provision.

Participants

Participants were recruited nationally through a Facebook page set up for the project, e-newsletters sent through subscription-based parenting networks, and through flyers sent to local

childcare and community centres and handed out in-person at Brisbane-based parenting events. Additionally, Parenting WA coordinated with local child health services to send a mail-out to WA parents waiting to access face-to-face Triple P services. These parents were invited to participate in the trial, however choosing to participate did not forfeit their place on the waiting list.

An information website was set up to explain the aims and participation requirements for the project, and allow parents to register their expression of interest. The first registration was received on the 29th April, 2012, and recruitment was closed after the final registration on the 1st April, 2014. Parents that had registered their interest were contacted via telephone shortly afterwards for a screening interview to assess their eligibility for the project.

Eligibility criteria

Families were required to have at least one child aged between two and eight, and report concerns regarding the target child's behaviour in at least three domains drawn from DSM-IV criteria for externalising behaviour problems such as conduct disorder and attention-deficit/hyperactivity disorder (e.g. "Does your child often say 'no' or refuse to cooperate when asked to do something?"). The interview was used to exclude parents with minimal concerns about their child, and who were simply looking for general parenting advice.

In addition, to ensure that we reached parents more likely to be in need of clinical support, families needed to meet criteria for at least one additional stressor from the following socioeconomic risk factors: (a) currently single (or separated, divorced or widowed), (b) currently unemployed (unless supported financially by a partner), (c) in a low education bracket, with one or both parents having no higher than a Year 12 education, (d) experiencing financial stress, (e) experiencing regular conflict with their partner around parenting, or (f) experiencing adjustment difficulties such as high levels of anxiety or depression over the last four weeks. Financial stress was indicated if they reported difficulties meeting essential expenses over the last six months, spent more money than they brought in, or had just enough money to get through to the next pay day. Conflict with a partner around parenting was assessed using the Parent Problem Checklist (PPC; Dadds & Powell, 1991), using the recommended clinical cut-off score of five or more on the Problem subscale. Depression and anxiety was assessed during screening using the brief 10-item Kessler-10 (Kessler et al., 2002) with a score of 22 or higher as the cut-off value.

Parents were not eligible to participate if they (a) were currently accessing parenting support elsewhere, (b) had a child with a diagnosed intellectual disability, developmental delay, or Autism Spectrum Disorder, (c) reported difficulties reading English without assistance, or (d) did not have access to an Internet-connected computer with sufficient connection speed to watch a YouTube video. Parents not eligible to participate were referred to other local services.

Measures

A modified version of the *Family Background Questionnaire* (Sanders & Morawska, 2010) was used at baseline to collect key demographic information and indicators of socioeconomic status. The following outcome measures were chosen for their relevance and reliability. Internal consistencies for measures used in the study were assessed using Cronbach's alpha coefficients, with values ranging between adequate (.66) and high (.97).

Child behaviour

Child behaviour problems were measured using the *Intensity* and *Problem* subscales of the Eyberg Child Behaviour Inventory (ECBI; Eyberg & Pincus, 1999). The *Intensity* scale measures the frequency of disruptive behaviours on a scale of 1 (*never*) to 7 (*always*). The *Problem* scale measures how many disruptive child behaviours the parent considers to be a problem using a Yes/No format. The ECBI has 36 items, and good test-retest reliability ($r = 0.86$). Both subscales showed high internal consistency in this sample, with $\alpha = .91$ and $\alpha = .89$ respectively.

Parenting practices

Coercive parenting was assessed using the 30-item Parenting Scale (PS; Arnold, O'Leary, Wolff, & Acker, 1993). The PS provides a Total score and three subscale scores (*Laxness*, *Over-reactivity*, and *Hostility*). Parents indicate using a 7-point Likert scale how they would typically handle various disruptive behaviours, with options ranging between more and less effective responses to the behaviour. The Total score has good test-retest reliability ($r = 0.84$). Internal consistency was adequate for the Hostility subscale ($\alpha = .66$), good for the Laxness and Over-reactivity subscales ($\alpha = .74$ for both), and high for the Total score ($\alpha = .86$).

Parental adjustment

Parental adjustment was measured using the 21-item Depression, Anxiety and Stress Scale (DASS-21; Lovibond & Lovibond, 1995). The DASS-21 assesses symptoms of depression, anxiety and stress with good discriminant and convergent validity, and has high test-retest reliability ($r = .71$-$.81$). Participants indicate to what extent each item applies to them on a scale of 0 to 3. The subscales all demonstrated high internal consistency, with $\alpha = .91$ for Depression, $\alpha = .79$ for Anxiety, and $\alpha = .89$ for Stress.

Parenting confidence

The Parenting Tasks Checklist (PTC; Sanders & Woolley, 2005) assesses task-specific self-efficacy as a measure of parenting confidence. The PTC provides scores on two subscales: *Setting self-efficacy* (e.g. "Going to the doctor") and *Behavioural self-efficacy* (e.g. "Refuses to eat food"). Item responses are given on a scale of 0 (*Certain I can't do it*) to 100 (*Certain I can do it*). Both subscales had very high internal consistency ($\alpha = .92$ and $\alpha = .97$ respectively).

Relationship quality and adjustment

Indicators of relationship adjustment included the Parent Problem Checklist (PPC; Dadds & Powell, 1991) and the Relationship Quality Index (RQI), an adaptation of the Quality of Marriage Index (Norton, 1983).

The PPC measures conflict between partners around parenting on a 16-item scale, and has good test-retest reliability ($r = .90$). The *Problem* subscale indicates how often conflict around parenting arises using a Yes/No format, and the *Extent* subscale indicates the perceived severity of these issues on a scale of 1 (*Not at all*) to 7 (*Very much*). Internal consistency was high in this sample for both subscales, with $\alpha = .84$ and $\alpha = .92$ respectively.

The RQI measures relationship satisfaction through five general items rated on a 7-point Likert scale (1 = *Very strongly disagree*, 7 = *Very strongly agree*) and one global item rating overall relationship happiness between 1 (*Unhappy)* and 10 (*Perfectly happy*). The measure demonstrated strong internal consistency in the sample ($\alpha = .94$).

Parental anger

Parents' anger response to their child's problematic behaviours was assessed using the Parental Anger Inventory (PAI; Hansen & Sedlar, 1998). The PAI presents parents with 50 items describing difficult child-specific behaviours and asks them to rate (1) whether the situation has been a problem for them in the past month using a Yes/No format, and (2) how angry the situation makes the parent feel, ranging from 1 (*Not at all*) to 5 (*Extremely*). Two subscales are attained, *Problem* and *Intensity*, each with good reliability ($r = .84$ and $r = .91$ respectively). Both subscales also had good internal consistency in this sample ($\alpha = .89$ and $\alpha = .96$).

Parent interviews

Prior to group randomization, a random subsample of parents was selected to participate in a set of nine telephone interviews, three scheduled at each assessment time point (T1, T2, and T3), using a modified version of the Parent Daily Report interview (PDR; Chamberlain & Reid, 1987). Each set of calls was scheduled to take place within a two-week period, to coincide as closely as possible with the date of questionnaire completion.

The Parent Daily Report is a structured interview format where parents were asked a series of questions regarding the 24-hour period immediately preceding the call. Three outcomes were assessed for this study. First, the frequency of prosocial child behaviours (e.g. "Being cheerful, showing contentment and self-confidence"), measured across seven items each rated on a four-point Likert scale (0 = *Not at all*, 1 = *A bit*, 2 = *Some*, 3 = *A lot*). Second, the number of occurrences of difficult child behaviours (e.g. "Being aggressive, fighting, hitting, biting, kicking others"), measured across 19 items rated on a 7-point Likert scale from *0* to *6 or more times*. Third, for any difficult behaviours that had occurred at least once, parents were asked to rate their overall level of irritation due to that behaviour ("How much did it irritate you?"), on the same four-point Likert

scale used for prosocial behaviours. Parents were also asked how much time they had spent with the child during the last 24 hours so that we could control for differences in the amount of contact time with the child.

Participant satisfaction

Client satisfaction was assessed using the Client Satisfaction Questionnaire (CSQ; e.g. Sanders et al., 2000; Sanders, Markie-Dadds, & Turner, 2012) at post-intervention for the treatment groups only. The CSQ is a 13-item measure looking at satisfaction on a range of indicators such as the quality of the service, to what extent the program met the needs of the family, and whether they feel the program has equipped them to deal more effectively with problems that arise. Items are rated on a scale of 1 to 7, and a total score ranging between 13 and 91 is attained by summing the items with higher scores indicating greater satisfaction.

Procedure

During the initial screening interview, the details of the study were explained to parents, including the randomization process and participation requirements. A random number generator was used during the call to determine if the parent should be assigned to participate in PDR interviews, and if so they were discussed with the parent. No parents assigned to PDRs declined to participate during the screening interview.

Following completion of the T1 survey and PDR interviews (for those assigned), participants were randomized to either TPOL, TPOLe or CUAU and notified via an automated email. Group randomization was achieved using a computer-generated list of random numbers produced by a researcher not involved in the study and stored in an online database. Following allocation, participants' group assignments were visible to the research team so that practitioners could be allocated and access codes sent to participants as needed.

Parents randomized to the TPOLe condition were allocated to an available practitioner who would make initial telephone contact to introduce themselves and schedule their first telephone consultation. Following this the parent was sent login details for the online program. Parents in the TPOL condition were sent login details immediately following randomization. Program access was provided to treatment parents for four months from the date of first login, at which point program access automatically expired. Automated notification emails were sent two weeks and one week prior to expiry to remind participants to finish any remaining modules and download any resources they wished to keep. If parents had not logged in to the program one week after being sent their access code an email reminder was sent, with further follow-up phone calls if still not logged in after two weeks. Apart from these reminders, the only interaction with parents in the TPOL condition was technical assistance if required.

Post-intervention (T2) data collection occurred immediately following program expiry (four months after initial login), with follow-up (T3) data collection completed five months later. Parents in the CUAU condition continued to complete surveys and PDRs (if assigned) at four-months post-enrolment and nine-months post-enrolment, but otherwise received no further contact during this time. After completion of T3 assessment, parents in the CUAU group were emailed an access code for the online program, and received four months of self-directed access from the date of first login.

Intervention

Triple P Online is an eight-module online behavioural family intervention (BFI), based on existing Level 4 Triple P interventions (Sanders, 2012). The program covers the key concepts of positive parenting in depth, and features video, interactive activities, downloadable resources, a dynamically-generated workbook, and optional technology-assisted reminders (e.g. SMS, email). Users are encouraged to set goals for change which are revisited periodically during the program to help the user assess their progress. Later modules encourage users to identify high-risk situations (e.g. shopping trips) and combine strategies and principles discussed earlier in the program into a cohesive prevention plan. More information about the content of modules is available in Sanders et al (2012).

Up to eight practitioner support sessions were provided to parents randomized to the TPOLe group. The guidelines for practitioners were based on the implementation of telephone consultations during Level 4 Group Triple P. Practitioners were asked to (a) check that the parent had successfully logged in to the program and/or completed the next module; (b) ask the parent to set an agenda for the session, (c) review content (i.e. ask parent to identify ideas that stood out to them), (d) review goals or practice tasks from the prior session, (e) discuss any agenda items, and (f) discuss an adherence plan if the parent has not engaged with the program.

Parents were encouraged to complete one online module and one telephone consultation each week for eight weeks, however given the built-in four-month window of access to the online program we allowed for some flexibility with the consultation process such that parents were able to reschedule calls when legitimate scheduling conflicts arose. Telephone consultations were considered 'missed' if the parent did not answer at the designated time and made no attempt to reschedule or notify their practitioner. This process meant that some parents allocated to the TPOLe condition did not participate in any calls despite multiple attempts by the research team to make contact.

Protocol adherence

      Practitioners noted the dates and duration of each consultation, as well as dates of contact attempts. We also tracked the number of modules completed and the amount of time spent on modules as measures of intervention engagement and dosage.

Missing data

      For parent self-report outcomes, subscale scores were calculated according to scoring guidelines provided with each measure. As subscale scores could not be accurately computed for some participants due to missing items, multiple imputation of missing item-level responses was conducted to capitalize on all available data, which has been shown to provide greater statistical power for parameter estimates than scale-level imputation (Enders, 2010). Multiple imputation by fully-conditional specification was applied using the *MICE* package (van Buuren & Groothuis-Oudshoorn, 2011; van Buuren, 2007) in *R* (R Core Team, 2015). Fifteen imputations were generated from 30 iterations each, using predictive mean matching as the imputation method and with randomized group entered as a cluster variable. A three-step imputation strategy was used where temporary subscale scores were computed using available data and entered into the conditional model as auxiliary predictors, then replaced after each iteration with updated subscale scores (Enders, 2010), as the number of individual item-level variables to impute across all outcome scales was otherwise prohibitively large. Item response sets that were entirely missing due to attrition were excluded from the imputation process and treated as missing data in the mixed-effects models described below, which do not require balanced data for intent-to-treat analyses. Missing PDR data was also addressed through multilevel modelling rather than multiple imputation.

Statistical analyses

      Intent-to-treat analyses were conducted using hierarchical linear mixed-effects models (LMMs), with assessment time point as the level 1 variable, nested within participants ($N = 183$) as the level 2 variable. Kreft and Leeuw (1998) report that with small number of level 1 observations (i.e. < 5), at least 150 are recommended at level 2 in order to detect cross-level interactions with power of 0.90.

      Models were initially estimated using full information maximum likelihood (FIML) for model comparisons, then normal-theory restricted maximum likelihood (RML) for final parameter estimates which provides more accuracy than FIML with smaller sample sizes (Kwok et al., 2008). For each outcome, Model 1 was estimated as a baseline random intercept-only model. Model 2 was estimated with random intercepts and the variable *time* entered as both a fixed and random effect. Model 3 extended Model 2 by adding *group* as a fixed effect, while Model 4 added the interaction between time and group. Random slopes and intercepts were included to account for variation

between participants in baseline scores and rates of change over time using an unstructured covariance matrix, which is completely general and allows intercept and slope variances and covariances to be freely estimated within the model. Residual within-person variances were estimated using an identity covariance matrix, which assumes error independence and homogeneity. In each case, *time* (T1, T2 and T3) and *group* (CUAU, TPOL, TPOLe) were entered as categorical variables, with planned contrasts specified such that the first category acted as the reference group for the second and third categories (i.e. T1 vs T2; T1 vs T3; CUAU vs TPOL; CUAU vs TPOLe).

Models were fit for each imputed dataset, with fixed effects parameter estimates pooled using Rubin's (1987) combining rules and the Barnard-Rubin adjustment for degrees of freedom (Barnard & Rubin, 1999). The proportion of variance explained by each model was calculated using the R^2_{lmm} approach recommended by Nakagawa and Schielzeth (2013) for linear mixed-effects models, which partitions variance explained into that which is attributable to fixed effects only (marginal R^2), or both fixed and random effects (conditional R^2), with R^2 values averaged across imputations. Wald tests comparing each higher model with its preceding one were conducted to test the null hypothesis that any additional parameter(s) in the higher model are equal to zero, providing an indication of whether the parameters should be retained, and with degrees of freedom corrected using the Reiter (2007) method. Table 3 shows results of model comparison, with tests designated as *F* statistics (as the Wald estimate is assumed to follow an *F* distribution). As *F* tests within mixed models are approximate and interpretation should be guided by both statistical and theoretical considerations (Cheng, Edwards, Maldonado-Molina, Komro, & Muller, 2010), we applied a relaxed cut-off level of $p < .10$ when determining which model to use for further hypothesis testing.

Where the interaction model provided an adequate fit, our primary hypotheses were explored through planned comparisons of predicted growth trajectories for treatment groups using the control condition as a reference category. Unstandardized pooled beta coefficients representing the difference in change scores between groups are reported as B_{diff}.

PDR outcomes were explored using full maximum likelihood LMMs instead of RML, to allow log-likelihood testing of nested models. An additional covariate (hours) was entered for the two frequency outcomes to control for differences in the amount of time spent with the child during the 24-hour period.

Cohen's *d* effect sizes were calculated as the mean difference in change scores between groups divided by the pooled pre-treatment standard deviation, with a bias correction applied (Morris, 2008). Effect sizes were computed for each imputation and pooled using Rubin's combining rules, and interpreted using conventions of small (0.2), medium (0.5), and large (0.8).

Reliable and clinical change

A reliable change index (RCI; Jacobson & Truax, 1991) was calculated for the primary outcome measures ECBI Intensity, ECBI Problem, and the total score on the Parenting Scale, using follow-up data as the most distal measure of change from baseline. Auxiliary estimates of test-retest reliability were computed using correlations between T1 and T2 scores and standard deviations of baseline scores in the CUAU group. Clinical significance was calculated as the proportion of participants moving out of the clinical range on the same outcome measures, using published clinical cut-offs. Reliable and clinical change was determined for participants with complete information available following imputation. Proportions were computed for each imputed dataset and then averaged, with values rounded to the nearest whole number to aid interpretability and allow for chi-square tests of independence. For significant omnibus tests, pairwise analyses were conducted with p values adjusted using the Holm correction (Holm, 1979), which is similar to Bonferroni correction but less conservative. A summary of reliable and clinical change is shown in Table 6, with adjusted p values reported for group comparisons.

Results

Preliminary analyses

A total of 373 parents registered their expression of interest through the website. Nine could not be contacted for screening; the remaining 364 were screened for eligibility with 205 (56%) meeting inclusion criteria and sent a link to the online T1 questionnaire and consent form via email. One parent declined consent at this point, and a further 21 parents did not complete T1 assessment and were not randomized to condition.

Forty-nine parents were assigned to PDRs; two withdrew from the study prior to completion of the first round of interviews and so were not randomized to condition. In total, 183 parents completed T1 assessment and were randomized to condition, with 47 (26%) participating in PDR interviews. Following randomization there were 57 parents allocated to the self-directed Triple P Online condition (TPOL), 66 to receive Triple P Online enhanced with practitioner support (TPOLe), and 60 allocated to the computer-use-as-usual control condition (CUAU). Figure 2.1 outlines the flow of participants through the study.

Sample characteristics

Table 2.1 displays demographic characteristics across the sample by group allocation. Overall, parent ages ranged between 22 and 51 ($M = 34.9$; $SD = 5.3$), with child ages ranging between 1 and 8 ($M = 3.5$; $SD = 1.5$). Parents were mostly mothers, with only seven fathers

recorded as the primary participant (3.8%), and 53.5% of the target children were female across the sample.

The majority of participants lived in Western Australia (79.2%), were married or in a de facto relationship (89%), had children living with their original family (84.7%), and identified as white (93.4%). Regarding education and employment, 60.6% of the participating parents and 38.9% of their reported partners had a university degree, while 54.6% of the participating parents and 96.2% of their reported partners were in either full- or part-time employment at T1.

When asked whether they had experienced difficulty meeting essential expenses within the last six months, 14% responded 'yes', while 16.9% reported not having enough money left over for any non-essential purchases after paying for essential expenses.

To determine whether the randomization process was successful, chi-square tests for independence and univariate ANOVAs were used to compare treatment and control groups across all demographic variables. Only parent ethnicity differed significantly between groups, with the CUAU control group containing only parents identifying as white, 7.8% of parents in the TPOLe group identifying as Asian (with none in the other two groups), while 8.8% of parents identified with 'other' ethnic categories in the TPOL group. Given the very small percentage of parents in the sample that did not identify as white, as well as evidence that Triple P is effective with parents from culturally diverse backgrounds (Morawska et al., 2010), we do not believe this difference introduces any significant interpretive difficulties for the outcomes reported below.

Missing data

Seventy-six (41.5%) participants had no missing data across all three assessment time points, while 68.9% of all subscale scores were able to be calculated from complete item-level data. For items with missing responses not attributable to attrition, amount missing ranged between 0.2% to 11%, with 2.94% of item-level responses missing overall. The assumption of missing completely at random (MCAR) was not supported at the $p < .05$ level for subscales, and visual analysis suggested a primarily monotonic mechanism. Given that an inclusive item-level imputation strategy was used drawing on the large amount of auxiliary parent data captured at T1 (Collins, Schafer, & Kam, 2001), along with maximum likelihood estimation for analyses, a missing at random (MAR) mechanism was considered an appropriate assumption.

Attrition

Seventeen parents (29.8%) from the TPOL group did not complete T2 questionnaires. Three of these parents re-engaged and completed T3 questionnaires, while a further 5 parents that had completed T2 were lost to T3 follow-up. For TPOLe, 16 parents (24.2%) did not complete T2 questionnaires, 2 returned to complete T3 questionnaires, while a further 3 parents did not complete

T3 follow-up questionnaires. In the CUAU control group, 7 parents (11.7%) did not complete T2 questionnaires, 2 returned for T3 follow-up, and a further 2 were lost to follow-up. Questionnaire completion rates are summarized in Figure 2.1.

Primary reasons for questionnaire non-completion were because parents withdrew from the study due to being too busy or enrolling in an alternative parenting intervention; otherwise because the research team was unable to make contact despite repeated follow-up attempts. Chi-square analysis indicated a significant difference between the three groups in terms of proportion of parents lost to follow-up, $\chi^2(2) = 10.43$, $p < .01$. Post hoc comparisons using Holm-adjusted p values indicated the CUAU group had a significantly lower rate of attrition than both the TPOL group ($p < .05$) and TPOLe group ($p < .01$). Parents in the control group appeared to be more motivated to complete assessments, possibly to ensure they would not miss out on receiving access to the intervention, whereas parents that had already accessed the program may have been less motivated to continue participating once their access had expired.

For the Parent Daily Report (PDR) telephone interviews, parents completed an average of 7.42 interviews ($SD = 2.28$) out of a maximum of 9. At T2, 10/47 parents (21.28%) did not complete any PDR interviews while at T3, 13/47 parents (27.66%) did not complete any PDR interviews. Chi-square analysis indicated no difference between groups in terms of participation versus non-participation in PDR interviews at T3, $\chi^2(2) = 3.63$; $p = 0.16$.

Intervention engagement

Figure 2.2 shows completion rates for each online module according to group allocation. Parents completed 4.52 modules on average ($SD = 3.12$; range 0 to 8) across both intervention groups, however there was a statistically significant difference in average module completion between the TPOL ($M = 3.25$, $SD = 3.08$) and TPOLe group ($M = 5.62$, $SD = 2.73$), $t(121) = -4.53$, $p < .001$. For the TPOL group, 13/57 (22.8%) completed all eight modules, while 31/66 (47%) in the TPOLe group completed all modules ($p < .001$, Fisher's exact test). There were 16/57 (28.1%) parents in the TPOL group that did not actively engage with the online intervention, defined as either not logging in at all, or logging in briefly but not completing the first module. A significantly lower proportion of parents in the TPOLe group (4/66, 6.1%) did not actively engage ($p < .05$, Fisher's exact test). Overall, mean module completion time was 62.95 minutes, using a 10% trimmed mean to account for outliers.
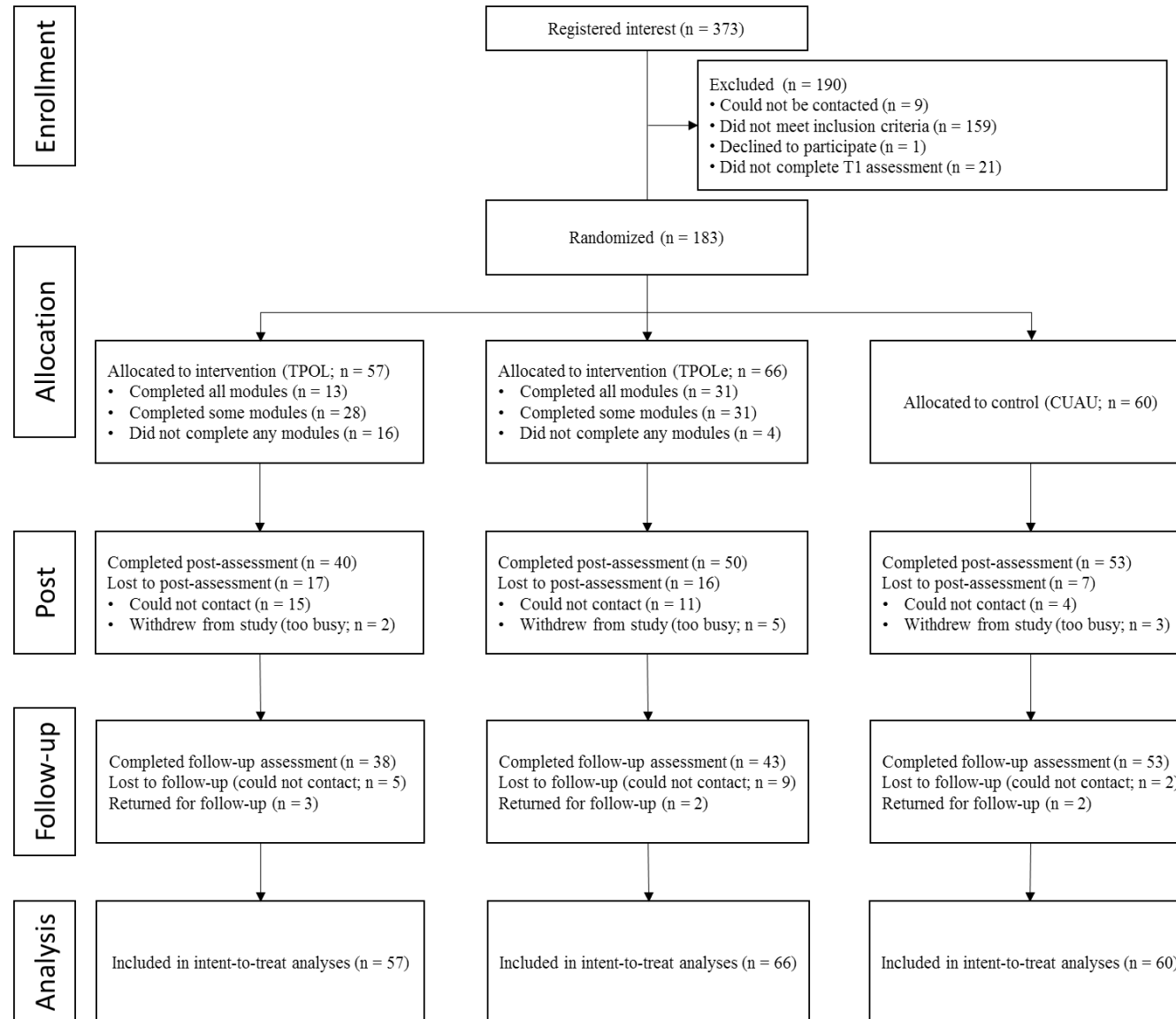
Figure 2.1. CONSORT diagram of participant flow

Table 2.1. Participant demographics by treatment condition.

Variable		TPOL (*n*=57) M *(SD)*	TPOLe (*n*=66) M *(SD)*	CUAU (*n*=60) M *(SD)*	F
Parent age (years)[a]		34.81 (5.16)	35.45 (5.88)	34.50 (4.81)	0.52
					H[b]
Child age (years)[a]		3.44 (1.45)	3.69 (1.7)	3.43 (1.24)	0.82
		% (*n*)	% (*n*)	% (*n*)	χ2
Location[c]	NSW	10.53 (6)	6.06 (4)	5.00 (3)	6.45
	NT	-	1.52 (1)	-	
	QLD	8.77 (5)	12.12 (8)	16.67 (10)	
	VIC	-	1.52 (1)	-	
	WA	80.70 (46)	78.79 (52)	78.33 (47)	
Child gender	Male	42.10 (24)	42.40 (28)	55.00 (33)	2.63
	Female	57.90 (33)	57.60 (38)	45.00 (27)	
Parent's relationship to child[c]	Mother	94.70 (54)	95.50 (63)	98.30 (59)	1.17
	Father	5.30 (3)	4.60 (3)	1.70 (1)	
Relationship status	Married/de facto	89.50 (51)	86.40 (57)	91.70 (55)	0.92
	Single/separated/divorced	10.50 (6)	13.60 (9)	8.30 (5)	
Household[c]	Original family	84.20 (48)	83.30 (55)	86.70 (52)	1.60
	Step family	3.50 (2)	3.00 (2)	3.30 (2)	
	Sole parent	10.50 (6)	12.10 (8)	6.70 (4)	
	Not specified/Other	1.80 (1)	1.50 (1)	3.30 (2)	
Ethnicity[c]	White	91.20 (52)	89.40 (59)	100.00 (60)	**15.34****
	Asian	-	7.80 (5)	-	
	Other (e.g. Pacific Islander, Arab)	8.80 (5)	3.00 (2)	-	
Parent education	High school	19.30 (11)	24.20 (16)	20.00 (12)	1.32
	Trade/technical college	21.00 (12)	18.20 (12)	15.00 (9)	
	University degree (undergraduate/postgraduate)	59.70 (34)	57.60 (38)	65.00 (39)	
Partner education	High school	21.60 (11)	25.00 (14)	25.50 (14)	2.04
	Trade/technical college	35.30 (18)	42.90 (24)	32.70 (18)	
	University degree (undergraduate/postgraduate)	43.10 (22)	32.10 (18)	41.80 (23)	
Parent employment status	Full time/part time	63.60 (42)	54.40 (31)	45.00 (27)	4.41
	Not working/job seeking	36.40 (24)	45.60 (26)	55.00 (33)	
Partner employment status[c]	Full time/part time	94.10 (48)	96.40 (54)	98.20 (54)	1.23
	Not working/job seeking	5.90 (3)	3.60 (2)	1.80 (1)	
Able to meet essential expenses[c,d]	No	19.30 (11)	13.60 (9)	10.00 (6)	3.27
	Yes	79.00 (45)	86.40 (57)	88.30 (53)	
	Unsure	1.80 (1)	-	1.70 (1)	
Can afford after expenses[a,e]	Not much	21.10 (12)	16.90 (11)	13.30 (8)	3.40
	Some things	50.90 (29)	49.20 (32)	43.30 (26)	
	Most things	28.10 (16)	33.90 (22)	43.30 (26)	

Note. TPOL = Triple P Online (self-directed condition); TPOLe = Triple P Online Enhanced (practitioner-supported condition); CUAU = Computer-use-as-usual (control condition); ** = Significant at the .01 level.

[a]Data missing for 1 TPOLe case. [b]Kruskal-Wallis rank sum test used due to non-normal distribution. [c]Fishers' Exact Test used for significance testing as expected frequencies <5 for one or more cells. [d]Able to meet essential expenses in the last 12 months. [e]After essential expenses, how much money is leftover for nonessential purchases.

For the TPOLe group, parents participated in 4.2 clinical telephone support sessions on average (SD = 2.75). Call duration ranged between 5 minutes at the lower, and 60 minutes at the upper, with an average duration of 23.69 minutes (SD = 8.26). Using Kendall's Tau for non-parametric data there was a significant correlation between the number of telephone consultations and number of online modules completed, τ = .42, p (one-tailed) < .001.
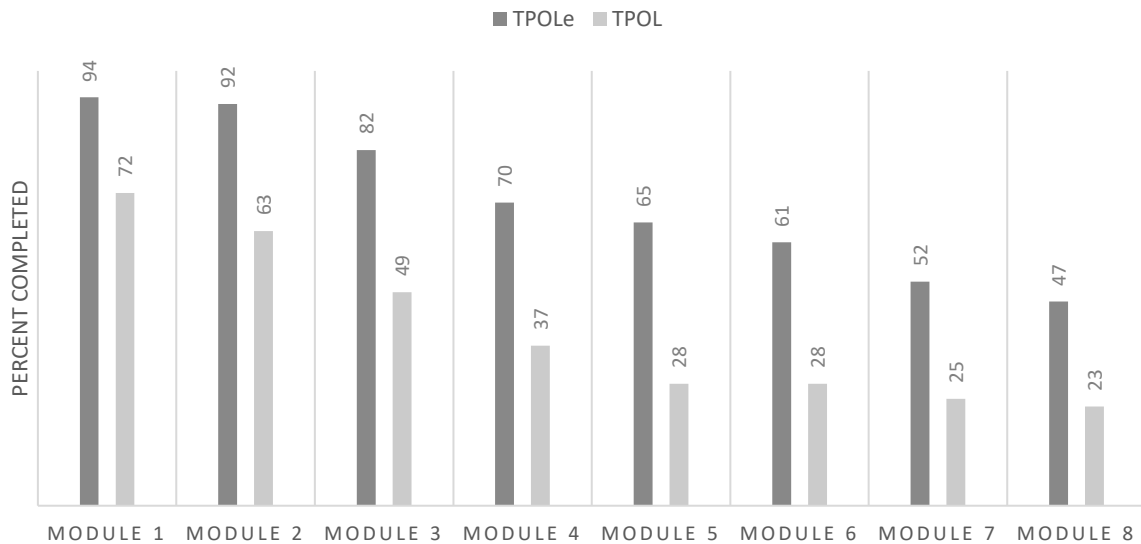
Figure 2.2. Module completion rates for the two intervention groups

Intervention effects

Means, standard deviations and Cronbach's alphas are shown for each outcome in Table 2.2. Mean scores and Cronbach's alpha were averaged across imputed datasets. Standard deviations were first converted to log scores to better reflect a normal distribution, and transformed back after averaging. Table 2.3 shows model comparisons and proportion of variance explained for hierarchical linear mixed models. Based on Wald tests there were significant time by group interaction effects for all parent-report outcomes except RQI and PAI Intensity, whereas PS Hostility and DASS Anxiety were within the relaxed p < .10 range and therefore included in further interaction hypothesis testing. PAI Intensity had a significant main effect of time, $F(2, 63.52)$ = 5.43, p < .01, suggesting a general trend towards improvement over time that was not specific to any group. There was no evidence of any change on the RQI scale and so it was omitted from further hypothesis testing.

Table 2.2. Outcome descriptive statistics for each group (TPOL, TPOLe, CUAU) at T1, T2, and T3, pooled across imputed datasets.

Measure	α^a	TPOL (*N* = 57)			TPOLe (*N* = 66)			CUAU (*N* = 60)		
		T1 (*n=57*)	T2 (*n=40*)	T3 (*n=38*)	T1 (*n=66*)	T2 (*n=50*)	T3 (*n=43*)	T1 (*n=60*)	T2 (*n=53*)	T3 (*n=53*)
		M (SD)	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)
ECBI Intensity	.91	136.61 (27.46)	122.97 (28.78)	125.96 (25.49)	139.64 (24.68)	113.19 (24.39)	116.11 (29.12)	145.50 (24.02)	137.45 (26.05)	138.85 (23.08)
ECBI Problem	.89	16.00 (6.63)	10.27 (7.31)	12.34 (7.92)	18.05 (6.40)	10.64 (6.05)	9.56 (6.74)	17.01 (6.72)	15.72 (7.28)	16.96 (7.34)
PS Laxness	.74	2.93 (1.11)	2.34 (0.85)	2.48 (0.90)	3.02 (1.05)	2.26 (0.76)	2.22 (0.73)	3.11 (1.04)	2.80 (1.07)	2.85 (1.07)
PS Over-reactivity	.74	4.00 (1.02)	3.64 (1.19)	3.66 (1.17)	4.10 (1.05)	3.33 (1.02)	3.34 (1.09)	3.88 (1.11)	3.77 (1.09)	4.01 (1.07)
PS Hostility	.66	1.84 (0.81)	1.81 (1.01)	1.79 (0.95)	2.06 (0.99)	1.73 (0.85)	1.70 (0.93)	2.08 (1.18)	2.05 (1.18)	2.24 (1.24)
PS Total	.86	3.29 (0.55)	2.89 (0.67)	2.98 (0.62)	3.40 (0.57)	2.79 (0.58)	2.69 (0.65)	3.33 (0.63)	3.15 (0.72)	3.25 (0.76)
DASS Depression	.91	3.21 (3.58)	2.35 (3.63)	1.71 (2.56)	4.17 (3.92)	2.56 (3.66)	2.23 (3.38)	3.38 (4.31)	3.76 (5.04)	4.18 (4.95)
DASS Anxiety	.79	2.14 (2.29)	1.78 (2.81)	1.68 (2.61)	2.33 (2.85)	1.37 (1.89)	0.95 (1.80)	2.28 (3.52)	2.57 (3.45)	2.42 (3.33)
DASS Stress	.89	6.42 (3.78)	4.95 (4.63)	5.21 (4.55)	7.58 (4.57)	5.17 (4.09)	4.37 (3.96)	6.47 (4.99)	6.77 (4.77)	7.14 (4.92)
PTC Setting	.92	72.83 (15.21)	84.79 (13.94)	87.26 (10.98)	79.29 (13.33)	88.13 (10.44)	88.79 (13.58)	79.04 (13.63)	82.72 (13.92)	82.54 (12.54)
PTC Behaviour	.97	60.83 (19.36)	78.94 (17.25)	79.10 (16.05)	62.14 (18.78)	82.66 (14.97)	83.39 (15.15)	62.08 (22.80)	71.25 (21.79)	69.09 (21.30)
PPC Problem	.84	7.06 (3.84)	4.66 (3.92)	4.62 (4.27)	7.85 (4.00)	5.68 (3.79)	5.64 (3.82)	6.89 (3.72)	6.59 (4.36)	6.72 (4.04)
PPC Extent	.92	40.69 (13.55)	31.57 (15.11)	31.88 (15.80)	45.64 (21.10)	34.50 (18.94)	35.18 (17.94)	40.09 (18.44)	38.40 (18.51)	38.68 (17.58)
RQI	.94	32.47 (8.48)	31.40 (10.77)	32.47 (9.32)	31.00 (9.98)	33.97 (10.41)	32.44 (10.63)	33.07 (8.02)	33.50 (9.28)	31.95 (9.38)
PAI Problem	.89	26.40 (7.28)	21.81 (8.61)	22.59 (10.53)	25.84 (7.96)	22.88 (7.94)	20.51 (9.46)	27.24 (7.44)	26.72 (9.03)	26.26 (8.13)
PAI Intensity	.96	112.67 (34.23)	98.97 (30.63)	97.94 (33.32)	113.12 (28.28)	101.93 (29.87)	99.70 (31.07)	111.72 (33.25)	114.49 (33.59)	112.69 (31.89)
		(*n=19*)	(*n=14*)	(*n=12*)	(*n=15*)	(*n=11*)	(*n=9*)	(*n=13*)	(*n=13*)	(*n=12*)
PDR Irritate[b]	0.81	1.70 (0.55)	1.35 (0.58)	1.30 (0.68)	1.72 (0.31)	1.26 (0.59)	1.43 (0.43)	1.61 (0.36)	1.30 (0.39)	1.57 (0.42)
PDR Negative[b,c]	0.82	2.89 (1.21)	2.46 (1.26)	2.49 (1.11)	3.67 (3.58)	2.31 (1.66)	2.37 (1.85)	3.28 (1.47)	2.28 (1.06)	2.56 (1.06)
PDR Positive[b,c]	0.66	1.60 (0.89)	1.90 (0.86)	1.57 (0.53)	1.39 (0.80)	2.01 (1.90)	2.78 (2.46)	1.72 (0.59)	1.84 (1.01)	1.87 (1.05)

Note. For all outcomes except PDR, reported mean is average mean across imputed datasets and reported *SD* is exponent of the average log(*SD*) across imputations; TPOL = Triple P Online (self-directed condition); TPOLe = Triple P Online Enhanced (practitioner-supported condition); CUAU = Computer-use-as-usual (control condition); T1 = Time 1 (Pre-assessment); T2 = Time 2 (Post-assessment); T3 = Time 3 (Follow-up assessment); ECBI = Eyberg Child Behaviour Inventory; PS = Parenting Scale; DASS = Depression Anxiety Stress Scales; PTC = Parenting Tasks Checklist; PPC = Parent Problem Checklist; RQI = Relationship Quality Inventory; PAI = Parental Anger Inventory; PDR = Parent Daily Report.

[a]Unstandardised Cronbach's alphas, averaged across imputed datasets. [b]Means averaged across set of three interviews conducted at each assessment time point. [d]Mean number of occurrences per hour.

Table 2.3. Model comparisons for pooled nested mixed-effects models estimated using restricted maximum likelihood.

Measure	1. Intercept R^2_c	2. Time (main effect) R^2_m	R^2_c	F	p	3. Time + Group (main effects) R^2_m	R^2_c	F	p	4. Time x Group[a] (interaction effect) R^2_m	R^2_c	F	p
ECBI Intensity	0.50	0.07	0.90	**33.90*****	<.001	0.12	0.92	**6.84****	.001	0.16	0.93	**6.53*****	<.001
ECBI Problem	0.35	0.08	0.88	**26.88*****	<.001	0.11	0.91	**4.74****	.009	0.17	0.92	**7.54*****	<.001
PS Laxness	0.58	0.05	0.90	**25.98*****	<.001	0.09	0.93	**5.05****	.006	0.10	0.93	**2.99***	.018
PS Over-reactivity	0.56	0.03	0.90	**14.72*****	<.001	0.03	0.92	0.23	.793	0.06	0.92	**4.56*****	.001
PS Hostility	0.68	0.00	0.90	**3.48***	.033	0.02	0.92	1.88	.154	0.03	0.93	2.14~	.076
PS Total	0.54	0.07	0.91	**30.16*****	<.001	0.07	0.93	0.78	.462	0.11	0.93	**5.62*****	<.001
DASS Depression	0.58	0.01	0.89	2.83~	.061	0.02	0.92	1.46	.233	0.03	0.92	**3.30***	.012
DASS Anxiety	0.67	0.01	0.92	**4.31***	.015	0.02	0.94	1.31	.271	0.03	0.94	2.09~	.083
DASS Stress	0.54	0.02	0.89	**6.97****	.001	0.02	0.91	1.00	.369	0.05	0.92	**4.49****	.002
PTC Setting	0.40	0.08	0.88	**33.28*****	<.001	0.10	0.91	**3.32***	.038	0.12	0.92	**3.90****	.004
PTC Behaviour	0.44	0.12	0.91	**48.46*****	<.001	0.14	0.93	**3.29***	.037	0.16	0.93	**3.62****	.007
PPC Problem	0.57	0.03	0.89	**14.37*****	<.001	0.04	0.92	1.05	.351	0.06	0.92	**4.13****	.003
PPC Extent	0.56	0.03	0.89	**13.97*****	<.001	0.04	0.92	1.20	.303	0.06	0.92	**3.17***	.015
RQI	0.39	0.00	0.86	0.44	.646	0.00	0.90	0.27	.765	0.01	0.90	1.04	.389
PAI Problem	0.50	0.03	0.89	**14.81*****	<.001	0.05	0.91	2.59~	.077	0.08	0.92	**3.00***	.019
PAI Intensity	0.52	0.01	0.89	**5.43****	.007	0.02	0.92	0.94	.392	0.04	0.92	1.85	.120
	R^2_c	R^2_m	R^2_c	χ^2	p	R^2_m	R^2_c	χ^2	p	R^2_m	R^2_c	χ^2	p
PDR Irritate	0.18	0.03	0.35	**52.02*****	<.001	0.04	0.35	0.07	.968	0.05	0.34	2.22	.696
	1. Hours[b]	2. Hours + Time				3. Hours + Time + Group				4. Hours + Time x Group[a]			
PDR Negative	0.37	0.11	0.53	**51.38*****	<.001	0.12	0.53	0.37	.830	0.12	0.53	0.69	.952
PDR Positive	0.22	0.06	0.37	**35.94*****	<.001	0.08	0.38	4.15	.126	0.09	0.38	5.02	.286

Note. ~ = Borderline significant at the 0.1 level; * = Significant at the .05 level; ** = Significant at the .01 level; *** = Significant at the .001 level; *F* statistics based on Wald test of null hypothesis that additional parameter estimates introduced in pooled higher-level model are equal to zero. Test statistic assumed to follow an *F* distribution; R^2_m = *Marginal R^2*, pseudo-R^2 estimating proportion of variance explained by fixed effects only; R^2_c = *Conditional R^2*, pseudo-R^2 estimating proportion of variance explained by fixed and random effects (Nakagawa & Schielzeth, 2013). Pseudo-R^2 estimates averaged across imputed datasets.

[a]Main effects of Time and Group also included in the interaction model. [b]Hours refers to time spent with the child during the past 24 hours, entered as a covariate.

Short-term intervention effects

Short-term intervention effects were explored by examining the differences between groups in the mean rate of change from T1 (baseline) to T2 (post-assessment). Short-term effects are shown in Table 2.4. Based on treatment group comparisons only the ECBI Intensity reached statistical significance with a medium effect size, $B_{\text{diff}} = -14.18$, $t(254.55) = -3.06$, $p = .002$, $d = 0.50$. There were no statistically significant differences between the two treatment groups on any other outcomes at post-assessment. Planned contrasts between treatment groups and control are outlined below.

Child behaviour

Comparisons showed that for ECBI Intensity, there was a non-significant difference in slopes between the self-directed TPOL and CUAU groups at T2, $B_{\text{diff}} = -7.20$, $t(268.95) = -1.59$, $p = .11$, $d = 0.22$. There was however a significant large effect ($d = 0.76$) for the TPOLe group compared to CUAU, $B_{\text{diff}} = -23.38$, $t(248.86) = -4.89$, $p < .001$. For the ECBI Problem scale, slopes for the TPOL group indicated significant improvement relative to CUAU with a medium effect size, $B_{\text{diff}} = -4.34$, $t(263.90) = -2.92$, $p < .01$, $d = 0.66$. Similarly, there was a large effect ($d = .93$) for participants in the TPOLe group when compared to CUAU, $B_{\text{diff}} = -5.98$, $t(259.41) = -4.22$, $p < .001$.

Parenting practices

Change from baseline on the PS Total score was significantly greater for both intervention groups relative to control, with a small effect for TPOL participants, $B_{\text{diff}} = -0.25$, $t(245.83) = -2.08$, $p < .05$, $d = 0.39$, and medium effect for TPOLe participants $B_{\text{diff}} = -0.42$, $t(245.23) = -3.71$, $p < .001$, $d = 0.73$. For the three PS subscales, a significant small effect ($d = 0.26$) was demonstrated on the Laxness scale in favour of the TPOL group relative to control, $B_{\text{diff}} = -0.34$, $t(257.32) = -1.99$, $p < .05$, and similarly for the TPOLe group, $B_{\text{diff}} = -0.49$, $t(263.39) = -3.06$, $p < .01$, $d = 0.43$. Mean slopes for the TPOLe group were also significantly greater than CUAU on the Over-reactivity subscale, $B_{\text{diff}} = -0.62$, $t(246.79) = -3.22$, $p < .01$, $d = 0.61$, but there was no difference in rates of change between the TPOL and CUAU groups, $B_{\text{diff}} = -0.25$, $t(251.32) = -1.25$, $p = 0.21$, $d = 0.20$. For PS Hostility there was a small significant effect ($d = 0.27$) for the TPOLe group relative to control, $B_{\text{diff}} = -0.30$, $t(261.65) = -2.06$, $p < .05$, but no effect for the TPOL group, $B_{\text{diff}} = -0.08$, $t(263.62) = -0.53$, $p = .60$, $d = 0.00$.

Parental adjustment

Planned contrasts for DASS Depression revealed a significant medium effect ($d = 0.48$) for the TPOLe group relative to control, $B_{\text{diff}} = -1.73$, $t(267.09) = -2.64$, $p < .01$, while there was a non-significant difference between TPOL and CUAU, $B_{\text{diff}} = -0.87$, $t(266.81) = -1.26$, $p = .21$, $d = 0.30$.

Both intervention groups showed significant improvement relative to control for the DASS Stress subscale, with $B_{\text{diff}} = -1.75$, $t(265.94) = -2.04$, $p < .05$, $d = 0.40$ for TPOL and $B_{\text{diff}} = -2.61$, $t(267.50) = -3.22$, $p < .01$, $d = 0.57$ for TPOLe. For DASS Anxiety, pairwise comparisons demonstrated a significant improvement for TPOLe compared to control, $B_{\text{diff}} = -1.19$, $t(267.70) = -2.47$, $p < .05$, $d = 0.39$, but not for TPOL, $B_{\text{diff}} = -0.64$, $t(265.50) = -1.26$, $p = .21$, $d = 0.22$.

Parenting confidence

For the PTC Setting subscale, pairwise comparisons showed a significant medium effect ($d = 0.57$) relative to control for the TPOL group, $B_{\text{diff}} = 8.03$, $t(261.53) = 2.87$, $p < .01$, and a smaller significant effect ($d = 0.38$) for the TPOLe group, $B_{\text{diff}} = 5.53$, $t(253.79) = 2.07$, $p < .05$. This was one of the few outcome scales to show a stronger effect for participants in the self-directed TPOL group than the practitioner-supported TPOLe group, although the difference between treatment groups did not reach statistical significance (see Table 4). For the PTC Behaviour subscale, both active groups showed significant improvement relative to CUAU at T2. In this case the effect was stronger for the TPOLe group, $B_{\text{diff}} = 10.93$, $t(254.25) = 2.98$, $p < .01$, $d = 0.54$, than for the TPOL group, $B_{\text{diff}} = 7.91$, $t(248.06) = 2.04$, $p < .05$, $d = 0.42$.

Partner relationships

Slopes representing pre-post change on both PPC subscales demonstrated significant improvement for the two intervention groups relative to control. For PPC Problem, effects approached medium size for TPOL, $B_{\text{diff}} = -1.96$, $t(244.51) = -2.51$, $p < .05$. $d = 0.49$, and TPOLe, $B_{\text{diff}} = -1.99$, $t(243.53) = -2.70$, $p < .01$. $d = 0.45$. A similar pattern emerged for PPC Extent, with $B_{\text{diff}} = -7.38$, $t(243.63) = -2.18$, $p < .05$. $d = 0.32$ for TPOL and $B_{\text{diff}} = -9.96$, $t(241.80) = -3.13$, $p < .01$. $d = 0.44$ for TPOLe relative to control.

Parental anger. For PAI Problem, both intervention groups showed significantly greater reductions in anger at T2 compared to control, with a medium effect ($d = 0.55$) for TPOL participants, $B_{\text{diff}} = -4.37$, $t(266.48) = -2.77$, $p < .01$, and a smaller effect ($d = 0.34$) for TPOLe participants, $B_{\text{diff}} = -3.13$, $t(268.10) = -2.11$, $p < .05$. The interaction model was not significant for PAI Intensity, although there was a main effect of time indicating all groups had shown a similar amount of improvement from baseline, $B = -6.54$, $t(242.63) = -2.30$, $p < .05$.

Table 2.4. Pairwise comparisons showing differences between groups in change from baseline levels at T2 (post-assessment).

Outcome	CUAU vs TPOL				CUAU vs TPOLe				TPOL vs TPOLe			
	B_{diff}	SE	p	d (95% CI)	B_{diff}	SE	p	d (95% CI)	B_{diff}	SE	p	d (95% CI)
ECBI Intensity	-7.20	4.52	.113	0.22 (-0.14, 0.58)	**-21.38*****	4.37	<.001	0.76 (0.39, 1.13)	**-14.18****	4.64	.002	0.50 (0.14, 0.86)
ECBI Problem	**-4.34****	1.49	.004	0.66 (0.29, 1.04)	**-5.98*****	1.42	<.001	0.93 (0.56, 1.31	-1.64	1.51	.279	0.26 (0.11, 0.62)
PS Laxness	**-0.34***	0.17	.048	0.26 (-0.10, 0.63)	**-0.49****	0.16	.002	0.43 (0.08, 0.78)	-0.15	0.17	.369	0.15 (-0.20, 0.51)
PS Over-reactivity	-0.25	0.20	.213	0.24 (-0.13, 0.61)	**-0.62****	0.19	.001	0.61 (0.25, 0.97)	-0.36~	0.21	.071	0.39 (0.03, 0.75)
PS Hostility	-0.08	0.15	.597	0.00 (-0.36, 0.36)	**-0.30***	0.15	.040	0.27 (-0.08, 0.62)	-0.22	0.15	.159	0.32 (-0.03, 0.67)
PS Total	**-0.25***	0.12	.039	0.39 (0.02, 0.76)	**-0.42*****	0.11	<.001	0.73 (0.36, 1.09)	-0.17	0.12	.151	0.36 (0.00, 0.72)
DASS Depression	-0.87	0.70	.210	0.30 (-0.06, 0.67)	**-1.73****	0.66	.009	0.48 (0.12, 0.83)	-0.86	0.70	.224	0.20 (-0.16, 0.56)
DASS Anxiety	-0.64	0.51	.211	0.22 (-0.14, 0.58)	**-1.19***	0.48	.014	0.39 (0.04, 0.74)	-0.55	0.51	.282	0.23 (-0.13, 0.58)
DASS Stress	**-1.75***	0.86	.043	0.40 (0.03, 0.76)	**-2.61****	0.81	.001	0.57 (0.21, 0.92)	-0.86	0.86	.320	0.22 (-0.13, 0.58)
PTC Setting[a]	**8.03****	2.80	.004	0.57 (0.20, 0.94)	**5.53***	2.67	.040	0.38 (0.03, 0.74)	-2.51	2.80	.371	0.21 (-0.14, 0.57)
PTC Behaviour[a]	**7.91***	3.88	.043	0.42 (0.05, 0.79)	**10.93****	3.67	.003	0.54 (0.18, 0.90)	3.02	3.90	.439	0.12 (-0.24, 0.49)
PPC Problem	**-1.96***	0.78	.013	0.49 (0.11, 0.86)	**-1.99****	0.74	.008	0.45 (0.09, 0.82)	-0.02	0.80	.977	0.03 (-0.33, 0.39)
PPC Extent	**-7.38***	3.38	.030	0.32 (-0.09, 0.74)	**-9.96****	3.19	.002	0.44 (0.06, 0.81)	-2.59	3.43	.452	0.16 (-0.22, 0.54)
RQI[a,b]	-1.12	2.22	.614	0.22 (-0.23, 0.67)	2.88	2.12	.176	0.27 (-0.15, 0.68)	4.00	2.27	.080	0.46 (0.04, 0.87)
PAI Problem	**-4.37****	1.58	.006	0.55 (0.18, 0.92)	**-3.13***	1.49	.036	0.34 (-0.01, 0.70)	1.23	1.60	.440	0.19 (-0.17, 0.54)
PAI Intensity[b]	-15.19	6.98	.030	0.47 (0.10, 0.85)	-13.42	6.58	.042	0.45 (0.09, 0.82)	1.77	6.99	.800	0.07 (-0.30, 0.43)
PDR Negative	0.67	4.80	.890	0.06 (-0.35, 0.47)	0.39	5.08	.938	0.07 (-0.36, 0.50)	-0.27	4.77	.954	0.01 (-0.38, 0.40)
PDR Irritate	-0.78	0.24	.748	0.15 (-0.25, 0.56)	-0.18	0.25	.487	0.42 (-0.02, 0.86)	-1.02	1.05	.333	0.24 (-0.15, 0.63)
PDR Positive	1.67	1.03	.104	0.22 (-0.19, 0.63)	0.65	1.09	.548	0.55 (0.11, 0.99)	-1.02	1.05	.333	0.26 (-0.13, 0.65)

Note. B_{diff} parameter estimates represent differences in slopes (unstandardized beta) between groups. Unless otherwise indicated, negative scores indicate improvement in favour of the second group; Cohen's *d* calculated as difference in pre-post change scores between groups, divided by the pooled baseline standard deviation. Effect sizes pooled across imputed datasets using Rubin's (1987) combining rules and reported as absolute value along with 95% confidence intervals; ECBI = Eyberg Child Behaviour Inventory; PS = Parenting Scale; DASS = Depression, Anxiety, Stress scales; PTC = Parenting Tasks Checklist; PPC = Parent Problem Checklist; RQI = Relationship Quality Index; PAI = Parental Anger Inventory; PDR = Parent Daily Report. ~ = Borderline significant at the 0.10 level; * = Significant at the .05 level; ** = Significant at the .01 level; *** = Significant at the .001 level.

[a]Positive scores indicate improvement in favour of the second group for PTC, RQI, and PDR Positive scales. [b]Model containing group x time interaction was not the best fit to the data.

Long-Term intervention effects

Long-term intervention effects were explored through group differences in estimated slopes of change from baseline to T3 (nine-month follow-up), with results shown in Table 2.5. Comparisons between the two treatment groups revealed change on the ECBI Intensity and Problem subscales was statistically greater for TPOLe than TPOL participants, with B_{diff} = -13.94, $t(267.95)$ = -2.49, p = .013, d = 0.50 and B_{diff} = -4.83, $t(263.43)$ = -2.79, p = .006, d = 0.75 respectively. Participants in the TPOLe group also had significantly greater improvement than TPOL on the PS Total score at T3, B_{diff} = -0.30, $t(243.99)$ = -2.27, p = .024, d = 0.70. There were no significant differences in slopes at T3 between the two treatment groups on any other outcomes. Planned comparisons with the control condition as the reference group are outlined below.

Child behaviour

For ECBI Intensity, only TPOLe participants maintained a significant improvement at T3 relative to control, B_{diff} = -17.22, $t(268.74)$ = -3.29, $p < .01$, d = 0.70. Where TPOL participants had an initial improvement at T2, at T3 the gains were no longer significantly better than CUAU, B_{diff} = -3.29, $t(268.89)$ = -0.60, p = .55, d = 0.16. For ECBI Problem, again TPOLe showed significantly greater change at T3 relative to control, with a very large effect size, B_{diff} = -8.15, $t(265.31)$ = -5.02, $p < .001$, d = 1.28. There was a medium effect (d = 0.50) for TPOL compared to CUAU, which trended towards being significant, B_{diff} = -3.32, $t(266.06)$ = -1.97, p = .05.

Parenting practices

At T3, both treatment groups maintained significantly greater improvement on PS Total scores when compared to control (TPOL: B_{diff} = -0.27, $t(246.52)$ = -2.12, $p < .05$, d = 0.40; TPOLe: B_{diff} = -0.57, $t(265.34)$ = -4.73, $p < .001$, d = 1.06). At the subscale level, TPOLe participants showed significant maintenance of improvement relative to control on Laxness, B_{diff} = -0.59, $t(268.50)$ = -3.08, $p < .01$, d = 0.51, Over-reactivity, B_{diff} = -0.80, $t(266.83)$ = -4.10, $p < .001$, d = 0.82, and Hostility, B_{diff} = -0.46, $t(268.68)$ = -2.71, $p < .01$, d = 0.48. TPOL participants did not maintain gains found at T2 on the Laxness scale, B_{diff} = -0.28, $t(257.39)$ = -1.40, p = .16, d = 0.18, but did show significant improvement on Over-reactivity, B_{diff} = -0.46, $t(262.01)$ = -2.24, $p < .05$, d = 0.44. There was no difference between TPOL and CUAU on the Hostility subscale (see Table 2.5).

Parental adjustment

Planned contrasts for subscales of the DASS showed that compared to control, significant improvement was maintained at T3 for the TPOLe group on Depression, B_{diff} = -2.49, $t(268.42)$ = -3.12, $p < .01$, Anxiety, B_{diff} = -1.39, $t(267.98)$ = -2.83, $p < .01$, and Stress, B_{diff} = -3.63, $t(266.94)$ = -4.10, $p < .001$. Effect sizes ranged from just under medium levels up to high (d = 0.66, 0.47 and 0.81 respectively). For the TPOL group, while no effect was seen at T2 for Depression there was a

significant medium effect ($d = 0.58$) at T3, $B_{diff} = -2.11$, $t(268.28) = -2.54$, $p < .05$, while maintenance of change on the Stress subscale bordered on significant, $B_{diff} = -1.79$, $t(266.59) = -1.94$, $p = .05$, $d = .42$. There were no effects for TPOL participants on the Anxiety subscale at T3 when compared to control (see Table 2.5).

Parenting confidence

Similar to findings at post-assessment, significant improvement was maintained on PTC Setting and PTC Behaviour subscales at T3 for both intervention groups when compared to control. For PTC Setting, there was a large effect ($d = 0.76$) for TPOL participants, $B_{diff} = 10.03$, $t(250.23) = 3.57$, $p < .001$, and a smaller but still significant effect ($d = 0.44$) for TPOLe participants, $B_{diff} = 6.39$, $t(249.06) = 2.71$, $p < .05$. Effects were larger for TPOLe participants ($d = 0.68$) than TPOL participants ($d = 0.53$) on PTC Behaviour, with $B_{diff} = 13.67$, $t(252.23) = 3.61$, $p < .001$ and $B_{diff} = 10.05$, $t(252.44) = 2.55$, $p < .05$ respectively.

Partner relationships

Both intervention groups demonstrated maintenance of improvements at T3 on the PPC Problem subscale when compared to CUAU (TPOL: $B_{diff} = -2.43$, $t(243.65) = -3.38$, $p < .01$. $d = 0.55$; and TPOLe: $B_{diff} = -2.21$, $t(243.01) = -3.16$, $p < .01$. $d = 0.49$), and likewise for the Extent subscale, with $B_{diff} = -8.27$, $t(237.34) = -2.33$, $p < .05$. $d = 0.34$ for TPOL and $B_{diff} = -9.07$, $t(235.68) = -3.42$, $p < .01$. $d = 0.36$ for TPOLe when compared to CUAU.

Parental anger

For the PAI Problem subscale the TPOLe group demonstrated a medium effect ($d = 0.58$) relative to control at T3, $B_{diff} = -4.39$, $t(266.87) = -2.60$, $p < .05$. For TPOL participants, the significant medium effect seen at T2 had reduced at T3 ($d = 0.39$) and was borderline significant, $B_{diff} = -3.10$, $t(268.54) = -1.77$, $p = .08$. We did not interpret interaction effects for the Intensity subscale as only the main effect of time was significant, suggesting similar improvement for all groups from baseline to T3, $B = -9.01$, $t(268.31) = -3.36$, $p < .01$.

Parent interviews

No overall interaction effects were found for parent interview data, however there was a significant main effect of time for frequency of reported negative child behaviours (PDR Negative), $\chi^2(7) = 51.38$, $p < .001$, average amount of irritation due to difficult child behaviours (PDR Irritate), $\chi^2(7) = 52.02$, $p < .001$, and frequency of reported prosocial child behaviours (PDR Positive), $\chi^2(7) = 35.94$, $p < .001$ (see Table 3). Parameter estimates for PDR outcomes demonstrated large standard errors and residual errors, with 95% confidence intervals for residuals not crossing zero suggesting there was significant variance not accounted for in the model. Outliers were observed, however sensitivity analysis revealed no difference in effects after their removal on any of the PDR

outcomes. Visual inspection of the PDR Positive data showed a linear upwards trend across time for the TPOLe group, whereas both TPOL and CUAU demonstrated an initial increase at T2 followed by a downward slope at T3. For PDR Negative and PDR Irritate, all groups showed a common linear downwards trend across time. It is possible the interview process itself had some positive impact on outcomes, however because only a small subsample of participants completed PDRs it is also possible that any true group by time interaction was masked by a lack of power.

Clinical and reliable change

Table 2.6 outlines the proportions of participants demonstrating clinical and reliable change from baseline levels at T3 for each group, along with results of chi-square tests of independence.

In terms of clinical change, on the ECBI Intensity subscale 11/22 (50%) of TPOL participants, 17/28 (60.7%) of TPOLe participants, and 6/35 (17.1%) of CUAU participants that were in the clinical range at T1 were under the clinical cut-off by T3, $\chi^2(2) = 13.54$, $p < .01$. Pairwise comparisons showed proportions for both intervention groups were significantly higher than control at the $p < .05$ level after Holm adjustment. The same pattern was observed for the Problem subscale, with 9/20 (45%) of TPOL participants, 19/27 (70.4%) of TPOLe participants, and 0/29 of CUAU participants under the clinical cut-off at T3, $\chi^2(2) = 30.53$, $p < .01$ (Fisher's exact test), with proportions for both intervention groups significantly higher than control, $p < .001$. For those in the clinical range at T1 on the PS Total score, 8/21 (38.1%) of TPOL participants, 18/27 (66.7%) of TPOLe participants, and 6/31 (19.4%) of CUAU participants were under the clinical cut-off at T3, $\chi^2(2) = 13.47$, $p < .01$. Follow-up analysis revealed a significant difference between TPOLe and CUAU, $p < .01$.

At follow-up assessment there were significant group differences on both ECBI subscales and the PS Total in terms of reliable change. Post hoc testing using Holm-adjusted significance levels revealed a significant difference between TPOLe and CUAU for each, $p < .05$. Proportions of reliable change in the TPOL condition were in between rates of reliable change for both control and TPOLe participants, but the differences did not reach significance in either direction for any of the outcomes.

Participant satisfaction

Overall satisfaction was very high for both intervention groups. A total satisfaction score out of 91 was obtained by summing across the 13 items of the Client Satisfaction Questionnaire, with $M = 65.13$ ($SD = 12.28$) for participants in the TPOL group, and a significantly higher score of $M = 72.58$ ($SD = 12.58$) for participants in the TPOLe group, $t(80.37) = 2.76$, $p < .01$. The majority of parents in both groups rated the quality of the service received at least 5/7 ("good") or better (TPOL: 89%; TPOLe: 88%). When asked about satisfaction with the amount of help received, 90%

of parents in the TPOLe group and 68% of parents in the TPOL group reported feeling at least "satisfied" (a score of 5/7 or higher), with a chi-square test using Yates' continuity correction for two groups indicating the difference was statistically significant, $\chi^2(1) = 5.14$, $p < .05$. Similarly, when asked whether the parent received the type of help they wanted, 68% of parents in the TPOL group and 88% of parents in the TPOLe group responded with a score of 5/7 ("yes, generally") or higher. Again the difference between groups was statistically significant, $\chi^2(1) = 3.95$, $p < .05$ (using Yates' continuity correction).

Discussion

This trial provided further empirical support for the efficacy of web-based parenting support using Triple P Online. As a self-directed intervention, participants in the TPOL condition demonstrated short-term reductions in the frequency of reported child behaviour problems and coercive parenting practices, as well as related outcomes such as improved parental self-efficacy and reductions in parental stress, conflict between partners, and parental anger. These changes were mostly maintained at follow-up, although we found borderline significance for child behaviour problems. While largely consistent with earlier Triple P Online findings (Sanders, Baker, et al., 2012), our overall effect sizes for the self-directed condition were smaller on most outcomes, and maintenance effects were not as strong for child behaviour problems. We discuss this further below.

Parents in the practitioner-supported condition (TPOLe) showed larger effect sizes on all outcomes relative to the TPOL condition, with the exception of the PTC Setting subscale measuring parental self-efficacy, and with these stronger effects maintained at follow-up assessment. The difference between groups was particularly evident for reductions in difficult child behaviours and coercive parenting practices, the primary outcomes targeted by the intervention, with analyses showing a significant difference between the two active treatment groups. In comparison to earlier findings from Sanders et al (2012), parents receiving practitioner support in our study showed larger effect sizes at post-assessment and follow-up on most measures, again with the exception of the PTC Setting subscale. It is unclear whether there is a statistically robust trend towards greater self-efficacy for parents not receiving clinical support with Triple P Online; perhaps parents completing the program on their own are more likely to attribute change to their own efforts and thereby gain greater confidence in their parenting. It would be interesting to explore the effects of guided versus unguided delivery on self-efficacy in further research.

In addition to better outcomes, parents receiving support completed more modules, were more satisfied, and more likely to report that the amount and type of help received was what they wanted. Relative to the control condition, both treatment groups had a significantly higher proportion of families with clinical levels of child behaviour problems at baseline move out of the

clinical range by follow-up. Conversely, significantly higher levels of clinical change in coercive parenting and reliable change on both primary outcomes was only found for the practitioner-supported condition at follow-up.

One possible explanation for many of these group differences may be the significantly higher level of module completion for the TPOLe condition (Figure 2.2). Completion rates for this condition in our study were similar to those demonstrated in Sanders et al (2012), while completion rates for self-directed participants in our study were lower than found previously. This could reflect the fact that our study specifically targeted parents experiencing additional risk or stress factors at home, where such factors may have influenced their ability or motivation to complete an online program on their own. Perhaps clinical support is particularly important for keeping parents engaged with online parenting support when more demanding circumstances are involved. That said, the majority of participants in our sample were college or university educated, in a relationship, employed, and able to cover most of their essential expenses, which suggests our criteria may have been too lenient to draw any conclusions about program characteristics in the context of a more vulnerable Australian population.

There were also methodological differences between the two studies that need to be considered. While no clinical support was provided in the Sanders et al (2012) trial, early check-up calls were included to troubleshoot any technical problems preventing participants from accessing the program, and reminder calls and emails were involved for those that had not logged in to the program for three weeks. Alternatively, in our self-directed condition participants were instructed to contact the research team if they experienced technical difficulties, and otherwise only received courtesy reminder emails two weeks and again one week prior to program expiry. While these are minor differences, evidence from prior eHealth studies suggests small changes in participant instructions or support orientation may significantly impact program adherence and outcomes (e.g. Kleiboer et al., 2015), and currently these mechanisms are not well understood within the context of online parenting support. For example, supportive accountability has been posited as an important process for enhancing adherence to web-based treatments, however in some cases that accountability may have the reverse effect of promoting avoidant behaviours in those that prefer autonomy and flexibility (Mohr et al., 2011). Certainly our experience was that some parents allocated to receive practitioner-support were impossible to engage despite repeated attempts to make contact. Further exploration around the impact of parents' preferences might help explain such differences in the uptake of clinical support. Other influences such as the therapeutic relationship and the clinical skill and knowledge of the practitioner may also play a role, highlighting the need for further studies constructed in a way that can begin to isolate and test such putative mechanisms (e.g. Kazdin, 2011).

Table 2.5. Pairwise comparisons showing differences between groups in change from baseline levels at T3 (follow-up assessment).

Outcome	CUAU vs TPOL				CUAU vs TPOLe				TPOL vs TPOLe			
	B_{diff}	SE	p	d (95% CI)	B_{diff}	SE	p	d (95% CI)	B_{diff}	SE	p	d (95% CI)
ECBI Intensity	-3.29	5.45	.547	0.16 (-0.21, 0.52)	**-17.22****	5.24	.001	0.70 (0.34, 1.06)	**-13.94***	5.60	.013	0.50 (0.14, 0.86)
ECBI Problem	-3.32~	1.68	.050	0.52 (0.15, 0.89)	**-8.15*****	1.62	<.001	1.28 (0.89, 1.66)	**-4.83****	1.73	.006	0.75 (0.38, 1.12)
PS Laxness	-0.28	0.20	.164	0.18 (-0.19, 0.54)	**-0.59****	0.19	.002	0.51 (0.16, 0.87)	-0.31	0.21	.135	0.32 (-0.04, 0.68)
PS Over-reactivity	**-0.46***	0.21	.026	0.44 (0.07, 0.81)	**-0.80*****	0.20	<.001	0.82 (0.45, 1.18)	-0.34	0.21	.103	0.40 (0.04, 0.76)
PS Hostility	-0.19	0.18	.275	0.20 (-0.16, 0.57)	**-0.46****	0.17	.007	0.48 (0.13, 0.83)	-0.26	0.18	.149	0.35 (-0.01, 0.70)
PS Total	**-0.27***	0.13	.035	0.40 (0.02, 0.77)	**-0.57*****	0.12	<.001	1.06 (0.69, 1.43)	**-0.30***	0.13	.024	0.70 (0.33, 1.08)
DASS Depression	**-2.11***	0.83	.012	0.58 (0.21, 0.94)	**-2.49****	0.80	.002	0.66 (0.30, 1.02)	-0.38	0.85	.653	0.11 (-0.24, 0.47)
DASS Anxiety	-0.60	0.51	.239	0.20 (-0.16, 0.56)	**-1.39****	0.49	.005	0.47 (0.12, 0.83)	-0.78	0.52	.133	0.35 (0.00, 0.71)
DASS Stress	-1.79~	0.92	.053	0.42 (0.06, 0.79)	**-3.63*****	0.89	<.001	0.81 (0.45, 1.17)	-1.84~	0.94	.051	0.47 (0.11, 0.83)
PTC Setting[a]	**10.03*****	2.81	<.001	0.76 (0.38, 1.14)	**6.39***	2.71	.019	0.44 (0.08, 0.80)	-3.64	2.83	.199	0.35 (-0.01, 0.70)
PTC Behaviour[a]	**10.05***	3.93	.011	0.53 (0.16, 0.90)	**13.67*****	3.78	<.001	0.68 (0.32, 1.04)	3.63	3.95	.359	0.16 (-0.20, 0.51)
PPC Problem	**-2.43****	0.73	.001	0.55 (0.17, 0.93)	**-2.21****	0.70	.002	0.49 (0.13, 0.85)	0.22	0.76	.775	0.05 (-0.31, 0.41)
PPC Extent	**-8.27***	3.55	.021	0.34 (-0.07, 0.75)	**-9.07****	3.42	.008	0.36 (-0.02, 0.75)	-0.80	3.65	.827	0.07 (-0.32, 0.46)
RQI[a,b]	1.02	2.49	.682	0.07 (-0.34, 0.49)	2.16	2.39	.366	0.21 (-0.23, 0.65)	1.14	2.54	.653	0.14 (-0.28, 0.57)
PAI Problem	-3.10~	1.75	.078	0.39 (0.02, 0.75)	**-4.39***	1.69	.010	0.58 (0.22, 0.94)	-1.29	1.82	.478	0.21 (-0.15, 0.56)
PAI Intensity[b]	-15.20	6.54	.021	0.46 (0.10, 0.83)	-13.16	6.28	.037	0.47 (0.12, 0.83)	2.04	6.68	.760	0.04 (-0.32, 0.39)
PDR Negative	-1.07	5.32	.841	0.11 (-0.30, 0.52)	-3.22	5.68	.571	0.36 (-0.07, 0.80)	-2.15	5.47	.695	0.26 (-0.13, 0.65)
PDR Irritate	-0.29	0.26	.263	0.47 (0.06, 0.89)	-0.24	0.27	.373	0.42 (-0.01, 0.86)	1.75	1.53	.254	0.12 (-0.27, 0.51)
PDR Positive	0.43	1.45	.769	0.14 (-0.27, 0.55)	2.18	1.56	.164	1.23 (0.76, 1.70)	1.75	1.53	.254	1.21 (0.78, 1.63)

Note. B_{diff} parameter estimates represent differences in slopes (unstandardized beta) between groups. Unless otherwise indicated, negative scores indicate improvement in favour of the second group; Cohen's *d* calculated as difference in pre-post change scores between groups, divided by the pooled baseline standard deviation. Effect sizes pooled across imputed datasets using Rubin's (1987) combining rules and reported as absolute value along with 95% confidence intervals; ECBI = Eyberg Child Behaviour Inventory; PS = Parenting Scale; DASS = Depression, Anxiety, Stress scales; PTC = Parenting Tasks Checklist; PPC = Parent Problem Checklist; RQI = Relationship Quality Index; PAI = Parental Anger Inventory; PDR = Parent Daily Report. ~ = Borderline significant at the 0.10 level; * = Significant at the .05 level; ** = Significant at the .01 level; *** = Significant at the .001 level.

[a]Positive scores indicate improvement in favour of the second group for PTC, RQI, and PDR Positive scales. [b]Model containing group x time interaction was not the best fit to the data.

Table 2.6. Proportion of participants moving out of the clinical range and showing reliable change between baseline and follow-up (T3).

| | | Clinically improved | | | | | | Reliably improved | | | | | |
| | | Omnibus | | | Group comparisons (p)[b] | | | Omnibus | | | Group comparisons (p)[b] | | |
Measure	Group	% (n/n)	χ^2	p^a	TPOL vs CUAU	TPOLe vs CUAU	TPOL vs TPOLe	% (n/n)	χ^2	p^a	TPOL vs CUAU	TPOLe vs CUAU	TPOL vs TPOLe
ECBI Intensity	TPOL	50.0 (11/22)	**13.54****	.001	**.038***	**.003****	.638	21.1 (8/38)	**7.82***	.020	.479	**.037***	.360
	TPOLe	60.7 (17/28)						37.2 (16/43)					
	CUAU	17.1 (6/35)						13.2 (7/53)					
ECBI Problem	TPOL	45.0 (9/20)	**30.53*****	<.001	**.001****	**<.001*****	.147	15.8 (6/38)	**13.95*****	<.001	.215	**.002****	.177
	TPOLe	70.4 (19/27)						34.9 (15/43)					
	CUAU	0.0 (0/29)						5.7 (3/53)					
PS Total	TPOL	38.1 (8/21)	**13.47****	.001	.240	**.002**	.186	13.2 (5/38)	**15.14*****	<.001	.208	**.002****	.146
	TPOLe	66.7 (18/27)						32.6 (14/43)					
	CUAU	19.4 (6/31)						3.8 (2/53)					

Note. Number of participants showing reliable or clinical change calculated from available scale-level data following imputation. Counts averaged across imputations and rounded to the nearest whole number for chi-square analysis; ECBI = Eyberg Child Behaviour Inventory; PS = Parenting Scale; * = Significant at the .05 level; ** = Significant at the .01 level; *** = Significant at the .001 level.

[a]2-tailed *p* value for Fishers' Exact Test reported where expected frequency for any cell is <10. [b]Adjusted *p* values reported for group comparisons (Holm, 1979)

Limitations

One limitation of the present study was the lack of data regarding the content and fidelity of clinical support provided to participants, due to technical limitations whereby conversations could not be recorded and content-analysed. We do know that on average, parents participated in four of the eight telephone consultations that were offered, suggesting four calls scheduled fortnightly may be a sufficient support model for most parents. However, we expect that untracked, incidental interactions may have also occurred with parents in the supported delivery condition, meaning our knowledge of exactly how much contact each parent received is limited. For example, an unintended consequence of providing telephone consultations was a natural extension to email contact. While this was mostly limited to scheduling of consultations or following up parents that had missed a session, practitioners may have also responded to parent emails with general advice outside of their scheduled consultations. This may be important in terms of keeping parents engaged and maintaining positive therapeutic relationships, however further research would be required to better understand the additive contribution of combined email and telephone consultation versus one or the other. It highlights the need, at least within empirical research, for the development of clear practitioner guidelines and effective monitoring systems to help identify a minimally-sufficient support model.

Additionally, while the Parenting Scale is frequently used within parenting intervention research as a measure of negative or dysfunctional parenting practices, another limitation of this study was the lack of a comprehensive measure of positive parenting practices. Assessing both aspects is important for further study of mediators and mechanisms of change within parenting programs, as there is some support for the notion that changes in negative and positive parenting may play a different role in terms of other parent and child outcomes (Forehand et al., 2014). The Parenting and Family Adjustment Scales (PAFAS; Sanders, Morawska, Haslam, Filus, & Fletcher, 2014) is one measure that includes a positive parenting component, but at the time of this study validation work was still underway and there were no comparable measures of positive parenting available that had been validated with an Australian sample of parents with children as young as two years. We recommend inclusion of validated measures that assess positive parenting practices in future studies, such as the PAFAS or Alabama Parenting Questionnaire (APQ; Dadds, Maujean, & Fraser, 2003) for parents of older children, alongside measures of negative parenting such as the Parenting Scale. This approach would provide a more comprehensive overview of how parenting practices are affected in response to the intervention.

Finally, the general lack of participating fathers, as well as the omission of secondary data from fathers of two-parent households, present limitations in terms of the generalisability of

findings and insights gained from this trial. Researchers typically struggle to engage fathers within parenting programs, and as such many trials suffer from a lack of father data (Panter-Brick et al., 2014). Engaging fathers is important as the quality of the father-child relationship in the early years plays an important role in determining the trajectory of a child's development, and father participation in parenting programs is often associated with better outcomes overall (Wells, Sarkadi, & Salari, 2016). A recent consumer preference study found that web-based parenting programs were a highly preferred delivery modality for fathers (Frank, Keown, Dittman, & Sanders, 2015), yet little is known about their preference for self-directed or practitioner-supported online delivery. Additionally, fathers may benefit from parenting programs even if not directly participating (Dittman et al., 2014), although father involvement likely leads to better maintenance of gains (Bagner & Eyberg, 2003). Collecting data from both parents provides a more comprehensive overview of program effects within the household, and allows for more fine-grained analysis of change processes and whether these differ by parent gender. Assessing non-participating fathers was beyond the scope of this study, yet this is clearly an area deserving greater attention in future research.

Final comment

Online parenting programs are highly attractive for many parents, and delivered within a public health framework have significant potential to increase the reach and impact of quality parenting support (Metzler et al., 2012). Currently, the evidence suggests that as a self-administered intervention parents can achieve positive outcomes, however there may be significant gains by adding brief, regular practitioner contact. More work is needed to unravel the mechanisms responsible for improved outcomes through guided delivery so as the minimally sufficient level of support can be better established.

Chapter 3

Consumer perspectives on mechanisms of parenting change within the Triple P—Positive Parenting Program: An exploratory factor analysis

Parenting interventions such as the Triple P—Positive Parenting Program draw on multiple theoretical foundations, including social learning theory, self-regulatory models, and principles of cognitive, behavioural and affective change (Sanders & Mazzucchelli, 2013; Sanders, 2012). The program targets modifiable parenting factors, such as increasing parenting confidence or reducing the use of harsh and coercive discipline strategies, with the goal of promoting positive child outcomes such as fewer child social, emotional and behavioural problems in the short term, and prevention of serious problems later in adolescence (Biglan et al., 2012; Taylor & Biglan, 1998).

Although Triple P has a robust evidence base demonstrating its efficacy in both prevention and treatment contexts (e.g. de Graaf et al., 2008b; Sanders, Kirby, et al., 2014), as is often the case in psychological intervention research the evaluation processes typically focus on select outcomes considered indicators of treatment success, such as frequency of difficult child behaviours and coercive parenting practices, or parental adjustment and self-efficacy. Meanwhile investigation into the causal processes responsible for change is often neglected (Kazdin & Nock, 2003). Triple P's underlying theoretical frameworks suggest a range of possible mechanisms are involved during treatment including cognitive and behavioural changes such as shifts in attributions or beliefs, implementation of specific strategies like behaviour monitoring or positive discipline strategies, and increases in specific self-regulatory skills such as self-efficacy and resilience (Sanders & Mazzucchelli, 2013). Affective, environmental and contextual changes may be involved as well, for example attenuation of depressive symptoms in parents, reduced conflict with a partner, or greater exposure to positive feedback from others. So far however there has been limited evaluation of the mechanisms activated during Triple P, and thus we know little about their relative importance or the specific pathways involved in treatment outcomes.

In the broader parenting field, these questions have been the topic of much discussion. For example, prior research has demonstrated the influence of parental self-efficacy and sense of competence, (e.g. Coleman & Karraker, 1998; Deković, Asscher, Manders, Prins, & van der Laan, 2012; Jones & Prinz, 2005), knowledge (e.g. Hess, Teti, & Hussey-Gardner, 2004; Morawska, Winter, & Sanders, 2009), and wellbeing and adjustment (e.g. DeGarmo, Patterson, & Forgatch, 2004; Weaver, Shaw, Dishion, & Wilson, 2008) in relation to indicators of parenting competence. Within the context of Triple P, McTaggart and Sanders (2007) showed that parental self-efficacy

partially mediated change in dysfunctional parenting styles, while a study of Workplace Triple P showed reductions in dysfunctional parenting practices mediated change in individual stress-levels, which in turn mediated work-related stress (Hartung & Hahlweg, 2011). Furthermore, Sanders and Morawska (2005) examined the links between parenting knowledge, competence and self-efficacy, and identified a range of possible mechanisms such as parental attributions, beliefs, expectations, self-efficacy, social supports, and self-regulation as potential candidates for further study. Although these studies are informative, they are inconclusive with regards to how exactly parenting change comes about during Triple P and there is not yet a clear mapping between the components of intervention delivery and the changes experienced by parents during participation in the program.

Several researchers have discussed potential advantages stemming from identifying mediators or mechanisms responsible for treatment outcomes in psychological interventions (e.g. Kazdin, 2009; Kraemer et al., 2002). These benefits include access to additional insight into how intervention effectiveness can be improved, by allowing program developers to focus on those aspects of the program that produce the biggest gains for consumers while minimizing time spent on techniques or strategies that have marginal benefit. Identifying the causal pathways involved can also provide useful information on predictors of program success, opening up possibilities for early identification of potential non-responders or refinement of participant selection and triage processes. Additionally, such efforts might provide better understanding of the factors contributing to or maintaining the presenting issues. In light of this, ascertaining which mechanisms are required or the most important for generating the parenting outcomes targeted during Triple P, along with a greater understanding of how the intervention works to activate them, seems a worthwhile pursuit. However clearly more research is needed.

The aim of this study is to add to our current understanding of the relative role and importance of mechanisms identified within Triple P by harnessing consumer feedback in the form of accredited program practitioners. Triple P has a history of incorporating consumer feedback into the development process, albeit primarily from the parent's perspective (e.g. Sanders & Kirby, 2011), yet we believe practitioners' views are an under-utilized resource offering valuable insight into the change processes they observe in the parents they work with regularly.

To this end, we used program resources to identify a list of putative mechanisms of parenting change activated during Triple P, based on the principles, behavioural strategies, and processes utilized in program delivery. Items were initially categorized under a simple four-domain structure, hypothesized according to Triple P's foundations of cognitive-behavioural and social learning principles, as belonging to either behavioural, cognitive, affective, or social/contextual parenting changes. Accredited Triple P practitioners were contacted through an online survey and asked to rate the perceived importance of individual mechanisms for producing parenting change.

Exploratory factor analysis was utilized to determine whether a clear factor structure would emerge. We hope that practitioners' views on the processes of change experienced by parents will be useful for further empirical and applied work in the area.

Methods

Participants

Participants were contacted through the Triple P Provider Network (TPPN), an email database of accredited Triple P practitioners worldwide. All members of the TPPN were able to complete the survey, although the invitation email encouraged those with current or recent experience delivering Triple P (i.e. delivered within the last 12 months) to respond. As an incentive, an optional prize draw was included where participants could win an online gift voucher to the equivalent value of $100AUD. Personal details were not linked to survey responses to ensure anonymity.

Approximately 13,000 email invitations were sent via the TPPN mailing list. The invitation received an initial response rate of approximately 6%, with 783 people opening the survey. Of those that opened the survey, 770/783 (98.34%) began responding to the preliminary section on demographic information, with 685/770 (88.96%) continuing to the main survey.

Content analysis

To develop an initial list of proposed mechanisms we began with a thorough content analysis of both Level 4 Standard Triple P and Level 4 Group Triple P, chosen as these are the two longest-running Triple P variants and were largely representative of the types of processes, information and techniques utilized most commonly across the Triple P spectrum.

Close examination of the practitioner manuals and parent resources was undertaken by the first author, noting down possible mechanisms activated during program delivery. This included reflection on the principles, strategies, and behavioural exercises taught to parents during the program, relevant activities that occur at home between sessions, behaviour monitoring and other homework tasks, therapeutic processes encouraged in the practitioner manual (e.g. prompting parents to think about what they did well), and any incidental events not mentioned in the resources but identified from clinical experience (e.g. the parent noticed improvements in their child's behaviour at home). The goal was to compile a list of as many discrete mechanisms as possible that might be activated during program participation.

Each mechanism was grouped within one of four general domains that align theoretically with the social learning and cognitive-behavioural principles of Triple P: (1) cognitive changes, (2) affective changes, (3) behavioural changes, and (4) contextual factors (e.g. social or environmental

changes). Duplicates were removed and face-validity of the remaining items reviewed with the second author prior to inclusion in the survey.

Survey development

Seventy-nine survey items were developed based on the initial list of identified mechanisms and grouped according to their domains: cognitive (COG), behavioural (BEH), affective (AFF), or contextual, including social and environmental factors (CONT). Item content is shown in Table 2.

Items were uploaded in survey format to the Qualtrics platform (http://www.qualtrics.com) with respondents asked to rate, based on their experience delivering Triple P, the perceived importance of each item for producing overall parenting improvement through participation in the program. A seven-point rating scale was used with 1 = '*not observed or not important*', 4 = '*somewhat important*', and 7 = '*extremely important*' for overall parental change.

Participants were also asked to provide some demographic and background information such as gender, country of residence, primary language spoken, age group, level of education, years of experience delivering Triple P, whether they are recent users of the program (i.e. currently delivering or have delivered within the past 12 months), and which program variants they were accredited to deliver. Only Triple P variants that had been disseminated with supported accreditation pathways at the time of the study were included.

Statistical analysis

Data screening, demographic characteristics, assessment of multivariate normality, outlier detection, and missing data imputation were handled using the *R* software environment (R Core Team, 2015). *R* packages used are cited where relevant. Analyses included exploratory factor analysis (EFA), conducted in *Mplus* (Muthén & Muthén, 2012), and rank ordering individual items and factors.

<div align="center">

Results

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Initial data screening

Prior to analyses data was screened for non-informative cases. We removed 142 cases due to a large proportion ($> 20\%$) of missed survey items. A further 24 cases showed minimal response variance (*var* < 0.1), for example where the participant responded '7' for all items, and were removed. Seven cases were also removed due to very short completion times (< 5 mins) which suggested a non-serious attempt.

Using the above decision criteria, a total of 597 cases were retained for analysis. There were no significant differences between retained and dropped cases on demographic characteristics such as age, gender, country of residence, primary language spoken, or level of education. However,

those retained for analysis were significantly more likely to be recent users of the program (i.e. had delivered Triple P within the last 12 months) $\chi^2(1) = 31.39$, $p < .001$, report having accreditation in more Triple P program variants ($M = 3.20$, $SD = 2.58$ versus $M = 1.88$, $SD = 1.77$ for dropped cases), $t(450.43) = -7.91$, $p < .001$, and report more years of experience delivering Triple P ($M = 2.86$, $SD = 2.37$ versus $M = 2.37$, $SD = 1.88$ for dropped cases), $t(252.13) = -2.64$, $p < .01$. Table 3.1 outlines the key demographic characteristics of the retained sample of 597 participants, and a breakdown of the percent of practitioners reporting accreditation across different Triple P variants is shown in Figure 3.1.

Ranked item responses

Descriptive statistics for the initial 79 survey items are show in Table 3.2. The three items rated as having greatest importance overall were: (1) *The parent realized that their own behaviour can have a positive or negative impact on their child's behaviour* ($M = 6.48$, $SD = 0.86$); (2) *The parent began to use strategies for encouraging good behaviour, such as praise, interesting activities, and giving their child positive attention* ($M = 6.47$, $SD = 0.89$); and (3) *The parent received constructive feedback from the practitioner, helping them to identify their strengths as a parent* ($M = 6.36$, $SD = 0.8$). The three lowest ranked items overall were: (1) *The parent made an effort to seek out and expand their peer support networks outside of the program* ($M = 4.21$, $SD = 2.06$); (2) *The parent practiced new parenting strategies with a friend, partner, or peer before attempting them with their child* ($M = 4.23$, $SD = 1.77$); and (3) *The parent developed ongoing, supportive relationships with other parents in the program* ($M = 4.58$, $SD = 1.93$).

Suitability of the data for factor analysis

Prior to conducting EFA we first explored the suitability of the data by examining distributional assumptions, outliers, missing data and sampling adequacy (Zygmont & Smith, 2014).

Distributional assumptions

EFA is commonly conducted using maximum-likelihood estimation which can produce biased estimates of factor loadings when the assumption of multivariate normality is not met (Schmitt, 2011). Examining our raw data revealed a large amount of variable skew (range 2.61 to -0.37) and kurtosis (range -1.17 to 10.09), suggesting the assumption of multivariate normality was not tenable. This conclusion was supported using the Henze-Zirkler (1990) multivariate normality test, $HZ = 1.00$, $p < .001$, which examines departure of the observed distribution from a hypothetical multivariate normal distribution. Values for skew and kurtosis are included in Table 3.2.

To examine whether outlier removal would improve normality we looked for multivariate outliers using the adjusted projection technique recommended by Wilcox (2012) for high-dimensional data ($p > 9$). Four cases were identified as possible multivariate outliers (cases 42, 117, 149, 409), however removing these did not improve multivariate normality or mean item correlations, $t(6160) = 0.44$, $p = .66$, thus they were retained.

Zygmont and Smith (2014) suggest addressing multivariate non-normality by factor analysing a polychoric or robust correlation matrix instead of Pearson correlation coefficients, and utilizing alternative extraction methods that do not assume a normal distribution.

Table 3.1. Descriptive characteristics for sample

Variable ($N = 597$)		% (n)
Gender	Male	9.05 (54)
	Female	90.28 (539)
	Not reported	0.67 (4)
Country	Canada	28.31 (169)
	United Kingdom	24.96 (149)
	Australia	19.26 (115)
	United States	14.57 (87)
	Netherlands	3.18 (19)
	Germany	3.02 (18)
	Ireland	1.84 (11)
	Belgium	1.68 (10)
	New Zealand	1.17 (7)
	Other	1.34 (8)
	Not reported	0.67 (4)
Primary language	English	84.76 (506)
	Dutch	26 (4.36)
	German	17 (2.85)
	French	1.51 (9)
	Chinese	0.84 (5)
	Spanish	0.84 (5)
	Other	17 (2.85)
	Not reported	2.01 (12)
Age	18 – 25	1.34 (8)
	26 – 34	19.77 (118)
	35 – 44	31.49 (188)
	45 – 54	31.99 (191)
	55 – 64	13.74 (82)
	65+	0.84 (5)
	Not reported	0.84 (5)
Education	High School	2.18 (13)
	Undergraduate	67.34 (402)
	Postgraduate	24.46 (146)
	Other	5.53 (33)
	Not reported	0.50 (3)
Delivered Triple P within last 12 months	Yes	97.65 (583)
	No	2.18 (13)
	Not reported	0.17 (1)
		M (*SD*)
Number of accredited programs reported		3.20 (*2.58*)
Years of Triple P experience reported[a]		2.86 (*2.37*)

[a]Years experience not reported by four respondents
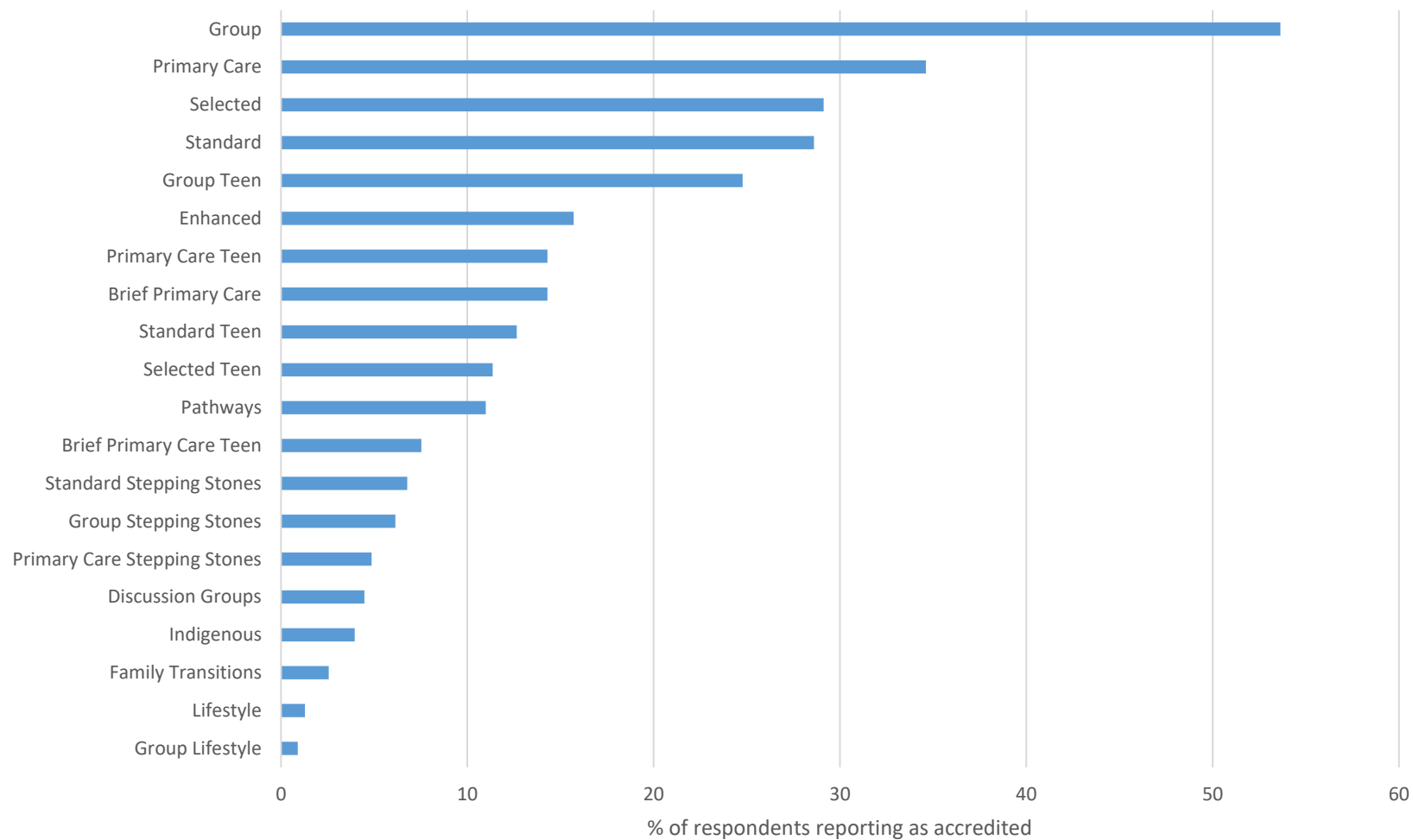
Figure 3.1. Percentage of respondents reporting accreditation in Triple P variants

Table 3.2. Descriptive statistics and primary factor loading for survey items ($N = 597$)

Item code	Item	Mean	SD	Skew	Kurtosis	Loading[a]	Factor
COG9	The parent realized that accessing parenting support (such as Triple P) is normal and acceptable	5.49	1.29	-0.89	0.60	0.64	1
COG10	The parent's motivation to improve their parenting increased	6.07	1.05	-1.64	3.80	0.58	1
COG8	The parent came to believe that attending Triple P would be helpful for their family	5.85	1.11	-1.16	1.66	0.57	1
COG6	The parent came to accept that having some difficulties with their child's behaviour is a normal parenting experience	5.61	1.16	-0.75	0.54	0.43	1
COG7	The parent developed more realistic beliefs about their child's behaviours, such as how often they occur or how severe they really are	5.81	1.08	-0.80	0.59	0.40	1
COG2	The parent realized that their own behaviour can have a positive or negative impact on their child's behaviour	6.48	0.86	-2.13	5.88	-	
COG4	The parent's prior beliefs about the reasons for their child's misbehaviour (such as that their child misbehaves on purpose), began to change	5.78	1.13	-1.06	1.23	-	
COG5	The parent identified specific events that often lead to problem behaviours, such as particular times of the day or a routine task their child does not enjoy	5.71	1.15	-0.95	1.03	-	
COG1	The parent gained a better overall understanding of what can cause problem behaviours in children	6.01	1.01	-0.86	0.19	-	
COG22	The parent learned to realistically identify their own strengths and weaknesses as a parent	5.49	1.19	-0.79	0.63	0.67	2
COG13	The parent identified other barriers preventing them achieving their goals, such as lack of time, energy, motivation or skills	5.40	1.32	-0.99	0.97	0.61	2
COG12	The parent identified personal beliefs preventing them from making changes in their own parenting behaviour (e.g. "I've always done things this way", or "I'm just not good at giving praise")	5.25	1.48	-0.94	0.52	0.60	2
COG23	The parent learned to think about their own behaviour, such as what they did well and how they could have improved the way they managed a recent difficult parenting situation	5.83	1.06	-1.03	1.46	0.54	2
COG25	The parent realized that time, energy, and personal commitment would be required to see improvements in their child's behaviour	6.00	1.04	-1.19	1.63	0.43	2
COG11	The parent developed specific intentions to make changes in their own behaviour, such as thinking about when, where, and how their behaviour would be different	6.00	1.02	-1.18	1.85	0.40	2
COG17	The parent recognized how a combination of strategies could be used to problem-solve difficult parenting situations	5.80	1.02	-0.92	0.96	0.40	2
COG26	The parent recognized that strategies for improving their relationship with their child or teaching their child new skills are just as important as strategies for managing misbehaviour	6.06	1.08	-1.40	2.50	-	
BEH18	The parent began to take care of their own needs as a parent, such as occasionally taking time out for themselves	5.57	1.47	-1.23	1.32	-	
COG19	The parent became more confident in their ability to manage their child's behaviour in different settings and locations (such as shopping trips)	5.99	1.04	-1.17	2.00	0.58	3
COG18	The parent learned to develop a clear and specific plan for managing high-risk situations	5.68	1.17	-1.25	2.26	0.56	3
COG16	The parent learned to identify high-risk situations where their child's behaviour was more likely to be difficult to manage	5.76	1.10	-1.02	1.48	0.49	3

Code	Description						
COG20	The parent became more confident in their ability to use specific parenting strategies (e.g. time-out, planned ignoring) for managing problem behaviours	6.14	0.95	-1.55	4.05	0.46	3
BEH16	The parent learned to implement a plan for managing high-risk parenting situations	5.62	1.34	-1.38	2.29	-	
BEH6	The parent reviewed their progress towards goals by monitoring and recording their own behaviour	4.65	1.58	-0.64	-0.19	0.73	4
BEH7	The parent practiced new parenting strategies with a friend, partner, or peer before attempting them with their child	4.23	1.77	-0.37	-0.69	0.66	4
BEH8	The parent learned to provide feedback to others (e.g. a partner) on their use of parenting strategies in a constructive and non-judgmental manner	4.73	1.68	-0.71	-0.12	0.66	4
BEH3	The parent learned to set clear goals for change in their own behaviour	5.96	1.13	-1.44	2.69	0.61	4
BEH5	The parent began to keep track of their child's behaviour using graphs or a behaviour diary	4.63	1.62	-0.54	-0.37	0.57	4
BEH2	The parent learned to set clear goals for change in their child's behaviour	5.69	1.19	-1.00	1.32	0.56	4
BEH14	The parent learned to reflect on how they managed a practice or role-play situation, identifying what they did well and how they could improve	4.64	1.61	-0.60	-0.20	0.56	4
BEH9	The parent made efforts to overcome difficulties and obstacles that were preventing them from achieving their goals	5.53	1.26	-1.08	1.59	0.54	4
BEH4	The parent learned to make a realistic plan for achieving their goals by breaking goals into smaller steps	5.72	1.18	-1.06	1.32	0.54	4
BEH15	The parent learned to reflect on how they managed a real-life parenting situation, identifying what they did well and how they could improve	5.57	1.20	-0.91	0.97	0.45	4
AFF19	The parent became happier overall	5.91	1.21	-1.71	4.01	0.78	5
AFF23	The overall quality of the relationship between parent and child improved	6.26	0.98	-2.12	7.32	0.77	5
AFF20	The parent's day-to-day stress around parenting their child reduced	5.96	1.11	-1.52	3.66	0.71	5
AFF24	The parent became more positive overall about being a parent	6.17	1.04	-1.97	5.97	0.68	5
AFF18	The parent felt more pleasure in their role as a parent	5.79	1.22	-1.37	2.65	0.64	5
AFF16	The parent began to enjoy spending time with their child more	6.18	1.06	-2.01	5.88	0.55	5
AFF22	The parent became more responsive to the child's needs	5.95	1.21	-1.83	4.55	0.52	5
COG15	The parent came to believe that changes in their child's behaviour were because of changes in their own behaviour	6.19	1.06	-1.93	5.26	0.52	5
AFF21	The parent was less likely to become depressed when they experienced parenting difficulties	5.41	1.60	-1.39	1.57	0.48	5
COG24	The parent came to believe that their child's behaviour can be addressed through changes in their own parenting behaviour	6.16	0.90	-1.10	1.31	0.46	5
COG14	The parent began to notice improvements in their child's behaviour	6.26	0.97	-1.78	4.64	0.44	5
AFF13	The parent felt less angry towards their child	5.94	1.47	-1.94	3.61	0.43	5
COG21	The parent's overall confidence in their abilities as a parent increased	6.34	0.84	-1.56	3.84	0.42	5
BEH10	The parent began to use strategies for improving their relationship with their child, such as quality time and showing affection	6.27	1.06	-1.99	5.24	-	

Code	Description						
AFF8	The parent became more proud of their child's achievements	6.03	1.23	-1.81	3.94	-	
CONT7	Improvements in the child's behaviour led to parenting changes	5.80	1.27	-1.58	3.11	-	
AFF10	The parent's feelings of shame around not succeeding as a parent were reduced	5.34	1.56	-1.21	1.13	0.75	6
AFF9	The parent felt less concerned about looking like a failure because they are seeking parenting assistance	5.23	1.64	-1.11	0.68	0.71	6
AFF6	The parent began to worry less about how their child might turn out in future	5.20	1.52	-1.06	0.85	0.560	6
AFF5	The parent became less worried about making common parenting mistakes	5.45	1.41	-1.24	1.54	0.58	6
AFF3	The parent's sense of guilt regarding their child's problem behaviours (e.g. feeling like the problems are all their fault) was reduced	5.67	1.39	-1.40	2.11	0.56	6
AFF1	The parent felt relief at receiving parenting support	6.06	1.21	-1.53	2.43	0.53	6
AFF11	The parent's overall anxiety about parenting was reduced	5.83	1.21	-1.44	2.87	0.52	6
AFF7	The parent's doubts about their abilities as a parent were reduced	5.86	1.19	-1.56	3.39	0.52	6
AFF4	The parent became more comfortable taking time out; for example, hiring a babysitter to have a date-night with their partner	4.86	1.76	-0.81	-0.14	0.41	6
AFF12	The parent's fear of taking their child out (e.g. shopping trips, friend's house) was reduced	5.51	1.54	-1.48	1.90	-	
AFF2	The parent felt hopeful that their child's behaviour problems could be improved	6.26	0.92	-1.59	3.84	-	
AFF17	The parent felt less disappointment that their parenting experience wasn't what they expected	4.84	1.68	-0.86	0.08	-	
BEH13	The parent began to use strategies for managing misbehaviour, such as planned ignoring, logical consequences, or quiet time	6.18	1.06	-2.04	5.99	0.53	7
BEH11	The parent began to use strategies for encouraging good behaviour, such as praise, interesting activities, and giving their child positive attention	6.47	0.89	-2.61	10.09	0.52	7
BEH12	The parent began to use strategies for teaching their child new skills and behaviours, such as incidental teaching or behaviour charts	5.79	1.24	-1.39	2.58	0.49	7
CONT4	The parent received constructive feedback from the practitioner, helping them to identify their strengths as a parent	6.36	0.80	-1.23	1.28	0.89	8
CONT3	The parent received support and encouragement from the practitioner	6.31	0.87	-1.27	1.32	0.88	8
CONT5	The parent received constructive feedback from the practitioner, helping them to identify areas for potential improvement	6.25	0.88	-1.43	2.79	0.83	8
CONT2	The parent developed a good therapeutic relationship with the practitioner	5.79	1.27	-1.16	1.25	0.69	8
AFF14	The parent experienced less anger towards their partner (leave blank if not applicable)	5.04	1.89	-0.98	-0.07	0.88	9
AFF15	The quality of the parent's relationship with their partner improved (leave blank if not applicable)	5.05	1.87	-1.03	0.06	0.83	9
BEH17	The parent began to work more effectively as a team with their partner, particularly around how to manage problem behaviours or difficult parenting situations (leave blank if not applicable)	5.36	1.78	-1.26	0.72	0.46	9
BEH1	The parent made their home a safer environment for their child	4.58	1.93	-0.54	-0.79	0.64	10
CONT1	The parent's efforts to make the home environment more child-safe led to a more positive family atmosphere	4.66	1.95	-0.70	-0.63	0.61	10

COG3	The parent identified outside influences that could be impacting their child's behaviour, such as the media or peer groups	4.84	1.46	-0.44	-0.26	-	
CONT8	The parent developed ongoing, supportive relationships with other parents in the program	4.37	2.15	-0.48	-1.16	0.85	11
CONT9	The parent made an effort to seek out and expand their peer support networks outside of the program	4.21	2.06	-0.43	-1.16	0.82	11
CONT11	The parent learned from watching and listening to the experiences of peers, such as others in the group or parents on the DVD	5.57	1.65	-1.37	1.28	0.450	11
CONT10	The parent received positive feedback regarding improvements in their child's behaviour from others outside the program, such as a playgroup teacher or friend	4.96	1.99	-0.94	-0.30	0.48	11
CONT6	The parent received support from family or close friends when necessary	5.33	1.68	-1.24	0.87	-	

[a]Factor interpretation was based on factors loading > 0.40. Loadings for items below the cut-off are omitted from table. See Table 4 for full rotated pattern matrix.

Missing data

For the main survey data 0.64% was missing overall. There were 55/79 (69.62%) items with no missing data, and generally low levels of missing responses in the other 24 items ($M = 2.27\%$; $SD = 5.06$). Three items with the highest amount missing discussed changes in attitudes toward a partner (items AFF15, AFF14, and BEH17 had 17.76%, 16.91% and 6.53% missing respectively). The hypothesis that data was missing completely at random (MCAR) was initially rejected using the multivariate test for nonparametric data in the *MissMech* package in *R* (Jamshidian, Jalal, & Jansen, 2014; $p < .05$) but was supported when these three items were excluded. Because these variables were so few in number and contributed valuable information regarding attitudes towards a partner, we decided to retain them for analysis under the tentative assumption of data missing at random (MAR; McKnight, McKnight, Sidani, & Figueredo, 2007).

Missing values were imputed using the *missForest* package in *R* (Stekhoven & Buhlmann, 2012), an iterative technique based on random forests which is suitable for nonparametric data and yields a single complete dataset, thus avoiding the added complexity introduced through multiple imputation where factor loadings must be pooled following estimation. Random forest imputation has been shown to produce good to superior rates of imputation error when compared to alternative approaches such as multiple imputation using chained equations (Liao et al., 2014; Waljee et al., 2013).

Sampling adequacy

We calculated and compared properties from three correlation matrices based on Pearson correlation coefficients, polychoric correlations, and robust correlation estimates (Wilcox, 2012) following imputation, with the latter two better accounting for non-normality in the data. The polychoric correlation matrix correlated highly with the Pearson correlation matrix ($r = .96$), and had better mean item correlations than the Pearson ($\beta = -0.05$, $t(12320) = -20.32$, $p < .001$), and robust correlation matrices ($\beta = -0.03$, $t(12320) = -12.64$, $p < .001$), and so we proceeded using polychoric correlations.

Suitability of the data for factor analysis was assessed using the Kaiser-Meyer-Olkin measure of sampling adequacy (MSA; Kaiser, 1970). Overall MSA was very high for the polychoric correlation matrix (MSA = 0.96), with all individual items having an MSA greater than 0.85 suggesting factor analysis should produce reliable and distinct factors (Field, Miles, & Field, 2012). Bartlett's test of sphericity also indicated item correlations were sufficient for factor analysis, $\chi^2(3081) = 36606.91$, $p < .001$.

There is little consensus on the minimum sample required for EFA. Some suggest at least 300 participants while others recommend at least five participants per variable (Henson & Roberts,

2006). Our sample of 597 participants and participant-variable ratio of approximately 8:1 suggested sample size was sufficient for factor analysis.

Exploratory Factor Analysis

Factor retention decision criteria

Parallel analysis (PA) and Velicer's minimum average partial method (MAP) are regarded as the two most accurate strategies for determining the number of factors to retain in EFA (Hayton, Allen, & Scarpello, 2004), although substantive reasoning and factor interpretability should be considered also (Ford, MacCallum, & Tait, 1986). MAP and PA, conducted using the *psych* package in *R* (Revelle, 2015), recommended retaining 9 and 11 factors respectively, thus we estimated models retaining 9, 10 and 11 factors for comparison. Visual examination of the scree plot suggested a drop after four factors which corresponded with the domain model originally hypothesized, therefore an additional four-factor model was also estimated.

Factor analysis

Factor analysis was conducted using *Mplus* (Muthén & Muthén, 2012). Data was treated as categorical using the WLSMV estimator to account for multivariate non-normality, which iterates over a polychoric correlation matrix. An oblique *geomin* rotation strategy was used to improve interpretability of the factor structure.

Model fit indices for the four estimated models are shown in Table 3.3. While significant chi-square goodness-of-fit tests indicate poor model fit, this test is sensitive to sample size and so alternative fit indices including CFI, RMSEA and SRMR were considered, along with interpretability of the factor structure (Schmitt, 2011). Fit indices revealed the four-factor model had somewhat adequate fit to the data, while the remaining models had superior fit. The 11-factor model demonstrated the best fit with all indices within acceptable ranges for categorical data, CFI = 0.96, RMSEA = 0.04, SRMR = 0.03 (Schmitt, 2011). Examination of the rotated pattern matrices also revealed the 11-factor model had the most interpretable factor structure with the fewest poorly-loading or cross-loading items.

Table 3.3. Fit indices for 4, 9, 10 and 11-factor models

Model	χ^2	df	CFI	RMSEA (90% CI)	SRMR	Total variance explained (%)
4 factors	7923.07***	2771	0.898	0.054 – 0.057	0.052	49
9 factors	4977.97***	2406	0.949	0.041 – 0.044	0.033	57
10 factors	4649.85***	2336	0.954	0.039 – 0.042	0.031	58
11 factors	4334.64***	2267	0.959	0.037 – 0.041	0.029	59

*** Significant at the .001 level

The rotated pattern matrix for the 11-factor solution is shown in Table 3.4, with loadings > 0.40 in bold. Communalities indicating the proportion of item variance explained by the factors were mostly at acceptable levels ($M = 0.63$, $SD = 0.12$), with only 12/79 items falling below 0.5. Using 0.40 as the cut-off for factor interpretation, 3 items cross-loaded onto more than one factor while 14 items did not load strongly on any one factor. Cross-loading items were interpreted on one factor only; usually its highest-loading factor however in one case (BEH5) the second-highest loading was used based on review of item content and stronger item-total correlations. Bivariate correlations between factors are shown in Table 3.5.

Factor interpretation

The 11 factors were assigned the following labels which broadly summarise the types and domains of changes described by the items: (1) Normalisation, (2) Cognitive enablers, (3) Self-efficacy, (4) Self-management, (5) Parent-child relationships, (6) Negative affect, (7) Positive parenting strategies, (8) Therapeutic relationship, (9) Partner relationship quality, (10) Home safety, and (11) Social support. Items are listed in Table 3.2 ordered by their primary interpreted factor.

Factor 1: Normalisation. The items on this factor refer to the parent gaining more a realistic view of their child's behaviour (*The parent developed more realistic beliefs about their child's behaviours, such as how often they occur or how severe they really are*), normalisation of their own parenting difficulties or need for support (e.g. *The parent came to accept that having some difficulties with their child's behaviour is a normal parenting experience*), and a shift in views regarding the intervention itself; specifically that it is a productive step towards making changes at home (e.g. *The parent came to believe that attending Triple P would be helpful for their family; The parent's motivation to improve their parenting increased*).

Factor 2: Cognitive enablers. These items refer to cognitive self-regulatory mechanisms described by Karoly (1993), specifically *discrepancy detection* (e.g. *The parent identified other barriers preventing them from achieving their goals, such as lack of time, energy, motivation, or skills*, or *The parent learned to think about their own behaviour, such as what they did well and how they could have improved the way they managed a recent difficult parenting situation*), and *discrepancy reduction* skills such as planning and problem-solving (e.g. *The parent developed specific intentions to make changes in their own behaviour, such as thinking about when, where, and how their behaviour would be different*, or *The parent recognized how a combination of strategies could be used to problem-solve difficult parenting situations*). In other words, the parent learns to think critically about their own areas of strength or difficulty in their parenting, identify potential barriers preventing them from achieving desired change, and consider how strategies or new behaviours might be implemented to overcome these challenges.

Table 3.4. Rotated pattern matrix of item factor loadings

Item	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11	Item-total correlation[a]	Communalities
COG9	**0.641**	0.026	-0.088	0.096	-0.011	0.260	0.055	-0.077	-0.037	0.023	0.084	.61	0.59
COG10	**0.582**	-0.005	0.024	0.048	0.266	-0.032	-0.083	0.076	-0.016	0.080	0.047	.58	0.59
COG8	**0.567**	-0.010	-0.008	0.065	0.026	0.109	0.030	0.128	-0.096	-0.082	0.133	.55	0.51
COG6	**0.428**	0.210	-0.004	-0.054	-0.064	0.096	0.144	0.068	0.083	0.096	0.037	.57	0.47
COG7	**0.404**	0.269	-0.008	-0.022	0.054	0.118	0.127	-0.026	0.021	0.061	0.021	.60	0.49
COG2	0.395	0.060	0.063	-0.063	0.353	-0.049	0.042	0.084	0.044	-0.068	-0.102	.47	0.49
COG4	0.380	0.195	0.025	0.048	0.122	0.092	-0.029	-0.033	0.105	0.039	-0.018	.54	0.43
COG5	0.342	0.161	0.191	0.079	-0.057	-0.004	0.076	-0.010	0.051	0.172	0.029	.51	0.42
COG1	0.292	0.049	0.094	-0.015	0.075	-0.014	0.120	0.166	0.130	0.158	-0.093	.46	0.38
COG22	-0.012	**0.665**	-0.038	0.098	0.057	0.046	-0.010	0.133	-0.007	0.030	-0.025	.69	0.64
COG13	-0.003	**0.610**	0.045	0.052	-0.062	0.024	0.034	0.021	0.022	0.046	0.158	.58	0.52
COG12	0.105	**0.599**	-0.010	0.018	0.020	-0.012	-0.043	-0.044	0.067	0.068	0.096	.56	0.49
COG23	0.023	**0.543**	-0.044	0.197	0.226	0.011	-0.037	0.091	0.012	-0.069	-0.042	.66	0.66
COG25	0.114	**0.434**	0.094	-0.023	0.201	-0.039	0.033	0.090	0.010	-0.037	0.038	.58	0.49
COG11	0.142	**0.404**	0.048	0.092	0.324	-0.095	-0.030	0.066	-0.097	-0.049	-0.060	.55	0.52
COG17	0.066	**0.400**	0.386	0.069	0.015	-0.032	0.019	0.071	-0.030	0.106	0.084	.61	0.60
COG26	0.100	0.367	0.144	0.034	0.263	-0.154	0.061	0.054	0.042	-0.003	0.023	.57	0.52
BEH18	-0.126	0.327	0.066	0.084	0.142	0.150	0.149	-0.055	0.154	-0.021	0.176	.50	0.55
COG19	0.022	0.249	**0.577**	-0.001	0.208	0.077	0.037	-0.095	-0.022	0.031	-0.004	.69	0.71
COG18	-0.058	0.287	**0.559**	0.130	0.069	-0.006	0.009	-0.050	-0.003	0.184	0.030	.73	0.66
COG16	0.006	**0.414**	**0.493**	-0.007	-0.034	0.089	-0.035	0.043	-0.009	0.166	0.080	.65	0.63
COG20	0.188	0.049	**0.461**	0.044	0.203	0.073	0.122	-0.017	-0.032	-0.024	-0.106	.55	0.62
BEH16	-0.073	0.074	0.398	0.332	-0.005	0.008	0.186	0.042	0.091	0.014	0.108	.62	0.67
BEH6	-0.047	0.085	-0.385	**0.725**	0.040	0.013	**0.507**	-0.045	-0.110	0.023	0.033	.71	0.83
BEH7	0.016	-0.077	-0.031	**0.661**	-0.081	0.079	0.006	-0.123	0.143	0.027	0.133	.60	0.52
BEH8	0.088	0.007	-0.084	**0.659**	-0.118	0.133	-0.040	-0.002	0.169	-0.017	0.056	.65	0.59
BEH3	0.049	0.031	0.044	**0.614**	0.249	-0.163	-0.054	0.089	0.052	0.197	-0.155	.61	0.69
BEH5[c]	0.012	0.025	-0.352	**0.571**	-0.055	0.024	**0.639**	0.021	-0.155	0.051	0.000	.57	0.73
BEH2	0.133	-0.044	0.073	**0.563**	0.056	-0.073	0.112	0.090	-0.027	0.360	-0.139	.62	0.66

BEH14	-0.044	0.023	0.033	**0.558**	-0.029	0.089	0.024	-0.105	0.163	-0.054	0.133	.59	0.50
BEH9	0.038	0.071	0.037	**0.538**	0.068	0.024	0.098	0.133	0.051	-0.090	0.085	.68	0.66
BEH4	0.095	0.077	0.087	**0.536**	0.084	0.019	0.024	0.012	0.015	0.257	-0.128	.64	0.62
BEH15	-0.056	0.140	0.151	**0.447**	0.073	0.016	0.054	0.062	0.061	-0.177	0.172	.59	0.60
AFF19	-0.046	-0.002	-0.020	-0.009	**0.782**	0.320	-0.111	0.013	-0.140	0.220	0.046	.71	0.79
AFF23	-0.001	0.002	-0.056	-0.013	**0.771**	0.045	0.172	0.009	0.085	-0.018	0.072	.78	0.80
AFF20	-0.101	0.006	-0.032	0.071	**0.708**	0.370	0.009	-0.030	-0.058	0.071	-0.076	.71	0.74
AFF24	0.027	-0.028	0.004	-0.059	**0.676**	0.219	0.097	-0.056	0.013	0.040	0.152	.70	0.69
AFF18	0.017	0.014	-0.025	0.068	**0.641**	0.231	-0.096	-0.019	-0.010	0.187	0.090	.66	0.68
AFF16	0.001	-0.026	0.064	0.017	**0.546**	0.075	0.031	0.037	0.221	0.042	0.172	.71	0.70
AFF22	-0.107	0.078	0.009	-0.049	**0.524**	0.058	0.149	0.065	0.216	0.159	0.078	.68	0.68
COG15	0.266	0.173	0.087	0.044	**0.515**	-0.113	-0.085	-0.026	0.056	-0.131	-0.085	.54	0.61
AFF21	-0.098	0.058	-0.051	-0.038	**0.480**	0.293	0.104	-0.024	0.119	0.167	0.043	.58	0.59
COG24	0.086	0.377	0.001	0.098	**0.456**	0.003	0.008	0.046	0.003	-0.135	-0.158	.57	0.66
COG14	0.267	0.052	0.255	0.031	**0.442**	-0.009	-0.019	-0.072	0.000	-0.090	0.004	.56	0.58
AFF13	-0.113	0.039	0.084	-0.001	**0.428**	0.127	0.005	0.053	0.362	0.024	-0.002	.57	0.62
COG21	0.144	0.248	0.293	-0.017	**0.416**	0.060	0.026	-0.043	-0.107	-0.082	-0.073	.54	0.63
BEH10	0.053	0.046	0.106	0.068	0.398	-0.160	0.382	0.165	0.085	-0.130	0.032	.61	0.74
AFF8	0.087	-0.011	-0.016	0.049	0.367	0.340	0.075	0.059	0.061	0.047	0.084	.62	0.59
CONT7	0.110	-0.003	0.107	-0.013	0.265	0.089	0.084	0.194	0.055	0.177	0.077	.53	0.46
AFF10	0.026	-0.070	0.055	0.199	0.085	**0.745**	-0.156	0.121	0.064	-0.080	0.003	.76	0.82
AFF9	0.063	-0.082	0.041	0.182	-0.008	**0.706**	-0.162	0.113	0.016	0.004	0.097	.69	0.73
AFF6	0.081	0.225	-0.097	-0.026	0.059	**0.599**	0.100	-0.032	0.114	-0.020	-0.007	.69	0.63
AFF5	0.017	0.295	0.035	-0.071	-0.048	**0.577**	0.233	0.047	0.090	0.056	-0.066	.70	0.71
AFF3	0.015	0.223	0.048	0.055	0.045	**0.559**	0.017	0.096	0.026	-0.054	-0.110	.65	0.56
AFF1	0.193	0.068	0.240	-0.037	-0.057	**0.532**	-0.008	0.230	-0.203	0.024	0.006	.55	0.58
AFF11	-0.002	0.012	0.162	0.176	0.189	**0.522**	-0.073	0.076	0.019	-0.036	-0.017	.68	0.63
AFF7	0.030	0.151	0.072	-0.017	0.276	**0.520**	0.066	0.007	0.045	-0.163	0.000	.66	0.66
AFF4	-0.060	0.224	-0.025	0.039	-0.023	**0.406**	0.193	-0.070	0.234	0.051	0.104	.61	0.60
AFF12	-0.053	-0.058	0.293	0.069	0.166	0.396	0.067	-0.009	0.169	0.038	0.060	.62	0.61
AFF2	0.162	0.012	0.218	0.033	0.172	0.395	0.019	0.152	-0.165	-0.035	-0.004	.49	0.52
AFF17	0.013	0.064	-0.083	0.047	0.217	0.378	-0.028	0.068	0.161	0.221	0.015	.60	0.55

	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11		
BEH13	0.173	-0.040	0.151	0.039	0.162	0.130	**0.526**	0.026	0.000	-0.081	-0.067	.70	0.64
BEH11	0.042	-0.049	0.181	0.026	0.399	-0.208	**0.520**	0.161	0.070	-0.225	0.002	.65	0.87
BEH12	0.128	-0.052	0.110	0.132	0.162	-0.005	**0.491**	-0.005	0.023	0.074	0.033	.64	0.57
CONT4	-0.008	0.035	-0.023	0.026	0.099	0.011	0.004	**0.894**	-0.004	0.005	-0.002	.79	0.92
CONT3	0.001	0.017	0.022	-0.011	-0.033	0.062	0.022	**0.883**	-0.001	-0.020	0.037	.80	0.83
CONT5	0.021	0.006	-0.074	0.012	0.106	0.051	0.028	**0.830**	0.003	0.057	0.002	.77	0.83
CONT2	-0.027	0.128	-0.007	0.050	-0.103	0.077	-0.011	**0.694**	0.008	0.040	0.018	.63	0.57
AFF14	0.093	0.073	-0.023	0.030	0.039	0.048	-0.022	0.009	**0.877**	0.021	-0.019	.82	0.93
AFF15	0.089	-0.001	0.029	0.062	0.061	0.032	-0.025	0.009	**0.826**	-0.019	0.037	.82	0.86
BEH17	-0.021	0.043	0.121	0.278	0.035	-0.022	0.099	0.012	**0.457**	-0.051	-0.089	.59	0.52
BEH1	0.061	0.006	0.048	0.207	-0.004	0.000	0.048	-0.035	0.246	**0.635**	-0.021	.67	0.67
CONT1	-0.025	-0.011	0.018	0.061	0.062	0.015	0.037	0.058	0.284	**0.606**	0.163	.66	0.73
COG3	0.278	0.183	-0.057	-0.007	-0.184	0.081	-0.042	0.041	0.236	0.309	0.123	.45	0.43
CONT8	0.113	0.103	0.014	-0.043	0.027	-0.050	-0.083	0.011	0.024	-0.050	**0.850**	.68	0.72
CONT9	0.010	0.124	-0.004	0.059	0.002	-0.006	0.003	-0.017	-0.027	0.098	**0.819**	.69	0.79
CONT11	0.159	-0.016	0.062	0.044	0.060	0.087	0.086	0.130	-0.007	-0.195	**0.496**	.50	0.48
CONT10	0.021	-0.102	0.101	0.060	0.229	0.035	0.018	0.104	0.047	0.060	**0.475**	.56	0.50
CONT6	0.018	0.028	-0.087	0.068	0.123	-0.001	0.085	0.174	0.189	0.061	0.327	.47	0.42
Eigenvalues	3.63	5.11	3.04	4.79	8.44	6.50	2.87	3.73	3.60	1.95	2.91		
Prop. variance[a]	0.05	0.06	0.04	0.06	0.11	0.08	0.04	0.05	0.05	0.02	0.04		
Reliability (α)[b]	0.83	0.86	0.84	0.88	0.92	0.91	0.80	0.87	0.87	0.75	0.80		
M[c]	5.77	5.68	5.89	5.14	6.04	5.50	6.15	6.18	5.11	4.62	4.78	0.62	0.63
(SD)	(0.85)	(0.83)	(0.86)	(1.01)	(0.79)	(1.06)	(0.91)	(0.82)	(1.65)	(1.77)	(1.54)	(0.08)	(0.12)

Loadings > 0.4 shown in bold. F1 – F11 = Factor 1 – Factor 11. [a]Proportion of total variance explained by the factor. [b]Corrected item-total correlations and Cronbach's alpha calculated for individual factors using items loading highest on that factor, except for item BEH5. [c]BEH5 was loaded onto F4 instead of F7 based on stronger item-total correlations and review of item content. [c]Mean factor scores computed from items loading > 0.40.

Table 3.5. Bivariate factor correlations

	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11
F1	1										
F2	0.45*	1									
F3	0.36*	0.31*	1								
F4	0.38*	0.50*	0.41*	1							
F5	0.32*	0.42*	0.50*	0.49*	1						
F6	0.21*	0.30*	0.16	0.35*	0.35*	1					
F7	0.23*	0.29*	0.36*	0.34*	0.35*	0.23*	1				
F8	0.39*	0.35*	0.26*	0.36*	0.40*	0.34*	0.24*	1			
F9	0.13*	0.35*	0.22*	0.40*	0.41*	0.41*	0.29*	0.22*	1		
F10	0.03	0.17*	-0.06	0.15*	0.05	0.23*	0.14*	0.11*	0.17*	1	
F11	0.09	0.16*	0.06	0.31*	0.18*	0.39*	0.21*	0.17*	0.34*	0.26*	1

* Significant at the .05 level. F1 – F11 = Factor 1 – Factor 11.

Factor 3: Parental self-efficacy. The four items loading onto this factor describe improvements in the parent's confidence in their ability to manage their child's difficult behaviours, particularly regarding high-risk situations. More specifically, two items describe increases in self-efficacy for managing difficult behaviours (*The parent became more confident in their ability to manage their child's behaviour in different settings and locations (such as shopping trips)*, and *The parent became more confident in their ability to use specific parenting strategies (e.g. time-out, planned ignoring) for managing problem behaviours*). Two items discuss planning ahead to prevent problems occurring (*The parent learned to identify high-risk situations where their child's behaviour was more likely to be difficult to manage*, and *The parent learned to develop a clear and specific plan for managing high-risk situations*). Identifying high-risk situations cross-loaded onto Factor 2, which describes conceptually related self-regulatory processes with significant moderate correlation between the two, $r = .31$, $p < .05$. Ultimately the item was assigned to this factor for interpretation given its specificity and higher factor loading.

Factor 4: Goal-oriented behaviour. Factors 2 and 4 had the highest Pearson correlation, $r = 0.50$, $p < .05$, highlighting the similarities between these two self-regulatory mechanisms. Where Factor 2 describes cognitive processes involved in recognizing discrepancy between the current and desired state and contemplating steps needed to make change, this factor describes more active goal-oriented behaviours such as goal setting, self-monitoring, and implementing strategies designed to align the parent's actual behaviour with their intended goals, for example skills practice, breaking goals into small, achievable steps, and critical self-reflection on the application of skills and strategies (Karoly, 1993). Two cross-loading items (BEH5 and BEH6) are discussed under Factor 7 below.

Factor 5: Parent-child relationship. This factor includes a combination of affective and cognitive changes describing increased feelings of positivity regarding the parenting role and the parent-child relationship. Specifically, increases in general happiness, confidence and pleasure in

the parenting role, feeling more connected with the child, reductions in stress or depressed feelings when faced with parenting difficulties, being more likely to notice the child's positive behaviour, and feeling as though the child is responding positively to changes in their parenting. Factors 5 and 3 also had the highest Pearson correlation, $r = .50$, $p < .05$, highlighting the conceptual overlap between increased positivity in the parenting role and feeling more competent as a parent.

Factor 6: Negative affect. Items loading on this factor describe reductions in negative thoughts and feelings such as guilt, shame, anxiety, worry, and doubts. Two positively-phrased items (*The parent became more comfortable taking time out; for example, hiring a babysitter to have a date-night with their partner*, and *The parent felt relief at receiving parenting support*) imply reductions in negative states such as guilt, worry, or helplessness.

Factor 7: Positive parenting strategies. Five items loaded highly onto this factor, with two cross-loading onto Factor 4 (*The parent reviewed their progress towards goals by monitoring and recording their own behaviour*, and *The parent began to keep track of their child's behaviour using graphs or a behaviour diary*). Although the latter had a higher loading on this factor (0.639 versus 0.571 for Factor 4), both cross-loading items were interpreted on Factor 4 due to better item fit and higher item-total correlations when loaded onto that factor.

The remaining three items on Factor 7 referred to the implementation of positive parenting strategies for managing misbehaviour, encouraging desirable behaviour, and teaching the child new skills.

Factor 8: Therapeutic relationship. Four items describing the therapeutic relationship loaded strongly onto this factor. Items refer to the parent receiving support, encouragement, and constructive feedback from a practitioner as well as the importance of developing a good parent-practitioner relationship.

Factor 9: Partner relationship quality. This factor includes three items describing improvements in the quality of the partner relationship, reduction in anger towards a partner, and working with a partner more effectively as a parenting team.

Factor 10: Home safety. Two items load on this factor, both alluding to benefits achieved from having a safe, interesting environment for the child at home (*The parent made their home a safer environment for their child*, and *The parent's efforts to make the home environment more child-safe led to a more positive family atmosphere*). This strategy is discussed in Triple P as a way to minimize risk of harm to the child and reduce a common source of frustration for parents.

Factor 11: Social support. These items describe benefits derived from peer networks. Parents may develop new, supportive relationships with other parents through participation in Triple P or expand existing peer support networks. Parents might also receive positive reinforcement from outside influences, such as helpful feedback from a child's teacher. Learning

vicariously through shared experiences with other parents can occur in group settings, or through watching multimedia-based vignettes in 1:1 or self-directed programs.

Factor reliability

Reliability was calculated for each factor using Cronbach's alpha coefficients and corrected item-total correlations. To remain conservative all 79 items were included. Although items with poor factor loadings (< 0.40) were not interpreted they were assigned to their highest-loading factor for reliability calculations, so as to ascertain the overall reliability of the survey.

Factors demonstrated good internal reliability with Cronbach's alpha coefficients ranging between $\alpha = .75$ and $\alpha = .92$. Corrected item-total correlations were adequate, ranging between $r = .50$ and $r = .82$ for items contributing to factor interpretation ($M = .63$, $SD = 0.08$), but as low as $r = .45$ for items not meeting the cut-off loading. Reliability estimates are included in Table 3.4.

Factor scores

Mean scores were computed for each factor using items loading above the 0.40 cut-off level. Although more refined factor scoring techniques are possible which provide greater validity (e.g. regression or Bartlett scores), sum scores retain variability in the original data and are a suitable approach for basic exploratory purposes (DiStefano, Zhu, & Mindrila, 2009). Mean factor scores were computed rather than total sum scores to allow for comparison between factors, as the number of items with adequate loadings varied.

The final row of Table 3.4 shows mean factor scores computed using the above procedure. Factor 10 (*home safety*) had the lowest ranking in terms of mean practitioner rating of importance for parenting change, $M = 4.62$, $SD = 1.77$. Factor 11 (*social support*) was the second-lowest ranked factor in terms of mean rating, $M = 4.78$, $SD = 1.54$.

The factors with the highest mean ratings were Factor 8 (*therapeutic relationship*; $M = 6.18$, $SD = 0.82$), followed by Factor 7 (*implementation of positive parenting strategies*; $M = 6.15$, $SD = 0.91$), and Factor 5 (*positive parent-child relationship*; $M = 6.04$, $SD = 0.79$).

Discussion

The primary aim of this study was to investigate practitioners' perceptions of the importance of a broad range of possible mechanisms of parenting change activated in response to participation in the Triple P—Positive Parenting Program. We believe those experienced in delivering parenting programs provide a novel perspective regarding the key mechanisms at work in the parents they see, and are an under-utilized resource in this area. Putative mechanisms were identified through content analysis of the program's resources, combined with consideration of its theoretical frameworks. Our initial hypothesis was that mechanisms would fit a basic four-domain structure consistent with the

cognitive-behavioural and social learning theories on which Triple P is based, namely *affective*, *behavioural*, *cognitive* and *contextual* changes. However exploratory factor analysis revealed an 11-factor model provided the best fit, accounting for almost 60% of item variance. These factors covered a range of domains including self-regulatory processes, cognitive changes such as normalizing of difficulties, goal-oriented behaviour, implementation of program-related strategies, emotional wellbeing, and relationships with others including practitioners, peers, and partners. Encouragingly, these factors aligned well with the various mediators suggested by prior parenting intervention research.

More than simply confirming that the causal mechanisms we identified through content analysis could be mapped onto a number of key domains consistent with the program's theoretical underpinnings, our findings also suggested a hierarchy of relative importance in terms of achieving parenting change, at least from the perspective of Triple P practitioners. Findings should clearly be interpreted with caution given that responses were collected only from practitioners. Ideally we would collect feedback from all key stakeholders (e.g. parents, practitioners and program developers), along with observational or assessment data where possible. We recommend adopting a multi-informant approach for future research in this area to help mitigate against potential bias.

At the top end of the hierarchy, the domain of therapeutic relationship was the highest-rated factor, with the role of the practitioner also appearing twice in the top five at the individual item level (*The parent received constructive feedback from the practitioner, helping them to identify their strengths as a parent;* and *The parent received support and encouragement from the practitioner*). We agree that clinicians play an important role in the therapeutic process, and plenty of research supports the relationship between quality therapeutic relationships and clinical change (Kazdin & Whitley, 2006). In the context of this research we were not surprised to find that practitioners view their own involvement as an important contributor towards parenting change, again highlighting the need for confirmation through a multi-informant approach.

The implementation of Triple P strategies was rated as the second-most important process leading to parenting outcomes at both the individual item level (*The parent began to use strategies for encouraging good behaviour, such as praise, interesting activities, and giving their child positive attention*), and the factor level (Factor 7: *implementation of positive parenting strategies*). Triple P's multilevel system incorporates a range of options, from intensive, multi-week treatment programs where strategy use is encouraged week-to-week and progress regularly discussed, down to 'light touch' alternatives such as a short series of seminars or one-off discussion groups with minimal clinical follow-up. For light touch options intervention efficacy is typically assessed after a short delay to give parents time to implement strategies at home (e.g. Sofronoff, Jahnel, & Sanders, 2011), which aligns with the assumption that implementation of strategies is necessary to achieve

parent outcomes. Yet this mechanism has not been directly tested within Triple P. Furthermore, there are a broad range of strategies communicated during the program, and conceivably some have greater impact on the parent than others. Between-session monitoring of the type and frequency of strategies used at home seems a good candidate for further exploration, to better determine whether variations in parent's implementation of strategies has a differential impact on program outcomes.

The individual item with the highest ranking was *The parent realized that their own behaviour can have a positive or negative impact on their child's behaviour*. While this item did not load onto any factors it was most similar to Factor 1 (*normalisation*), which included changes in parents' personal beliefs about their own parenting experiences and changes in their expectations regarding intervention benefits. Taken together, these items describe a range of attributional shifts and increases in personal agency, whereby the parent begins accepting their capacity to influence their child's behaviour through changes in their own behaviour (e.g. attending the program). Again, between-session monitoring of cognitive changes such as beliefs, attributions, motivation to change and parents' expectations would be an informative process to help better understand the relative contribution of these mechanisms towards achieving parent outcomes.

One important consideration is that practitioners were primed to think about global parenting improvement rather than any specific parenting outcomes indicated throughout Triple P research, such as warm, responsive parenting, appropriate use of positive discipline strategies, or increases in self-efficacy. Presumably different types of changes involve different causal pathways, and unfolding the specific mechanisms underlying each parenting outcome is a worthwhile pursuit. At the very least, empirically investigating these causal pathways will require further hypothesis testing through randomized controlled trials, including multiple assessments of both the outcome of interest and its proposed mechanisms across the course of intervention (Kazdin, 2007). Unfortunately, reliance on traditional methods of data collection such as multiple home or clinic observations (which require independent coding), and lengthy self-report parent questionnaires, can be financially taxing to implement and burdensome for participants, which might prohibit adding extra questionnaires and assessment time points to the data collection schedule. Exploring mechanisms of change within parenting programs may require researchers to adopt alternative data collection approaches such as Ecological Momentary Assessment (Moskowitz & Young, 2006). One option could be to implement push reminders for simple daily 'check-ups' through mobile devices that take seconds to complete and allow researchers to collect regular feedback across a range of domains (e.g. Runyan et al., 2013). Combined with modern multilevel approaches to longitudinal data analysis which can appropriately model within-person variance and are not precluded by missing data points (Singer & Willett, 2003), such approaches have potential appeal as effective tools useful for describing and modelling the causal processes of change over time.

Conclusion

More work is needed to better understand the mechanisms at work during evidence-based parenting interventions such as Triple P. This chapter outlines how a theoretically-supported four-domain model of parenting changes could expand into a more descriptive set of discrete changes based on practitioners' views. The goal of such work is to provide insight useful for further exploration of mechanisms of change within behavioural parenting programs such as Triple P. Clearly it would be unwieldy to include comprehensive assessment of eleven putative mediators within empirical studies, however overlap between the highest-ranked item and factor scores highlighted in this chapter suggests there may be a smaller set of domains that have more bearing on parenting outcomes. These findings may be useful as a potential starting point for further exploration in empirical studies focusing on analyses of mediators and mechanisms of change within Triple P.

Chapter 4

Mediators of parenting change and the moderating role of depression in a web-based parenting program: Evidence from a randomised controlled trial of Triple P Online

Recent empirical trials have demonstrated that web-based parenting programs can be effective at different levels of support, with evidence that parents benefit from both self-help approaches (e.g. Sanders, Baker, et al., 2012; Sanders, Dittman, et al., 2014), or in combination with professional support (e.g. Bert et al., 2008). Yet few studies have extended findings beyond evaluation of treatment outcomes to further explore factors that contribute towards or mitigate against treatment success in an online parenting program. As mentioned in Chapter 1, a recent paper following-up from a non-inferiority comparison between self-directed Triple P Online and the "Every Parent's Self-Help Workbook" (Markie-Dadds et al., 1999) found that outcomes were significantly predicted by factors such as module completion, baseline levels of child behaviour difficulties and poor parenting (Dittman et al., 2014). Additionally, an eighteen-month follow-up study of an online Parent Management Training intervention, shown to have good treatment outcomes at post-intervention and six-month follow-up (Enebrink et al., 2012), examined whether engagement with different types of homework tasks were predictive of outcomes, with findings indicating that completion of homework tasks aimed at reducing negative parenting behaviours were more predictive of pre-post changes in child problem behaviours than tasks aimed at improving use of positive parenting strategies (Högström, Enebrink, Melin, & Ghaderi, 2015).

While such trials are informative, clearly more work is needed to better understand the mediating and moderating processes involved in web-based parenting programs. With this as a primary goal, the present study is a follow-up to the main RCT findings reported in Chapter 2, with a focus on secondary analyses of potential mediators and moderators that might influence outcomes. There are two key areas of focus: (1) ascertaining the potential influence of initial levels of parental depression, including whether depression was a moderator of treatment outcomes and program engagement, and (2) to test whether various putative theoretically-derived mechanisms mediated treatment outcomes and whether evidence of diverging processes is identifiable between the two active treatment groups.

Mohr and colleagues (Mohr et al., 2011) have put forward a model of 'supportive accountability' to explain the underlying processes responsible for increased adherence when human support is provided to users of web-based treatments. The model posits accountability as a central component, with related factors such as the degree of social presence (e.g. synchronous telephone communications versus asynchronous email reminders), whether there are clear

expectations between the consumer and therapist, the influence of goal setting, the perceived expectations and knowledge of the clinician, and the quality of the therapeutic relationship. In turn, the impact of accountability on engagement may also be moderated by motivational factors, including the user's pre-existing intrinsic motivation, or external motivating influences such as appropriate use of praise by the support person.

The influence of intrinsic motivation is not yet well understood in the context of online parenting intervention, however one potential risk factor that may have an adverse effect is parental depression. Studies investigating the potential impact of depression on treatment outcomes within parenting interventions generally have not found it to be a strong moderating factor of improvements in key outcomes such as dysfunctional parenting (McTaggart & Sanders, 2007) or disruptive child behaviours (Beauchaine et al., 2005), although there is some evidence that children of depressed mothers respond better to treatment (Gardner et al., 2010). Conceivably however, depressive symptomatology may negatively impact a parent's ability to engage with an online program in the absence of human support, where greater levels of intrinsic motivation are likely required (Mohr et al., 2011), and thus have an adverse influence on treatment outcomes. Findings from a recent qualitative study exploring the acceptability of an online cognitive-behavioural treatment for depression (MoodGYM) support this notion, with users reporting difficulties such as poor concentration, low self-esteem, or feelings of apathy as intrinsic barriers to program engagement (Schneider et al., 2014). Morawska and Sanders (2006) also noted that parents allocated to a self-directed parenting workbook condition and who had higher levels of depression initially, were less likely to complete the program, whereas the same effect was not reported for those in the condition with brief practitioner involvement. Perhaps the inclusion of even minimal levels of support provides some buffer against negative effects of parental adjustment difficulties on program engagement.

Taken together, these findings suggest that higher baseline levels of depression may be negatively associated with program engagement in an online parenting intervention, particularly when parents are not clinically supported through the program. However, the involvement of a therapist may play an ameliorative role, such that program engagement and treatment outcomes are less impacted by the same depressive symptoms. This study aimed to determine whether the severity of parental baseline depression moderated program engagement and outcomes for the two treatment conditions. It was hypothesised that for parents in the self-directed treatment condition, those with higher baseline levels of depression would show less program engagement in terms of fewer modules completed. Consequently, because greater adherence to an online parenting program may lead to better treatment outcomes (Dittman et al., 2014), it was hypothesised that parents in the self-directed condition with higher levels of initial depressive symptoms would shower fewer

benefits in terms of key outcomes such as reductions in child behaviour problems, dysfunctional parenting styles, and increases in parenting confidence. Conversely, it was expected that practitioner involvement would ameliorate the adverse effects of depression, through the mechanisms of maintaining greater parental engagement with treatment or supporting the development of parental self-regulatory capabilities; thus baseline depression would not negatively impact levels of program engagement or treatment outcomes for parents in the practitioner-supported condition.

The second aim of this study was to explore possible mediating processes of parenting change within the intervention. While many parenting studies have focused on the importance of parenting changes for improvements in child behaviour (e.g. Forehand et al., 2014), the processes that lead to parenting change have received less attention in the literature, and there have been no studies examining theoretically and empirically-supported mechanisms of parenting change within an online parenting intervention. The focus on mediators is important for identifying the active components of the program that drive change, which has implications for ongoing refinement of program content, structure, or dissemination approaches (Kraemer et al., 2002). It is also important to determine whether change processes seen in online treatments align with those observed through face-to-face treatment approaches, and whether the hypothesised causal pathways differ when participants receive practitioner support or use the program in a self-help fashion.

Chapter 3 described a consumer feedback study designed to elicit practitioners' views on how parents change during participation Triple P. The two items ranked by practitioners in that study as having the highest perceived importance were *The parent realized that their own behaviour can have a positive or negative impact on their child's behaviour*, referring to self-regulatory skills such as increases in personal agency, and *The parent began to use strategies for encouraging good behaviour, such as praise, interesting activities, and giving their child positive attention*, referring to the implementation of positive parenting strategies. Implementation of positive strategies was also the second-highest ranked domain at the factor level, behind the therapeutic relationship. These findings align with core aims of the Triple P Online program: to both promote parents' self-regulatory skills and increase parental use of positive parenting strategies (Sanders, Baker, et al., 2012).

The enhancement of parental self-regulatory skills, including changes in personal agency and self-efficacy, has received significant attention within the parenting literature (Coleman & Karraker, 1998), and is central to the Triple P framework (Sanders & Mazzucchelli, 2013). Changes in parental self-efficacy has also received prior support within Triple P research as a mediator of change in dysfunctional parenting (McTaggart & Sanders, 2007). Increases in the use of positive parenting behaviours have also been shown to mediate the effects of parent training interventions on

child outcomes (Forehand et al., 2014; Gardner et al., 2010), however the mediating relationship between increases in the use of positive parenting practices and reductions in negative or dysfunctional parenting styles through behavioural family intervention is less well-established.

Practitioner-support was provided as only a relatively brief adjunct (approximately two hours on average per participant over the intervention period), whereas the primary mode of intervention delivery was through the online program itself, which targets both behavioural and self-regulatory skills in parents. As such, it was hypothesised that treatment effects on reductions in dysfunctional parenting styles would be significantly mediated by increases in use of positive parenting strategies and improvements in self-efficacy for both treatment groups.

Method

The following sections summarise key methodological details relevant to this study. A more detailed description of the RCT design and procedure is available in Chapter 2. The main trial was registered on the Australian New Zealand Clinical Trials Registry (ANZCTR), registration number ACTRN12614000672651.

Participants

Participants were recruited by advertising through social media and local childcare and community centres. Permission was also obtained to send a mail-out to parents in a waiting list to access Triple P through their local government health service. Parents with a child aged between two and nine were eligible to participate on the basis of concerns about managing their child's behaviour, as well as reporting at least one other potential risk factor including: (a) single parents; (b) both parents currently unemployed; (c) no further education beyond high-school; (d) financial pressure, indicated by being unable to meet essential expenses; (e) conflict with a partner over parenting; or (f) high levels of depression or stress.

One-hundred and eighty-three participants were randomised to receive either a self-directed version of Triple P Online (TPOL; $n = 57$), a practitioner-supported version of Triple P Online (TPOLe; $n = 66$), or a computer-use-as-usual control condition (CUAU; $n = 60$). Table 4.1 outlines the demographic characteristics of the sample. Parents were aged between 22 and 51 ($M = 34.9$; $SD = 5.3$), and age of the target child ranged between 1 and 8 ($M = 3.5$; $SD = 1.5$). The majority of parents were mothers (96.2%), and roughly half of the children female (53.5%).

Sociodemographic factors revealed that most parents identified as white (93.4%), had a partner (89%), and the majority of children lived with their original families (84.7%). A little more than half of the primary parents had a university degree (60.6%) and were currently working (54.6%). Few parents reported difficulties meeting essential expenses or being unable to purchase non-essential items (14% and 16.9% respectively). As reported in the primary RCT paper, there

were no significant differences between groups on any sociodemographic variables except for ethnicity; of the few non-white parents in the sample, during the randomisation process none were allocated to the control condition. Ethical approval to conduct the study was granted by the Behavioural and Social Sciences Ethical Review Committee at the University of Queensland, project number 2012000186.

Procedure

Parents were initially sent baseline assessment measures via email (T1), and then randomised to condition following completion of the measures. Parents randomised to the TPOL and TPOLe groups were emailed an access code for the online program, including instructions on how to get started. Program access expired 16 weeks from the date of first login, at which point post-intervention assessment (T2) was conducted, with a 5-month follow-up assessment (T3) not reported in the present study. Parents in the CUAU condition followed the same assessment timeline, and were then provided with login details to access the program after completion of follow-up assessment.

Intervention

Triple P Online (Turner & Sanders, 2011) is self-contained web-based variant of Level 4 Triple P interventions (Sanders, 2012), consisting of eight, self-contained online modules. An online workbook records the user's progress through the program, goals are tracked throughout, and optional technology-assisted reminders (e.g. SMS, email) can be set up by the user to act as prompts or reminders. Parents allocated to the intervention conditions (TPOL and TPOLe) received immediate access to Triple P Online for a period of four months. Parents randomised to the TPOLe condition were allocated an accredited Triple P practitioner who would provide the parent with up to eight telephone consultations, scheduled weekly where possible, with a focus on enhancing self-regulatory skills and discussing barriers to engagement. Where parents did not respond to the telephone at the scheduled time, a consultation was considered to be missed and the practitioner would attempt to re-engage the parent for the next session. Overall, parents completed an average of 4.2 telephone consultations ($SD = 2.75$), with mean duration 23.69 minutes ($SD = 8.26$, range = 5 – 60).

Measures

A small subset of the outcome scales reported in the main RCT study (Chapter 2) were used for the present analyses, described below.

Child behaviour problems

The severity of child behaviour problems were assessed using the Intensity subscale of the Eyberg Child Behaviour Inventory (ECBI; Eyberg & Pincus, 1999), which was found to have good internal consistency (α = .91). Parents rate how often 36 problem behaviours currently occur on a 7-point scale of 1 (*never*) to 7 (*always*), with ratings summed for a total Intensity score.

Table 4.1. Participant demographics by treatment condition.

Variable		TPOL (*n*=57) M *(SD)*	TPOLe (*n*=66) M *(SD)*	CUAU (*n*=60) M *(SD)*	*F*
Parent age (years)[a]		34.81 (5.16)	35.45 (5.88)	34.50 (4.81)	0.52
					H[b]
Child age (years)[a]		3.44 (1.45)	3.69 (1.7)	3.43 (1.24)	0.82
		% (*n*)	% (*n*)	% (*n*)	χ^2
Location[c]	NSW	10.53 (6)	6.06 (4)	5.00 (3)	6.45
	NT	-	1.52 (1)	-	
	QLD	8.77 (5)	12.12 (8)	16.67 (10)	
	VIC	-	1.52 (1)	-	
	WA	80.70 (46)	78.79 (52)	78.33 (47)	
Child gender	Male	42.10 (24)	42.40 (28)	55.00 (33)	2.63
	Female	57.90 (33)	57.60 (38)	45.00 (27)	
Parent's relationship to child[c]	Mother	94.70 (54)	95.50 (63)	98.30 (59)	1.17
	Father	5.30 (3)	4.60 (3)	1.70 (1)	
Relationship status	Married/de facto	89.50 (51)	86.40 (57)	91.70 (55)	0.92
	Single/separated/divorced	10.50 (6)	13.60 (9)	8.30 (5)	
Household[c]	Original family	84.20 (48)	83.30 (55)	86.70 (52)	1.60
	Step family	3.50 (2)	3.00 (2)	3.30 (2)	
	Sole parent	10.50 (6)	12.10 (8)	6.70 (4)	
	Not specified/Other	1.80 (1)	1.50 (1)	3.30 (2)	
Ethnicity[c]	White	91.20 (52)	89.40 (59)	100.00 (60)	**15.34****
	Asian	-	7.80 (5)	-	
	Other (e.g. Pacific Islander, Arab)	8.80 (5)	3.00 (2)	-	
Parent education	High school	19.30 (11)	24.20 (16)	20.00 (12)	1.32
	Trade/technical college	21.00 (12)	18.20 (12)	15.00 (9)	
	University degree (undergraduate/postgraduate)	59.70 (34)	57.60 (38)	65.00 (39)	
Partner education	High school	21.60 (11)	25.00 (14)	25.50 (14)	2.04
	Trade/technical college	35.30 (18)	42.90 (24)	32.70 (18)	
	University degree (undergraduate/postgraduate)	43.10 (22)	32.10 (18)	41.80 (23)	
Parent employment status	Full time/part time	63.60 (42)	54.40 (31)	45.00 (27)	4.41
	Not working/job seeking	36.40 (24)	45.60 (26)	55.00 (33)	
Partner employment status[c]	Full time/part time	94.10 (48)	96.40 (54)	98.20 (54)	1.23
	Not working/job seeking	5.90 (3)	3.60 (2)	1.80 (1)	
Able to meet essential expenses[c,d]	No	19.30 (11)	13.60 (9)	10.00 (6)	3.27
	Yes	79.00 (45)	86.40 (57)	88.30 (53)	
	Unsure	1.80 (1)	-	1.70 (1)	
Can afford after expenses[a,e]	Not much	21.10 (12)	16.90 (11)	13.30 (8)	3.40
	Some things	50.90 (29)	49.20 (32)	43.30 (26)	
	Most things	28.10 (16)	33.90 (22)	43.30 (26)	

Note. TPOL = Triple P Online (self-directed condition); TPOLe = Triple P Online Enhanced (practitioner-supported condition); CUAU = Computer-use-as-usual (control condition); ** = Significant at the .01 level.
[a]Data missing for 1 TPOLe case. [b]Kruskal-Wallis rank sum test used due to non-normal distribution. [c]Fishers' Exact Test used for significance testing as expected frequencies <5 for one or more cells. [d]Able to meet essential expenses in the last 12 months. [e]After essential expenses, how much money is leftover for nonessential purchases.

Parenting practices

Coercive and dysfunctional parenting styles (hereafter referred to as *negative parenting*) were assessed using the 30-item Parenting Scale (PS; Arnold et al., 1993), which asks parents to rate their likelihood of responding to certain problem behaviours with varying degrees of laxness, over-reactivity, or hostility, with items scored using a 7-point Likert scale. A Total score is obtained by taking the mean response across all items ($\alpha = .86$).

Parental depression

Parental depression was measured using the Depression subscale of the 21-item Depression, Anxiety and Stress Scale (DASS-21; Lovibond & Lovibond, 1995), which has good discriminant and convergent validity. Seven items contribute to the Depression subscale, measured on a scale of 0 to 3. The subscale was found to have high internal consistency ($\alpha = .91$).

Self-efficacy

An indication of parental self-efficacy was assessed using the Behaviour subscale of the Parenting Tasks Checklist (PTC; Sanders & Woolley, 2005), which asks participants to rate their confidence managing various difficult behaviours (e.g. *Refuses to do as told; Throws a tantrum*) on a scale of 0 to 100 ($\alpha = .97$).

Implementation of positive parenting strategies

As no observational measures were available regarding parents' strategy use, an additional item (labelled IMP) was included at T1 and T2 to gauge how strongly parents identified with using new strategies: I used new parenting strategies in the last four weeks that I was not aware of, or would not have felt confident using, this time last year. Parents rated the extent that the statement reflected how they felt about their own parenting over the last four weeks on a scale of 1 to 5 (1 = Not at all true for me; 3 = Somewhat true for me; 5 = Completely true for me).

Intervention engagement

Although engagement with online programs can be defined in various ways such as number of logins, time spent in the program, or proportion of activities completed (Donkin et al., 2011), for the present study engagement was defined as the number of online modules completed.

Attrition

A CONSORT diagram of participant flow is shown in Figure 4.1. Baseline data was available for all 183 randomized families. At T2, data was available for 143 participants (78.1%), and T3 assessment data was available for 134 (73.2%) participants. T3 assessment data was not used for the present analyses. Most parents lost to follow-up assessments were not able to be

contacted by the research team despite multiple attempts. Other reasons included lack of time or conflicting schedules, moving overseas, or enrolling in a face-to-face parenting program. Chi-square analysis revealed there were significantly more parents lost to follow-up in the treatment groups than the control condition, $\chi^2(2) = 10.43$, $p < .01$, suggesting CUAU parents may have been more motivated to continue with the study to ensure they received access to the intervention, whereas parents were less motivated to continue the assessment process after program expiry.

Moderation analyses

Normal-theory hierarchical linear regression models were used to assess whether baseline depression moderated child behaviour outcomes, dysfunctional parenting, and parental self-efficacy. Criterion variables consisted of T2 scores on the ECBI Intensity, PS Total, and PTC Behaviour scales, while T1 scores on the DASS Depression subscale were used as an indication of baseline depression.

Analyses were conducted individually for each of the three dependent variables, following a two-step process. In Step 1, T1 depression scores and two dummy-coded categorical variables representing the active treatment groups were entered as predictors (TPOL and TPOLe, with CUAU as the reference category for both). In addition, the T1 score of the relevant dependent variable was entered as a covariate to control for baseline differences. In Step 2, the interaction between baseline depression and treatment group was entered. A significant interaction term indicated the outcome was moderated by participants' initial severity of depressive symptoms. Visual analysis of standardised residual and Cook's Distance plots for each of the models suggested the assumption of normality was reasonable, and there were no problematic outliers observed.

A non-linear modelling approach was required to assess the influence of depression on program engagement, as the dependent variable (modules completed) was count data (e.g. total number of modules completed by each participant out of eight), and did not follow a normal distribution. Figure 4.2 depicts the total number of modules completed by participants for each intervention condition.

Due to the count nature of data, negative binomial (NB) regression was utilised instead of linear regression. NB regression is a non-linear modelling framework that extends the Poisson regression model for count data but with less restrictive assumptions, and thus is better-suited to over-dispersed count data where the conditional variance and conditional mean are not equal (Gardner, Mulvey, & Shaw, 1995), which was the case here. NB models allow an offset variable to be entered into to account for the exposure rate; in this case, the maximum possible number of modules a participant could complete (8). This was entered as the log value of the total number of modules (log[8]), which the model treats as a constant with coefficient of 1.0.
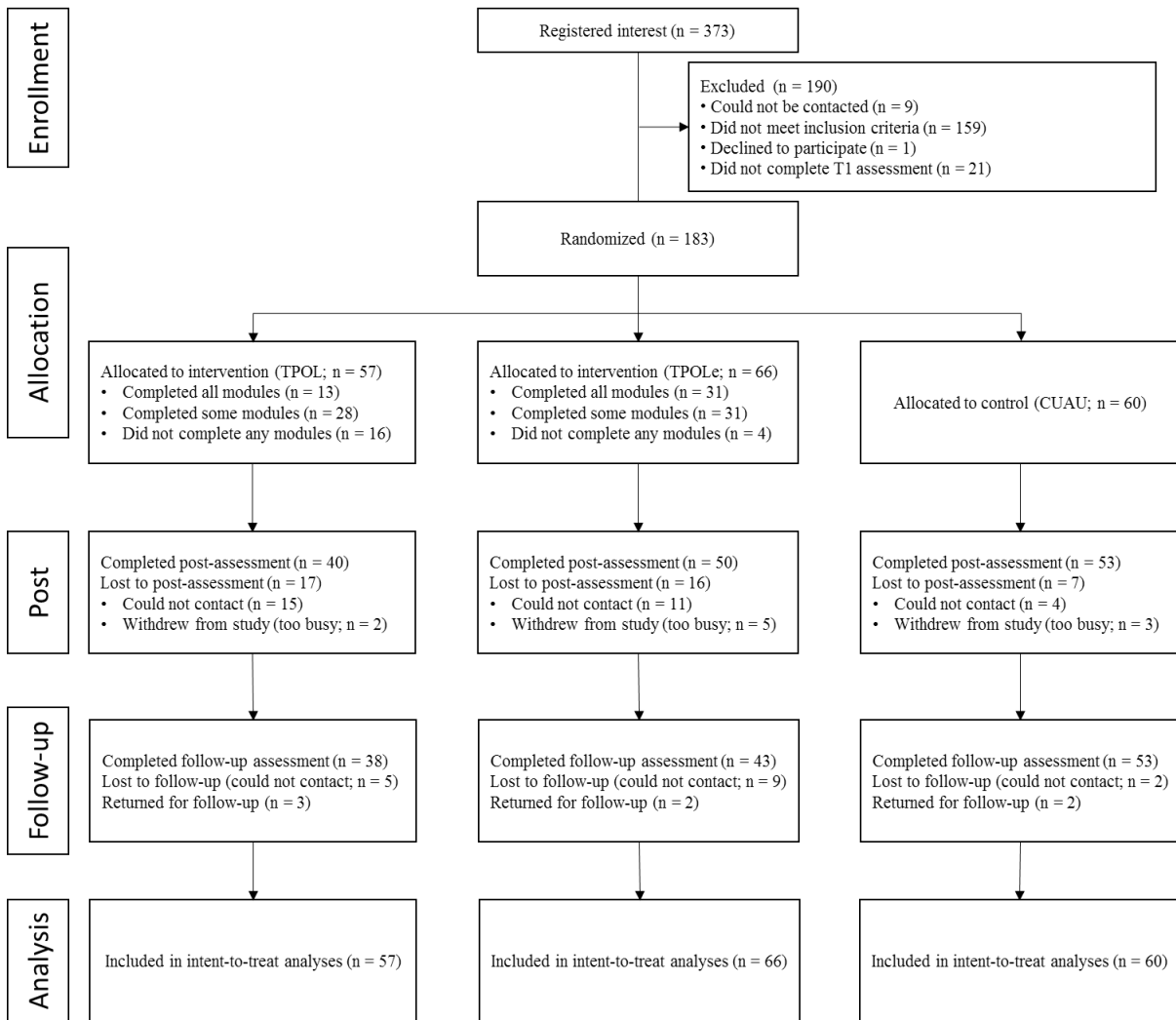
Figure 4.1. CONSORT diagram of participant flow

A similar two-step hierarchical approach to that above was utilised, with some slight modifications. First, it was not meaningful to include control participants in this analysis, as they had not yet been provided with any access to the program at post-intervention and would have unnecessarily inflated the zero-count through no exposure to online modules. Therefore, a subset of the data was used consisting of only participants in the TPOL and TPOLe treatment conditions ($n =$ 123). In Step 1, T1 depression and group were entered as predictors, in addition to T1 ECBI Intensity scores to control for any influence that baseline child behaviour difficulties may have had on module completion rates. The T1 depression x treatment condition interaction term was then entered in Step 2 as before.

Because coefficients are obtained on a log scale, to assist interpretation a plot showing fitted values of baseline depression and expected values on the dependent variable (modules completed) was generated, shown further below. To verify the assumption of over-dispersion, chi-square difference tests were conducted, comparing each NB model with a Poisson model containing

identical parameters. In each case the NB model was a significantly better fit than the more restrictive Poisson model, thus suggesting NB was a more suitable approach for the data.

Mediation analyses

To analyse the putative mediatory relationships between treatment condition and outcomes, a series of structural equation models (SEM) were conducted in Mplus 7.4 (Muthén & Muthén, 2012) using maximum likelihood estimation. The lower half of Figure 4.3 shows a simple single-mediator model, with path *a* denoting the effect of treatment on the proposed mediator, path *b* the effect of the mediator on outcome, and path *c'* the direct effect of treatment on outcome. Path *c* in the upper half of the diagram shows the unmediated effect of treatment on outcome.
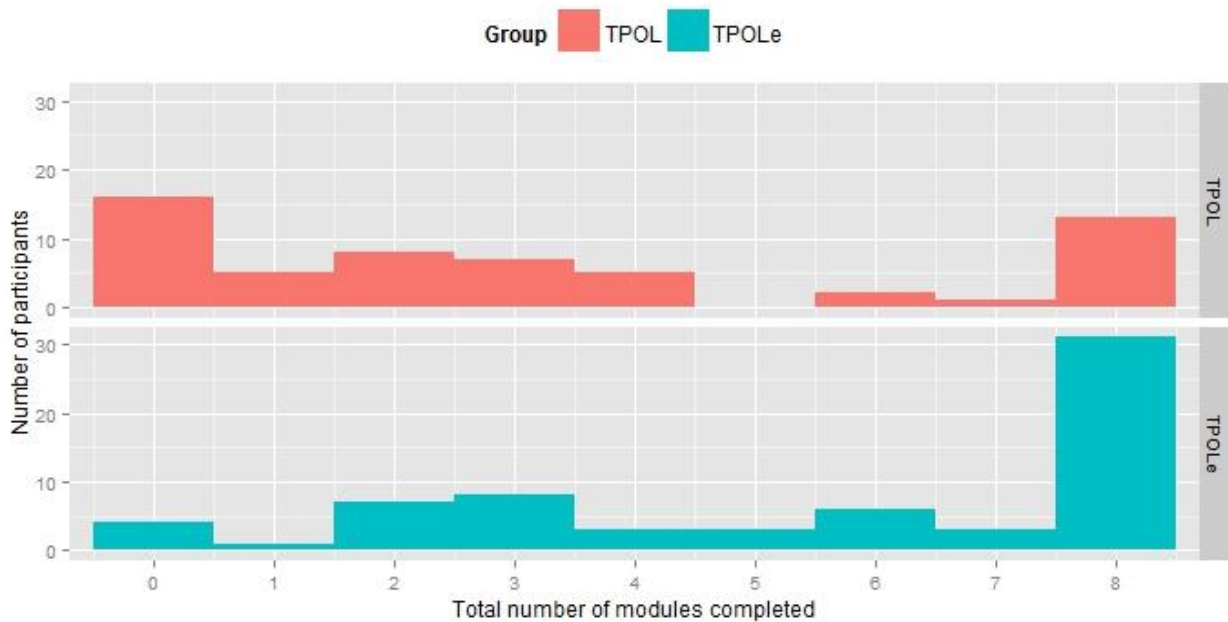

Figure 4.2. Total number of modules completed by participants across each treatment group.

Recent work has suggested that a significant, unmediated *c* pathway, traditionally a prerequisite in traditional causal steps approaches (Baron & Kenny, 1986), is not required for mediation due to possible suppression effects or small treatment effects (MacKinnon, Krull, & Lockwood, 2000). As such, recommendations to explore indirect effects are followed in order to determine whether the total effect of treatment on outcome was significantly mediated (MacKinnon, Lockwood, Hoffman, West, & Sheets, 2002; Rucker, Preacher, Tormala, & Petty, 2011; Shrout & Bolger, 2002). The indirect effect (the product of paths *a* and *b*), captures both the amount of change in the mediator that is due to the treatment condition, as well as the extent that the outcome is affected by the mediator (MacKinnon, Fairchild, & Fritz, 2007). Indirect effects have been shown

to have a positively skewed distribution, thus a bias-corrected bootstrapping procedure is recommended to produce unbiased estimates. Bias-corrected bootstrapped confidence intervals from 10,000 resamples were calculated, with significance indicated if the 95% confidence interval did not cross zero. Bootstrapping is also the preferred approach as it retains retaining statistical power when sample sizes are small-to-moderate (Mackinnon, Lockwood, & Williams, 2004; Shrout & Bolger, 2002).

Model fit for SEM models was explored through model chi-square estimates and alternative fit indices. Model chi-squares examine the null hypothesis that there is no difference between the model and observed data, and so a non-significant result is desirable. However, because of its sensitivity to both sample size and the strength of correlations in the data, it is often interpreted in conjunction with other fit indices such as CFI (Hu & Bentler, 1999), RMSEA (Steiger & Lind, 1980), and SRMR (Byrne, 2013). Adequate fit is indicated when values of CFI are at least 0.90, and RMSEA less than approximately 0.08 (Browne & Cudeck, 1993), although a CFI of at least 0.95 is more commonly used as indicative of good fit. SRMR less than 0.05 also suggests adequate model fit (Byrne, 2013).
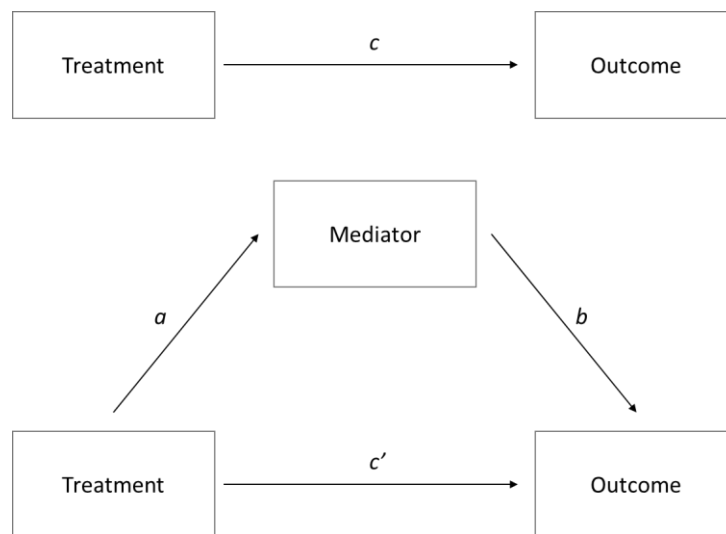

Figure 4.3. Diagram of a simple SEM path model (top) and single-mediator SEM model (bottom).

The main mediation hypotheses were that parental self-efficacy and implementation of positive parenting strategies would significantly mediate intervention effects on dysfunctional parenting style, however it was also relevant to assess whether mediation pathways were different for the two treatment conditions. As the study may have been underpowered to detect possible small differences in effect sizes between the two active treatment groups through a direct comparison, two-group SEM models were run to simultaneously estimate mediation pathways for each treatment group relative to the CUAU control condition. A generic structural diagram depicting this SEM

model is represented by the solid boxes in Figure 4.4. Although this approach constitutes non-orthogonal contrasts as the same set of control participants were included in each part of the model, it was deemed suitable for exploratory purposes as it allows at least visual indication of differences in path weights between conditions through standardized coefficients.

For the initial model, all paths were allowed to freely vary across groups[1]. A nested, partially-constrained model was also estimated so that models could be statistically compared in order to test whether mediation pathways differed to a statistically significant degree between treatment conditions. In the constrained model, paths between treatment condition and putative mediator (path *a*), between putative mediator and outcome (path *b*), and between treatment condition and outcome (path *c*) fixed to be equal across groups (i.e. *a1 = a2*; *b1 = b2; c1 = c2*), while all other paths were unmodified. A significant chi-square difference test would indicate improvement in fit for the unconstrained model versus the constrained model, hence suggesting paths were significantly different across treatment groups.

Finally, in light of findings reported below that treatment effects on self-efficacy were moderated by baseline depression, the possibility that initial depressive symptoms influenced the putative mediating process of self-efficacy on dysfunctional parenting was explored, as depicted by the dotted boxes in Figure 4.4. First, the unconstrained model was re-estimated with T1 DASS Depression scores entered as a predictor of the model's T2 mediator term, with the T1 depression x treatment condition interaction entered into the model but fixed at zero. Conceptually, this model tested whether baseline depression was a significant predictor of change in self-efficacy, while assuming no difference in effects based on treatment condition. A subsequent model was then computed allowing the T1 depression x treatment interaction term to be freely estimated rather than fixed at zero, which represented the possible moderation of treatment effects on self-efficacy by initial depression. Chi-square difference tests between these two nested models were conducted, with a significant value indicating the less-constrained model was a better fit, thus supporting a moderation effect within the putative mediation model.

Because T1 x treatment condition interaction terms were used in the models, T1 scores were grand-mean centred to improve interpretability, so that coefficients of main effects would represent change at the T1 mean rather than zero.

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[1]All paths were freely estimated with the exception of T1 covariate scores, entered to control for baseline differences, as these were assumed to be equal across conditions. However, T1 x treatment interactions, included to control for any differences between treatment and control groups in the influence of baseline scores on post-intervention scores, were freely estimated.

Results

Across the subset of pre- and post-intervention variables used for the present analyses, 11.2% of data was missing overall. The hypothesis that data was missing completely at random (MCAR) was supported at the $p < .05$ level using R software provided by Jamshidian, Jalal, and Jansen (2014). Chi-square analysis and independent t tests revealed no significant differences between parents that completed T2 assessment and those that did not, on any of the primary sociodemographic characteristics or baseline levels of child behaviour problems.
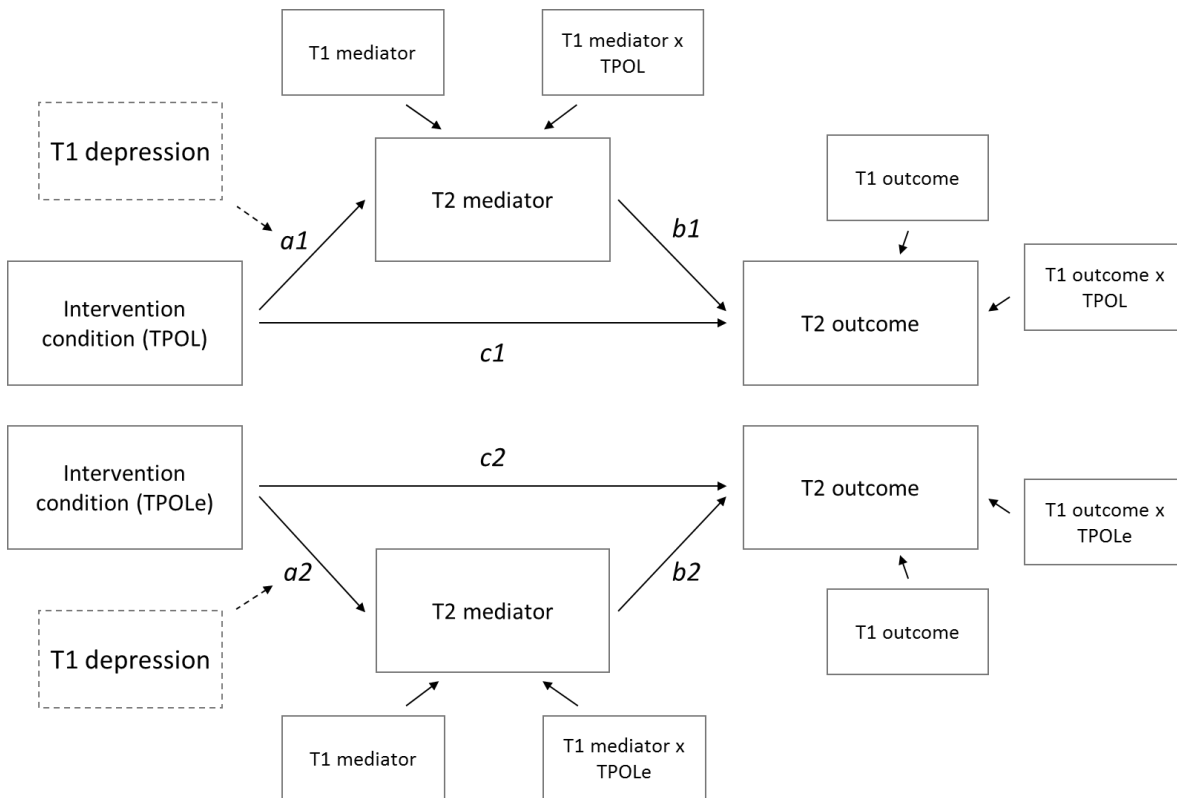

Figure 4.4. Structural model used for two-group mediator analyses showing paths and covariates. In partially constrained models for chi-square difference testing, constraints were *a1 = a2* and *b1 = b2*. Baseline depression examined as potential moderator of T2 mediator for parental confidence.

To include all participants in analyses and produce a single dataset used for both mediator and moderator analyses, missing values at T2 were imputed using Expectation-Maximisation (EM). Although multiple imputations of missing data were available for all measures used in the primary analyses, it was necessary to re-impute with the EM algorithm for the present analyses as (a) only missing responses at the item level were imputed in the original dataset to allow for calculation of partially-completed scale scores, while scale scores missing due to attrition were handled through maximum likelihood estimation, and (b) there are currently no methodological guidelines available regarding the pooling of bootstrapped confidence intervals for indirect effects across multiply

imputed data. EM is also considered a suitable approach when the hypothesis of MCAR is supported (Enders, 2010).

Means and standard deviations at T1 and T2 are presented in Table 4.2 for all variables used in the following analyses, followed by bivariate Pearson correlations in Table 4.3. There were significant correlations within and across time points for most variables, except for the single item used to assess implementation of strategies which showed minimal correlation overall at T1, although at T2 correlated significantly with many of the other T2 measures. Because this item represented recent *increase* in strategy use, it would be expected that scores would be low at T1, thus there would be minimal opportunity for it to correlate with other factors.

Moderation analyses

Effects of baseline rates of depression on post-intervention child behaviour problems are shown in Table 4.4, including B and β coefficients, *F* significance tests of model comparisons and R^2 change statistics for each model. The model entered in Step 1 containing treatment group, baseline measures of child behaviour problems as a covariate, and initial levels of parental depression was significant, explaining 47% of the variance in post-intervention scores. Participants in the practitioner-supported condition (TPOLe) showed significant improvement on child behaviour problems at T2, while there was no significant improvement found for participants in the self-directed condition (TPOL). Baseline depression was not a significant predictor of post-intervention scores, and the interaction between depression and treatment group did not significantly improve on the variance explained by the model when entered in Step 2 ($\Delta R^2 = .004$), suggesting that initial depression did not moderate child behaviour outcomes immediately following intervention.

Table 4.5 shows that post-intervention ineffective parenting styles were significantly explained by the Step 1 model containing baseline levels of ineffective parenting and depression, as well as treatment group ($R^2 = .384$). A significant treatment effect was found for the TPOLe condition at post-intervention but not TPOL. Initial depression was not a predictor of post-intervention parenting styles, and there was no improvement in model fit when adding the interaction between treatment condition and depression in Step 2 ($\Delta R^2 = .011$).

For post-intervention parenting confidence, as shown in Table 4.6 the model in Step 1 was significant, explaining 34% of the variance in outcome. There were significant improvements found for participants in the TPOLe condition relative to the CUAU control group, but not for TPOL relative to CUAU. Initial depression was not a significant predictor in Step 1, however the model was significantly improved when the depression by condition interaction was added in Step 2 ($p < .05$; $\Delta R^2 = .028$). For parents in the self-directed condition, there was a significant negative

association between initial depression and post-intervention parenting confidence relative to CUAU, suggesting that in the absence of additional support, parents with higher levels of baseline depression showed fewer treatment benefits in terms of their parenting confidence. There was however no relationship between initial depression and change in parenting confidence for the CUAU and TPOLe groups. Figure 4.5 illustrates these relationships using low (0-1), medium (1-4) and high (4-20) DASS Depression scores, based on quantile scores from the original continuous variable (n = 38, 77, and 68 respectively). Analysis of simple slopes showed that for the TPOL group, parents with low and medium baseline depression both had significantly greater parenting confidence at post-intervention than parents with high levels of depression at baseline ($t(173)$ = 2.79, $p < .01$ and $t(173)$ = 3.36, $p < .01$ respectively), whereas post-intervention scores for the CUAU and TPOLe groups did not change based on initial depression. Also, for parents with high baseline depression there were no significant differences between post-intervention parenting confidence scores for the CUAU and TPOL groups, $t(173)$ = 1.52, $p = .130$, but the TPOL group had significantly lower scores than TPOLe, $t(173)$ = -2.78, $p < .01$. There was no difference between post-intervention parenting confidence scores for TPOL and TPOLe participants when initial depression was in the low or medium range.
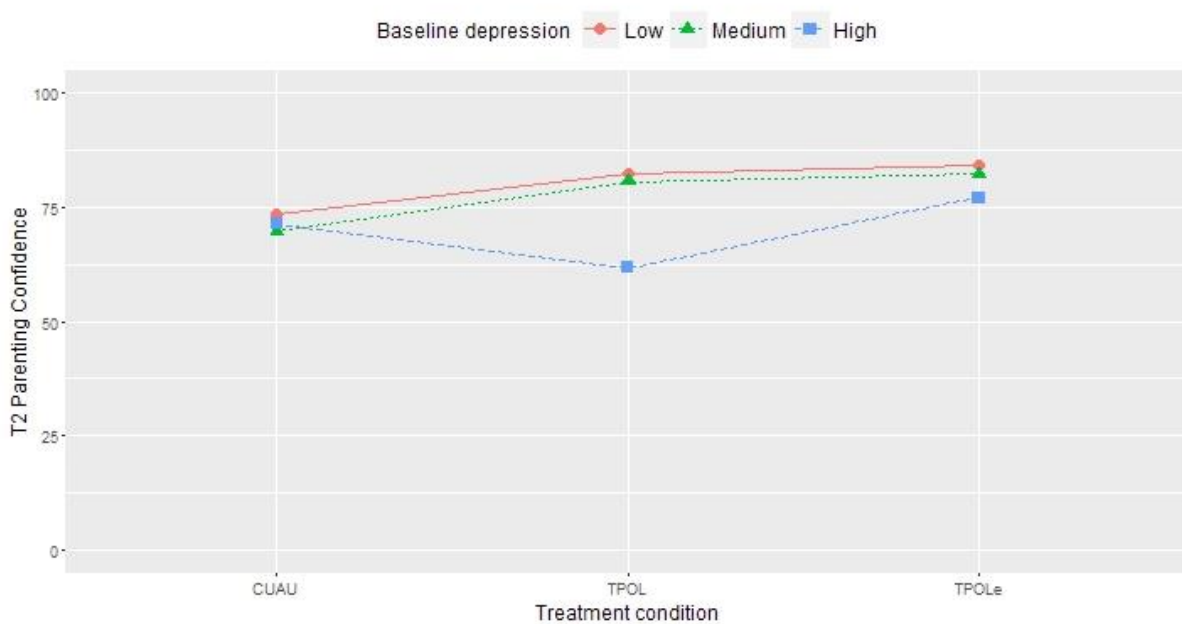

Figure 4.5. Plot depicting the relationship between treatment condition, baseline depression, and improvements in parenting confidence at T2.

Table 4.2. Means and standard deviations for predictor and outcome variables used in moderator and mediator analyses.

| Measure | TPOLe | | | | TPOL | | | | CUAU | | | |
| | Time 1 | | Time 2 | | Time 1 | | Time 2 | | Time 1 | | Time 2 | |
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
ECBI Intensity	139.71	24.62	113.87	26.31	136.61	27.46	125.95	28.70	145.46	24.01	137.49	26.58
PS Total	3.33	0.55	2.81	0.58	3.22	0.53	2.96	0.64	3.26	0.61	3.09	0.66
PTC Behaviour	62.14	18.78	80.01	15.53	60.83	19.36	76.62	18.03	62.08	22.80	72.06	21.41
IMP	2.26	1.07	3.41	1.29	2.28	1.31	3.32	1.14	2.35	1.46	2.40	1.29
DASS Depression	4.17	3.92	3.10	3.59	3.21	3.58	3.38	4.04	3.38	4.31	3.65	4.80

Note. ECBI = Eyberg Child Behaviour Inventory; PS = Parenting Scale; PTC = Parenting Tasks Checklist; DASS = Depression, Anxiety and Stress Scale; IMP = Implementation of positive parenting strategies; TPOL = Triple P Online (self-directed); TPOLe = Triple P Online enhanced (practitioner-supported condition); CUAU = Computer-use-as-usual control condition.

Table 4.3. Bivariate Pearson correlations between continuous variables used for moderator and mediator analyses.

Measure	1	2	3	4	5	6	7	8
1. ECBI Intensity - T1	-							
2. PS Total - T1	0.28***	-						
3. PTC Behaviour - T1	-0.43***	-0.44***	-					
4. DASS Depression - T1	0.26***	0.21**	-0.24***	-				
5. IMP - T1	0.05	-0.08	0.13	0.15*	-			
6. ECBI Intensity - T2	0.65***	0.18*	-0.33***	0.14	0.11	-		
7. PS Total - T2	0.16*	0.57***	-0.28***	0.12	0.07	0.39***	-	
8. PTC Behaviour - T2	-0.28***	-0.29***	0.51***	-0.14	-0.07	-0.51***	-0.56***	-
9. IMP - T2	-0.05	-0.1	0.18*	-0.1	0.16*	-0.22**	-0.39***	0.37***

Note. ECBI = Eyberg Child Behaviour Inventory; PS = Parenting Scale; PTC = Parenting Tasks Checklist; DASS = Depression, Anxiety and Stress Scale; IMP = Implementation of positive parenting strategies; T1 = Time 1 (pre-intervention assessment); T2 = Time 2 (post-intervention assessment); * $p < .05$; ** $p < .01$; *** $p < .001$

Table 4.4. Linear regressions for effects of baseline depression on post-intervention child behaviour problems.

Predictors	*Step 1*				*Step 2*			
	B	SE	β	p	B	SE	β	p
Baseline score	0.71	0.07	**0.612***	< .001	0.71	0.07	**0.613***	< .001
Group								
TPOL	-3.81	4.05	-0.060	.349	-3.45	4.07	-0.054	.398
TPOLe	-18.80	3.91	**-0.306***	< .001	-18.52	3.92	**-0.302***	< .001
DASS D	0.05	0.42	0.007	.897	-0.07	0.66		.921
Interactions								
DASS D x TPOL					0.92	1.04	0.062	.378
DASS D x TPOLe					-0.33	0.95	-0.026	.733
F (df1, df2)	40.04 (4, 178)				0.72 (2, 176)			
p	< .001				.490			
ΔR^2	.474				.004			

Note. Criterion variable is T2 (post-intervention) scores on the Eyberg Child Behaviour Inventory (ECBI), Intensity subscale; Baseline score is T1 ECBI Intensity scores entered as covariate; TPOL = Triple P Online (self-directed); TPOLe = Triple P Online enhanced (practitioner-supported condition); DASS D = Depression, Anxiety, Stress Scale (Depression subscale); * = significant at the .05 level; ** = significant at the .01 level; *** = significant at the .001 level.

Table 4.5. Linear regressions for effects of baseline depression on post-intervention ineffective parenting.

Predictors	*Step 1*				*Step 2*			
	B	SE	β	p	B	SE	β	p
Baseline score	0.70	0.07	**0.591***	< .001	0.69	0.07	**0.583***	< .001
Group								
TPOL	-0.15	0.10	-0.105	.125	-0.23	0.13	-0.159~	.077
TPOLe	-0.30	0.09	**-0.218**	.002	-0.21	0.13	-0.154	.100
DASS D	0.01	0.01	0.041	.497	0.01	0.02		.586
Interactions								
DASS D x TPOL					0.02	0.03	0.090	.343
DASS D x TPOLe					-0.02	0.02	-0.100	.351
F (df1, df2)	27.72 (4, 178)				1.57 (2, 176)			
p	< .001				.211			
ΔR^2	.384				.011			

Note. Criterion variable is T2 (post-intervention) scores on the Total score for the Parenting Scale (PS); Baseline score is T1 PS Total scores entered as covariate; TPOL = Triple P Online (self-directed); TPOLe = Triple P Online enhanced (practitioner-supported condition); DASS D = Depression, Anxiety, Stress Scale (Depression subscale); ~ = significant at the .10 level; * = significant at the .05 level; ** = significant at the .01 level; *** = significant at the .001 level.

For predictors of program engagement, defined as number of modules completed, initial DASS depression scores and a dummy variable representing treatment condition (TPOLe, with TPOL as reference group) were entered as predictors in Step 1, as well as T1 child behaviour problems to control for any potential influence of pre-existing levels of disruptive child behaviour on program engagement. As described earlier, an offset value (log[8]) was also included to account for the maximum possible number of modules. The first model improved significantly over a baseline model containing just the intercept and offset, $\chi^2 = 17.99$, $p < .001$, outlined in Table 4.7.

Table 4.6. Linear regressions for effects of baseline depression on post-intervention parenting confidence.

Predictors	Step 1				Step 2			
	B	SE	β	p	B	SE	β	p
Baseline score	0.51	0.06	**0.539***	< .001	0.52	0.06	**0.545***	< .001
Group (*versus CUAU*)								
TPOL	4.63	2.92	0.112	.115	10.48	3.79	**0.253**	.006
TPOLe	9.08	2.83	**0.227**	.002	8.07	3.80	**0.201***	.035
DASS D	-0.25	0.31	-0.05	.421	0.16	0.48		.742
Interactions								
DASS D x TPOL					-1.80	0.75	**-0.23***	.017
DASS D x TPOLe					0.17	0.68	0.03	.807
F (df1, df2)	23.25 (4, 178)				3.93 (2, 176)			
p	< .001				.021			
ΔR^2	.343				.028			

Note. Criterion variable is T2 (post-intervention) scores on the Parenting Tasks Checklist (PTC), Behaviour subscale; Baseline score is T1 PTC Behaviour scores entered as covariate; TPOL = Triple P Online (self-directed); TPOLe = Triple P Online enhanced (practitioner-supported condition); DASS D = Depression, Anxiety, Stress Scale (Depression subscale); * = significant at the .05 level; ** = significant at the .01 level; *** = significant at the .001 level.

Table 4.7. Negative binomial regressions for effects of baseline depression on module completion (treatment groups only).

Predictors	Step 1				Step 2			
	B	SE	β	p	B	SE	β	p
Baseline ECBI Intensity	0.00	0.00	0.017	.467	0.00	0.00	0.018	.437
Group: TPOLe	0.59	0.14	**0.095***	< .001	0.34	0.19	0.054~	.071
DASS D	-0.04	0.02	-0.046~	.051	-0.09	0.04	**-0.113**	.008
Interaction (DASS D x TPOLe)					0.08	0.04	0.090~	.054
$2LL^a$	-610.09				-606.33			
χ^2 (df)[b]	17.99 (3)				3.76~ (1)			
p	< .001				.052			

Note: Coefficients of negative binomial regression are on a logarithmic scale; Criterion variable is total number of modules completed (maximum of eight). Models control for baseline level of child behaviour difficulties by entering T1 scores on the Eyberg Child Behaviour Inventory (ECBI), Intensity subscale.

[a]Difference between 2 x log-likelihood ratios used for testing whether model improves, chi-square distribution; Only active treatment groups included in the model; TPOL = Triple P Online (self-directed); TPOLe = Triple P Online enhanced (practitioner-supported condition); DASS D = Depression, Anxiety, Stress Scale (Depression subscale); ~ = significant at the .10 level; * = significant at the .05 level; ** = significant at the .01 level; *** = significant at the .001 level. [b]First chi-square value represents comparison of Step 1 model with baseline model (not shown) containing only intercept and offset value. Second chi-square value is comparison of Step 2 model with Step 1.

At Step 1, being in the TPOLe condition was significantly associated with a higher rate of module completion, commensurate with findings reported in Chapter 2. Additionally, T1 depression scores were borderline significant predictors of total modules completed *(p* = .051), suggesting an overall non-significant trend towards a negative association between initial depression and program engagement. Step 2 introduced the interaction between depression and treatment condition to the model, and the log-likelihood test of model fit showed that Model 2 was a borderline significant improvement, χ^2 = 3.76, *p* = .052. Examination of the coefficients showed a significant negative association between module completion and depression for the TPOL condition, β = -0.113, *p* < .01,

95% C.I. = -0.165, -0.026. The coefficient for the TPOLe interaction term (β = 0.090, 95% C.I. = 0.000, 0.162), representing the difference in log slopes between TPOL and TPOLe, was in the reverse direction and almost equal to the coefficient for TPOL. Conceptually speaking, this would indicate no relationship between depression and module completion for TPOLe participants, however the difference between slopes was just above the .05 significance level (p = .054).

In summary, the hypothesis that pre-intervention depressive symptomatology would significantly moderate outcomes for the self-directed condition but not the practitioner-supported condition was partially supported. No moderation effects of depression were found for measures of post-intervention disruptive child behaviour or dysfunctional parenting styles, which is commensurate with previously reported findings from moderation studies of face-to-face parenting interventions (e.g. Beauchaine et al., 2005; McTaggart & Sanders, 2007). However, parenting confidence was moderated such that parents with high levels of baseline depression that were allocated to the self-directed condition showed significantly less improvement in parenting confidence compared to the practitioner-supported conditions.

Finally, no moderation of program engagement was found when strict significance criteria were applied, and thus the hypothesis was not supported. There were however some clear trends in the data suggesting a possible relationship which the study may have been underpowered to detect. Figure 4.6 depicts this graphically using low, medium and high levels of depression, computed as above using quantile scores from the continuous variable.
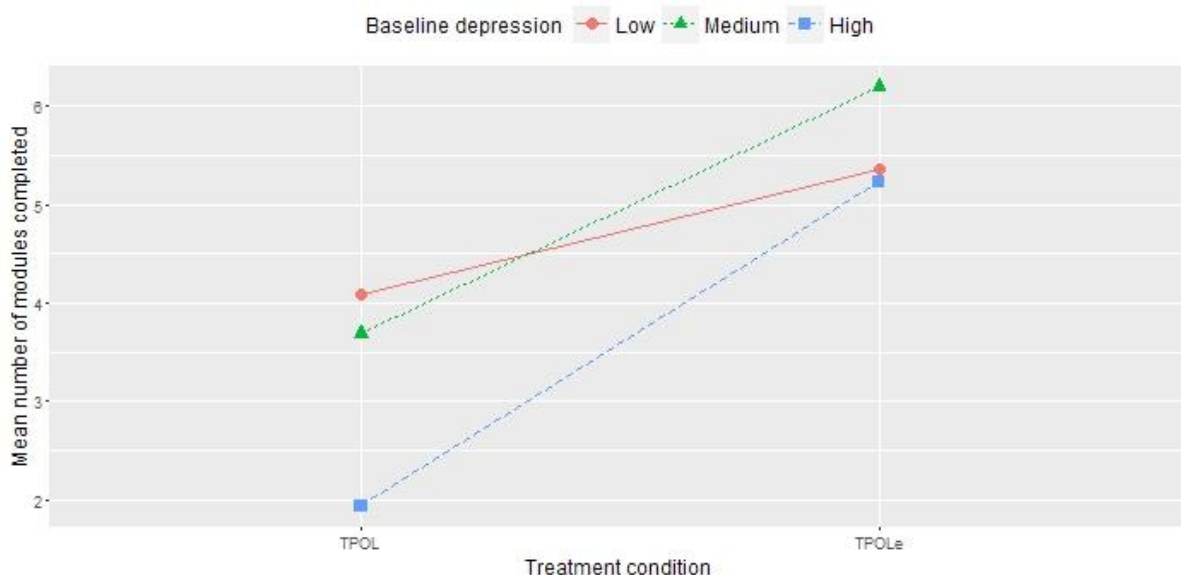

Figure 4.6. Plot depicting the potential relationship between treatment condition, baseline depression, and number of modules completed.

Mediation analyses

The initial model for implementation of strategies had adequate fit, $\chi^2(10) = 18.66$, $p = .045$, RMSEA = 0.084, CFI = 0.957, SRMR = 0.038. Chi-square difference testing of nested models revealed an overall non-significant difference between groups in terms of mediation pathways, $\chi^2(3) = 1.53$, $p = .676$. Standardised coefficients and bootstrapped confidence intervals for indirect, direct and total effects are shown in Table 4.8, with confidence intervals for indirect effects supporting the hypothesis that implementation of positive strategies would significantly mediate intervention effects on dysfunctional parenting for both groups. Both intervention conditions were significantly associated with increases in parent-reported implementation of positive parenting strategies at post-intervention, which in turn was significantly associated with decreases in dysfunctional parenting.

The recommended effect size metric for mediation analyses is the proportion of the total effect accounted for by the indirect effect. However as was the case here, this approach is not suitable when direct and indirect effects have opposite signs, as the size is no longer bounded by 0 and 1, rendering its interpretation meaningless (Wen & Fan, 2015). No suitable alternative effect size metric has yet been suggested within the mediation literature. Thus direct comparisons of the strength of the mediation effects are not possible in the present study, however as seen above, joint testing of the equality of the primary mediation paths suggested no statistically significant difference between groups.

For parenting confidence, the initial model had poor fit according to model chi-square and RMSEA indices, $\chi^2(10) = 25.12$, $p = .005$, RMSEA = 0.112, although other indices were adequate, CFI = 0.951, SRMR = 0.030. The chi-square difference test of nested models suggested no statistically significant difference between groups in terms of the primary mediation paths. To determine whether a more robust model could be estimated, T1 DASS Depression scores were entered first as a covariate, and second as a moderator, of change in parenting confidence (the putative mediator). This was supported in light of findings reported earlier that parenting confidence was significantly moderated by baseline depression, however it was not clear if this relationship would be maintained within a mediation model. In the first step, baseline depression was entered as a predictor of T2 parenting confidence with the T1 depression x treatment condition interaction term included but fixed at zero. Model fit improved in this step, however most indices were still below acceptable levels, $\chi^2(16) = 33.70$, $p = .006$, RMSEA = 0.095, CFI = 0.943, SRMR = 0.027. In the second step, the T1 depression x treatment condition interactions terms for both groups were unconstrained and freely estimated. Although the model chi-square was significant, alternative fit indices improved to within adequate levels for interpretation, $\chi^2(14) = 25.98$, $p = .027$, RMSEA = 0.084, CFI = 0.962, SRMR = 0.024. Furthermore, the chi-square difference test of nested models

was significant, $\chi^2(2) = 7.81$, $p = .020$, confirming significant moderation of the mediation variable (parenting confidence) by initial levels of depression.

Standardized path coefficients at mean-centred levels of baseline depression are shown on the diagram in Figure 4.7, with additional T1 covariate paths omitted for clarity. Path coefficients represent the relationships between variables when baseline depression is mean centred, showing no significant mediation effect of treatment on dysfunctional parenting through parenting confidence when parents were at average levels of initial depression for the sample. The mediation effect was significant for TPOLe (Est = -0.078, 95% C.I. = -0.131, -0.023).

However, because T1 depression was a significant moderator of parenting confidence for the TPOL group, examination of conditional indirect effects outlined in Table 4.8 provide a better understanding of the hypothesised pathways using centred values as suggested by Preacher, Rucker and Hayes (2007). When baseline depression was centred at 1SD below the mean, parenting confidence significantly mediated T2 dysfunctional parenting for both groups. At mean levels and +1SD above the mean, mediation was not apparent for the TPOL condition, but remained present for the TPOLe condition.
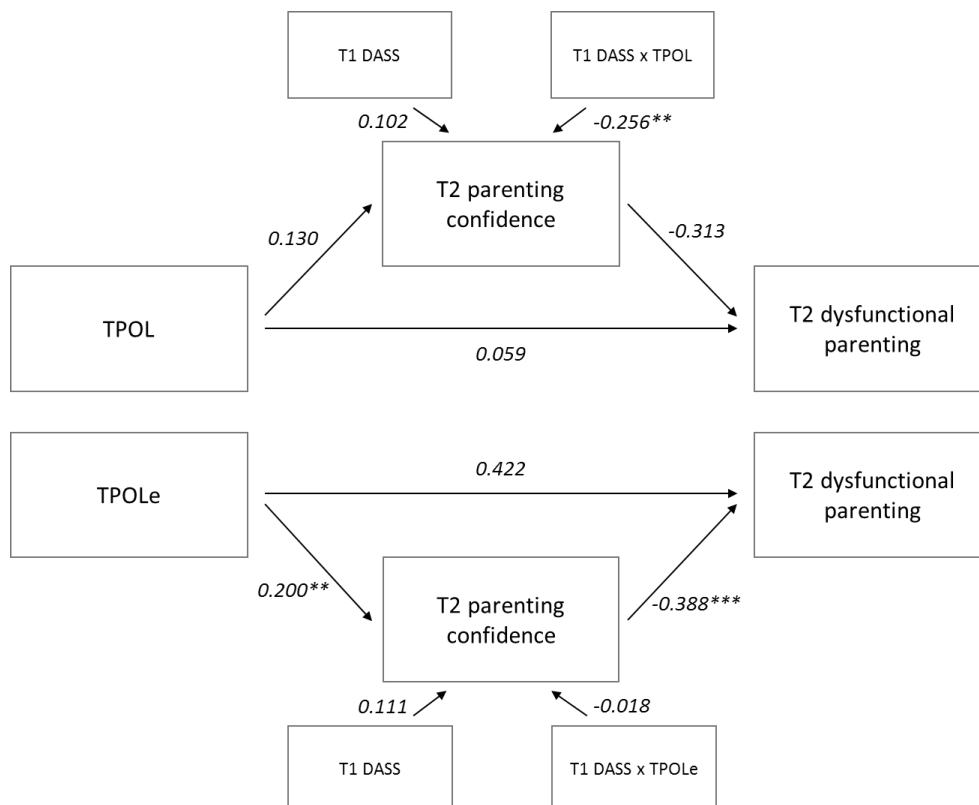

Figure 4.7. Structural model showing standardized path coefficients for moderated mediation of post-intervention dysfunctional parenting by parenting confidence, conditional on baseline depression. Coefficients shown are for mean-centred depression scores.

Table 4.8. Standardized parameter estimates of direct, indirect and total effects for final mediation models.

| Model | Standardized coefficients | | | Total effect | | | Indirect effect (*a* x *b*) | | | Direct effect (*c'*) | | |
| | | | | | 95% C.I. | | | 95% C.I. | | | 95% C.I. | |
	a	*b*	*c'*	Est	Lower	Upper	Est	Lower	Upper	Est	Lower	Upper
INT → IMP → DP												
TPOL	**0.358*****	**-0.249*****	0.075	-0.015	-0.644	0.597	**-0.089**	-0.164	-0.031	0.075	-0.562	0.700
TPOLe	**0.372*****	**-0.287*****	0.580	0.473	-0.178	1.174	**-0.107**	-0.186	-0.045	0.580	-0.093	1.299
Conditional mediation[a]												
DASS = -1SD												
INT → PTC B → DP[d,e]												
TPOL	**0.301*****	**-0.313*****	0.059	-0.036	-0.673	0.598	**-0.094**	-0.161	-0.035	0.059	-0.579	0.698
TPOLe	**0.213***	**-0.388*****	0.422	0.340	-0.246	0.931	**-0.082**	-0.150	-0.009	0.422	-0.159	0.998
DASS = mean												
INT → PTC B → DP[d,e]												
TPOL	0.130	**-0.313*****	0.059	0.018	-0.622	0.660	-0.041	-0.084	0.005	0.059	-0.579	0.698
TPOLe	**0.200****	**-0.388*****	0.422	0.345	-0.240	0.924	**-0.078**	-0.131	-0.023	0.422	-0.159	1.000
DASS = +1SD												
INT → PTC B → DP[d,e]												
TPOL	-0.073	**-0.313*****	0.059	0.081	-0.562	0.731	0.023	-0.033	0.103	0.059	-0.579	0.698
TPOLe	**0.189***	**-0.388*****	0.422	0.349	-0.235	0.931	**-0.073**	-0.148	0.001	0.422	-0.159	0.988

Note: INT = Dummy-coded intervention condition (TPOL or TPOLe), CUAU as reference condition; TPOL = Triple P Online (self-directed condition); TPOLe = Triple P Online enhanced (practitioner-supported condition); CUAU = computer-us-as-usual (control condition); DP = Dysfunctional parenting, measured using the total score of the Parenting Scale; IMP = Implementation of positive parenting strategies; PTC B = Parenting Tasks Checklist, Behaviour scale. Significant indirect effects shown in bold.

[a]Baseline depression was a significant moderator of the treatment→mediator pathway, hence standardised path coefficients shown for mean-centred DASS scores and ± 1SD from the mean (Preacher et al., 2007).

Discussion

Drawing on established theoretical models of change within behavioural family interventions, as well as empirical findings from prior parenting and web-based treatment research, this study tested the hypothesis that initial depressive symptomatology would have an adverse effect on both program engagement and treatment outcomes for parents completing a self-directed online parenting program. This hypothesis was partially supported; at post-intervention assessment, measures of child behaviour and dysfunctional parenting were not directly affected by baseline levels of depression, which is commensurate with some prior research findings with face-to-face treatments (e.g. Beauchaine et al., 2005; McTaggart & Sanders, 2007). However, as severity of initial depressive symptomatology increased, the positive intervention effects on parental self-efficacy were shown to be significantly ameliorated. There was also a trend evident in the data that suggested the possibility of an association between higher initial levels of depression and fewer modules being completed, although this did not reach conventional levels of statistical significance.

Furthermore, as hypothesised there were no moderating effects of initial depression on program engagement or treatment outcomes for parents that received telephone support from a practitioner. As discussed in Chapter 2, while the primary mechanism of intervention delivery was the online program, parents in the support condition were offered up to eight telephone sessions with the aim of promoting parental self-regulatory skills and maintaining parental engagement. On average, parents completed about four sessions each over the 16-week period of program access, with a mean duration of approximately 24 minutes per call, equating to just over one and a half hours of therapist contact time. While this varied across participants, with some partaking in all eight calls and others none, it suggests that even brief amounts of therapist support relative to traditional face to face treatments may be particularly beneficial for more depressed parents.

In accordance with models of supportive accountability and theories of motivation (e.g. Mohr et al., 2011), it is possible that more depressed parents lacked the intrinsic motivation needed to engage with the program when accountability was absent, and therefore received less exposure to content resulting in fewer treatment benefits. However, effects of depression on module completion did not reach significance, suggesting other possible mechanisms may have been involved. For parents in the self-directed condition in this study, depression was shown to primarily disrupt increases in parental confidence. Additionally, the strength of the mediating pathways between intervention condition and reductions in dysfunctional parenting styles through parental confidence were shown to be conditional on baseline levels of depression, but again only for parents not receiving additional support. These findings concur with prior research suggesting self-efficacy and depression are negatively associated (Coleman & Karraker, 2003), but suggest that even depressed

parents can improve their self-efficacy through a mostly self-directed intervention if provided with a small amount of extra help.

Finally, mediator analyses supported the hypothesis that treatment-induced increases in self-efficacy and implementation of positive strategies would play a role in reducing dysfunctional parenting behaviours. There were no significant differences between mediation pathways for the two treatment groups, suggesting largely similar processes were at work, however as previously discussed there was a conditional effect of depression on the self-efficacy pathway for participants that did not receive support.

Limitations

There are a number of limitations to consider in this research. First, by using negative binomial regression to analyse the potential moderation of module completion rates by baseline depression, the study may have been underpowered to detect a significant effect that was actually present. Considering one-third of participants (i.e. control participants) were excluded from this analysis, it is possible that sample size was a limiting factor obscuring the significance of the effect. Indeed, the data showed a trend that fell just below conventional significance levels, making it difficult to arrive at any conclusions about the effect of depression on program engagement, but tentatively supporting the notion that a relationship *may* exist. Alternative methodological approaches may have yielded more favourable outcomes in line with the stated hypotheses, for example grouping the count data into discrete categories such as "low", "medium" and "high" completion rates, or deciding on a minimum dosage cut-off and using a binary indicator (e.g. did/did not complete minimum). While these approaches are common and not inherently incorrect, they rely on arbitrary decisions about the data, and collapsing into categories sacrifices available information (Gardner et al., 1995). Instead, further investigation of potential moderators of module completion in studies with larger sample sizes is warranted. Another option may be to combine information across matched samples from multiple trials of comparable web-based parenting treatments to further explore factors that consistently predict or moderate program engagement.

Another limitation is that data was collected using only parent self-report measures, and relatedly, one of the putative mediators explored in this study (implementation of positive parenting strategies), was assessed using only a single item. These issues place constraints on the generalisability of findings, and suggest they should be considered as preliminary only. Future research adopting multi-method or multi-informant approaches to data collection, such as home observations, and child or teacher data, may provide more robust estimates of the processes of interest, particularly if multiple sources of information are combined into one latent construct. Thus, while support was found for the implementation of positive strategies and increases in self-efficacy

as significant mediators of reductions in dysfunctional parenting styles, replication in future work would increase the confidence that these are important mechanisms of change within an online parenting intervention.

Finally, it is acknowledged that the mediation analyses used in the study did not incorporate any temporal separation between assessment time points of the putative mediator and outcome. Demonstrating that change in the putative mediator occurs prior to change in the outcome of interest is important for establishing that one is a mechanism responsible for change in the other (Kazdin & Nock, 2003). The proposed direction of mediation is not statistically driven, instead relying on theoretically-derived hypotheses, thus it is possible that the reverse effects better suit the underlying processes. For example, it is certainly plausible that changes in dysfunctional parenting behaviours are an important mechanism that drive increases in parental self-efficacy, or that as parents cease using harsh or coercive parenting strategies there are more opportunities to include positive strategies in their behavioural repertoire. Further exploring bi-directional changes or hypothesised causal chains may provide a better picture of the active pathways, although it is important that hypotheses are theoretically derived.

Clinical implications and final comment

It is unlikely that online parenting programs will be an equally effective approach for every family, and there is a need to better understand both predictors of treatment success and the causal pathways associated with outcomes (e.g. Kazdin, 2009, 2011; Kraemer et al., 2002), as well as the role and importance of therapist support. This study suggests that active increases in positive strategy use likely plays an important role, and that the standalone program is effective at helping parents learn and implement new skills whether or not practitioner support is provided. Gaining more confidence as a parent is also an important predictor of whether parents use fewer harsh and coercive practices, but when parents are depressed practitioner support may be necessary to buffer against its adverse effects. These findings may help service providers interested in providing online parenting programs to families as part of routine care, to be more confident when defining appropriate levels of additional help in line with the needs of the parents they support.

Chapter 5

Conclusions and implications

This final chapter provides a summary of the findings reported within this thesis, followed by a discussion of the limitations within the program of research and methodological suggestions for addressing said limitations in future. Finally, a review of the clinical implications is presented, including reflections on some promising avenues for future research that have potential to contribute towards the continued development and evaluation of technology-assisted parenting programs. As a whole, it is hoped that the research makes a compelling case for the continued investment in parallel streams of research focusing on online parenting intervention, with ongoing efforts to find ways of further enhancing and disseminating self-directed web-based support as a universal strategy with broad reach, while endeavouring to further understand the role of human support and guidance for parents that need additional help.

The Triple P—Positive Parenting Program is a widely adopted multilevel system of parenting support designed to equip parents with the skills they need to raise children in a positive environment, without the use of harsh or coercive parenting strategies (Sanders, 2012). Triple P promotes a public health approach to parenting support, with the goal of achieving widespread reach to help reduce negative, coercive cycles of family dysfunction associated with later problems in adolescence and adulthood (Biglan et al., 2012; Sanders, 2010). Central to this goal is the concept of minimal sufficiency. Minimal sufficiency is important for two key reasons: first, providing just enough support for families to achieve positive change is critical for the development of important self-regulatory skills such as self-efficacy and personal agency, or the notion that change can be ascribed to the parent's efforts rather than instilling reliance on a program or therapist (Coleman & Karraker, 1998; Sanders & Mazzucchelli, 2013). Second, it is widely recognized that there are insufficient resources available to meet the needs of all families through intensive, one-to-one parenting support, and even when support is available, evidence suggests that many families do not attend parenting programs even when facing difficulties with managing their child's behaviour (Prinz & Sanders, 2007; Sanders, Markie-Dadds, et al., 2007). Accordingly, and in line with consumer-based studies investigating parents' preferences for support (e.g. Metzler et al., 2012), there has been a burgeoning interest in the development and dissemination of light touch, low intensity parenting support options such as web-based delivery. Online programs have potential to increase the reach and accessibility of information while reducing some of the logistical and perceived barriers that prevent families from accessing parenting support (e.g. Spoth et al., 1996). The core strategies and principles taught during Triple P, derived from social learning theory and

cognitive behavioural principles, are ideally suited for online delivery, where a rich combination of text, multimedia, and interactive exercises can be utilized to communicate concrete skills and parenting information. Triple P Online (Turner & Sanders, 2011) embodies the first efforts to adapt the Level 4 Triple P program into a web-based format, and a growing number of empirical trials have demonstrated its efficacy as a primarily self-directed intervention (Love et al., 2016; Sanders, Baker, et al., 2012; Sanders, Dittman, et al., 2014). Returning to the concept of minimal sufficiency, it is important to extend this work to (a) better understand how program outcomes are influenced by the inclusion of practitioner support, (b) further understand the active mechanisms that bring about change, and (c) determine whether any benefits from its use are mitigated by other factors such as pre-existing levels of parenting difficulties.

Conclusions regarding the efficacy of online parenting support, both with and without practitioner guidance

Chapter 2 presented findings from the first randomized controlled trial of Triple P Online to investigate outcomes through a direct comparison of two active web-based treatment groups: random allocation to a self-directed condition versus a practitioner-supported condition, with a computer-use-as-usual control condition included. Results provided further empirical support for the efficacy of Triple P Online, commensurate with prior Triple P studies and in agreement with a number of published reviews and meta-analyses suggesting the internet is an effective medium for delivering psychological interventions (e.g. Barak et al., 2008; L'Abate, 2015; Marks, Cavanagh, & Gega, 2007). For parents in the self-directed intervention, participants reported reductions in the frequency of child disruptive behaviour problems, lax parenting styles, as well as overall reductions in ineffective parenting immediately post-intervention. Overall stress was also shown to be significantly reduced, parenting confidence increased, and reported levels of conflict with a partner decreased. These changes were largely maintained at five-month follow-up, although child behaviour problems and stress were on the borderline of significant improvement compared to their initial baseline levels, while parental depression showed delayed improvement, with significant change from baseline levels at follow-up but not post-intervention.

Except for relationship quality[2], parents in the practitioner-supported condition showed significant improvement on all self-report outcomes at post-intervention and follow-up.

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[2]Based on visual inspection of the data, many participants reported feeling highly satisfied with their relationship at pre-assessment, thus ceiling effects may have influenced the model's ability to detect changes in this domain. However negative skew suggests either an alternative modelling strategy (e.g. censored models) or outlier removal may have yielded a better understanding of the relationship processes. It is also possible that an online parenting program has limited or no effects on the quality of the partner relationship. Further research outside the scope of this dissertation would be needed to identify whether an online parenting program such as Triple P is capable of positively influencing the quality of partner relationships.

Furthermore, significantly stronger effects were demonstrated at follow-up for reductions in child behaviour problems and overall ineffective parenting, while effects were roughly double in size for certain subscales such as the Parenting Scale and Depression Anxiety and Stress scale, although these differences did not reach the level of statistical significance. For other outcomes, similar treatment effects were observed between both treatment groups, such as parenting confidence, parental anger, and conflict with a partner.

Further benefits in favour of the practitioner-support condition included: better program engagement, as seen through significantly more modules completed on average than the self-directed condition; more clinically significant and statistically reliable change on measures of child behaviour and parenting styles; and significantly higher satisfaction when support was provided.

Chapters 3 and 4 focused on further exploring observed differences between treatment conditions through analysis of proposed mediators and moderators, identified through review of prior parenting and Triple P research combined with consumer feedback from program practitioners.

Important parenting change processes: Learnings from practitioners

A secondary goal of the RCT presented in Chapter 2 was to identify some of the underlying processes and moderating factors that predicted or explained treatment outcomes. While various psychosocial processes have been posited in the literature, many have focused on how changes in parenting mediate or are causally associated with improvements in child behaviour problems. This is an important end goal, however fewer studies have sought to explore important processes that explain parenting changes. Chapter 3 presented findings from a study which adopted consumer-feedback methodology to enlist a novel source of information and feedback about parenting changes: Triple P practitioners. While parents and their children are inarguably the intended end-recipients of the program, many professionals are active and recurrent 'users' of the program, having opportunities for repeated exposure to program content, materials and resources, are potentially well-versed in implementing parent training techniques, and many are likely to have witnessed change in parents first-hand across multiple sessions. Although only one source of information out of many, practitioners perhaps offer unique insights into the processes of change at work in the parents they see and are under-utilized resource in the parenting literature.

Practitioners were asked to reflect on their experiences from working with parents, and rate the perceived importance of a range of hypothesised causal processes which aligned theoretically with Triple P's social learning and cognitive behavioural focus, and were identified through collaboration and careful content analysis of program resources. To provide an initial structure for items, proposed items were originally grouped into one of four domains derived from cognitive-

behavioural and social learning principles: *affective*, *behavioural*, *cognitive* and *contextual* changes (i.e. social or environmental factors). Exploratory factor analysis of item responses revealed the initial four-domain model was not a good fit to the data, however the following 11-factor structure provided suitable fit: (1) Normalisation, (2) Cognitive enablers, (3) Self-efficacy, (4) Self-management, (5) Parent-child relationships, (6) Negative affect, (7) Positive parenting strategies, (8) Therapeutic relationship, (9) Partner relationship quality, (10) Home safety, and (11) Social support. Review of both factor and raw item scores highlighted the therapeutic relationship, implementation of positive parenting strategies, development of more positive parent-child relationships, and self-regulatory processes such as increases in personal agency, as having greatest perceived importance from the practitioner perspective.

Analysis of proposed mediators and the moderating role of parental depression in online parenting support

Chapter 4 described secondary analyses of data from the primary RCT of practitioner-supported versus self-directed Triple P which aimed to further explore whether differences in treatment outcomes could be attributed to variations in the underlying mechanisms or effects of baseline moderators. Parental depression was hypothesised as one factor having potentially important implications for parents' ability to engage with an online program, particularly in the absence of therapist contact where greater levels of intrinsic motivation are likely required. Accordingly, program engagement and primary treatment outcomes including dysfunctional parenting styles, reductions in problematic child behaviour, and increases in parental self-efficacy were hypothesised to be moderated by baseline depression for participants in the practitioner-supported condition but not the practitioner-supported condition.

As expected, moderator analyses revealed no moderating effects of depression for the practitioner-supported condition on any of the targeted outcomes. Conversely, for the self-directed condition, baseline depression was shown to significantly moderate post-intervention measures of parenting confidence, but not child behaviour or dysfunctional parenting. The hypothesis that program engagement would be moderated by depression was not supported although a clear trend emerged, suggesting it may be a viable candidate for further exploration with larger samples.

Following from this, mediator analyses were conducted to determine whether hypothesised causal mechanisms would be associated with improvements in dysfunctional parenting using two-group structural equation models (SEM) to simultaneously estimate pathways for both treatment groups relative to control. Proposed mediators included implementation of positive parenting strategies and parental confidence, selected on the basis of the theoretical underpinnings of the

program, prior empirical work, and in line with feedback from the practitioner survey reported in the previous chapter.

As hypothesised, the single-item measure of changes in parents' implementation of positive parenting strategies was shown to significantly mediate improvements in dysfunctional parenting for both treatment conditions. Initial model fit was poor when parenting confidence was assessed as the putative mediator, suggesting the variance in the data was not well explained. As depression was shown to moderate parental self-efficacy in the prior analyses, it was added as a moderator to the SEM mediation model, thus improving model fit substantially, and demonstrating that mediation of dysfunctional parenting through self-efficacy was conditional on baseline depression for the self-directed condition, but not the practitioner-supported condition.

In summary, this study found no evidence that initial depression directly prevented parents from benefitting from an online program in terms of their ability to make behavioural changes, such as implementing new strategies or using less harsh discipline practices, or influence their child's disruptive behaviours. However, it did suggest that depression may adversely affect the acquisition of important self-regulatory skills such as self-efficacy, while providing therapist support mitigated against this negative relationship. Mediation models reiterated this notion: self-efficacy mediated the intervention effects on dysfunctional parenting for both treatment conditions, but for the self-directed condition this was only evident when parental depression at baseline was low.

Limitations

While limitations have been discussed within each of the previous empirically-focused chapters of this dissertation, there are a few overarching issues worth noting. The first is the general reliance on self-report measures, which is of particular importance when it comes to generalising findings from randomised controlled trials. In this case, because of the web and telephone-based nature of the intervention, parents were able to be recruited from across Australia with little to no impact on delivery. The fact that dissemination of web-based interventions is not hampered by distance is one of the promising advantages of the medium. However, in terms of research trials it makes multimodal assessment difficult. Generally parenting researchers strive to include some form of observational assessment to balance against potential social desirability or perception bias in parent self-report. However, observations were clearly not feasible in this instance. Instead, telephone interviews were conducted at each assessment time point with a small subset of parents in an effort to obtain a second source of data on child behaviour, although these were subject to the same limitation as the questionnaires: the primary source of information was the parent's self-report, albeit in the context of a semi-structured interview. Furthermore, no significant changes were found within the telephone interview data, though given the small subsample of participants

that contributed to interviews it is possible there was simply insufficient power to detect effects. The lack of robust multimodal assessment is therefore an important limitation to keep in mind when considering the clinical implications of this dissertation.

A second limitation of the RCT was a lack of information regarding the content and fidelity of clinical support provided to parents. Fidelity checks are often utilised within intervention trials to ensure intervention delivery is consistent with the intended, manualised treatment approach. For this research, the primary modality of intervention delivery was through the web-based program. In a sense, this guarantees that content is delivered with fidelity, while the capabilities within the program allow for some tailoring (Mazzucchelli & Sanders, 2010) and alternative metrics such as module completion rates or time spent in the program provide some indication as to the level and consistency of intervention exposure across participants. Adding therapist support however introduces a potential new source of variability in terms of intervention fidelity, and in the present program of research there were no mechanisms in place to monitor content of consultations. Thus it is uncertain to what extent practitioners incorporated the recommended processes for promoting self-regulation in parents, or whether calls were simply just to "check in". Additionally, there was some email contact outside of consultations with parents, which although was primarily to arrange and reschedule sessions, may have extended to clinically-focused communications in some instances such as advice-giving or providing encouragement. For future research that utilises mixed methodologies incorporating web-based and practitioner-supported delivery of parenting support, clearly defining consultation guidelines and monitoring sessions for the intended content, duration, and types of interactions between parents and practitioners may be beneficial. Such detailed information would help researchers to formulate clearer hypotheses around the mechanisms that explain the added benefits of guided support.

The final limitation to be discussed is with regards to the sociodemographic characteristics of the parents recruited for this research. Parents were mostly white and college or university educated, there were only a small proportion of single parents, most were employed and able to meet most of their essential expenses, and the vast majority were mothers. These characteristics reflect only a sub-section of the Australian population, where this research was conducted, and are even less representative of the broader worldwide population. Because web-based parenting programs purport to extend the reach of evidence-based parenting support beyond current levels, it is important to conduct research with a wide and representative population of parents to determine whether findings are applicable at a broader level. As mentioned in Chapter 1, a digital divide means parents with more socio-economic disadvantage or from low and middle-income countries may have restricted internet access or poorer computer literacy, and as a result may be less inclined to use or want web-based parenting support (Mejia et al., 2014; Plantin & Daneback, 2009).

Research within such settings poses unique and complex challenges, yet such efforts are vital for better understanding the benefits and limitations of web-delivered and low intensity parenting programs. An encouraging example of this is the recent trial by Love and colleagues (2016) which demonstrated that Triple P Online could be deployed through community centres with highly vulnerable and at-risk parents, and with promising results. Additionally, further research targeting fathers is needed to better understand how online parenting programs are perceived and whether treatment effects, change processes, and support preferences differ between parent genders (Panter-Brick et al., 2014).

Clinical implications

The program of research presented in this thesis demonstrated that in general, parents fare better when they are clinically supported through an online parenting intervention. However, it would be folly to simply conclude that all parents given access to a web-based program require support from a practitioner. This approach would negate many of the inherent benefits that inspired research into web-based parenting programs in the first place, such as the potential for increased reach at low cost and with minimal or no reliance on therapist involvement.

In their supportive accountability model, Mohr and colleagues (2011) describe a number of proposed mechanisms by which therapist contact derives benefits for consumers in web-based treatments, such as the initial expectations of the recipient, the perceived knowledge and skill of the practitioner, the therapeutic relationship or bond, and the level of accountability or monitoring put in place by the support person. Given the potential intricacies involved, it is crucial to develop a clearer picture of the characteristics of parents that are likely to benefit from standalone, self-directed web-based intervention, and those that require some additional support.

While recent studies have indicated that parents in high-income countries generally like the idea of accessing parenting information and support through the internet (e.g. Metzler et al., 2012; Rothbaum et al., 2008; Walker et al., 2012), it is likely that their reasons vary. For some, the immediacy and flexibility of access to content may be the main appeal. Others may view added support from a practitioner as beneficial, while yet others may be drawn to the autonomous, flexible and self-directed nature of a comprehensive self-contained package, preferring to engage with the content on their own and in their own time.

Such preferences may be reflective of various factors such as baseline levels of parenting competence, external circumstances such as work and childcare commitments, or other mitigating issues like depression. As suggested by findings from this research, there may be opportunities to triage potential users based on pre-existing difficulties such as depression, as depressed parents seem less likely to benefit in terms of important self-regulatory skills when no support is provided.

Mohr and colleagues (2011) also highlight some possible adverse or counter-effective processes that might arise from the provision of human support and which could mitigate against its potential benefits. For example, when the pre-existing intrinsic motivation to complete a task is high, ongoing follow-up from a practitioner may be perceived as controlling or unwanted. Alternatively, in line with cognitive dissonance theory (Festinger, 1962), defensive mechanisms may be activated when a person has committed to completing a task but is later unable or unwilling to follow through. Certainly anecdotal experience gained throughout the course of this research suggests that some parents actively avoided telephone communication at all costs. Parents were not asked their preference for support in the present study at baseline assessment. Cognisance towards parental preferences in future work might help to identify whether support preferences interact with certain family or sociodemographic characteristics.

Finally, various proposed causal mechanisms of parenting change were identified in Chapter 3 which corroborated with prior findings within the literature, as well as the theoretical underpinnings of the program. Building on this work, preliminary support was found for the active role of the development of self-efficacy and the implementation of positive parenting strategies in reducing dysfunctional parenting through participation in a web-based intervention. This is an important but incremental step; simple mediation models are informative for the development of more complex, multi-step causal hypotheses, and many of the putative processes of parenting change that were deemed important by practitioners may be candidates for further exploration within online parenting programs. Demonstrating clear causal pathways of change and their mitigating factors is important for developers and researchers to better identify the core processes that should be targeted to maximise treatment benefits.

Final comment

Although parents accessing self-administered intervention can achieve positive outcomes, there appear to be significant gains by adding brief, regular practitioner contact. That said, self-directed delivery remains important within a minimally sufficient framework, and has clear benefits in terms of widespread reach at low cost, which are important goals in the pursuit of a public health approach to parenting support. It is hoped that this program of research has highlighted the importance of continuing to pursue both avenues of research, with the goal of providing further insight into the mitigating characteristics responsible for differences in treatment outcomes between these two complimentary modalities of parenting support, as well as causal mechanisms that explain intervention benefits, and disparities in changes between parents participating either with or without therapist support.

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