

Report

Information technology-based support for parents — a rapid evidence assessment

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Disclaimer:

The Parenting Research Centre does not endorse any particular approach presented here. The searches were conducted in March 2016. Readers are advised to consider new evidence and information arising since the publication of this review.

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Glossary

CD-ROM/DVD	Optical discs that can be read/displayed on computers or dedicated devices. They can present information via text, audio or video, and in some cases offer a limited degree of interactivity.
Coaching	The provision of support for skills development. May be provided during real-time parent–child interaction via audio feedback, or at other times via face-to-face discussion, phone, email or online forum.
Computer app	A specific, stand-alone, software program for desktop, laptop or tablet computer. May be interactive and customisable; may or may not use internet connectivity.
E-books/e-readers	E-books are electronic versions of printed books which can be read via a computer or on a dedicated handheld device (e-reader).
Hard-to-reach populations	Parents and families who are isolated, economically or socially disadvantaged, or vulnerable.
Information technology	The use of any computer or other electronic device to create, process and deliver electronic content.
Informational website	A website with no or minimal interactivity, presenting information only. May contain audio-visual content.
Interactive website	Information presented on a website in such a way that users must interact with the site, for example watch videos and animations, complete quizzes, or play games, in order to obtain information. The interactive elements are assumed to assist user engagement with the material, increasing time spent on the site and how much information is understood and retained.
Online therapy	Programs offered online that seek to replicate an existing face-to-face intervention or create a new intervention which provides the key elements of face-to-face therapy.
Outcomes	A measurable change or benefit to a child or parent. Either an increase in a desirable behaviour (e.g. improved parenting practice, increased vaccination rate), or a decrease in an undesired behaviour (e.g. decreased conduct problems), or an improvement in circumstances or psycho-emotional states (such as depression, stress or anxiety).
Post hoc tests	Exploratory statistical tests, conducted after an initial analysis. Ideally used to gain further insight into statistically significant results, but sometimes used to search for significant differences among subgroups after overall comparisons fail to reach significance. May be acceptable, but should be viewed with some caution.
Randomised, non-randomised, and quasi-experimental study design	<p>Randomised controlled trials (RCTs) assign participants randomly to either the intervention or control (comparison) group. RCT designs are considered the most rigorous, and such designs maximise confidence that differences observed between groups are attributable to the intervention in question.</p> <p>Non-randomised (quasi-experimental) study designs also compare interventions with controls, but participants are not allocated to conditions randomly (rather, they are allocated based on some other factor such as availability). Investigators generally attempt to ensure that intervention and control participants are equivalent in all respects other than group allocation, but differences in outcomes post investigation are less able to be confidently attributable to the intervention of interest than in randomised designs.</p>
Self-guided/self-directed	Parents proceed at their own pace through a program, with no or minimal input from therapists or researchers. The program may use parents' responses to shape progress through the material.

Smartphone app	A specific, stand-alone, software program for smartphones. May be interactive and customisable; may or may not use internet connectivity.
Targeted intervention	An intervention or program that is intended for a population with specific characteristics, experiences or risk factors.
Telehealth	A delivery mode of reasonably long standing for medical, health and education services. It uses teleconferencing and videoconferencing, provided via phone, a dedicated system or online telephony. In this REA, only those interventions which are not the functional equivalent of an in-person consultation or therapy session have been included.
Text message/SMS/MMS	Short informational text-based messages sent to mobile phones. May be automated; may be customised based on client responses or agency data. MMS systems also support video and sound messages.
Universal intervention	A general intervention or program which targets the general population. It may be preventive or may address existing behaviours, but is not directed at any particular group or risk factors.
Web-based learning	Web-based learning programs occupy a middle ground between online therapies and interactive websites. They may involve therapist or coach contact, but this is generally a smaller component of the intervention, or may rely solely on pre-recorded audio-visual demonstrations and instruction.

1. Executive summary

The bottom line in information technology-based support for parents

- There is growing evidence that information technology can be used to improve a wide range of parent and child outcomes. However, this research is still in its infancy, especially for newer platforms such as smart phones.
- There appears to be value in embedding or connecting the use of Information technology-based interventions to face-to-face services, and in applying and using principles of effective design to online and information technology-based interventions.
- The effectiveness of information technology-based interventions is wholly dependent on the effectiveness of the underlying approach. Technology is merely a delivery mode; the underlying content of an intervention needs to be effective.
- All approaches using technology, whether using new content or adapting an existing face-to-face intervention, require rigorous implementation and outcomes evaluation to determine efficacy and effectiveness.

Evidence for specific technology platforms

- Nearly all information technology modes seem to work for some populations and some outcomes.
- The most commonly used platform identified in this review was the internet; mobile phones were also used extensively.
- There were relatively few computer and smartphone apps, e-reader, or telehealth interventions identified.
- Web-based, self-directed support and education was the most frequently identified type of information technology-based intervention delivered to parents and was useful for improving parenting skills, parent behaviour and parent outcomes.
- Online therapies and parenting programs were associated with improved outcomes and may be comparable to face-to-face modes.
- Interactive websites appear to work better for improving knowledge and changing attitudes than static, information-only websites.
- There was limited or mixed evidence for informational websites, e-books, computer and smartphone apps, and CD-ROM/DVDs.

Using information technology-based interventions with parents

- Simple interventions appear to work well for simple outcomes (for example text messages for reminders and prompts) but may be less useful for more complex behaviour change.
- The majority of information technology-based interventions were highly interactive.
- Information technology-based interventions are delivered as stand-alone, self-directed programs, but also as adjuncts to existing face-to-face programs.
- Most information technology delivery modes appeared to be fairly acceptable to parents, with attrition rates comparable between intervention and control.
- Interventions (even those which were on the whole self-directed and stand-alone) often involved additional support from a therapist, and the clearest benefits for online therapies, parenting programs, and web-based learning were seen when this offline support was provided. However, many interventions were successfully delivered entirely independent of live feedback. Further consideration and evaluation is needed to determine if extra support is required.
- Interactive text messages may be useful for filling some services gaps in areas with poor access to services, but consideration should be given to potential issues of access to equipment and internet.
- Information technology-based interventions are in use with a range of hard-to-reach parenting populations, particularly with low-income families.
- A small number of information technology-based interventions have been trialled with Australian populations.
- Barriers to delivering information technology-based interventions include access to equipment and poor internet speed.

1.1. Overview

Parenting plays a crucial role in determining the health, wellbeing and education outcomes of children. There is evidence to suggest that some face-to-face parenting programs may be effective for improving children's outcomes. Information technology-based support is becoming more readily available to parents and has the potential to reach large numbers of parents in a convenient and potentially low-cost approach. However, to our knowledge, the effectiveness and acceptability of technology-based support for parents has not been subject to a rigorous review of the evidence.

This review aims to determine the state and quality of the evidence for the effectiveness of online and other information technology-based interventions for parents, including parenting programs, interventions designed to change parent behaviour, interventions for improving parent outcomes and interventions for improving child outcomes.

1.2. Methods

This review employed a rapid evidence assessment (REA) methodology in which the processes of a systematic review were streamlined and various limitations were imposed in order to produce a relatively rigorous review within a shorter timeframe than a systematic review. Seven electronic databases were searched in March 2016, and additional studies were sought via key organisation websites and from experts in parenting. Studies were eligible for inclusion if they were in English, were published from 2010 onwards, and assessed the effectiveness of an information technology-based intervention for parents using some form of comparison group design. Findings were analysed according to technology type and whether the intervention was intended to improve:

- Parenting skills: programs promoting the development of parenting skills and reducing dysfunctional parenting.
- Parent behaviour: interventions designed to promote specific parent behaviours; more specific than those promoted by parenting skills programs.
- Parent outcomes: interventions which focus on improving specific parent outcomes.
- Child outcomes: interventions which involve parents but which focus on improving child outcomes.

1.3. Results

The systematic search and selection process identified 118 papers for inclusion in this review: 109 individual studies and nine systematic reviews. The largest group of interventions focussed on improving parent behaviours (n=34), followed by parenting skills (n=21), outcomes for parents (n=19) and outcomes for children (n=17). Interventions were predominantly provided via web-based learning (n=28), interactive websites (n=24), and text messaging (n=25). The majority of these interventions were evaluated using randomised controlled trials (n=103). The interventions were delivered to a wide range of parent populations, including 24 for parents considered to be hard to reach. The majority of studies were conducted overseas, with 12 conducted in Australia. Thirty-five papers related to universal interventions and papers related to interventions targeted to particular parent and child populations. A breakdown of the studies included in this review, by technology platform and type of outcomes the intervention aimed to improve, appears in Table 1.

Table 1. Overview of publications (and interventions) by technology platform and outcomes

	Parenting skills	Parent behaviours	Parent outcomes	Child outcomes	Total Interventions (publications)
Online therapy	1 (2)	0	5 (6)	2 (3)	8 (11)
Web-based learning	17 (20)	5 (5)	3 (3)	0	25 (28)
Interactive websites	0	5 (6)	6 (6)	11 (12)	22 (24)
Text messaging/SMS/MMS	2 (2)	15 (18)	4 (5)	0	21 (25)
Computer apps	0	3 (3)	0	0	3 (3)
Smartphone apps	1 (1)	0	0	0	1 (1)
CD-ROM/DVD	0	1 (1)	1 (1)	2 (2)	4 (4)
Informational website	0	3 (3)	0	1 (1)	4 (4)
e-Books	0	1 (1)	0	0	1 (1)
Telehealth	0	1 (1)	0	1 (1)	2 (2)
Related publications ¹	0	4	1	1	6
Total	21 (25)	34 (38)	19 (21)	17 (19)	91 (109)

1. These are additional publications which are not evaluations of included interventions but which give extra contextual information (for e.g. barriers to engagement) on included interventions.

1.4. Discussion

1.4.1. Overview of findings

Nearly all the information technology modes identified in this REA worked well for some populations and some outcomes. The internet and mobile phones were the most commonly used technology platform identified in this review; there were relatively few computer and smartphone app, e-reader, or telehealth interventions identified.

Web-based, self-directed support and education was the most frequently type of intervention identified, and these interventions were useful for improving parenting skills, parent behaviour, and parent outcomes.

Online therapies and parenting programs were associated with improved outcomes and were generally comparable to face-to-face modes when this information was available.

Interactive websites appear to work better than static, information-only websites for improving knowledge and changing attitudes.

Information technology-based support was well received by parents, with no differences in attrition observed between these modes and face-to-face delivery. Barriers to the use of technology may include low levels of ownership of technology, such as smartphones, and poor or no internet connections.

1.4.2. Limitations

The literature search for this REA was limited to high-quality articles published in English from the year 2010 onwards and there may have been relevant studies dated before this cut off period.

Publications were only included if they could be located online, and we did not contact authors or search grey databases for additional studies.

Extraction of findings was completed using a formal data extraction template. These were completed by individual co-authors and, while some cross-checking of individual studies was conducted, we did not carry out a concordance analysis to check coder agreement.

While we have indicated whether interventions significantly improved outcomes, we did not undertake extensive analysis of the quality of the studies measuring these outcomes. We did not complete a formal Risk of Bias analysis, as is usual in a systematic review. As a result, the analysis is not as complete as it would be in a systematic review.

1.4.3. Conclusion

People are beginning to use technology in all sorts of ways to support children and families in all kinds of areas. Web-based learning programs, interactive websites, online therapies and text messaging are all widely used. Smartphone and tablet interventions may be increasingly used, but formal evaluations are not yet common in the literature.

Parent support via information technology is a new and rapidly developing field. Information technology-based interventions can be effective, and may be especially useful when resources are constrained and need can't be met with traditional approaches. There is a growing body of research, some of it very good, suggesting that information technology can be used to improve a wide range of parent and child outcomes. However, this research is still in its infancy, especially for newer platforms.

Nearly all information technology modes seem to work for some populations and some outcomes. Simple interventions appear to work well for simple outcomes (e.g. text messages for reminders and prompts) but may be less useful for more complex behaviour change. Information technology may be of use in different phases of the change process (the 'knowledge-to-behaviour' change continuum). Some studies suggested that information technology interventions are more effective at changing attitudes and knowledge than changing behaviour.

The effectiveness of information technology-based interventions is wholly dependent on the effectiveness of the underlying approach. In cases where research compared an evidence-based intervention delivered face-to-face to one delivered online we found the online version performed similarly.

It is still early days culturally for parental engagement in online programs, even though parental use of information websites is extremely high. Engagement with particular target groups and with parents generally is still an issue. This is true for face-to-face programs as well, but the challenge of finding the right information in the online sphere is an issue that warrants consideration in this context. However, all kinds of people are participating in information technology parent support and attrition seems comparable to that of traditional face-to-face approaches and may have lesser cost implications.

There appears to be value in embedding or connecting the use of information technology-based interventions to face-to-face services, and in applying and using principles of effective design to online and information technology-based interventions.

At this stage, it makes sense to think of information technology-based interventions as supplementing and supporting frontline face-to-face services. Every person helped by an online solution is one fewer client for more expensive face-to-face services.

1.4.4. Implications for policy and practice

When deciding if and how to choose an existing or create a new information technology-based intervention for parents, consider the following points:

- ***Online therapies, interactive websites and web-based learning show promise***

Several promising options for parent and child outcomes are online therapies, interactive websites, and web-based learning programs. For simpler outcomes, text messaging can be useful.

- ***There is no clear information about crucial features of effective information technology support interventions***

There is no clear pattern to which features are crucial to the effectiveness of information technology-based support. The current evidence does not allow us to say with certainty whether offline resources or interactivity in conjunction with information-technology are necessary for program success.

- ***Choice of underlying intervention is key to choosing the most appropriate information technology platform.***

The choice of underlying intervention should take priority over the choice of information technology platform: use programs with an established evidence base. Some platforms will be more appropriate than others for any given interventions: the intervention, not the delivery mode, is key.

- ***Supplementary, non-technology-based support may be beneficial in conjunction with information technology***

It may be helpful to provide other support, such as an initial home visit to familiarise participants with the program technology, or regular phone calls, or email contact. This can increase the customisability of the intervention and aid in engaging participants.

- ***Reminders delivered by information technology may prompt participation and engagement***

Less intensive support, such as reminder emails or text messages, may improve participation and engagement.

- ***Changing attitudes and knowledge is not the same as changing behaviour***

While changing parents' attitudes and knowledge is a worthwhile aim, it should not be assumed that this will translate to changed behaviour.

- ***Reliable access to suitable information technology infrastructure and services is variable***

Not all sectors of the population have equal access to information technology resources, including equipment and internet coverage. Subsidising this access either completely or partially may improve parents' willingness and ability to complete the intervention.

- ***There is a gap in the evidence for diverse Australian populations***

There is very limited evidence for the effectiveness of information technology-based interventions in Australian culturally and linguistically diverse populations. Further research is

needed to determine acceptability and efficacy of such interventions for diverse participants, and the best strategies for engaging and retaining participants.

- ***Evidence for newer technologies has yet to emerge but may be captured by an updated review***

Interventions delivered by relatively new information technologies such as smartphones and tablets do not appear to have been rigorously evaluated to date. There is currently no clear picture of their benefits for participants, but this is likely to become available in the three to five years following publication of this report. A brief rapid evidence assessment conducted in the future, covering only the years since publication, would capture any new information about these recent technologies.

2. Background

This report describes the rationale, methods, findings and implications of a review of information technology-based support for parents. In this section we provide context for parent support delivered via information technology and an introduction to the scope, method and research questions of this review.

2.1. Parents and parenting support

Becoming a parent is one of the most formative transitions and central milestones in life. It puts parents on a steep learning curve. Parenting is a key determinant of the development and wellbeing of children, and supporting families in their parenting is a powerful way of improving health and educational outcomes for children (O'Connor & Scott, 2007).

The importance of supporting parents has been increasingly recognised by government and the community. Parents play a central role in shaping the development and supporting the wellbeing of children (National Scientific Council on the Developing Child, 2007; Phillips & Shonkoff, 2000). Various systematic reviews have demonstrated the effectiveness of parenting education for improving child outcomes (e.g., Barlow et al., 2011; Barlow, Smailagic, Ferriter, Bennett, & Jones, 2010; Eccleston, Palermo, Fisher, & Law, 2012; Woolfenden, Williams, & Peat, 2009). Yet challenges remain in bringing evidence-based parenting support to scale, and traditional models of program delivery frequently struggle to reach the intended target group and suffer relatively high rates of attrition (Bor, Sanders, & Markie-Dadds, 2002; Dennis & Hodnett, 2009).

Information technology may be an effective platform for cost-effective information and program delivery in a range of service domains, including parenting and family support. Australia is one of the most digitally-connected countries in the world (EY Sweeney, 2014). Continuous connectivity to the internet marks a point of change for finding and using information, and the early years of childhood is a time that parents are looking for reliable resources they can trust and share and put to immediate use. There is considerable potential here in Victoria to supplement and enhance existing services for children and families by leveraging new technologies in delivering a wider range of online services and programs for parents.

2.2. Information technology-based support

Parents are now potentially able to access information about raising children from a broad range of sources: traditional media (print, TV, radio), social support networks (both virtual and personal), and the internet via desktop computer and, increasingly, mobile devices. Information technology-based communications to deliver and enhance health interventions emerged around 2000 and have been trialled in the areas of education, child health and mental health, and general parenting (Hall & Bierman, 2015). The demand for quality online information by Australian parents continues to grow (Green & Oberklaid, 2014). Parents, particularly mothers, are very active on parenting websites (EY Sweeney, 2014), providing enormous potential for parenting programs and other initiatives for parents to be delivered in more contemporary, multimodal ways.

Online universal support programs that are available to all parents, interventions targeting vulnerable families, and portals linking parents to high-quality information, have proliferated extensively in recent years. Platforms for delivery include apps, guided and self-directed eLearning modules, SMS initiatives and websites. Brief, free to participants and low-cost to providers, self-directed online parenting programs may be effective in teaching parenting skills (Calam, Sanders, Miller, Sadhnani, & Carmont, 2008).

2.3. Why is this review needed?

Given the potential global reach of information technology-based universal and targeted interventions, there is a pressing need to bring together the international evidence on how information technology and digital platform can best be harnessed in Australia. We need to consolidate what is known about how new technology is being used to improve parenting, parent and child outcomes. We also need to know how new technology may be able to help engage and retain parents in interventions, deliver interventions to parents, and reach people that may be harder to engage in interventions.

Information technology-based interventions have the potential to reach large numbers of parents, including those that may be hard to reach face to face. As in the mental health field, where online interventions targeting mental health problems such as depression and anxiety have been found to be as effective as face-to-face services (Barak, Hen, Boniel-Nissim, & Shapira, 2008), there is the potential to design and deliver more intensive programs and interventions for parents that were previously available only in service settings. Indeed, a broader suite of online service delivery options could substantially increase families' access to evidence-based parenting support. Given the recent proliferation of technology use and information technology-based interventions, it is vital that policymakers and program designers receive guidance regarding the acceptability and effectiveness of information technology-based interventions. While some of these individual initiatives may have been evaluated for effectiveness, there is no known current appraisal of the evidence that determines what works across the full range of technology platforms. This review will be useful for informing policy and practice decisions regarding the types of technology that might be best suited to delivering interventions for parents, as well as the content of interventions that could be delivered via technology.

2.4. Research question and scope of this review

In this review we answer the question — *What is the state and quality of the evidence for the effectiveness of online and other information technology-based interventions delivered to parents?*

The scope of this review includes:

- parenting programs
- interventions intended to affect parent behaviour
- interventions intended to improve parent outcomes
- interventions with a parent component intended to improve child outcomes.

In answering this question, we consider such issues as:

- What kinds of interventions are being delivered to parents via information technology?
- What information technology platforms have been used to deliver interventions to parents?
- How effective are interventions delivered to parents by information technology?
- What modes of information technology are preferred by parents, and for what purposes?
- How usable and acceptable do parents find interventions delivered via information technology?
- What are the current challenges to delivering information technology-based interventions to parents and what are some approaches to overcoming these challenges?
- What kinds of interventions are being delivered to hard-to-reach adults via information technology?

- How effective are interventions delivered to hard-to-reach adults via information technology?
- What do we know about recruiting and retaining vulnerable parents and other hard-to-reach adults?

3. Methodology

A rapid evidence assessment (REA) methodology was used to conduct this review. The REA methodology is described below.

3.1. REA methodology

REA methodologies are well suited to provide rigorous overviews of current knowledge. They are an accelerated or streamlined version of full systematic reviews, facilitating the synthesis of evidence in an area within a shorter timeframe than that possible with a systematic review (Ganann, Ciliska, & Thomas, 2010). The advantage of systematic over traditional literature reviews is that they provide increased methodological rigour, thereby allowing greater confidence in findings. Explicit, systematic methods of data collection maximise the identification of relevant work and minimise the risk of biased findings (Higgins & Green, 2008). REAs bring the advantages of systematic reviews to a topic (rigorous systematic search, impartial inclusion decisions, and transparent and replicable method) and, like systematic reviews, are a superior alternative to traditional literature reviews. However, they are less costly than systematic reviews in terms of time and resources.

3.1.1. Search strategy

Evaluations of information technology-based interventions for supporting parents were identified via a systematic search of the following sources:

- electronic bibliographic databases
- select organisation websites
- invited study recommendations

3.1.2. Electronic database search

We conducted a systematic search of the following academic databases in March 2016: PsycInfo, MEDLINE, Education Resources Information Center (ERIC), Cumulative Index to Nursing and Allied Health (CINAHL), Sociological Abstracts, Social Services Abstracts and the Technology Research Database.

The search was limited to the year 2010 onwards and to the English language. This was in order to capture recent developments in a rapidly evolving field. Search terms included a broad range of information technology terms, parent terms, hard-to-reach population terms, and research design terms. The search strategy was adapted to meet individual requirements of each electronic bibliographic database; those for Medline are listed in Box 1, **Appendix 1**.

3.1.3. Selected websites

We searched eight key organisation websites to locate additional published and unpublished (grey) papers reporting evaluations of supporting parents using information technology. Where available, search functions were used on these websites or titles in publication, and report lists were searched. A list of sites searched appears in Box 2, **Appendix 1**.

3.1.4. Invited study recommendations from content experts

Because of the collective expertise of the Parenting Research Centre and the Raising Children Network on this topic, we invited members of the authorship team and other staff at the Parenting Research Centre to recommend studies for potential inclusion in this REA.

3.2. Study selection

All potential studies were entered into Endnote reference management library and screened for inclusion in the REA against the following selection criteria:

Inclusion criteria

1. Intervention delivered via a technology platform as defined in the key definitions (see Glossary).
2. Intervention targeted one of two groups:
 - a. parents – may report parenting, parent and/or child outcomes
 - b. any person identified in the study as ‘hard to reach’ (see **Glossary**).
3. Paper reported an evaluation of the intervention.
4. The study design used a comparison group (including randomised, quasi-randomised, non-randomised, and historical comparisons).
5. Evaluation published 2010–present.
6. Evaluation published in English.
7. Published in journal, website, or online dissertation.
8. Publication is a systematic review meeting the following criteria:
 - a. Review had a clearly defined question.
 - b. Review used an a priori search strategy with defined inclusion and exclusion criteria.
 - c. A minimum of two databases were searched.
 - d. More than one rater extracted/assessed study information.

Exclusion criteria

1. Intervention targets child directly rather than via parents.
2. Intervention targets adults who are not identified as parents or not in capacity as parent (e.g. adult depression generally rather than post-natal depression).
3. Interventions that are not either delivered to parents or to people identified as ‘hard to reach’.
4. Technology is only a minor component, not the focus, of a broader program (e.g. face-to-face intervention with additional material delivered online).
5. Intervention is predominantly telehealth: real-time consultations with professionals via telephone or videoconference (including online videoconference) with no other component.
6. Publication date pre 2010.
7. Conference proceedings, books and book chapters.
8. Study protocol only.
9. Dissertations if not available online.

3.3. Data extraction

Information such as technology delivery mode, population, intervention content, and outcomes was extracted from included studies using a data extraction template. The extraction fields are listed in **Appendix 1**.

Descriptions of all the interventions and programs identified are provided in **Appendix 2**.

3.4. Data synthesis

Our search strategy returned a large number of eligible papers. To enable synthesis of findings in a manageable format, we grouped interventions by information technology (IT) category:

- online therapy

- web-based learning
- interactive website
- text messaging/SMS/MMS
- computer app
- smartphone app
- CD-ROM and DVD
- information website
- e-book and e-reader
- telehealth

These categories represent a rough ordering of intervention by degree of responsiveness to participant, personalisation, and (to a lesser degree) resource intensiveness. However, these categories are imposed after the fact on the broad range of available interventions and should be considered as general, non-exclusive classifications. Many interventions contain components from several categories.

Within each IT type, we then categorised programs and interventions by the outcomes they addressed:

- Parenting skills: programs promoting the development of parenting skills and reducing dysfunctional parenting.
- Parent behaviour: interventions designed to promote specific parent behaviours; more specific than those promoted by parenting skills programs.
- Parent outcomes: interventions which focus on improving specific parent outcomes.
- Child outcomes: interventions which involve parents but which focus on improving child outcomes.

In the next section, we present an overview of the systematic reviews and individual studies identified in our search, overall findings for each IT category, and then specific findings by outcome type and the nature of the evidence for them.

4. Results

In this section we present the findings of the systematic search into information technology-based support for parents. Details of the results of our search of databases, expert recommendations, and website searches are presented in the flowchart in **Appendix 1**.

We identified 184 eligible publications, and initial screening of included studies revealed that many interventions targeted parents who are generally considered to be hard to reach. Therefore, studies which met inclusion criteria but which dealt with hard-to-reach populations who were not also parents were excluded from data extraction and synthesis. Interventions targeting hard-to-reach parents are indicated in the findings tables below.

In addition, the majority of telehealth interventions identified in the search stage of this REA were interventions consisting solely of phone or videoconferencing interactions qualitatively similar to in-person interventions, rather than being novel IT methods. Even where a newer platform is used, such as Skype or another computer-based videoconference tool, such interventions have more in common with traditional in-person therapies than with the novel information technology described elsewhere in this report. Although telehealth interventions can overcome challenges of distance and scarce expertise (Chi & Demiris, 2015; Elbert et al., 2014) they still require a considerable commitment of resources. Following consultation with the Department of Education and Training (who commissioned this review) those interventions which were simply an in-person consultation conducted via telephone or videoconference were excluded from these results.

With these two extra exclusion categories, the total number of publications included in this review is 118: 109 individual studies and nine systematic reviews.

An overview of the search results is presented first, followed by findings from systematic reviews and then findings from single studies organised by technology type and support type.

4.1. Overview of studies identified

This review identified nine systematic reviews and 109 individual studies. Individual studies evaluated both universal and targeted interventions and fell into outcome categories as follows:

- Parenting skills: 25 publications
 - Universal interventions: 4 (16%)
 - Targeted interventions: 21 (84%)
- Parent behaviours: 38 publications
 - Universal interventions: 22 (58%)
 - Targeted interventions: 16 (42%)
- Parent outcomes: 21 publications
 - Universal interventions: 5 (24%)
 - Targeted interventions: 16 (76%)
- Child outcomes: 19 publications
 - Universal interventions: 4 (21%)
 - Targeted interventions: 15 (79%)

These categories comprise 103 papers. A further six papers provided important contextual information and additional findings for the evaluations already evaluated by RCT.

All included studies used a comparison group (generally a wait-list control, usual-care control, or an alternative intervention) and the majority randomly allocated participants to either the intervention or the comparison group. Where group allocation was not random this is indicated in the findings table.

All effects discussed in this review — improvements in parenting style; increased knowledge, self-efficacy, or confidence; reduced symptoms of depression; increased clinic attendance rates etc. — are statistically significant and relative to the study comparison group. For example, if both the intervention and comparison group improved on an outcome from baseline to follow-up assessment, then this would be counted as either *no effect* (if the comparison was a wait-list or usual-care control) or as *clear effect* (if the comparison was a face-to-face version of the online intervention).

4.2. Presentation of findings

For each intervention type, an overview of all studies is presented in a table. Where a large number of studies was identified, these are further subdivided by outcome type. Each table is followed by a narrative synthesis of each broad outcome category (parenting skills, parent behaviour, parent outcomes, and child outcomes). Categories are only reported if they contain relevant studies. All interventions were evaluated in randomised controlled trials unless otherwise indicated.

Tables are divided into sections based on the clarity of the evidence in their favour: ‘clear effects’ means that the intervention resulted in statistically significant positive change (that is, change favouring intervention over the comparison) in all outcomes reported; ‘mixed effects’ means that statistically significant positive changes were reported following the intervention for some, but not all, outcomes measured; ‘no effects’ means that the intervention performed no better than the comparison condition (i.e. the changes or lack of changes in outcomes were roughly equivalent for both groups and all outcomes).

Australian studies are indicated by a tick in the appropriate column. Similarly, the ‘hard to reach’ column indicates interventions which target populations which traditionally have less access to health services and interventions: culturally and linguistically diverse groups, rural populations, socioeconomically disadvantaged groups, people in developing economies, etc.

4.3. Systematic reviews

We identified nine systematic reviews and/or reviews with meta-analyses. They met the minimum systematic review criteria of pre-specified search and selection method and multiple reviewers. A range of publication types was acceptable to authors of included reviews; in presenting findings from the reviews we have emphasised those which were based on controlled trials and, where possible, a meta-analysis.

Breitenstein, Gross, and Christophersen (2014) identified seven parent training interventions delivered by nine digital methods (spanning 2000 to 2012). Six studies used the internet, two used CD-ROMs, and one used a reality television series. All included studies had a comparison condition, but the nature of this comparison was not specified.

Almost 90% of the interventions identified used text and other didactic content, supplemented with videos of parent–child interactions to model the behaviours and strategies of interest.

In five of the seven interventions individualised support was provided, weekly or monthly, via telephone, weekly reminders, or group discussion boards. None of the studies assessed the effectiveness of digital delivery with and without personalised support, so it is not known what, if anything, personalised support adds.

The majority of studies reported intervention dose, but there was no consistent evidence on what factors affect completion rates. Although the interventions were to support parenting, only four studies reported parent–child outcomes.

On the limited data available, digital delivery models appear to produce comparable effects to face-to-face interventions for parent and child outcomes.

Average proportion of completion was 78% of sessions. The one included study that compared self-directed internet delivery with face-to-face delivery of the same intervention showed a higher completion rate for the internet version (41% vs 25%).

Hamm et al. (2014) conducted a systematic review of the use of social media (such as blogs, Twitter, YouTube and Facebook) in child health. Twenty-five studies (only seven of which were RCTs) examined social media interventions targeting health outcomes in children, youth, and parents and non-professional caregivers. The majority targeted adolescents and covered acute and chronic conditions, and health promotion. Seventeen of the 25 studies included a discussion forum and 16 were a component of a complex intervention. None of the studies reported statistically significant effects on health outcomes, compared with controls ranging from no intervention to comparable activities with different content, to the same content presented in different formats.

A review of internet-based peer support for parents (Niela-Vilén, Axelin, Salantera, & Melender, 2014) identified 38 publications including quasi-experimental studies, surveys, and qualitative studies. In most cases, peer support was provided via discussion that was controlled by a facilitator or moderator; and usually on an asynchronous discussion board or email list rather than in real-time. Both mothers and fathers were satisfied with their membership of groups, but mothers were more active users than fathers. The groups aimed to provide emotional and informational support; but due to the limited number of experimental designs located by the review, the results regarding effectiveness of internet-based peer support interventions were inconclusive. The evidence suggested that informational support (based on professional sources as well as parent experience) was the kind most often provided. The authors suggest that internet-based peer support had some effects on parenting skills and parents' mental wellbeing relative to control (nature of the control not specified), but evidence for this was limited.

Nieuwboer, Fukkink, and Hermans (2013b) conducted a review of web-based parenting services with evaluations published from 1998 to 2010. Seventy-five research articles were identified where the primary components of the parenting resources were delivered online. The resources identified were (in decreasing proportions) information pages (the majority, at 61%) followed by group forums, email communications between professional and parent, emailing lists, chats with peers, and chats with professionals. Only 19 of the 75 included publications were experimental studies that evaluated the effects of online support compared with control (ranging from no intervention, to resource provision, to 'traditional' program (in two cases)). The topics and findings were highly diverse and, although they all showed positive signs of feasibility, acceptance and effectiveness, these findings were generally based on positive satisfaction reports, although some studies reported medium-sized effects on parent and child outcomes.

A meta-analysis of the 19 experimental studies identified above (Nieuwboer, Fukkink, & Hermans, 2013a) found a statistically significant small-to-medium effect on parent outcomes. This effect was aggregated across a diverse set of outcomes such as postpartum depression, father's self-efficacy, maternal confidence, parental anger, problem solving and communication. A medium effect was also observed on child outcomes (e.g. use of alcohol, social competence, body esteem). The authors

argued that similar findings of medium effects have been reported for traditional forms of parenting training in different domains.

Text messaging for maternal and infant health was reviewed by Poorman, Gazmararian, Parker, Yang, and Elon (2015). The authors identified 48 articles, of which 30 were from randomised controlled trials with a range of comparison groups. There was good preliminary evidence in favour of text messaging for smoking cessation, medication adherence, weight loss and vaccine uptake. Evidence was less compelling for other outcomes such as sexually transmitted infection education, vitamin adherence, substance abuse and depression, which were not studied in populations relevant to maternal and child health. The authors suggest that future research needs to:

- develop standard terms for interventions and delivery models
- follow established theoretical models
- choose motivational rather than information messages
- vary message timing and content
- measure outcomes more aligned with text messaging content (to improve assessments of efficacy)
- examine reasons for reported high attrition rates.

A review of internet-delivered cognitive behavioural therapy (CBT) by Rooksby, Elouafkaoui, Humphris, Clarkson, and Freeman (2015) identified seven studies in six publications. Meta-analysis found moderate effects on child behaviour and anxiety outcomes compared with wait-list controls, and the authors concluded that CBT can be successfully delivered online.

A broader review (Siemer, Fogel, & Van Voorhees, 2011) investigated web-based interventions (with a mix of parent and child involvement) for a range of child and adolescent mental-health problems. Twelve interventions were found for childhood depression, anxiety, eating disorders, substance abuse, and health promotion (investigated in 20 studies). Meta-analyses found small-to-moderate effect sizes for each type of internet intervention, comparable to those found in adult internet interventions, although the wide range of study designs and comparison groups (both no-treatment and active controls were used) created some challenges in interpretation of results.

A review of e-health interventions for maternal and child health in the sub-Saharan African context (Obasola, Mabawonku, & Lagunju, 2015) found that such interventions can improve access to health information and health facilities. It recommended that information and communication technology interventions move from pilot initiatives to interventions on a sub-regional scale.

4.3.1. Summary

This review identified nine systematic reviews. They covered:

- parent training interventions delivered via a variety of digital methods
- the use of social media in child health
- internet-based peer support for parents
- web-based parenting services
- text messaging for maternal and infant health
- internet-delivered CBT for children
- web-based interventions for a range of child and adolescent mental health problems
- e-health interventions for maternal and child health in sub-Saharan Africa

Five of the nine reviews found small-to-moderate effects on some (but not all) of the outcomes measured, compared to control (the precise nature of this control was generally not further specified). Only a small minority of included studies (not whole reviews) compared online with face-to-face versions of the same intervention. Four reviews concluded that the evidence in favour of interventions was limited or conflicting.

The clearest effects were in reviews investigating similar interventions for a comparatively narrow range of outcomes. Most reviews highlighted the need for further and more rigorous research and more standardised terminology for interventions and delivery models in order to clarify which interventions hold most promise for which purposes.

While some systematic reviews found evidence of benefit from information technology for supporting parents, definitive evidence is still limited. However, while further research is needed to confirm findings, the broadly available and potentially cost-effective programs provided via information technology appear to show some initial promise across a wide range of parent and child outcomes.

4.4. Online therapy

This section reports on interventions offering a therapeutic experience online. These interventions (for example, BRAVE-ONLINE; Donovan & March, 2014) may have attempted to replicate an existing face-to-face intervention, or they may have provided a new intervention which provides the key elements of face-to-face therapy (for example Counsellor Assisted Problem Solving; Petranovich et al., 2015). An overview of all the online therapy interventions identified in this REA is presented in Table 4.1, for all outcome categories.

Table 4.1. Online therapy findings

Effects ¹	Intervention	Aus	Hard to reach	Population	Intervention and comparison	Findings	Other resources needed
Clear	CBT online (Kersting et al., 2011; 2013)	X	X	Women who had lost a child in pregnancy	<u>Intervention</u> : CBT delivered via 5 weeks of online writing assignments, with written feedback from a therapist <u>Comparison</u> : wait-list control with usual care	Improvements in maternal posttraumatic stress, grief, depression, and general psychopathology. Improvements persisted at 3-month follow-up.	Therapist feedback on writing assignments.
	Mom-Net (Sheeber et al., 2012)	X	X	Women with depression	<u>Intervention</u> : 8 weekly online tutorials delivering CBT, based on 'Coping with Depression' course (successfully adapted on other occasions). Feedback from coaches on tutorial activities. Access to moderated bulletin-board for chatting and 'ask an expert' Q&A <u>Comparison</u> : wait-list control with usual care	Improvements in depression (one of two measures used) and sense of confidence (some but not all measures); both maintained at 26-week follow-up. Post hoc tests showed mothers more likely to be in remission from depression after the intervention	Coaches to provide individual phone support (15-20 min conferences) and moderate the bulletin-board. Motivational interview prior to first tutorial.
	BRAVE-ONLINE (Spence et al., 2011)	✓	X	Adolescents with mild-to-moderate anxiety and their parents	<u>Intervention</u> : adolescents complete 10 weekly online therapy sessions incorporating standard CBT anxiety management techniques, peer modelling, interactive exercises, quizzes, and homework. Parents complete 5 sessions on strategies to help their child implement anxiety management techniques. Both groups have 1- and 3-month booster sessions. <u>Comparisons</u> : face-to-face BRAVE, wait-list control	Both versions of the therapy performed better than wait-list control at reducing numbers of children meeting diagnostic criteria, reducing severity of symptoms, and improving functioning. BRAVE-ONLINE worked just as well as face-to-face.	Therapist to monitor progress through sessions and homework activities, and send brief email responses.

Effects ¹	Intervention	Aus	Hard to reach	Population	Intervention and comparison	Findings	Other resources needed
Mixed	Adventures in Parenting (Farris et al., 2013)	X	X	Parents from any background	<u>Intervention:</u> 12-week online parenting course using principles of effective parenting <u>Comparisons:</u> face-to-face (group) version of course; booklet covering course information	Improvement in maternal depression symptoms, global severity. No effect on anxiety	Face-to-face version needed masters-qualified social worker. No staff needed to deliver web version.
	Counsellor-assisted problem solving (CAPS) (Petranovich et al., 2015)	X	X	Caregivers of adolescents with mild to severe TBI	<u>Intervention:</u> interactive didactic online modules, followed by Skype sessions with therapist to implement problem-solving and communication strategies. <u>Comparison:</u> self-guided, information-only website	Small decrease in global distress for some participants. No significant improvement in caregiver depression or self-efficacy	Initial face-to-face meeting with licensed clinical psychologist; regular Skype sessions thereafter.
	Counsellor-assisted problem solving (CAPS) (Narad et al., 2015)	X	X	Families where adolescents have TBI	<u>Intervention:</u> as for Petranovich et al. 2015, above. <u>Comparison:</u> as above	Small and mixed effects only. Post hoc analyses showed small improvements in frequency and severity of parent-teen conflict at 18-month follow-up. No differences in quality of family problem solving or communication	As above
	BRAVE-ONLINE (Donovan & March, 2014)	✓	X	Preschool children with anxiety and their parents	<u>Intervention:</u> parents complete 6 weekly online sessions, concentrating on relaxation strategies, avoidance and reinforcement, and managing anxious child behaviour. Children complete online games and quizzes. Both groups complete 2 booster sessions after the main program. <u>Comparison:</u> wait-list control	No difference between groups on diagnostic status of child at end of intervention. However, children in intervention had improved function and reduced anxiety symptoms and internalising behaviours, compared to control.	Telephone consultation with 4th year psychology graduates (supervised by registered psychologist) halfway through program

Effects ¹	Intervention	Aus	Hard to reach	Population	Intervention and comparison	Findings	Other resources needed
	Triple P Parenting online (Sanders et al., 2012; 2014)	✓	X	Parents of young children with early-onset disruptive behaviour	<u>Intervention:</u> 8 modules of readings, activities and homework; plus video demonstrations, parent-driven review or more information, computer-assisted goal setting, probes and exercises to check mastery; downloadable worksheets, tip sheets, and podcasts. <u>Comparisons:</u> Triple P workbook (2014); internet use as usual (2012)	<p>Performed as well as the workbook version on disruptive child behaviour and dysfunctional parenting. Both interventions also led to declines on risk of child maltreatment and inter-parental conflict.</p> <p>Triple P online had no effect on overall quality of parental relationship. At 6 month follow-up, most improvements were maintained but there was significant increase in intensity of problematic child behaviours and increase in use of ineffective parenting strategies, and some decline in relationship quality.</p> <p>Compared to internet as usual, Triple P online led to reduced rate and intensity of behaviour problems, lower use of dysfunctional parenting styles, greater parenting confidence, and lower parental anger.</p> <p>Compared to internet as usual, no changes on parental adjustment (depression, stress, anxiety) or conflict over parenting. Most effects maintained at six months.</p>	
None	Logging on* (Clifford & Minnes, 2013)	X	X	Parents of children with ASD	<u>Intervention:</u> facilitated online support group, average 3 parents/session, running bi-weekly for 8 sessions <u>Comparison:</u> treatment as usual	No effect on parenting stress, depression or anxiety symptoms, or positive perceptions.	Psychologist (masters-level minimum) to facilitate meetings.

*non-randomised controlled trial

1 Any indicators of effect in the findings column always refer to statistically significant changes or differences. Non-significant differences are reported as no difference.

ASD = autism spectrum disorder; Aus = Australian study; CBT = cognitive behavioural therapy; TBI = traumatic brain injury.

4.4.1. Parenting skills

Two studies evaluating one intervention were identified in this category, for parents of children with problem behaviours.

4.4.1.1. Mixed effects

The well-established Triple P Parenting program has been offered online. **Triple P Online** (TPOL; Sanders, Baker, & Turner, 2012; Sanders, Dittman, Farruggia, & Keown, 2014) is an intensive online positive parenting program for parents of children with early-onset disruptive behaviour problems.

Compared with parents using the internet as usual, TPOL reduced the rate and intensity of child behavioural and emotional problems; it reduced dysfunctional parenting style and parental anger, while increasing parenting confidence. Compared to control TPOL did not affect parental depression, anxiety, or conflict over parenting. Most benefits were maintained at six-month follow-up.

TPOL performed equivalently to a workbook-based self-help version of Triple P. Both interventions were associated with declines in levels of disruptive child behaviour, dysfunctional parenting styles, risk of child maltreatment, and inter-parental conflict, and significant improvements in parenting confidence and parent-child relationship on both mother and father report measures. Both versions also improved parental wellbeing measures for mothers (depression, anxiety and stress) and fathers (stress only). There were no effects on overall quality of the parental relationship. Most improvements were maintained at six-month follow-up, but intensity of child disruptive behaviours and use of ineffective parenting styles worsened.

4.4.2. Summary

One online parenting program (Triple P Parenting Online) showed improvements on many though not all parenting skills outcomes, when evaluated in two RCTs. The online version of Triple P performed equivalently to a self-help (offline) workbook version of the same program.

4.4.3. Parent outcomes

Six studies evaluating five interventions were identified in this category. The populations served were parents of young children, caregivers of children with autism spectrum disorder (ASD) and adolescents with traumatic brain injury (TBI), women with depression, and mothers with who had lost a child during pregnancy.

4.4.3.1. Clear effects

Two methods of presenting online cognitive behavioural therapy (CBT) affected parent outcomes. **Mom-Net** (Sheeber et al., 2012) used weekly online sessions based on an established face-to-face approach (Coping with Depression; Lewinsohn, Clarke, Rohde, Hops, and Seeley, 1996), with the addition of individual coaching, a moderated discussion site, and initial motivational interviews. **CBT online** (Kersting et al., 2013; Kersting, Kroker, Schlicht, Baust, & Wagner, 2011) delivered CBT as a series of online writing assignments in three phases, with written feedback from a therapist twice in each phase. Both online interventions, therefore, were supplemented by phone or email support from therapists.

In both Mom-Net and CBT online, participants experienced reductions in depression- and posttraumatic stress-related outcomes compared to comparison groups, which were maintained at follow-up.

4.4.3.2. Mixed effects

A general program for educating parents of any background on empirically supported principles of parenting (such as responding, mentoring and modelling), **Adventures in Parenting** (Farris, Bert, Nicholson, Glass, & Borkowski, 2013) had some effects on parent depression scores and general psychopathology compared to a booklet-only comparison with similar content, but no effects on parent anxiety. A web-based and a group face-to-face version of the intervention were compared; both were more effective than the booklet-only comparison.

Counsellor-assisted problem solving (CAPS; Petranovich et al., 2015) is a more intensive web-based therapy than Adventures in Parenting, for caregivers of adolescents with TBI, using face-to-face and Skype meetings with a family therapist in addition to online modules for adolescents and their family caregivers. The program is highly interactive and emphasises planning and implementing family problem-solving processes. Although lower income caregivers had significantly lower distress following the intervention compared with an information-only website, this difference was considered too small to represent reliable change and was not seen in all intervention participants. There were no significant improvements for caregiver depression or self-efficacy.

4.4.3.3. No effects

Logging On (Clifford & Minnes, 2013) is an online support group for parents of children with ASD. Groups were conducted via real-time chat sessions, facilitated by a psychologist. It was evaluated using a non-randomised controlled trial (considered to be a weaker form of evidence). There were no differences between intervention and control participants on any outcomes: parenting stress, depression or anxiety symptoms, or positive perceptions.

4.4.4. Summary

Four online therapies to improve parent outcomes evaluated using a randomised controlled trial (RCT) showed at least some significant effects, one evaluated in a non-RCT showed no benefits. Some, but not all, of the interventions with clearest benefits used substantial offline resources, such as phone or email support from therapists; however, a more intense intervention did not necessarily lead to greater benefits. In one study where online and face-to-face versions of a therapy were directly compared, the online therapy performed as well as the face-to-face version.

4.4.5. Child outcomes

Three studies evaluating two interventions were identified in this category: children with anxiety disorders (versions for older and younger children), and adolescents with TBI.

4.4.5.1. Clear effects

BRAVE-ONLINE for teenagers (Spence et al., 2011) is an online version of CBT for adolescents with a mild-to-moderate anxiety disorder and their families. It is intended to replicate a clinic-based intervention, using weekly web-based sessions for adolescents and their parents with an emphasis on acquiring and practising anxiety management skills. Therapists review sessions and provide telephone consultations.

BRAVE-ONLINE was compared with the face-to-face version, and with a wait-list control group. Participants in both interventions had significant improvement on anxiety measures compared with control, and this improvement was maintained at 6- and 12-month follow-up after the intervention concluded. There was no difference between the online and face-to-face versions on outcome measures which were assessed by a therapist; however, when parents rated their child's anxiety, only the face-to-face, and not the online version, performed better than control. On the other hand, young people's own ratings of their symptoms improved over all three conditions, suggesting that any intervention, even a control condition, assisted them to feel better.

4.4.5.2. Mixed effects

The version of CAPS described above had mixed effects for caregivers. A second study evaluated **CAPS** outcomes for adolescents (Narad et al., 2015), but found only small improvements in the frequency and severity of teen–parent conflict and no differences in the quality of family problem solving or communication, relative to information-only control.

BRAVE-ONLINE (above) was adapted for younger children (Donovan & March, 2014). While there was no difference in the diagnostic status of the child at the end of the 10-week study period (compared to a wait-list control) — that is, children were not anxiety-free — they had reduced anxiety symptoms and internalising behaviours.

4.4.6. Summary

Three online therapies to improve child outcomes evaluated using an RCT demonstrated some evidence of benefit. One intervention for adolescents with anxiety performed as well as the face-to-face therapy on which it was based, with clear evidence of benefit; a version of the same online therapy for younger children performed less well, but better than a comparison group. The third online therapy for this group had marginal benefit.

4.5. Web-based learning

Web-based learning programs occupy a middle ground in terms of the personalisation and coaching provided by online therapies and that provided by interactive websites. They tend to be of similar intensity to online therapies; however, although they may also involve therapist or coach contact, this is generally a smaller component of the intervention (as in, for example, the Parenting Toolkit; Irvine, Gelatt, Hammond, & Seeley, 2015). On the other hand, the intervention may rely solely on pre-recorded audio-visual demonstrations and instruction (for example Applied Behaviour Analysis; Jang et al., 2012).

An overview of all the web-based learning interventions identified in this REA is presented in Tables 4.2.1, 4.2.2, and 4.2.3, separated by outcome categories

Narrative syntheses of each broad outcome category (parenting skills, parent behaviour, parent outcomes, and child outcomes) are provided in separate sections below.

4.5.1. Parenting skills

We identified 17 interventions in 20 studies that addressed parenting skills. Note that if the intervention was one explicitly intended to improve parenting skills, it was included in this section even if other outcomes were measured.

The populations covered by these interventions were: expectant mothers and fathers, low-income mothers, mothers with serious mental illness, younger single mothers, parents of adolescent children and older students, parents of infants and younger children, parents in stepfamilies, families of children with ASD, families of children with behavioural and conduct problems, parents of children with TBI, parents of children with asthma, and families of children with foetal alcohol syndrome (FAS).

Table 4.2.1. Web-based learning findings: parenting skills

Effects ¹	Intervention	Aus	Hard to reach	Population	Intervention and comparison	Findings	Other resources needed
Clear	Applied behaviour analysis training (Jang et al., 2012)	X	X	Families of children with ASD	<u>Intervention:</u> e-learning program to train families in principles and procedures of applied behaviour analysis (ABA) treatment. 9 modules with visual notes, vocal instruction, and video demonstrations <u>Comparison:</u> wait list	Significant increase in knowledge of ABA principles and procedures	
	The Parenting Toolkit (Irvine et al., 2015)	X	✓	Families of children with behavioural problems, at risk for harsh parenting	<u>Intervention:</u> 9 videos of parenting scenarios, delivered in two sessions. Parents choose one of three possible responses and get feedback. Q&A videos mimicking a parent-therapist counselling session <u>Comparison:</u> wait list	Parents in intervention were less likely to overreact and use harsh responses in discipline interactions, more likely to follow through on promised consequences. Parents in intervention had increased self-efficacy and intention to use positive parenting practices.	
	Increasing parent-adolescent communication about sex (Villarruel et al., 2010)	X	✓	Latino parents of adolescent children	<u>Intervention:</u> computer-based education with parent and child present. 2 sessions, a week apart, covering information about risky sexual behaviour from adolescent perspective (video clips), skills development and practice, and homework (parent only) <u>Comparison:</u> wait list	Significantly more general parent-teen communication and communication about sexual topics in intervention group. Parents' levels of comfort at discussing sexual topics significantly increased.	
	Triple P via podcast (Morowska et al., 2014)	✓	X	Parents of young children	<u>Intervention:</u> discussion, between professional presenter and parenting expert, of the principles of Triple P Positive Parenting Program, initially broadcast on radio Parents downloaded 7 episodes of 9–14 minutes covering positive reinforcement,	Compared to control, intervention parents had greater decrease in frequency and number of problematic child behaviours, and a greater improvement on some adjustment scores. Parents felt more confident about managing behaviour and had reduced dysfunctional discipline styles.	

Effects ¹	Intervention	Aus	Hard to reach	Population	Intervention and comparison	Findings	Other resources needed
					managing disobedience and aggression, and social responsibility and empathy. <u>Comparison:</u> wait list	Benefits persisted at 6-month follow-up	
Mixed	Adolescent ParentWays (Taylor et al., 2015)	X	X	Parents of adolescents with behavioural problems	<u>Intervention:</u> recorded face-to-face sessions made available as online videos, plus supporting materials <u>Comparison:</u> face-to-face version; wait list	Both versions of intervention slightly more effective than comparison, but face-to-face more effective than online. Improved parent–teen interaction and knowledge of parenting skills; decreased perception of teen difficulty. No improvements on parent–teen relationship or parent knowledge of teen’s friends and whereabouts.	
	Parent Management Training (PMIT) (Enebrink et al., 2012; Hogstrom et al., 2013)	X	X	Parents of children with conduct problems	<u>Intervention:</u> internet-based parent training using written text, videos of example interactions, illustrations, quizzes, and a monitored discussion forum <u>Comparison:</u> wait list	Parents in intervention reported less use of harsh and inconsistent discipline, more positive praise and incentives; children had reduced conduct problems. PMIT differed in its effects on child behaviour problems depending on whether children scored high or low on callous-unemotional (CU) traits. There were no differences by CU score on pro-social behaviours, peer problems, parent ratings of child emotional problems, or parenting skills	Psychologists (supervised by experienced clinical psychologist) to provide feedback to parents. Discussion forum was monitored.
	Parenting Wisely* (Cotter et al., 2013)	X	✓	Low-income rural parents of children with behavioural problems	<u>Intervention:</u> self-paced online curriculum, with 9 video modules illustrating parent–child interactions. Accompanying manual <u>Comparisons:</u> parent-only 2-day workshop; parent–adolescent 5-week group; parent-only 5-week group	For online delivery, only parenting self-efficacy improved significantly. In other conditions there were also improvements in family problem solving, roles, and involvement, and parenting sense of competence and adolescent behaviour.	
	I-InTERACT (Raj et al., 2015; Mast et al., 2014;	X	X	Parents of young children with TBI	<u>Intervention:</u> 10 web-based sessions on positive parenting skills, behaviour management, managing stress. Each	No advantage compared to control on parental depression, self-efficacy, or stress	Masters-level clinician (supervised by licensed

Effects ¹	Intervention	Aus	Hard to reach	Population	Intervention and comparison	Findings	Other resources needed
	Antonini et al., 2014)				session followed with a videoconference call with therapist to discuss web content and practise parenting skills with live coaching. <u>Comparison:</u> internet resource comparison (IRC): information-only website	Low-income parents (only) had significant reductions in distress; small subset of families where TBI was result of abuse saw some positive effects on parenting and behaviour management skills compared to control Increase in positive parenting behaviours following intervention but not control; decrease in negative parenting behaviours in both groups No differences in child compliance.	psychologist) for coaching; substantial Skype/online videoconferencing component
	Increasing parent-student communication about alcohol use (Donovan et al., 2012)	X	X	Parents of college-age children	<u>Intervention:</u> online sessions, 2 per week for 4 weeks. Text-based lessons, video lessons, audio recordings, interactive material <u>Comparison:</u> electronic newsletters, information only	Parents in the interventions were more likely to discuss protective behavioural strategies and limiting drinking. No effect on other parent-teen communication, binge drinking, or reading college alcohol and other drug policy.	
	iPAM (Increasing Parental Awareness and Monitoring) for underage alcohol use (Brown et al., 2014)	X	X	Parents of middle or high school students	<u>Intervention:</u> single web-based session. 3 brief interactive modules on underage alcohol use, parental monitoring, and modelling parent-child modelling <u>Comparison:</u> wait list	Parents in intervention group had significantly increased knowledge at 4-week follow-up. No effect on parental monitoring or attitudes to underage alcohol use Parent-teen communication improved for both intervention and control groups, no effect from intervention.	
	Infant-Net (Baggett et al., 2010)	X	✓	Low-income mothers of infants	<u>Intervention:</u> an adaptation of the Play and Learning Strategies (PALS) program. Eleven 90-minute self-directed sessions focussing on skills development via video modelling. Weekly telephone support for	Mothers' ratings of infant positive behaviour improved significantly in intervention group. No difference between intervention and control on maternal responsiveness or depression.	Masters-level facilitators for telephone support and skills review Participants in both conditions received

Effects ¹	Intervention	Aus	Hard to reach	Population	Intervention and comparison	Findings	Other resources needed
					skills acquisition and practice. Online bulletin board for peer support <u>Comparison:</u> computer and internet connection (provided by study) with links to relevant internet resources		computers and internet connections.
	Online training for behavioural regulation (Kable, 2012)	X	X	Families of children with foetal alcohol syndrome (FAS)	<u>Intervention:</u> web-based translation of workshop speaker PowerPoint slides, plus caregiver manual <u>Comparisons:</u> in-person group workshops; usual care	Web-based and face-to-face workshop participants both had significantly improved FAS knowledge and advocacy skills. Face-to-face and usual-care groups had improved child behaviour relative to the online workshop. All three groups showed gains in knowledge of behavioural learning principles.	
	Online CBT (Kaplan, 2014)	X	X	Mothers with serious mental illness	<u>Intervention:</u> 12 weekly 30-min sessions covering child development, maternal mental health, and positive parenting. Quiz and homework assignment after each session. Moderated email listserv for peer support <u>Comparison:</u> information-only website	Participants had improved parenting and coping skills following the intervention. No effect of intervention on parenting efficacy or social support.	Trained moderators (a provider and a mother with relevant lived experience) to respond to and facilitate group discussion
	Parenting Toolkit (Gelatt et al., 2010)	X	X	Parents in stepfamilies with teenage children	<u>Intervention:</u> 9 interactive multi-media modules using behaviour modelling to demonstrate effective couple, parenting, and step-parenting practices. Articles and tip sheets provided <u>Comparison:</u> wait list	Intervention participants had greater improvement in 2 of 5 parenting domains and 1 of 4 family domains, relative to control participants. No effect of intervention on any couple domains	
None	New Mothers Network	X	✓	Single, low-income, adolescent African	<u>Intervention:</u> New mothers access information on parenting infants, have asynchronous dialogue with nurses and peers, and receive email consultation	No intervention effect on maternal depression, perceived stress, loneliness, parenting confidence or satisfaction, primary social support, or overall emotional support.	Research nurses for discussion forum; advanced practice

Effects ¹	Intervention	Aus	Hard to reach	Population	Intervention and comparison	Findings	Other resources needed
	(Hudson et al., 2012)			American mothers	with a senior maternal child nurse for 6 months following birth of child <u>Comparison</u> : usual care	Control group improved significantly in self-esteem at 6-month follow-up.	nurse for email consultations All intervention participants had internet/media player installed and connected in their home.
	Triple P for Asthma (Clarke et al., 2014)	X	X	Parents of young children with asthma	<u>Intervention</u> : online version of Triple P (Positive Parenting Program), an established intervention aimed at increasing parenting self-efficacy. Group seminar series of weekly video clips, delivered online, to enhance parental knowledge, skills, and confidence. Asthma-specific tip sheets were available for study duration. <u>Comparison</u> : wait list	Only 14 eligible parents registered for study (of 668 views of recruitment page and 140 visits to consent form page). No participants completed the program, all had discontinued by week 4.	
	Support for parenting infants** (Salonen et al., 2011)	X	X	Expectant mothers and fathers	<u>Intervention</u> : Online program to support parenting, breastfeeding, and infant care. Internet resources based on high-quality government-endorsed guidelines; forum to ask anonymous questions of nurses and midwives. Access during pregnancy and until 2 weeks after birth <u>Comparison</u> : usual care	No significant differences in parenting satisfaction and parenting self-efficacy between intervention users, intervention non-users, and control groups	Registered nurses and midwives to answer questions and provide advice online

*non randomised controlled trial

**quasi-experimental design with non-equivalent control

1 Any indicators of effect in the findings column always refer to statistically significant changes or differences. Non-significant differences are reported as no difference.

ASD = autism spectrum disorder; Aus = Australian study; CBT = cognitive behavioural therapy; TBI = traumatic brain injury.

4.5.1.1. Clear effects

Applied behaviour analysis (ABA) is an often-used therapeutic approach. Jang et al. (2012) used an **e-learning version of applied behaviour analysis** to deliver training to families of children with ASD, resulting in increased knowledge of ABA principles and procedures compared to usual care. The program delivered the training entirely online via notes, vocal instructions and video demonstrations.

The Parenting Toolkit (Irvine et al., 2015) used similar materials to teach parenting skills, but added in automated feedback for parents based on their responses, and Q&A videos intended to mimic a parent–therapist counselling session. Parents of children with behavioural problems, who were at risk of harsh parenting, were able to decrease negative parenting, increase positive parenting, and had increased self-efficacy and intention to use positive parenting practices compared with parents in a waitlist control group.

An unnamed **online education program** increased parent–teen communication, both generally and specifically about sexual topics, and also increased parents’ comfort level at having those conversations (Villarruel, Loveland-Cherry, & Ronis, 2010), compared with wait-list control. It also used video clips covering the material from an adolescent perspective, skills development, and added in homework for parents.

In contrast, an intervention with only minimal parent involvement and tailoring of material — downloadable **podcasts of discussions about Triple P** — was also effective at changing parent perceptions of problematic child behaviour and their own discipline styles and confidence, compared to wait-list control (Morawska, Tometzki, & Sanders, 2014).

4.5.1.2. Mixed effects

Adolescent ParentWays (Taylor et al., 2015) compared an online and a face-to-face version of a program for parents of adolescents with behavioural problems. The online participants viewed pre-recorded face-to-face sessions and read supporting materials. Although this version was neither tailored to individual parents nor responsive to them, it did have some effect on parent–teen interactions and parenting skills. Both versions performed better than no intervention, but the face-to-face version was more effective than the online version.

Similarly, **online training for behavioural regulation** (Kable, Coles, Strickland, & Taddeo, 2012) simply posted material from a workshop’s slides and manual online. This method was just as effective at improving parental knowledge as attending workshops in person, but not as useful for improving child behaviour.

The **Parenting Wisely** evaluation (Cotter, Bacallao, Smokowski, & Robertson, 2013) also compared an online version with face-to-face parent and parent–adolescent short workshops and longer group courses. However, in this case, the online version did not perform as well as the ‘live’ versions although the findings should be viewed with caution as a lower quality non-randomised design was used.

Internet-based Parent Management Training (PMIT; Enebrink, Hogstrom, Forster, & Ghaderi, 2012; Hogstrom, Enebrink, & Ghaderi, 2013) is an online version of an established program. It used written text, videos, quizzes, and a monitored discussion forum, and also provided therapist feedback to parents. Compared with a wait-list control, internet-based PMIT led to improvements in parental discipline practices and some reduction in child conduct problems, but had no effect on many other child and parent outcomes.

Another intervention with substantial therapist involvement, **I-InTERACT** (Antonini et al., 2014; Mast et al., 2014; Raj et al., 2015), combined web-based sessions with immediate discussion and skills practice with a coach via Skype. However, although the intervention participants improved on some

measures related to parenting their child with TBI, this was mainly for lower income parents and for families where the child's TBI was the result of abuse. Participants in the information-only website comparison condition also improved on some measures, and on others there was no difference between the intervention and comparison.

Infant-Net (Baggett et al., 2010) also provided therapist support via coaching telephone calls in its adaptation of the Play and Learning Strategies (PALS) program. As with many other web-learning programs, it used video modelling for skills development, which was then followed up with telephone support. Compared with an information-only condition, the interactive and therapist-supported version led to improvement on only some outcomes.

A version of **online CBT** (Kaplan, Solomon, Salzer, & Brusilovskiy, 2014) for mothers with serious mental illness used both professional providers and mothers with relevant lived experience of parenting with a mental illness to supplement online materials. Compared with participants accessing an information-only website, participants in this intervention did see improved parenting and coping skills, but did not experience increased self-efficacy or social support.

An **online intervention to increase parent–student communication about alcohol use** (Donovan, Wood, Frayjo, Black, & Surette, 2012) used text articles, video lessons, audio recordings of discussions, and interactive tools. Teens of parents who received the intervention were more likely to report that they had used protective behavioural strategies at six months follow-up compared to control group teens. There was no effect on other parent–teen communication, binge drinking or reading the college alcohol and other drug policy. However, the online intervention was compared here to informational newsletters rather than a wait-list control. As both groups were receiving information in some mode, this might have affected the outcomes observed.

Another intervention addressing underage alcohol use, **iPAM** (Increasing Parental Awareness and Monitoring; Brown, Dunn, & Budney, 2014), improved parent knowledge relative to wait-list control participants but had no effect on parent attitudes towards or monitoring of teen alcohol use.

Parenting Toolkit (Gelatt, Adler-Baeder, & Seeley, 2010) is a self-administered program using interactive behaviour-modelling videos to demonstrate effective parenting practices for parents and step-parents in stepfamilies. Compared with a wait-list control, participants improved on two of five parenting outcomes (over-reactive parenting practice and intentions) and one of four family outcomes (unrealistic expectations of family adjustment). There were no effects on couple outcomes.

4.5.1.3. No effects

A website allowing single, adolescent, low-income African American new mothers to access parenting information, a nurse-moderated forum, and email consultations with maternal child nurses (**New Mothers Network**; Hudson, Campbell-Grossman, & Hertzog, 2012) did not result in any improvements in mothers' wellbeing and support outcomes compared to usual care.

An **online program to support parenting and breastfeeding** (Salonen et al., 2011) which provided mothers with access to registered nurses and midwives as well as high-quality information, did not improve outcomes compared with usual care (in a study with a non-random, non-equivalent control).

It was not possible to assess the effectiveness of an **interactive online version of Triple P for parents of children with asthma** (Clarke, Calam, Morawska, & Sanders, 2014), as only a few eligible parents enrolled and all had discontinued by week 4 of the program.

4.5.2. Summary

17 web-based learning programs to improve parenting skills were evaluated in 19 RCT studies and one non-RCT study. Four programs showed clear evidence of benefit; evidence for a further ten was more mixed but still broadly positive. For three programs, there was either no evidence of benefit, or the evaluation was discontinued prior to program completion.

Contrary to what might be expected, the interventions with clear effects (that is, the interventions that led to improvement on all outcomes) were not those with the most support from real-time therapist or coach involvement. None of the four interventions which were effective for all reported outcomes (ABA online, Parenting toolkit, an intervention to increase parent–adolescent communication about sex, and Triple P via Podcast) required resources other than those provided online. Conversely, interventions with mixed effects (improvements for some outcomes, no improvement for others) had a range of materials, responsiveness to parents, and use of offline resources.

4.5.3. Parent behaviour

Five interventions evaluated in five studies addressed web-based learning for parent behaviour outcomes. They covered parents of infants and young children, breastfeeding mothers in remote areas, parents of young children at risk of obesity, and parents who smoke tobacco. Findings are presented in table 4.2.2.

Table 4.2.2. Web-based learning findings: parent behaviour

Effects ¹	Intervention	Aus	Hard to reach	Population	Intervention and comparison	Findings	Other resources needed
Clear	Internet intervention to increase exclusive breastfeeding (Giglia et al., 2015)	✓	✓	Breastfeeding mothers in remote areas	<u>Intervention</u> : website presenting evidence-based breastfeeding information; discussion forums, email contact with other participants; online and webcam consultations with lactation consultant <u>Comparison</u> : wait list	Mothers in intervention were more likely to exclusively breastfeed at 6 months; more likely to have accessed any website for information if they had a breastfeeding problem. No difference in information-seeking at 12 months	Lactation consultant for online/webcam discussion
	Paediatric basic life support skills (Krogh et al., 2015)	X	X	Parents of infants	<u>Intervention</u> : 17-minute online video demonstrating basic life support (CPR) skills, including self-assessment quiz; encouragement to practice with mannequin <u>Comparison</u> : 2-hour instructor-led version of the same course	Intervention and comparison groups had equivalent pass rates and levels of self-confidence and comfort with CPR (i.e. the online video worked as well as the longer, in-person course).	Mannequin for practice of CPR skills
Mixed	EMPOWER (Knowlden et al., 2015)	X	X	Parents of young children at risk of obesity	<u>Intervention</u> : 5 weekly sessions plus 1 booster session, with audio-visual presentations, interactive worksheets, and discussion boards. Focus was to maximise engagement and behaviour change. <u>Comparison</u> : equal number of sessions, equivalent interactive activities, knowledge-only focus	Child physical activity, sugar-free beverage consumption, and screen time outcomes all improved significantly in both conditions Small but significant advantage to intervention for fruit and vegetable consumption	
	Internet education for fruit and vegetable intake* (Bensley et al., 2011)	X	X	Clients of the Nutrition Program for Women, Infants, and Children (WIC).	<u>Intervention</u> : interactive website modules on nutrition with feedback, based on the existing WIC website materials. Participants could choose lessons tailored to interest and need. Optional follow-up nutritional	At initial follow-up, website group showed increased positive behaviours compared to traditional group nutrition classes, without counselling.	Staff able to deliver nutrition-focused motivational interviewing

Effects ¹	Intervention	Aus	Hard to reach	Population	Intervention and comparison	Findings	Other resources needed
					counselling from WIC staff. Delivered in two 9-month phases. <u>Comparisons:</u> group nutrition classes at WIC clinic with or without counselling; self-guided nutrition information via bulletin board with or without counselling.	Website participants who opted for counselling had better nutrition practice at initial follow-up than those who did not have counselling. Adding counselling to the traditional class group brought their performance up to that of the website group without counselling. No differences between all three groups at the end of the 2nd 9-month phase.	
	Web-based smoking cessation (Gillaspy et al., 2013)	X	X	Parents who smoke tobacco	<u>Intervention:</u> 30-minute interactive web-based program, assessing current smoking behaviour and developing personalised feedback to encourage reducing or ceasing smoking <u>Comparison:</u> usual care	At 1-month follow-up, intervention participants who were already contemplating change had higher readiness to change than did participants receiving usual care. No effect on contemplation of change in those with low pre-existing readiness to change.	
None	ND	ND	ND	ND	ND	ND	ND

*non-randomised controlled trial

1 Any indicators of effect in the findings column always refer to statistically significant changes or differences. Non-significant differences are reported as no difference.
Aus = Australian study; ND = No data.

4.5.3.1. Clear effects

An **internet intervention to increase exclusive breastfeeding** (Giglia, Cox, Zhao, & Binns, 2015) website combined evidence-based breastfeeding information with discussion forums and email contact with other participants, and offered consultations with lactation consultants via online discussion and webcam. It improved breastfeeding outcomes for women in remote areas, compared to wait-list control.

A **brief online video demonstrating basic life support skills for infants** (cardiopulmonary resuscitation, CPR; Krogh et al., 2015), which was intended to cover the same material as a much longer instructor-led workshop and provided materials to allow skills practice, was just as effective as the workshop at increasing knowledge, confidence and skills.

4.5.3.2. Mixed effects

Online audio-visual presentations with interactive worksheets and discussion boards (**EMPOWER**; Knowlden, Sharma, Cottrell, Wilson, & Johnson, 2015), which targeted parent engagement and behaviour change strategies, were sufficient to improve fruit and vegetable consumption in families with young children at risk of obesity. However, for child physical activity and other behavioural outcomes, the control non-interactive sessions, which targeted knowledge only, were just as effective.

In an **internet education program for fruit and vegetable intake** (Bensley, Anderson, Bruski, Mercer, & Rivas, 2011) adding a counselling component to either an interactive web program, group face-to-face nutrition classes, or self-guided nutrition information improved nutrition outcomes. However, if counselling was not provided in any of the conditions, there was a slight advantage to the interactive program over group nutrition classes. This evaluation was a non-randomised trial where participants could choose their delivery mode, so these results should be viewed with caution.

Finally, an **interactive online smoking cessation program** (Gillaspy et al., 2013) increased the readiness to change of parents who smoke relative to those receiving usual care, but only in participants who were already contemplating change.

4.5.4. Summary

Five web-based learning programs addressing parent behaviour were evaluated in four RCT and one non-RCT studies. All included interactive components, although for the infant CPR intervention the online program was non-interactive and followed by hands-on skills practice. It should be noted that participants could choose delivery mode in the nutrition counselling evaluation, which may have affected results; and the smoking cessation program increased only parents' readiness to change, and only in parents who were already contemplating change.

4.5.5. Parent outcomes

Three studies evaluating three interventions targeting parent outcomes were identified. They addressed mothers with depression and parents of children with cancer.

Table 4.2.3. Web-based learning findings: parent outcomes

Effects ¹	Intervention	Aus	Hard to reach	Population	Intervention and comparison	Findings	Other resources needed
Clear	Online self-help to improve mood (Ayers et al., 2015)	X	X	Mothers with depression	<u>Intervention</u> : brief online CBT program designed to challenge negative self-beliefs and encourage positive self-beliefs <u>Comparison</u> : group exercise encouraging improvement in time-management skills	Intervention group had increased positive mood at the end of the intervention, compared with control.	
Mixed	Internet guided self-help (Cernvall et al., 2015)	X	X	Parents of children with cancer	<u>Intervention</u> : 10-week online guided self-help. Text and visual material; emphasis on teaching CBT principles and strategies. Therapist provided written feedback on homework assignments via email. <u>Comparison</u> : wait list	Reduction in posttraumatic stress and depression symptoms compared with control No difference in anxiety levels at the end of the intervention, but intervention group was higher than control at baseline.	Therapist to provide email feedback
	Support for parenting infants** (Salonen et al, 2014)	X	X	Expectant mothers and fathers	<u>Intervention</u> : online program to support parenting, breastfeeding and infant care. Internet resources based on high-quality government-endorsed guidelines; forum to ask anonymous questions of nurses and midwives. Access during pregnancy and until 2 weeks after birth. <u>Comparison</u> : usual care	Infant centrality to mother's thoughts and actions improved at 6 weeks post discharge but at no other time points. No differences in parenting satisfaction or depressive symptoms	Registered nurses and midwives to answer questions and provide advice online
None	ND	ND	ND	ND	ND	ND	ND

**quasi-experimental design with non-equivalent control

1 Any indicators of effect in the findings column always refer to statistically significant changes or differences. Non-significant differences are reported as no difference.
Aus = Australian study; CBT = cognitive behavioural therapy; ND = no data.

4.5.5.1. Clear effects

An evaluation of an **online self-help program to improve mood** (Ayers, Fitzgerald, & Thompson, 2015) in mothers with depression found that brief online CBT designed to challenge negative self-beliefs and encourage positive self-beliefs led to greater improvements in positive mood than a group time-management exercise. That is, the CBT material presented online was more effective than other material presented in a group setting.

4.5.5.2. Mixed effects

Guided online self-help for parents of children with cancer (Cernvall, Carlbring, Ljungman, Ljungman, & von Essen, 2015), supplemented with email feedback from a therapist, reduced posttraumatic stress and depression symptoms; however, relative to wait-list control, it had no effect on parental anxiety symptoms. The **support for parenting infants** (Salonen, Pridham, Brown, & Kaunonen, 2014) intervention had short-term effects on infant centrality to mother's thoughts and actions, but no effects on parenting satisfaction or symptoms of depression.

4.5.6. Summary

Three web-based learning programs aimed at parent outcomes were evaluated in two RCTs and one non-RCT. There was a clear indication that a brief web-based CBT learning program was more effective than other material presented in a group setting. Support for other programs was less clear.

4.6. Interactive websites

Interactive websites present information in such a way that users must interact with the site, for example watch videos and animations, complete quizzes, or play games, in order to obtain information. The interactive elements are assumed to assist user engagement with the material, increasing time spent on the site and the amount of information that is understood and retained.

The demarcation between web-based learning and interactive websites is not always clear, as web-based learning programs generally use interactive websites as one component. Possible distinguishing features are:

- Extended duration: web-based learning programs often have multiple sessions to be completed in a set order, while interactive websites can be accessed in a single session even if in practice users return to them on several occasions; and
- Extra components: web-based learning programs use a website and discussion boards, tip sheets, and counselling or behavioural coaching; interactive websites by definition consist of websites only, which may, however, have some elements of automated coaching.
- It may be that the decision to implement an interactive website rather than a full web-based learning program is determined by the resources available.

An overview of the interactive websites identified in this REA is presented in Table 4.3.

Table 4.3. Interactive website findings

Effects ¹	Intervention	Aus	Hard to reach	Population	Intervention and comparison	Findings	Other resources needed
Clear	Customised Sleep Profile (Mindell et al., 2011a & 2011b).	X	X	Mothers of children with sleep difficulties	<u>Intervention</u> : completion of online sleep profile which generates customised child sleep advice; enhanced version also has a prescribed bedtime routine <u>Comparison</u> : usual care	Both interventions improved on sleep latency, difficulty falling asleep, number and duration of night wakings, longest continuous sleep period, and maternal confidence at managing sleep, compared to control. Intervention plus routine group had more total sleep time.	
	Postnatal iBA (O'Mahen et al., 2013)	X	X	Mothers of infants with depressive symptoms	<u>Intervention</u> : online multimedia sessions, completed at own pace, developed from Behavioural Activation manual. Homework between sessions. Links to Netmums, an online parenting resource site. <u>Comparison</u> : usual care (with access to Netmums' general depression chat room.	More women in intervention group were non-depressed at end of intervention; more women had reliable and clinically significant improvement in symptoms.	Email reminders, moderated chat room; online clinics for questions about material
	NetmumsHWD (O'Mahen et al., 2014)	X	X	Mothers with major depressive disorder	<u>Intervention</u> : modified version of iBA (O'Mahen et al, 2013). Core and optional Behavioural Activation modules, online chat room. Used Netmum's 'meet a mum' feature to provide social support. <u>Comparison</u> : usual care (with access to the general Netmums) site.	Women in intervention had reductions in depression symptoms, anxiety, and work and social impairment.	Weekly phone support from mental health workers. Active follow-up of women missing sessions.
	MyPyramid menu planner (Colleran et al., 2012)	X	X	Overweight lactating mothers	<u>Intervention</u> : mothers enter food intake and exercise into website, receive text and graphical feedback to support counselling <u>Comparison</u> : informational handouts; specifically instructed not to participate in structured exercise or decrease energy intake	Mothers in intervention had reduced fat, sugar, grain, and milk intake; increased whole fruit servings; reduced energy intake, and reduced weight at the end of the intervention.	Face-to-face counselling in the home

Effects ¹	Intervention	Aus	Hard to reach	Population	Intervention and comparison	Findings	Other resources needed
	Teen Driving Plan (Mirman et al., 2014a; Mirman et al., 2014b)	X	X	Parents of teenagers with a learner-driver permit	<u>Intervention</u> : video examples of driving environments; guides to structuring practice drives and creating a positive learning environment; interactive planning and logging tools <u>Comparison</u> : use of state's driver manual	At end of intervention, participants reported more practice in all but one environment, which was associated with lower driving test failure rate. Teens had higher perception of support and parents were more engaged with practice.	Reminder phone calls if minimum logins not made
	Brief web-based intervention for atopic dermatitis (Son & Lim 2014)	X	X	Mothers of young children with atopic dermatitis (AD)	<u>Intervention</u> : 2 interactive sessions with online assessment of learning after each. Information about AD and treatment, then applying this information at home <u>Comparison</u> : wait list	Mothers completing the intervention reported less severe AD in their child, while mothers receiving usual care reported more severe AD over the same period. Child quality of life and mother's self-efficacy improved following the intervention compared to the control group	
	America on the Move (Catenacci et al., 2014)	X	X	Parents of children at risk for obesity	<u>Intervention</u> : web-based adaptation of the AOM workbook, including activities, games, and recipes. <u>Comparison</u> : workbook based version of AOM	No difference between groups on sedentary behaviour (i.e. web-based version performed as well as the established workbook format). Attrition rates were lower in the in online version.	
	Web Active Balance Childhood (Chen et al., 2011)	X	X	Parents of children at risk for obesity	<u>Intervention</u> : online psycho-education for parents and children promoting healthy lifestyles. Content individually tailored, included graphics, text, comics, and voice over; adolescents could enter their progress which was converted to graphics. Parent site included exercises, discussion, and tips. <u>Comparison</u> : website with general, non-tailored information	6 months following intervention, intervention group performed better on hip-to-waist ratio, blood pressure, fruit and vegetable intake, level of physical activity, and knowledge.	Pedometer for children

Effects ¹	Intervention	Aus	Hard to reach	Population	Intervention and comparison	Findings	Other resources needed
Mixed	Automated online coaching for tooth brushing (Hurling et al., 2013)	X	X	Parents of young children	<u>Intervention</u> : website has cartoons, guide for parents, personalised plan of actions and rewards, review of progress. <u>Comparison</u> : usual care	Comparison had decrease in total brushing time; intervention did not increase. More individual children in intervention had positive change from baseline even though there was no increase in total time spent brushing for the whole group.	
	DECIDA (Shourie et al., 2013)	X	X	First-time parents	<u>Intervention</u> : website with informational links, decision guide, and options for further actions <u>Comparison</u> : leaflet plus usual care; usual care.	Decisional conflict was reduced more in the intervention group. Vaccination uptake was high in all groups and there was no difference between groups.	
	EHealth4Uth (van Beelen et al., 2014)	X	X	Parents of infants	<u>Intervention</u> : parents complete safety assessment online, which generates tailored safety advice which parents use to create action plan. Parents also receive email reminder <u>Comparison</u> : usual care (includes information leaflet)	Parents in intervention had reduced unsafe behaviour relating to child falls, poisoning, drowning and some behaviours relating to burns; no differences bathing or child presence in kitchen.	
	Web-based health promotion (Schwinn et al., 2014)	X	✓	Mothers living in public housing	<u>Intervention</u> : sessions on communication; drugs and health issues; coping and problem-solving. Mothers and daughters completed together. <u>Comparison</u> : usual care	Intervention participants scored higher on closeness, communication, parental monitoring, and fruit and vegetable consumption at end of intervention and 5 months later. Girls in intervention had increased physical activity, but this was not maintained at follow-up. Perceived stress was lower at follow-up but not immediately after intervention.	

Effects ¹	Intervention	Aus	Hard to reach	Population	Intervention and comparison	Findings	Other resources needed
						No difference in past-month substance use.	
	Internet family-based intervention (Fang & Schinke, 2013)	X	X	Mothers	<u>Intervention</u> : 9 sessions, each including interactive modules. Developmentally tailored audio, animation, graphics and activities; skills demonstrations, guided rehearsal, and immediate feedback. Mothers and daughters completed together. <u>Comparison</u> : usual care	At 2-year follow-up, intervention participants scored higher on closeness, communication, maternal monitoring, family rules about substance use, self-efficacy, and refusal skills. Daughters had significantly lower intention to use drugs, and significantly fewer instances of using drugs (other than cigarette use). No difference in daughters' depressive symptoms or body esteem.	
	Bounce Back Now (Ruggiero et al., 2015)	X	X	Parents and adolescents who had experienced disaster	<u>Intervention</u> : Bounce Back Now (BBN) versus BBN plus adult self help (ASH). BBN: children completed as many multimedia modules as they chose on PTSD and depression symptoms, substance use, etc. BBN+ASH: as for BBN, and 7 modules for parents addressing their own mental health. <u>Comparison</u> : web symptom assessment only	Adolescents in the experimental group had fewer PTSD symptoms at 12-months follow-up; the BBN group did better than BBN+ASH. BBN and BBN+ASH performed equally well on depression symptoms. There were no intervention effects for alcohol use, binge drinking, or cigarette use.	
	WebTIPS (Fortier et al., 2015)	X	X	Parents of children undergoing outpatient surgery	<u>Intervention</u> : uses education, skills training and interactive games to prepare children for surgery and teach them coping skills to manage anxiety and pain before and after. Linked multimedia site provides parents with information, skills training, and modelling techniques; tailored to parents' baseline anxiety,	Children in intervention experienced lower anxiety at the separation from their parents and the entrance to the operating room. There was no difference in anxiety at the introduction of the anaesthesia mask.	

Effects ¹	Intervention	Aus	Hard to reach	Population	Intervention and comparison	Findings	Other resources needed
					<p>coping style, pain management attitudes, and preferences for sedative use.</p> <p><u>Comparison</u>: usual perioperative care</p>	<p>Parents had a similar pattern of reduced anxiety.</p> <p>Children had lower emergence delirium as they regained consciousness.</p> <p>There were no differences in nurse-rated pain severity or analgesic use immediately after surgery.</p>	
	<p>Comprehensive Health Enhancement Support System plus Case Management (CHESS+CM)</p> <p>(Gustafson et al., 2012)</p>	X	X	Parents of children with asthma or wheezing	<p><u>Intervention</u>: CHESS online modules provide information, adherence strategies, and support via interactive website (same material presented as online games and audio-visual material for children). Case management from asthma coach</p> <p><u>Comparison</u>: usual care plus asthma information</p>	<p>Asthma control improved for the intervention but not the control group. Parental social support also improved and this in turn was a significant predictor of improved control.</p> <p>No difference between groups on symptom-free days or self-efficacy. A very small improvement in information competence</p>	Monthly phone calls from nurse case manager
	<p>Web-based early intervention following injury</p> <p>(Cox et al., 2010)</p>	X	X	Parents of children following unintentional injury	<p><u>Intervention</u>: child interactive website including CBT and resilience activities, accompanied by a parent booklet.</p> <p><u>Comparison</u>: wait list</p>	<p>6 months post-intervention children in the intervention group had reduced anxiety in comparison to the children in the control group.</p> <p>No effect on posttraumatic stress in parents</p>	
None	<p>Supporting Parents and Carers of Children with Eczema (SPaCE)</p> <p>(Santer et al., 2011)</p>	X	X	Parents of children with eczema	<p><u>Intervention</u>: core and optional modules about eczema care, including videos, tick charts, action plans for GP consultation, summaries for relatives and schools, activities; SPaCE plus additional meeting with healthcare professional to orient to program</p>	No effect of either version of intervention on symptoms or quality of life	

Effects ¹	Intervention	Aus	Hard to reach	Population	Intervention and comparison	Findings	Other resources needed
	<u>Comparison:</u> usual care						
	AfterTheInjury (Marsac et al., 2013)	X	X	Parents of children with recent injury	<u>Intervention:</u> videos, rating scales, tailored tips and printable care plan <u>Comparison:</u> usual care	No effect on parent knowledge of child reactions at discharge or at 6-week follow-up	Reminder emails; research assistants guide parents through standard activities before child is discharged.
	MumsQuit (Herbec et al., 2014)	X	X	Pregnant women who smoke	<u>Intervention:</u> interactive, personalised, and structured quit plan; offers evidence-based behaviour change techniques. Email reminders when new sessions released. Based on an existing smoking cessation site, adapted for pregnancy. Used an advisor avatar. <u>Comparison:</u> static informational website	No effect on self-reported 4-week continuous abstinence	
	Teens taking charge (Stinson et al., 2010)	X	X	Parents of adolescents with juvenile arthritis	<u>Intervention:</u> adolescents had access to 12 weekly online modules: managing illness, stress, lifestyle issues etc. Parents monitored, and completed 2 modules aimed at helping their child to manage their illness. <u>Comparison:</u> attentional control: weekly phone contact from trained research assistant	No effect on health related quality of life or parent treatment adherence	Weekly scripted phone consultations with trained health coach (for adolescents)
No/negative effects	Online journal writing for reducing maternal stress (Whitney & Smith, 2015)	X	X	Mothers of children with socially disruptive behaviour	<u>Intervention:</u> participants followed a structured online writing program, completing 8 writing sessions <u>Comparison:</u> usual care	No difference in maternal stress levels after controlling for initial stress	

¹ Any indicators of effect in the findings column always refer to statistically significant changes or differences. Non-significant differences are reported as no difference. Aus = Australian study; PTSD = posttraumatic stress disorder.

4.6.1. Parent behaviour

We identified six studies of five interventions targeting parent behaviour. They targeted parents of infants and young children, families with poor oral health, parents of children with sleep difficulties or at risk of incomplete immunisation, and parents of premature infants.

4.6.1.1. Clear effects

The **Customised Sleep Profile** (Mindell et al., 2011a; Mindell et al., 2011b) allowed mothers to complete an online sleep profile, which then generated customised advice for parents about child sleep. An enhanced version of the program added a prescribed bedtime routine, but both versions improved most child sleep outcomes compared to usual care.

4.6.1.2. Mixed effects

An **automated online coaching website** (Hurling et al., 2013) with animations, parent guide, and a personalised action plan had limited effects on child tooth brushing. Total tooth brushing time did not increase in the intervention group, but more families in the intervention than in the usual-care comparison group showed some increase in brushing, compared to baseline.

In a study of the **DECIDA decision aid for MMR vaccination** (Shourie et al., 2013) — combining informational links, a decision guide and options for future action — vaccination uptake was found to be high in participants in both the intervention and comparison groups, with no significant difference between groups. However, there was a greater reduction in decisional conflict in the intervention group than in the comparison group.

An interactive website, **EHealth4Uth home safety** (van Beelen, Beirens, den Hertog, van Beeck, & Raat, 2014), similarly combined information with assessment and the generation of tailored advice, which parents could use to create an action plan. Six months after the intervention, parents had reduced unsafe behaviour relating to most but not all of the areas assessed, compared with parents receiving usual care.

4.6.1.3. No effects

Supporting Parents and Carers of Children with Eczema (SPaCE; Santer et al., 2014) also combined interactive components and action plans, and an enhanced version of the program used an initial consultation with a health professional to orient parents to the site. However, neither version of the intervention affected symptoms or quality of life compared with a group receiving usual care.

4.6.2. Summary

Five interactive website interventions for improving parent behaviour were evaluated in six RCT studies. All four of the interventions that had some evidence of beneficial parent behaviour outcomes had some capacity for personalisation by the user; however, the intervention for which no benefit was seen had similar capacity.

4.6.3. Parent outcomes

Six studies of six interventions addressed outcomes for parents. The populations covered by interactive website interventions were pregnant women who smoke, mothers with depression, mothers at risk of obesity, parents of children who had experienced injury, and parents of children with behavioural problems.

4.6.3.1. Clear effects

Two interactive website interventions for mothers with depression, **Postnatal iBA** (O'Mahen et al., 2013) and **Netmums Helping With Depression** (HWD); O'Mahen et al., (2014)), had clear positive

effect. They were both based on an existing version of cognitive behavioural therapy and made use of an existing parenting resource site, Netmums.

Postnatal iBA used multimedia sessions, with homework and links to Netmums' resources and moderated chatroom. Participants could also access an online clinic to ask questions about the material. At the end of the intervention, more women were classified as non-depressed or had reliable and clinically significant improvement in symptoms, compared with women accessing Netmums' general depression chatroom.

Netmums' HWD was a modified version of iBA, adding use of Netmums' social support mechanism and weekly phone support from mental-health workers. Compared with usual care plus access to Netmums, women in Netmums HWD had reduced depression symptoms, anxiety, and work and social impairment.

MyPyramid menu planner (Colleran & Lovelady, 2012) was a website where new mothers could enter food intake and exercise details, then receive text and graphical feedback to support face-to-face counselling. Compared with information-only handouts, mothers in the intervention group had reduced fat, sugar, grain and milk intake, increased whole fruit intake, reduced energy intake, and reduced weight by the end of the intervention. One caution with this study is that participants in the control group were specifically instructed not to participate in structured exercise or to decrease their energy intake, so this may not be a reliable finding.

4.6.3.2. No effects

Two interventions that also used audio-visual material and supported personalised action plans, **AfterTheInjury** (Marsac et al., 2013) and **MumsQuit** (Herbec, Brown, Tombor, Michie, & West, 2014) failed to lead to either improved parent knowledge of child reaction to injury or continuous smoking abstinence, respectively, when compared with usual care or a static informational website.

An **online journal writing program** (Whitney & Smith, 2015) performed no better than wait-list control at reducing stress and improving mother-child stress in mothers of children with socially disruptive behaviours. Mothers in the intervention reported higher stress post-intervention, but this difference disappeared once initial stress levels were controlled for.

4.6.4. Summary

Six interactive websites for improving parent outcomes were evaluated in six RCTs. Three show clear evidence of benefit, although instructions to control participants in the MyPyramid evaluation may have inflated apparent differences in group performance. Both promising and less promising interventions used audio-visual material and supported some degree of personalisation.

4.6.5. Child outcomes

We identified 11 interventions (evaluated in 12 studies) addressing child outcomes. They targeted children about to undergo surgery, children with atopic dermatitis or asthma, children at risk for obesity, children who had experienced unintentional injury, adolescents in general, adolescents with serious health conditions, and adolescents who had experienced disaster.

4.6.5.1. Clear effects

The **Teen Driving Plan (TDP)** (Mirman et al., 2014a; Mirman et al., 2014b) used video examples and interactive planning and logging tools to increase parent involvement in their children's driving practice. After 24 weeks, teens and parents enrolled in TDP (compared with those using only the relevant state driving manual) reported more practice in each of the driving environments assessed (other than highway practice), which led to fewer teens failing their driver's license test for unsafe driving. Use of TDA also led to teens having a higher perception of support from their parents, and greater engagement of parents with practice.

An online version of **America on the Move** (AOM; Catenacci et al., 2014) was compared with the established, workbook version of AOM. The interactive online version included activities, games, and recipes, and performed as well as the original format at reducing sedentary behaviour, with lower attrition rates. Another interactive website intervention aimed at child physical activity and healthy lifestyle, **Web Active Balance Childhood** (Chen, Weiss, Heyman, Cooper, & Lustig, 2011), allowed children to enter their progress and have it converted to graphics. A linked parent site included exercises, discussion, and tips. It performed better than a general information website on outcomes such as child hip-to-waist ratio, blood pressure, fruit and vegetable intake, level of physical activity, and knowledge.

A **brief web-based intervention for atopic dermatitis** (Son & Lim, 2014), where mothers completed two short interactive sessions followed by online assessment of learning, led to mothers reporting less severe AD in their children compared to mothers receiving usual care. Mothers' self-efficacy and child quality of life also improved.

4.6.5.2. Mixed effects

Mothers and daughters living in public housing participated in **web-based health promotion** (Schwinn, Schinke, Fang, & Kandasamy, 2014), with sessions on communication, drugs and health issues, and coping and problem solving. At the end of the intervention and five months later, participants had improved on some outcomes (including closeness and communication) but not others (physical activity increased briefly but was not maintained, stress was lower at follow-up but not immediately). Importantly, there was no difference between intervention and the usual-care control on past-month substance use.

A similar intervention, also completed together by mothers and daughters, was the **internet family-based intervention** (Fang & Schinke, 2013). Two years after the intervention, participants scored higher than usual-care control participants on closeness, communication, maternal monitoring, family rules about substance use, self-efficacy, and refusal skills. Daughters had significantly lower intention to use drugs compared with control participants, and significantly fewer instances of using drugs (other than cigarette use). There was no difference in daughters' depressive symptoms or body esteem.

Bounce Back Now (BBN; Ruggiero et al., 2015) was intended to reduce PTSD symptoms in adolescents who had experienced a disaster. BBN alone (for adolescents only) was compared with BBN plus adult self-help (ASH) and usual care. BBN and BBN+ASH performed equally well on depression symptoms; both groups improved compared with usual care on PTSD symptoms; however, the BBN alone (no parent component) group did better. There were no intervention effects for alcohol use, binge drinking or cigarette use.

A very specific intervention, **WebTIPS** (Fortier et al., 2015), prepared parents and young children for child surgery. Linked parent and child websites provided information, skills training, anxiety management strategies, and modelling techniques. Compared with usual perioperative care, children and parents completing WebTIPS experienced lower anxiety in the lead-up to surgery. There was no difference in anxiety at the point of introducing the anaesthesia mask.

Comprehensive Health Enhancement Support System plus case management (CHESS+CM; Gustafson et al., 2012) added case manager phone calls and emails to interactive child and parent websites on asthma management. There was only minimal improvement on parents' information competence relative to the usual care plus asthma information control group, and no difference on symptom-free days or parent self-efficacy (both groups improved); however, asthma control and parent social support both improved in the intervention group compared to control.

Finally, a very small-scale **web-based early intervention** (Cox, Kenardy, & Hendrikz, 2010) in which parents had access to a child-focused website and additional offline information, reduced anxiety in

children after unintentional injury, compared to usual care, but had no effect on parents' posttraumatic stress.

4.6.5.3. No effects

In **Teens Taking Charge** (Stinson et al., 2010) parents accessed their teen's arthritis management interactive site, and completed modules of their own which supported them to encourage healthy behaviour in their child. Compared to an attentional control (where participants received regular phone calls to discuss their self-management, but received no input from the research assistant making the calls) this intervention had no effect on health-related quality of life or treatment adherence.

4.6.6. Summary

Eleven interactive websites intended to address child outcomes were evaluated in 12 RCTs. Four interventions of varying degrees of complexity (including one short, but still interactive, program) showed clear evidence of positive effects on child outcomes. Six programs had mixed success; it is noteworthy that these programs ranged from a short intervention on a very specific short-term outcome, to interventions targeting a broad range of outcomes which were improved up to two years later. A single intervention showed no effect on child outcomes; unlike the other interactive websites reviewed in this section, parental involvement was only minimal in the website with no positive effects.

4.7. Text messaging/SMS and MMS

Text messages/SMS are short informational text-based messages sent to mobile phones. They may be sent by automated systems and their content may be customised based on client responses or agency data. MMS systems also support video and sound messages.

An overview of all the text messaging/SMS/MMS interventions identified in this REA is presented in Table 4.4.

We identified 26 studies evaluating 22 interventions. The populations covered by these interventions were: mothers who are breastfeeding; mothers with HIV; mothers with limited access to antenatal care; mothers at risk of obesity or incomplete immunisation; families at risk for child maltreatment; parents of children with behavioural problems, vision problems, at risk of obesity, or at risk of incomplete immunisation; Aboriginal families of children with otitis media; and families with poor oral health.

Table 4.4. Text messaging/SMS/MMS findings

Effects ¹	Intervention	Aus	Hard to reach	Population	Intervention and comparison	Findings	Other resources needed
Clear	SMS for cataract treatment reminders (Lin et al., 2012)	X	X	Parents of children with vision problems	<u>Intervention</u> : SMS reminders 1 and 4 days before scheduled appointments at cataract clinic <u>Comparison</u> : usual care	Attendance rates at scheduled appointments were higher, more children received additional (needed) procedures, and diagnosis of ocular hypertension was significantly higher in the intervention group.	
	SMS to reduce mother–infant HIV transmission (Odeny et al., 2014)	X	✓	HIV-positive pregnant women in sub-Saharan Africa	<u>Intervention</u> : 8 text messages before and 8 after birth; supportive, encouraging, reminding to look after own health, and to attend clinic <u>Comparison</u> : usual care	Mothers in intervention group were more likely to attend clinics and their infants were more likely to have been tested for HIV 6 weeks after birth.	Call backs from study nurse if requested (free for participants)
	Text messaging to prevent weight gain (Lombard et al., 2010)	✓	X	Mothers of primary school children	<u>Intervention</u> : monthly text messaging was a component of a community-based intervention. <u>Comparison</u> : non-interactive group session. No text messages	Women in intervention had lost weight and women in comparison had gained weight at the end of 12 months.	Interactive group sessions at child’s school
	Bi-directional messaging for adolescent vaccines (O’Leary et al., 2015)	X	X	Parents of adolescents	<u>Intervention</u> : initial text message to remind vaccination due; up to 3 reminders if parent does not respond to either make appointment or opt out <u>Comparison</u> : usual care	Higher rates of completing all needed vaccinations and of completing any vaccine in the intervention group Parents who made any response to initial message (even if that was to opt-out of further reminders) more likely to complete all needed vaccinations for their child than those who did not respond	
	Text messaging for influenza vaccination (Stockwell et al., 2012a; 2012b; 2015)	X	✓	Low-income parents of infants—adolescents	<u>Intervention</u> : automated text reminders, combination of educational and administrative; patterns determined by appropriate vaccination schedule	More children received the target vaccination and any vaccination in the intervention groups. Versions of the intervention which contained an	

Effects ¹	Intervention	Aus	Hard to reach	Population	Intervention and comparison	Findings	Other resources needed
					<u>Comparison</u> : usual care, paper mailing, and text message only (no educational component)	educational element were most effective.	
	Text messaging for parent vaccination (Stockwell et al., 2014)	X	✓	Low-income pregnant women	<u>Intervention</u> : Automated text messages sent weekly for 5 weeks during pregnancy <u>Comparison</u> : usual care	Women receiving text messages were more likely to receive an influenza vaccination, with greatest effects seen early in the intervention.	
Mixed	Text messaging reminders for attendance at child maltreatment prevention (Murray et al., 2015)	X	✓	Parents enrolled in a parent-training program to prevent child maltreatment	<u>Intervention</u> : automated, personalised weekly text reminders on the day before class <u>Comparison</u> : no reminders	Compared to no reminders, receiving text messages did not increase attendance. However, after controlling for parenting stress, parents in the text message group were more likely to complete the course	
	Cellular Phone-enhanced Planned Activities Training (CPAT) (Carta et al., 2013)	X	✓	Mothers in families at high risk of child maltreatment	<u>Intervention</u> : Planned Activities Training (PAT; manualised home-visiting program aimed at improving parent-child interactions and teaching parenting strategies) with additional twice-daily text messages and occasional voice messages providing encouragement and reminders. Weekly phone consultation with coaches <u>Comparison</u> : PAT (no messages); wait list	Both intervention groups (CPAT and PAT) had increased maternal involvement immediately after and 6 months post intervention; and improved general parenting interaction immediately after, but not 6-month post. Maternal depression and parenting stress was lower in CPAT than both PAT and wait list at 6-month follow-up. No difference between any groups on child behaviour	Family coaches — however these are also needed for the unenhanced version.

Effects ¹	Intervention	Aus	Hard to reach	Population	Intervention and comparison	Findings	Other resources needed
	SMS for oral health education (Sharma et al., 2011)	X	X	Mothers of preschool children	<u>Intervention</u> : 21 text messages sent over 7 days, repeated over 4 weeks. Covered relationship between oral and general health, preventative diet, oral care techniques <u>Comparison</u> : leaflet with identical messages	Intervention participants had greater oral health knowledge, attitude, and practice. Both groups improved on child's visible plaque index.	
	Text2Floss (Hasemian et al., 2015)	X	✓	Mothers attending dental clinics	<u>Intervention</u> : daily text message checks if flossing occurred on previous day; text message response depending on answer <u>Comparison</u> : usual care	Intervention participants flossed more, had higher knowledge about child oral health, and decreased poor dietary practices. No effect on tooth brushing (own or child's), using mouth rinse, or some oral hygiene knowledge	
	SMS for improving infant feeding practice (Jiang et al., 2014)	X	X	First-time mothers of infants	<u>Intervention</u> : weekly text messages based on WHO breastfeeding guidelines from 3rd trimester to 12 months after birth <u>Comparison</u> : usual care	Mothers in the intervention breastfed exclusively for longer, had higher rates of exclusive breastfeeding at 6 months, and were less likely to give solid food before their child was 4 months old. No difference in duration of any breastfeeding, breastfeeding rate at 12 months, and other infant feeding practices	

Effects ¹	Intervention	Aus	Hard to reach	Population	Intervention and comparison	Findings	Other resources needed
	MumBubConnect (Gallegos et al., 2014)	✓	X	Mothers of infants	<u>Intervention</u> : weekly text message for 8 weeks asking how breastfeeding was proceeding. Response tailored to mother's answer. Phone call within from lactation counsellor if answer indicated distress <u>Comparison</u> : usual care	Women receiving intervention were more likely to continue exclusive breastfeeding; had improvements in active coping and less negative coping than mothers in comparison group. No differences between groups on self-efficacy, negative or positive emotions, or accountability	Lactation counsellors to make calls if mothers' text responses contain keywords indicating distress
	Text4Baby (Evans et al., 2012; 2014)	X	X	Pregnant women	<u>Intervention</u> : 3 text messages per week, tied to stage of pregnancy, relating to healthcare beliefs and behaviours <u>Comparison</u> : usual care	4 weeks after starting the intervention, mothers had increased agreement with pregnancy-related health beliefs. No effect on behavioural outcomes 2–3 months after starting the intervention, mothers had increased belief that 'I am prepared to be a new mother'. No other effects on attitudes and behaviours	
	Wired Mothers (Lund et al., 2014)	X	✓	Pregnant women in sub-Saharan Africa	<u>Intervention</u> : text messages with health messages and appointment reminders (frequency and content dependent on stage of pregnancy) and mobile-phone vouchers to cover cost of contacting primary healthcare providers <u>Comparison</u> : usual care	More women in intervention group received the recommended number of antenatal visits. No difference between groups on quality of care received	Mobile phone vouchers. Healthcare facilities randomised to intervention were given mobile phones for staff

Effects ¹	Intervention	Aus	Hard to reach	Population	Intervention and comparison	Findings	Other resources needed
	Healthy4Baby (Herring et al., 2014)	X	✓	Low-income women in early pregnancy at risk of obesity	<u>Intervention</u> : initial coaching session; daily text messages relating to 6 empirically supported weight-change strategies; self-monitoring texts 3–4 times/week followed by immediate personalised feedback. Private chat room provided on Facebook Bi-weekly 15-minute phone calls from health coach <u>Comparison</u> : usual care	Intervention participants had lost more weight at the end of the intervention. No differences in individual dietary or exercise outcomes	Bachelors-level health coach Intervention participants received digital scale, pedometer, calorie guide, water bottle.
	MobileMums (Fjeldsoe et al., 2010; 2015)	✓	X	Mothers of young children	<u>Intervention</u> : face-to-face and telephone consultations for goal setting and progress, 3–5 personalised text messages per week for 12 weeks. Social support person received 2 messages per week with tips on how to provide support and updates on participant's goals. <u>Comparison</u> : minimal contact group: information-only website, separate Facebook group	Intervention group had more frequent and longer moderately vigorous physical activity; more brisk walking duration. No differences at 6-month follow-up	Behavioural counsellor for consultations Participant-nominated social support person Information pack, vouchers for free trials of physical activities
	Text message reminders for HPV vaccination (Rand et al., 2015)	X	X	Parents of adolescents	<u>Intervention</u> : up to 4 text message reminders of when child's human papillomavirus (HPV) vaccinations came due. <u>Comparison</u> : text messages on teen health topics unrelated to vaccination	No differences in rates of receiving first dose of HPV vaccine when ages and genders were matched; across the entire sample more intervention participants received their first dose.	

Effects ¹	Intervention	Aus	Hard to reach	Population	Intervention and comparison	Findings	Other resources needed
None	MMS for attendance at ear clinics (Phillips et al., 2014)		✓	Aboriginal parents of children with otitis media	<u>Intervention</u> : ear health videos sent via MMS over 6 weeks. Short animations of Aboriginal role models using local languages, encouraging ear health and clinic attendance. Ear health text messages in English. <u>Comparison</u> : usual care, with text message at beginning and end of study period	No differences on clinic attendance rates or ear health outcomes	
	Text messages for dental reminders (Nelson et al., 2011)	X	✓	Families attending low-income dental clinics	<u>Intervention</u> : text message reminders 48 hours before appointment <u>Comparison</u> : voice message reminders 48 hours before appointment	Intervention participants were more likely to be no-shows than comparison participants.	
	Vaccines4Kids (Niederhauser et al., 2015)	X	X	Parents of newborn infants	<u>Intervention</u> : text message immunisation reminders before infant's 2-, 4-, and 6-month well-child clinic visit <u>Comparison</u> : text messages at same time points but on unrelated health topics	No difference in immunisation rates between groups. Rates started small in both groups and compliance decreased as infants grew older.	
	Text message reminders for delayed paediatric influenza vaccination (Hofstetter et al., 2015)	X	✓	Parents of young children	<u>Intervention</u> : weekly automated text message reminders for 5 weeks plus 2 booster messages, relating to importance of influenza vaccination. 2nd group had additional interactive messages allowing parents to request extra information.	No difference between groups on vaccine coverage of child or of other family members	

Effects ¹	Intervention	Aus	Hard to reach	Population	Intervention and comparison	Findings	Other resources needed
					<u>Comparison</u> : usual care (included telephone appointment reminders from clinic)		

1 Any indicators of effect in the findings column always refer to statistically significant changes or differences. Non-significant differences are reported as no difference.
 Aus = Australian study.

4.7.1. Parenting skills

4.7.1.1. Mixed effects

Automated, personalised weekly text reminders on the day before class did not increase attendance at a parent-training program intended to prevent child maltreatment (**Text messaging reminders for attending child maltreatment prevention classes**; Murray, Woodruff, Moon, & Finney, 2015), compared with no reminders. However, after taking parenting stress into account, parents in the text message group were more likely to complete the course.

Conversely, among mothers at high risk of child maltreatment, twice-daily text messages with occasional voice messages (**Cellular Phone-enhanced Planned Activities Training, CPAT**; Carta, Lefever, Bigelow, Borkowski, & Warren, 2013) did reduce maternal depression and parenting stress compared with parents completing regular (unenhanced) Planned Activities Training (PAT). Both groups showed some improvements in maternal involvement with the child and in general parenting practices, so this cannot be attributed to the text messaging component. Both groups also had support from family coaches.

4.7.2. Summary

Two text message interventions were evaluated addressing parenting skills (both evaluated by RCT). Findings were mixed: some outcomes were improved and some performed no better than either a no-treatment or an alternative-treatment comparison.

4.7.3. Parent behaviour

4.7.3.1. Clear effects

SMS reminders were effective at increasing compliance with best practice in care before and after operations for cataract (**SMS for increasing compliance with paediatric cataract treatment**; Lin et al., 2012), and with increasing vaccination rates for a range of child ages and vaccination types (**Text messaging for children and adolescents**; Stockwell et al., 2015; Stockwell, Kharbanda, Martinez, Lara, et al., 2012; Stockwell, Kharbanda, Martinez, Vargas, et al., 2012). An educational element to the text messages, rather than simple appointment reminders, made them more effective for low-income parents.

Text messages were supplemented with free call-back requests so mothers could have a nurse call them back (or could call nurses themselves) in an intervention for HIV-positive women in sub-Saharan Africa (**Two-way SMS to prevent mother-to-child HIV transmission**; Odeny et al., 2014). Compared to usual care, these mothers were more likely to attend clinics and their infants were more likely to have been tested for HIV by six weeks after birth. **Bidirectional text messaging for adolescent vaccination** (O'Leary et al., 2015) also increased vaccination rates in adolescents compared with usual care: both for the vaccinations targeted, and for any vaccination. Adolescents in the intervention group were more likely to receive needed non-vaccination health services.

4.7.3.2. Mixed effects

Compared with a leaflet on oral health and oral care techniques, text messages sent to mothers' phones improved their health, knowledge and practice (**SMS for improving oral health practice**; Sharma, Hebbal, Ankola, and Murugabupathy, 2011); both groups improved on child oral health measures. A more interactive intervention, asking about daily practice and responding appropriately (**Text2Floss**; Hashemian, Kritz-Silverstein, & Baker, 2015), improved mothers' rates of flossing and oral health knowledge, and had some effect on child diet, compared with printed materials. However, there was no effect on tooth brushing (mother or child) or other oral hygiene practices.

Reminder text messages had no effect on the rates at which teens received Human Papilloma Virus (HPV) vaccinations when compared within age- and gender-matched groups (Rand et al., 2015). However, across all ages and both genders, more teenagers received HPV vaccination if their parents received reminders (compared with unrelated teen health messages). Overall rates of vaccination were low in both groups, which the authors suggest may be because of the sensitive nature of HPV vaccination.

In addition to reminding parents of appointments and vaccinations, text messages have been trialled as a means of improving healthcare beliefs and behaviours. **Text4Baby** (Evans et al., 2014; Evans, Wallace, & Snider, 2012) is a text messaging service for pregnant women and new mothers targeting women who are traditionally under-served and who face health disparities. Text messages were sent tailored to women's stages of pregnancy, a total of 135 messages. Compared with usual care, there were some effects on participants' perception of readiness to be a new mother and beliefs about the importance of taking prenatal vitamins, regular visits to the healthcare provider, and not drinking alcohol; but no improvements on other outcomes.

Interactive text messaging, combined with other resources such as discussion forums, have been used in an attempt to deliver service to women in remote communities. **MumBubConnect** (Gallegos, Russell-Bennett, Previte, & Parkinson, 2014) sent weekly text messages to breastfeeding women. Their responses determined if they would receive a follow-up call from a breastfeeding counsellor (for keywords, chosen from a list, relating to feelings of stress or sadness) or an automated text message of encouragement (for keywords suggesting things were going well). Compared with usual care, mothers in the intervention were more likely to continue exclusive breastfeeding and show improvements in active coping; there were no differences in other outcomes such as self-efficacy.

A similar improvement in exclusive breastfeeding rate and duration was seen when women received simple informational texts about the importance of breastfeeding compared with usual care (**SMS for improving infant feeding practice**; Jiang et al., 2014), although there was no effect on duration of any breastfeeding and other infant feeding practices.

As described in a similar intervention in the previous section (Odeny et al., 2014), supplementing text messages with other resources can assist in contexts where medical care is scarce. Pregnant women in sub-Saharan Africa received health education and appointment reminders via text message (**Wired Mothers**; Lund et al., 2014) and also received vouchers to cover the cost of direct communication with their healthcare provider. Healthcare providers also received mobile phones as part of the intervention. Compared with usual care, mothers in the intervention group were more likely to receive the recommended number of antenatal clinic visits, although there was no difference in the quality of care women received. It should be noted that women were not provided with phones as part of this intervention and only a minority owned or had sole use of a mobile phone.

4.7.3.3. No effects

Immunisation reminders sent by text message (Niederhauser, Johnson, & Tavakoli, 2015) were not effective at increasing immunisation compliance for parents of newborn infants compared with text messages on non-immunization health topics. This intervention used fewer reminders than interventions described above and had no educational or informational component. On the other hand, an intervention using **educational, interactive text reminders** (Hofstetter et al., 2015) also failed to show any impact on vaccination rates, compared with information-only text reminders or telephone appointment reminders.

Simple text message appointment reminders for low-income families (Nelson, Berg, Bell, Leggott, & Seminario, 2011) were not effective at reducing child dental appointment no-shows, compared with voice message reminders. However, many participants were existing clients of the clinics and had previously been used to receiving voice reminders.

A relatively complex **messaging intervention for Aboriginal families** (Phillips et al., 2014), using culturally appropriate MMS videos on ear health in Aboriginal languages, and personalised text messages in English, had no effect on clinic attendance rates or ear health outcomes for children, compared with usual care control. Participant numbers in this remote Australian study were particularly small.

4.7.4. Summary

Fifteen text message interventions for parent behaviours were evaluated in 18 RCTs. Five interventions were effective at improving compliance with best-practice healthcare in a range of contexts, including in disadvantaged populations. Interventions where parents could respond to the text messages fell into this category. A further seven interventions were successful at improving some, but not all, of their targeted behaviours; results in these evaluations may have been affected by low mobile phone ownership or sensitive subject matter. Four text messaging interventions of varying degrees of complexity showed no effect on parent behaviours.

4.7.5. Parent outcomes

4.7.5.1. Clear effects

Mothers of primary school-age children attended short, interactive group sessions at their child's school, and then received monthly follow-up text messages for the next year (**Text messaging to prevent weight gain**; Lombard, Deeks, Jolley, Ball, & Teede, 2010). Mothers in the comparison group (short, group sessions with no interaction and no text message follow-up) gained weight over the study period, while mothers in the intervention condition lost weight.

Automated text messages, sent weekly for five weeks and advising women on the risks of influenza to pregnant women and newborns (Stockwell et al., 2014), were more effective than usual care at increasing influenza vaccination in low-income, urban pregnant women. In this intervention women also received an interactive message offering more detailed information.

4.7.5.2. Mixed effects

Healthy4Baby (Herring, Cruice, Bennett, Davey, & Foster, 2014) combined daily text messages relating to empirically-supported weight change strategies with coaching phone calls, self-monitoring texts, and feedback with motivational support. Participants were also provided with a private chat room on Facebook. Compared with participants receiving usual care, Healthy4Baby participants lost more weight over the intervention, although secondary outcomes such as sugary drink and fast food consumption were unchanged.

The **MobileMums** program (Fjeldsoe, Miller, Graves, Barnett, & Marshall, 2015; Fjeldsoe, Miller, & Marshall, 2010) used personalised text messages targeting self-efficacy, goal setting, and other change variables, together with a face-to-face physical activity consultation and enlisting social support, to assist mothers with young children to be more physically active. Compared with women receiving information-only packs, intervention participants increased their physical activity in the short term (immediately after the intervention), but these gains were not maintained at six-month follow-up after the intervention.

4.7.6. Summary

Four text message interventions to improve parent outcomes were evaluated in five RCTs. Two interventions showed clear positive outcomes; one of these included initial face-to-face group sessions. Both of the two interventions with mixed effects on outcomes also included either face-to-face or telephone support.

4.8. Computer apps

Computer apps for the purposes of this REA are interventions presented on personal computer, laptop, or tablet device. They are restricted to the devices on which they are installed (in contrast to web-based interventions which are potentially available on any device connected to the internet although in practice, access may be restricted to registered participants).

An overview of the computer app interventions is presented in table 4.5.

Table 4.5. Computer app findings

Effects ¹	Intervention	Aus	Hard to reach	Population	Intervention and comparison	Findings	Other resources needed
Clear	TouchHear! (Vargas et al., 2010)	X	✓	Low-income, low literacy parents of children with asthma	<u>Intervention</u> : interactive version of existing asthma questionnaire; delivered via tablet, stylus, and noise-cancelling headphones. Questions provided as video clips in parent’s preferred language. Questions could be replayed and answers revised as needed. <u>Comparison</u> : original paper version	Parents’ answers had higher concordance with clinical assessment on the app version of the questionnaire.	Tablet, stylus, headphones provided.
Mixed	Bear Essentials (Cohen et al., 2015)	X	X	Parents of young children	<u>Intervention</u> : short training program using animations to demonstrate soothing tactics for young children receiving immunisation; instruction to distract child during clinic visit <u>Comparison</u> : distraction only; usual care	Immediately after procedure and 2 months later, improved knowledge of the effects of providing reassurance and information, and apologising, on children’s procedural distress Parents engaged in less reassurance and more distraction and encouragement of deep breathing during the procedure. Children engaged in more distraction and deep breathing. There were no effects on measures of child distress or pain.	
	Interactive computer agent to support breastfeeding (Edwards et al., 2013)	X	X	First-time mothers	<u>Intervention</u> : computer-animated agent, providing breastfeeding information and support. Interactive via multiple-choice input via touch screen. Dialogue using motivational interviewing techniques <u>Comparison</u> : usual care	Intervention group had improvement in intent to exclusively breastfeed. No effect on intent to exclusively breastfeed or time to exclusively breastfeed, attitudes towards breastfeeding, or confidence in ability to breastfeed	Tablet laptop

1 Any indicators of effect in the findings column always refer to statistically significant changes or differences. Non-significant differences are reported as no difference.
Aus = Australian study.

4.8.1. Parent behaviour

Three studies were identified, evaluating three interventions for parents of children at risk of incomplete vaccination, parents of children with asthma, and mothers who are breastfeeding.

4.8.1.1. Clear effects

TouchHear! (Vargas, Robles, Harris, & Radford, 2010) is an interactive version of an existing asthma questionnaire, delivered via tablet, stylus, and headphones. Questions are posed to parents by video clip in their language of choice, and can be replayed. Compared with the original paper version, parents' answers to TouchHear! agreed more closely with expert clinical assessment.

4.8.1.2. Mixed effects

A short training program used animations to demonstrate soothing and distraction tactics for young children receiving immunisation (**Bear Essentials**; Cohen et al., 2015). Compared to usual care, it led to parents having improved knowledge of the potential effects of providing reassurance and apologising during procedures, and engaging in less reassurance, more distraction, and more encouragement during immunisation. However, it did not reduce child distress or pain.

First-time mothers used an **Interactive computer agent to support breastfeeding** (Edwards, Bickmore, Jenkins, Foley, & Manjourides, 2013), a computer animated agent receiving input via touchscreen. The intervention had only minimal effects. Mothers showed improvement in their intention to exclusively breastfeed, but compared to usual care there was no difference in their intent to exclusively breastfeed, time to exclusively breastfeed, their attitudes towards breastfeeding, or their confidence in their ability to breastfeed.

4.8.2. Summary

Three computer apps targeting parent behaviour were evaluated in three RCTs. One app which offered an enhanced version of a pen-and-paper questionnaire performed better than the original; however, the other two had only mixed results and affected knowledge and attitudes rather than more direct outcomes.

4.9. Smartphone apps

Smartphone apps for the purposes of this REA are interventions presented on smartphone devices.

An overview of the smartphone apps identified is presented in table 4.6.

Table 4.6. Smartphone app findings

Effects ¹	Intervention	Aus	Hard to reach	Population	Intervention and comparison	Findings	Other resources needed
Clear	Helping the non-compliant child (Jones et al., 2014)	X	✓	Low-income parents of children with behavioural problems	<u>Intervention</u> : smartphone enhancement of the Helping the Noncompliant Child (HNC) program. Added: skills videos, brief daily surveys, text message reminders, video recording of home practice, mid-week video calls <u>Comparison</u> : original HNC with no enhancement	Suggested effects on engagement with therapy, skill generalisation, and problem intensity	Masters-level therapist; original 'Helping the Noncompliant Child' program
Mixed	ND	ND	ND	ND	ND	ND	ND
None	ND	ND	ND	ND	ND	ND	ND

1 Any indicators of effect in the findings column always refer to statistically significant changes or differences. Non-significant differences are reported as no difference.
Aus = Australian study; ND = no data.

4.9.1. Parenting skills

Only one intervention was found, for parents of children with behavioural problems.

4.9.1.1. Clear effects

Helping the Noncompliant Child is a behavioural parent training program. **Technology-enhanced Helping the Noncompliant Child (TE-HNC;** Jones et al., 2014) uses smartphone enhancement to increase parent engagement with the basic program. Compared with the original HNC intervention, it improved parent engagement with therapy, skill generalisation, and the intensity of child problems.

4.9.2. Summary

Only one smartphone app was identified. This was an enhancement of a pre-existing program and led to improved parenting skills outcomes.

4.10. CD-ROM/DVD

CD-ROM/DVD interventions are those presented on optical discs which can be read/displayed on computers or dedicated devices. They can present information via text, audio or video, and in some cases offer a limited degree of interactivity.

An overview of the CD-ROM and DVD interventions is presented in table 4.7

Table 4.7. CD-ROM/DVD findings

Effects ¹	Intervention	Aus	Hard to reach	Population	Intervention and comparison	Findings	Other resources needed
Mixed	Teens Talk Healthy Weight (Windham et al., 2014)	X	X	Adolescents at risk of obesity	<u>Intervention</u> : testimony from adolescent patients of a weight-loss clinic and their caregivers <u>Comparison</u> : usual care	Parent knowledge of obesity-related comorbidities improved post intervention. No improvements in parent self-efficacy, motivation, or feelings of connectedness to care provider	
	CD-ROM to prevent alcohol use (Schwinn & Schinke, 2010)	X	✓	Adolescents in public housing at risk for alcohol use	<u>Intervention</u> : CD-ROM plus parent intervention (CDP) was CD condition plus materials tailored for parents. Annual booster material for both groups for the next 6 years <u>Comparison</u> : CD-ROM alone (CD) had 10 skills-based sessions for adolescents	6 years after the original intervention, youths in both conditions performed equally well on alcohol refusal skills, negative alcohol-related consequences, and lower past-month substance use. The parent component did not improve outcomes compared to the CD condition.	
None	From the First to the Last Breastfeeding* (Labarère et al., 2011)	X	X	Mothers of infants	<u>Intervention</u> : CD-ROM using animation and video sequences to support breastfeeding. Based on self-efficacy theory <u>Comparison</u> : 1-hour breastfeeding education during routine antenatal classes	No effect at 4 weeks post discharge on rates of breastfeeding, breastfeeding duration, difficulties with breastfeeding, or satisfaction with the breastfeeding experience	
	Grieving in the NICU (Rosenbaum et al., 2015)	X	X	Parents who have lost an infant	<u>Intervention</u> : DVD of interviews with bereaved parents, grandparents, siblings, and grief counsellors and chaplains. Participants also received standard bereavement care (SBC). <u>Comparison</u> : SBC only	3 and 12 months after infant's death, no effect on parents' grief or depression At 3 months, parents who watched DVD had higher grief. Potential adverse effect	

* = non-randomised design

¹ Any indicators of effect in the findings column always refer to statistically significant changes or differences. Non-significant differences are reported as no difference.

Aus = Australian study

4.10.1. Parent behaviour

One intervention identified, for mothers of infants.

4.10.1.1. No effects

From the First to the Last Breastfeeding (Labarere et al., 2011) used animation and video sequences to support breastfeeding, but compared with 1-hour instruction as part of regular antenatal classes it had no effect on rates of breastfeeding, breastfeeding duration, difficulties with breastfeeding, or satisfaction with the breastfeeding experience.

4.10.2. Parent outcomes

One intervention identified, for parents who have lost an infant in a neonatal intensive care unit.

4.10.2.1. No effects

A DVD, **Grieving in the NICU** (Rosenbaum, Smith, Yan, Abram, & Jeffe, 2015), was developed to help support parents through the grieving process. It presented video interviews with bereaved parents, grandparents, and siblings, with input from grief counsellors and chaplains. Compared with standard bereavement care, it did not have any positive impact on grief or depression; there was some evidence of increased short-term grief in parents who watched it although this had equalised with the comparison group by 12-month follow-up.

4.10.3. Child outcomes

Two interventions evaluated in two studies were identified, both for adolescents: those at risk for obesity and those at risk for alcohol use.

4.10.3.1. Mixed effects

Teens Talk Healthy Weight (Windham et al., 2014) presented testimony from adolescent patients of a weight-loss clinic and their caregivers. It improved parent knowledge of obesity-related comorbidities, but had no effect on parent self-efficacy, motivation, or feelings of connectedness to care providers.

Schwinn and Schinke (2010) compared two versions of a **CD-ROM to prevent alcohol use**: a CD-ROM alone, or CD-ROM plus parent materials. Six years after the original intervention, youths in both groups performed equally well on alcohol use, consequences, and attitudes; the parent component did not improve outcomes compared to the CD-alone condition.

4.10.4. Summary

Four CD-ROM/DVD interventions, evaluated in RCTs, were identified over all outcome categories. On the whole, this was not a highly successful delivery mode, with only mixed outcomes at best. Specific parent materials did not add anything to the child CD-ROM in the only study where this comparison was made.

4.11. Informational websites

Informational websites are those that present information with no interactive elements. They are best considered as the equivalent of printed materials, although they may make use of the audio-visual capabilities of websites. An overview of the informational website interventions is presented in table 4.8

Table 4.8. Informational website findings

Effects ¹	Intervention	Aus	Hard to reach	Population	Intervention and comparison	Findings	Other resources needed
Clear	Proud2Parent (Rudd et al., 2015)	X	✓	Parents who are separating	<u>Intervention</u> : program aims to inspire parents to reduce conflict and their child’s exposure to it. Parents guided to making commitments to remaining part of their child’s life <u>Comparison</u> : usual care	Cases assigned to the intervention were more likely to reach full agreement at court hearing, provided hearing was held on same day as intervention.	
Mixed	Web portal evidence-based health information (Austvoll-Dahlgren, 2012)	X	X	Parents of infants and young children	<u>Intervention</u> : Parents given access to a web portal presenting evidence-based healthcare via discussion of research processes. Asked to perform 3 information search tasks. <u>Comparison</u> : wait list	Intervention participants had improved attitude towards searching for information. No differences for use of evidence-based information, critical appraisal skills, or beliefs about participation.	
	Choices Ahead (Harackiewicz et al., 2012)	X	X	Parents of adolescents	<u>Intervention</u> : website about science, technology, engineering and mathematics (STEM) courses including interviews with STEM students; brochures directed to parents. <u>Comparison</u> : usual care	Students in the intervention condition took more STEM courses overall in high school. No difference in foundational maths and science courses Students took more elective, advanced STEM courses. Mothers’ perceptions of the importance of STEM courses was increased, and more parent–child conversations about the value of STEM took place.	
None	Psychoeducation to prevent post-concussion symptoms	✓	X	Parents of children with mild traumatic brain injury (TBI)	<u>Intervention</u> : child-directed website with developmentally appropriate information about mild TBI and recovery. Parents had access to site and were sent a booklet covering the same material.	No advantage from intervention on child behaviour, depression, anxiety, PTSD symptoms, quality of life, post-concussion symptoms; or parent physical or mental health or knowledge of TBI	

(Olsson et al., 2014)

Comparison: usual ED paediatric care

1 Any indicators of effect in the findings column always refer to statistically significant changes or differences. Non-significant differences are reported as no difference.
Aus = Australian study

4.11.1. Parent behaviour

Three interventions identified in three studies: for parents of infants and young children, parents of adolescents, and parents who are separating.

4.11.1.1. Clear effects

The **Proud2Parent** (Rudd, Holtzworth-Munroe, Reyome, Applegate, & D'Onofrio, 2015) program is an informational website (with some associated activities) which aims to maintain separating parents' involvement in their child's life and reduce contested custody hearings. Cases assigned to the intervention were more likely those with no intervention to reach full agreement at a court hearing, provided the hearing was held on the same day as the intervention.

4.11.1.2. Mixed effects

A **web portal for improving public access to evidence-based health information** (Austvoll-Dahlgren, Bjorndal, Odgaard-Jensen, & Helseth, 2012) combined presentation of evidence-based healthcare with discussion of research processes. Participants who conducted three information search tasks had an improved attitude towards searching for information, but did not differ from a comparison group on using evidence-based information, critical appraisal skills, or beliefs about participation.

Use of the **Choices Ahead** (Harackiewicz, Rozek, Hulleman, & Hyde, 2012) website about science, technology, engineering and mathematics (STEM) led to students taking more STEM courses at advanced levels, but did not increase uptake of foundational maths and science courses compared to control.

4.11.2. Child outcomes

One intervention identified, for children with traumatic brain injuries.

4.11.2.1. No effects

A **psychoeducation website to prevent post-concussion symptoms in children with mild TBI** (Olsson et al., 2014), which was aimed primarily at children, but to which parents had access, did not improve child behaviour, depression, PTSD symptoms, quality of life, cognitive function, or post-concussion symptoms, or parent physical or mental health compared with usual care. It should be noted that 'usual care' in this Australian study was being received in emergency departments and specialist paediatric units so the standard of usual care was potentially quite high.

4.11.3. Summary

Three interventions for parent behaviour outcomes based around informational websites were evaluated in three RCTs. They had generally good outcomes for parent behaviour, with one showing clear effects and the other two showing mixed effects. However, in one of these studies the effects were on attitudes only, not skills.

An informational website information for child outcomes had no effect.

4.12. E-books and e-readers

E-books are electronic versions of printed books which can be read via a computer or on a dedicated handheld device (e-reader). Only one e-book intervention was identified. Findings are presented in table 4.9

Table 4.9. E-books and e-readers findings

Effects ¹	Intervention	Aus	Hard to reach	Population	Intervention and comparison	Findings	Other resources needed
Clear	ND	ND	ND	ND	ND	ND	ND
Mixed	E-book reading for parent-child interaction (Korat & Or, 2010)	X	X	Parents of young children	<u>Intervention</u> : commercial and educational e-books <u>Comparison</u> : printed versions of the intervention e-books	More mediation talk (focussing, affecting, expanding, encouraging, and regulating child's relation to the text) during exchanges initiated by mothers in the e-book condition. Mothers used more cognitive expanding and responded more to child initiations in the printed book condition.	
None	ND	ND	ND	ND	ND	ND	ND

1 Any indicators of effect in the findings column always refer to statistically significant changes or differences. Non-significant differences are reported as no difference.
Aus = Australian study; ND = no data.

4.12.1. Parent behaviour

One intervention identified, for parents of young children.

4.12.1.1. Mixed effects

A study comparing **e-book reading** with traditional reading for parent–child interaction (Korat & Or, 2010) found that commercial and educational e-books gave rise to more mediational talk from mothers and more child-initiated exchanges, while there was more cognitive expanding from mothers and more response to child initiations when mothers read equivalent printed books.

4.12.2. Summary

Only one e-book intervention was identified, and this had mixed effects on parent behaviour outcomes.

4.13. Telehealth

Telehealth is a delivery mode of reasonably long standing and has been widely used for at least 15 years (Chi & Demiris, 2015), and has been evaluated for many participant groups and outcomes (Elbert et al., 2014).

In this REA, only those interventions which are not the functional equivalent of an in-person consultation or therapy session have been included. Many of the interventions listed in other IT categories also included a telehealth element, usually consultations via telephone or Skype.

Telehealth findings are presented in Table 4.10.

Table 4.10. Telehealth findings

Effects ¹	Intervention	Aus	Hard to reach	Population	Intervention and comparison	Findings	Other resources needed
Clear	ND	ND	ND	ND	ND	ND	ND
Mixed	Personal Health Partner (Adams et al., 2014)	X	✓	Low-income parents of young children	<u>Intervention</u> : automated telephone calls using clinical data and synthetic speech systems; content based on Medicaid-recommended health risk questions <u>Comparison</u> : automated call, 18-question safety survey followed by tailored advice	Improvement on discussing relevant risk factors for tuberculosis, maternal depression, and prescription medication management. No improvement on discussing relevant risk factors for emergency health medication management, developmental screening, or obesity.	
	Healthy Eating and Activity (Wright et al., 2013)	X	✓	Children at risk of obesity in low-income African American families	<u>Intervention</u> : telephone counselling delivered via automated interactive voice response (IVR) system, which was based on an electronic health record behavioural counselling system. Calls made to child and to parent. Conversations tailored using participant responses <u>Comparison</u> : wait list	At 3-month follow-up (end of intervention) there was no effect on BMI changes for children or parents. Post hoc comparisons showed high child users (completing at least 4 calls) improved on weight, BMI, and BMI percentile compared to low users. No differences were seen in child and parent intakes of calories, fats, and fruit and vegetables, or in amount OF TV viewing time, in intervention compared to control participants.	
None	ND	ND	ND	ND	ND	ND	ND

¹ Any indicators of effect in the findings column always refer to statistically significant changes or differences. Non-significant differences are reported as no difference. Aus = Australian study; ND = no data.

4.13.1. Parent behaviour

One intervention identified, for parents of infants and young children.

4.13.1.1. Mixed effects

An intervention using automated telephone calls generated from clinical data using synthetic speech systems, **Personal Health Partner** (Adams et al., 2014) increased discussion of risk factors for tuberculosis, maternal depression, and prescription medication management, relative to a control group receiving initial phone surveys plus follow-up advice. It had no effect on discussion of risk factors for emergency health medication management, developmental screening, or obesity.

4.13.2. Child outcomes

One intervention identified, for children at risk of obesity.

4.13.2.1. Mixed effects

Healthy Eating and Activity (Wright et al., 2013) delivered telephone counselling via an automated interactive voice response system and an electronic health record-based behavioural counselling system. Calls were made to children and parents, and conversations were tailored based on participant responses. There was no overall effect on BMI of either parents or children, or on diet or TV viewing time compared to wait-list control. However, post hoc analysis showed that children who completed at least four calls did improve on weight, BMI, and BMI percentile compared to those completing fewer calls.

4.13.3. Summary

Two telehealth interventions (limited to those which are not the functional equivalent of a face-to-face intervention) were identified. They had mixed effects on parent behaviour and child outcomes, with a suggestion that, while many participants did not complete automated interventions, they are effective for participants who do manage to complete them.

4.14. Engagement strategies and barriers to engagement

Where authors of included studies detailed their strategies to increase participant engagement and overcome barriers to participation, this information was recorded and categorised. Summary tables of engagement strategies used in interventions identified in this review, and of barriers to engagement and challenges to delivery, are presented in **Appendix 3**.

4.14.1. Barriers to engagement and challenges to delivery

Access to computers and high-speed internet was a barrier mentioned in several studies (Raj et al., 2015; Villarruel et al., 2010). In some cases, participants without such access were excluded from the intervention; in others, participants were provided with needed equipment and internet connections thereby removing the barrier to engagement (Petranovich et al., 2015; Sheeber et al., 2012).

Mobile phone access was also a barrier to participation. Phillips et al. (2014) noted that mobile phone ownership was lower than expected in the remote Australian Aboriginal communities where they tested their intervention. In an intervention trialled in sub-Saharan Africa (Lund et al., 2014), only a minority of women owned a mobile phone, and others had various degrees of access to shared phones. Healthcare providers in this intervention also lacked access to mobile phones. In at least one study, parents started the intervention with a mobile phone but lost access during the program (Ahlers-Schmidt et al., 2012).

The practice setting can affect recruitment, if procedures are too cumbersome (Edwards et al., 2013). Physicians' offices reported that, although small and mobile, distributing and using tablets was still awkward. Staff in hospital settings also reported finding the unit in this study cumbersome and the author argues that this affected recruitment.

Barriers to participation are not unique to IT programs; in one study where there was high attrition from an online intervention, a similar rate was found in the face-to-face version (Spence et al., 2011). Lengthy and complex informed consent procedures affected recruitment regardless of delivery mode in a study which required parents to remotely consent to their child's general practitioner being contacted (Clarke et al., 2014).

As with any program, participants may have concerns about the sensitive nature of the materials covered; for example the authors of a study on adolescent Human Papilloma Virus vaccination recommended that text reminders be used in conjunction with strong practice-based interventions due to parent reluctance (Rand et al., 2015). Disadvantaged or marginalised populations may be hesitant about disclosing personal mobile phone numbers; Evans et al. (2012) attributed their low recruitment rates to many potential participants being recent immigrants, anxious about their documentation and residency status.

4.14.2. Engagement strategies of included programs

Program developers used a variety of strategies to increase parent engagement. Several programs allowed participants to choose the language of delivery (Lund et al., 2014; Phillips et al., 2014; Stockwell et al., 2014; Vargas et al., 2010; Villarruel et al., 2010). These tended to be programs making use of standardised and/or pre-recorded responses such as text messaging interventions.

Some engagement strategies involved increasing the program's relatability for users, by using age-appropriate actors in video clips (Wright et al., 2013) and having culturally relevant role models such as changing a generic female avatar who advised on how to quit to one resembling a female doctor or midwife (Herbec et al., 2014). In some programs, the relative anonymity of bulletin-board forums (compared to traditional home-visiting programs) was intended to reduce any barriers due to shame and embarrassment (Baggett et al., 2010).

Highly automated text messaging programs used variable delivery schedules to mask automation and prevent recipients becoming accustomed to and ignoring messages (Price et al., 2015). When participants could give simple text responses (e.g., pressing 1, 2 or 3) to opt in for more information, it also increased their engagement (Stockwell et al., 2015).

Some programs made use of existing relationships, introducing the new intervention in prenatal classes (Labarere et al., 2011). This strategy had to be used with care: an intervention where text message reminders replaced pre-existing phone call reminders reduced engagement even though participants already had a relationship with the care provider (Nelson et al., 2011) suggesting that the participants may have preferred the existing phone contact over text contact.

A common engagement strategy was to use sound instructional design including:

- incorporating games, quizzes, and other activities (Spence et al., 2011)
- requiring that modules be completed before progressing to other stages (Fang & Schinke, 2013)
- using reminders and prompts (Ruggiero et al., 2015)
- self-paced delivery (Baggett et al., 2010; Morawska et al., 2014).

These specific engagement strategies were used in addition to all the instructional design characteristics of web-based programs and interactive websites described above.

Some programs used more complex and resource-intensive strategies:

- active follow up for missed sessions (Mirman et al., 2014b; O'Mahen et al., 2014)
- providing an initial face-to-face orientation (Marsac et al., 2013; Raj et al., 2015).

Others provided practical assistance such as:

- providing and installing computers and internet connections (Petranovich et al., 2015; Sheeber et al., 2012)
- running hotlines to resolve technical issues during the intervention (Labarere et al., 2011; Raj et al., 2015)
- providing vouchers to cover mobile phone costs (Lund et al., 2014).

Finally, some programs used strategies mirroring those used to increase engagement with face-to-face interventions (though potentially delivered remotely) such as motivational interviews at the start (Sheeber et al., 2012) or telephone and videoconference coaching sessions (Herring et al., 2014; O'Mahen et al., 2014; Raj et al., 2015).

4.15. Other contextual factors

Only two included programs published a cost–benefit analysis. Burn et al. (2015) extrapolated findings from the Australian MobileMums trial (Fjeldsoe et al., 2015) to a theoretical cohort of over 36,000 women with a child under one year old in Queensland and, adjusting for inflation, the authors concluded MobileMums would be a cost-effective use of health resources.

They note that while the expected health benefits of the intervention are modest, with an average health improvement of only 0.0036 additional quality-adjusted life years (QALY), the cost of the intervention, after taking into account reduced healthcare utilisation, is low at just 31 AUD per person. Consequently, the expected cost-effectiveness ratio is 8608 AUD per QALY, which is far below the estimated willingness to pay for an additional QALY in Australia of 64,000 AUD.

DECIDA (Shourie et al., 2013) was also evaluated for cost–benefit and resource usage (Tubeuf et al., 2014). Parents in the usual-care control reported four times as many telephone contacts with their

GP as parents in the leaflet-plus-usual-care arm, and twice as many as those in the DECIDA arm; so provision of any extra information (not just the decision aid) reduced resource use. The authors also found that DECIDA led to higher MMR vaccine uptake with a gain of £7.17 for the (UK) National Health Service compared with a leaflet, and a gain of £9.20 compared with usual care.

Gazmararian, Elon, Yang, Graham, and Parker (2014) examined factors affecting enrolment in the Text4Baby program (Evans et al., 2012). Women received enrolment instructions and then could decide whether or not to self-enrol. 51% of women receiving instructions did attempt to enrol, and of those, 69% reported successful enrolment. Enrolment success was more likely among women with more education, with household income above \$10,000 (USD), and among women living in smaller households. Very few (1%) participants expressed concerns about enrolling in the Text4Baby service.

Anderson et al. (2012) investigated the formation of a working alliance between parents, children and their therapists, in clinic and online versions of BRAVE for Teenagers (Spence et al., 2011). Working alliance covers bond between therapist and patient, and agreement between therapist and patient on the goals of therapy and on how those goals are to be achieved. For youths, there was no difference in working alliance between online and face-to-face versions of BRAVE. However, parents and therapists formed closer working alliances in the face-to-face version of brave.

4.16. Program acceptability and usability ratings

Fifty-four studies included some kind of usability or acceptability measure. Participants were generally highly satisfied with programs presented via information technology, found them useful, and found the delivery mode easy and pleasant.

Most authors who measured participant satisfaction did so for the main intervention only; generally there were not satisfaction ratings presented for comparison conditions. Exceptions were Cotter et al. (2013), Kable et al. (2012) and Spence et al. (2011). These authors found that online formats compared favourably with face-to-face delivery, and when a range of online modalities was offered participants were satisfied with all of them. A single study recorded participant preference for text or voice reminders (Nelson et al., 2011) and found that parents preferred voice to text messages.

Where participant satisfaction was reported for the main intervention only, participants were generally highly satisfied (e.g. Bensley et al., 2011; Gelatt et al., 2010; Lin et al., 2012; Morawska et al., 2014).

Most participants also found IT interventions to be easy to use (which is reflected in the overwhelmingly positive views reported). Where a healthcare professional was provided to orient parents to programs, this was seen as unnecessary (Santer et al., 2014). Technical difficulties and a failure to receive equipment were the major usability issues reported (Labarere et al., 2011).

5. Discussion

This review has summarised the recent evidence for information technology-based support for parents that aimed to improve parenting, parent and child outcomes. In this section we use this evidence to draw together the findings of this review to address our research questions. We also provide a summary of the state of the evidence for interventions trialled for Australian parents and hard-to-reach parents, we consider gaps in the evidence, and close with concluding remarks.

5.1. Summary of findings

This REA identified 109 studies and nine systematic reviews reporting evaluations of 91 interventions providing information technology-based support for parents. The largest group of interventions focussed on improving parent behaviours (n=34), followed by parenting skills (n=21), outcomes for parents (n= 19) and outcomes for children (n=17). Interventions were predominantly provided via web-based learning (n=28), interactive websites (n=24), or text messaging (n=25). The majority of these interventions were evaluated using randomised controlled trials (n=103). The interventions were delivered to a wide range of parent populations, including 24 for parents considered to be hard to reach. Thirty-five publications investigated universal interventions, and 68 investigated interventions targeted to particular populations of parents and/or children.

The majority of studies were conducted overseas, with only 12 conducted in Australia. Ten of the 12 interventions developed and evaluated in Australia had promising findings, with improvements on many outcomes; two showed no evidence of benefit.

The eight most promising interventions in the Australian context were:

- **BRAVE-ONLINE** for adolescents with anxiety and their parents
- a version of **BRAVE-ONLINE** for preschool children
- **Triple P** for parents of children with problematic behaviour delivered online
- **Triple P** for parents of children with problematic behaviour delivered via podcast
- an **internet intervention to increase exclusive breastfeeding**
- **MumBubConnect**, a text messaging intervention
- a program of **text messaging to prevent weight gain** in mothers
- **MobileMums** to assist mothers to increase their physical activity.

In the following sections, we summarise the findings of the REA according to the key research questions. Key messages arising from this review appear in the following box.

Key messages

The bottom line in information technology-based support for parents

- There is growing evidence that information technology can be used to improve a wide range of parent and child outcomes. However, this research is still in its infancy, especially for newer platforms such as smart phones.
- There appears to be value in embedding or connecting the use of information technology-based interventions to face-to-face services, and in applying and using principles of effective design to online and technology-based interventions.
- The effectiveness of information technology-based interventions is wholly dependent on the effectiveness of the underlying approach. Technology is merely a delivery mode; the underlying content of an intervention needs to be effective.
- All approaches using technology, whether using new content or adapting an existing face-to-face intervention, require rigorous implementation and outcomes evaluation to determine efficacy and effectiveness.

Evidence for specific technology platforms

- Nearly all information technology modes seem to work for some populations and some outcomes.
- The most commonly used platform identified in this review was the internet; mobile phones were also used extensively.
- There were relatively few computer and smartphone apps, e-reader, or telehealth interventions identified.
- Web-based, self-directed support and education was the most frequently identified type of information technology-based intervention delivered to parents and was useful for parenting skills, parent behaviour and parent outcomes.
- Online therapies and parenting programs were associated with improved outcomes and may be comparable to face-to-face modes.
- Interactive websites appear to work better for improving knowledge and changing attitudes than static, information-only websites.
- There was limited or mixed evidence for informational websites, e-books, computer and smartphone apps, and CD-ROM/DVDs.

Using information technology-based interventions with parents

- Simple interventions appear to work well for simple outcomes (for example text messages for reminders and prompts) but may be less useful for more complex behaviour change.
- The majority of information technology-based interventions were highly interactive.
- Information technology interventions are delivered as stand-alone, self-directed programs, but also as adjuncts to existing face-to-face programs.
- Most information technology delivery modes appeared to be fairly acceptable to parents, with attrition rates comparable between intervention and control.
- Interventions (even those which were on the whole self-directed and stand-alone) often involved additional support from therapist, and the clearest benefits for online therapies, parenting programs, and web-based learning were seen when this offline support was provided. However, many interventions were successfully delivered entirely independent of live feedback. Further consideration and evaluation is needed to determine if extra support is required.
- Interactive text messages may be useful for filling some services gaps in areas with poor access to services, but consideration should be given to potential issues of access to equipment and internet.
- Information technology-based interventions are in use with a range of hard-to-reach parenting populations, particularly with low-income families.
- A small number of information technology-based interventions have been trialled with Australian populations.
- Barriers to delivering information technology-based interventions include access to equipment and poor internet speed.

5.1.1. Kinds of interventions being delivered to parents via information technology

This review identified a broad range of interventions being delivered to parents via information technology, from complex and intensive parenting programs to simple reminders for vaccinations and clinic attendance. These are categorised below. Note that ** indicates evaluations for which there were no effects on measured outcomes.

Several interventions evaluated in this REA (n=8 studies) were **counsellor-assisted therapies and parenting programs**. These are interventions delivered by counsellors, therapists or other facilitators and which could not be delivered without their involvement. These types of interventions included:

- CBT delivered online (n=4)
- counsellor-assisted problem solving (n=2)
- facilitated online support (n=1**)
- general parenting programs (n=1).

Self-directed support and education interventions were identified in this REA (n=40). Many of these interventions also used support from counsellors, therapists or coaches, but the main intention of the interventions was to allow parents to proceed at their own pace.

Interventions delivered via self-directed support and education included:

- applied behaviour analysis (n=1)
- breastfeeding education with support (n=4, with one showing no effect)
- breastfeeding self-directed learning (n=1**)
- CBT education and self-help (n=6)
- dental health (n=1)
- disaster recovery/PTSD education (n=1)
- driving education (n=2)
- education and support for childhood health and safety issues (n=1, with four finding no effect)
- grief support (n=1**)
- healthy lifestyle education and support (n=13, with one showing no effect)
- parent conflict reduction (n=1)
- reading skills (n=2)
- sleep skills (n=2)
- stress management (n=1**)
- Triple P Parenting programs (n=2)
- vaccination education (n=1).

Twenty-one evaluations of **parenting skills education** interventions were identified in this REA. These covered:

- general parenting skills (n=11, with one showing no effect)
- Triple P Parenting education (n=2, with one finding no effect)
- Parent Management Training (n=2)

- communication skills (n=4)
- enhancement of home-visiting skills training (n=1)
- reminders for parent-training education (n=1).

A further 18 studies involved **reminders for parent and child health**. Specifically, these included:

- clinic appointment reminders (n=3)
- dental health text messages (n=2, with one showing no effect)
- ear clinic reminders (n=1**)
- supporting health beliefs of pregnant women (n=2)
- text message support for infant feeding (n=1)
- vaccination reminders (n=7, with two showing no effect)
- healthy lifestyle support (n=2).

Support for parent-health professional communication was evaluated in five studies. These involved:

- online data collection (n=1);
- computer-enhanced message delivery (n=2); and
- parent/child engagement tools (n=2)

5.1.2. Information technology platforms used to deliver interventions to parents

The most commonly used technology platform identified in this review was the internet. Counsellor-assisted therapies, parenting programs, and self-help and education programs were all delivered via websites.

The majority of interventions were highly interactive; very few used information-only websites or non-interactive DVDs or CD-ROMS.

Mobile and smart phones were also extensively used, for text message interventions and (to a much lesser extent) for dedicated apps. Text message interventions were sometimes passive, where participants simply received reminders; but they frequently had interactive elements and encouraged parent responses.

Computer and smartphone apps, e-readers, and telehealth interventions were not well represented in this review.

Many interventions were stand-alone and did not require any extra input. However, many were supported with face-to-face meetings and/or phone or email contact with therapists.

5.1.3. Effectiveness of interventions delivered to parents by information technology

Therapies and parenting programs delivered online were associated with improvements in parenting skills, parent outcomes, and child outcomes. In studies where online programs were compared with face-to-face versions or self-help workbooks, the online versions generally performed as well as the more traditional delivery modes.

Some but not all of the interventions with the clearest evidence of benefit also used substantial offline resources, such as phone or email support from therapists. However, the most resource-intensive interventions did not necessarily lead to greater benefits for parents.

Web-based learning programs were amongst the best-represented interventions assessed in this review. Web-based learning was useful for improving parenting skills, parent behaviour, and parent outcomes; no child outcomes were assessed in this category.

As with online therapies, programs with the clearest evidence of benefit were not those with the most support from real-time therapist/coach involvement. The four interventions which were most effective for all reported outcomes (ABA online, Parenting toolkit, an intervention to increase parent-adolescent communication about sex, and Triple P via Podcast) required resources other than those provided online. Conversely, interventions with mixed effects (improvements for some outcomes, no improvement for others) required a range of materials, responsiveness to parents, and use of offline resources.

Another frequently used form of information technology identified in this review was the **interactive website**. Most such interventions incorporated audio-visual material and offered some ability for parents to personalise their use of the site. Interactive website interventions showed evidence of benefit for changing parent behaviour and for parent and child outcomes.

Text messaging and MMS interventions were also evaluated in many studies identified in this review. They tended to be most successful when addressing simple, determinate, health-related parent behaviours. A few attempted to modify parenting skills or other parent outcomes, but these interventions were less successful; such interventions were also more likely to include other components such as face-to-face counselling or telephone support.

Evidence was mixed for **informational websites** and for **e-books**, with some good outcomes for parent behaviour but only a few interventions evaluated.

Limited evidence in favour of **computer apps** and **smartphone apps** was identified in this review. Four interventions were found in our search and results were mixed, with only one showing clear improvements in parent behaviour outcomes. Another improved parenting skills, but this app was used as an enhancement of a pre-existing non-IT intervention. Similarly, only four **CD-ROM/DVD** interventions were identified in this review and, on the whole, this was not a highly successful delivery mode with mixed outcomes at best.

5.1.4. Preferred modes of information technology

All information technology delivery modes appeared to be fairly acceptable to users, with attrition rates comparable between intervention and control (whether that control was face-to-face therapy or wait-list/information only). One exception was automated phone interviews, which generally were not well accepted.

The choice of mode delivery can therefore be driven by theoretical considerations or the resource capacity of the provider. Non-IT additional support is often useful, but not necessarily crucial: 'stand-alone' IT programs worked well too.

5.1.5. Usability and acceptability of interventions delivered via information technology

Where this was reported (in around half the studies identified), participants were highly satisfied with ease of use and program quality in general for interventions delivered via information technology.

One caution is that satisfaction and usability were generally only measured for participants using the IT intervention under investigation, not for participants in control or comparison groups. However, in the few studies where it is possible to tell, online formats compared favourably with face-to-face delivery, and when a range of online modalities was offered participants were satisfied with all of

them. A single study recorded participant preference for text or voice reminders and found that parents preferred voice to text messages.

Most participants found IT interventions to be easy to use (which is reflected in the overwhelmingly positive views reported). Where a healthcare professional was provided to orient parents to programs, this was seen as unnecessary. Technical difficulties and a failure to receive equipment were the major usability issues reported; some researchers provided hotlines to troubleshoot IT issues and this was well received.

5.1.6. Challenges to delivering information technology-based interventions to parents and approaches to overcoming these challenges

Lack of access to computers and high-speed internet were barriers mentioned in several studies. Some parents were excluded from participation due to lack of such access; in other cases, participants were provided with needed equipment and internet connections.

Mobile phone ownership was lower than expected in remote Australian Indigenous communities, and this presented a barrier to participation in studies located in such communities. In an intervention trialled in sub-Saharan Africa only a minority of women owned a mobile phone, and the remainder had various degrees of access to shared phones. Healthcare providers in this intervention also lacked access to mobile phones. In at least one study, parents started the intervention with a mobile phone but lost access during the program. In some cases, researchers provided participants and healthcare providers with mobile phones and with vouchers to cover the cost of making mobile phone calls.

Where participants have access to, but not sole ownership of, IT equipment, shared ownership of phones and computers can raise confidentiality problems.

The practice setting can affect recruitment, if procedures or equipment are too cumbersome. Where space is limited (for example in physicians' offices) distributing and using even small and mobile equipment such tablets can be awkward.

Barriers to participation are not unique to IT programs; in one study where there was high attrition from an online intervention, a similar rate was found in the face-to-face version. Lengthy and complex informed consent procedures can affect recruitment regardless of delivery mode, as can interventions which address particularly sensitive subjects.

5.1.7. Interventions delivered to hard-to-reach adults via information technology

A wide range of interventions targeted hard-to-reach populations. We identified 26 publications evaluating 24 interventions, of which all but four showed some evidence of benefit. The information technologies used to deliver these interventions included:

- online therapies;
- guided and self-directed web-based learning programs;
- supported and self-directed interactive websites;
- computer apps;
- text message reminders; and
- mobile phone enhancements to a face-to-face program.

The hard-to-reach populations and promising interventions we identified in the REA are summarised next. Interventions for families at **risk for harsh parenting or child maltreatment** were assessed in three papers. These included the following:

- The Parenting Toolkit with video demonstrations of parenting scenarios and of Q&A sessions to decrease harsh discipline practices (n=1);
- text message reminders for parents enrolled in child maltreatment prevention training (n=1); and
- mobile phone enhancement in a home visiting program for mothers at high risk for child maltreatment (n=1).

The REA identified one study with **culturally and linguistically diverse parents**. This was a computer-based education program to increase parent-adolescent communication about sex.

Several studies were delivered to **parents with low incomes** (n=13). These interventions involved:

- text messaging for improving vaccination rates (n=4);
- text messaging for families attending dental clinics (n=1);
- text messages combined with face-to-face coaching for weight loss in pregnant women at risk of obesity (n=1);
- a smartphone enhancement of Helping the noncompliant child (n=1);
- a self-paced online learning program, Parenting Wisely for parents of children with behavioural problems (n=1);
- another self-directed program, Infant-Net for improving infant behaviour (n=1);
- web-based health promotion for mothers and daughters living in public housing (n=1);
- a CD-ROM intervention for adolescents in public housing (n=1);
- automated telephone calls for improving parent awareness of risk (n=1);
- automated telephone counselling in African American children at risk for obesity (n=1).

One study involved **parents with low literacy**. TouchHear! was an interactive, tablet-based version of an asthma questionnaire. There was also one study involving **parents in remote areas** and this was an internet intervention to increase exclusive breastfeeding. One study included **parents who are separating**. This was a brief computer education program, Proud2Parent, to help parents reach agreement and reduce conflict.

There were two studies involving **parents in developing countries**: text messaging for sub-Saharan women with HIV; and text messaging support for pregnant women and health professionals in sub-Saharan Africa.

5.1.8. Effectiveness of interventions delivered to hard-to-reach adults via information technology

A meta-analysis comparing effects for hard-to-reach parents versus parents in general was beyond the scope of this review.

There were no obvious differences between hard-to-reach parents and other parents, based on the range of interventions and IT platforms offered; nor were interventions offered to hard-to-reach parents noticeably less useful across a range of outcomes. Of the 24 interventions identified, all but four showed some evidence of benefit.

5.1.9. Recruiting and retaining vulnerable parents and other hard to reach adults

The authors of the publications identified in this review did not, in general, test the effectiveness of their recruitment and engagement strategies.

However, as highlighted above, a key barrier to using IT for parent support is a lack of access to IT equipment. Some interventions provided both equipment and ongoing technical support for their vulnerable parents. In other interventions, IT components such as text messaging were used as an engagement strategy for adjunct therapies.

Once parents have the appropriate equipment, initial orientation to online programs may be of some benefit, as will ongoing technical support and support related to the program subject matter from coaches.

5.1.10. Gaps in the evidence

One striking characteristic of this literature is that there is no clear pattern to which features are crucial to the effectiveness of information technology-based support. Online therapies which provided extensive contact with therapists and coaches (whether face-to-face or via phone or teleconference) were effective for some populations and outcomes, but less successful for others. Conversely, in some evaluations an information-only site worked as well as a more complex and interactive program. Thus, the current evidence does not allow us to say with certainty whether offline resources or interactivity are necessary for program success.

There were no webinar interventions and only very few interventions using smartphone and tablet apps identified in this review. In the case of webinars, such interventions are relatively old (in information technology terms) and thus may have been evaluated prior to the earliest publication date included in this review. For smartphones and tablets, the issue is reversed: such new interventions do not appear to have yet been evaluated using the moderately rigorous comparisons to which this review has been limited. Given the lack of studies on these platforms, we don't have a clear picture of their benefits to parents.

Although culturally and linguistically diverse populations were involved in several of the international evaluations, there were limited culturally and linguistically diverse populations in the Australian evaluations, with only one study investigating an intervention aimed Australian Aboriginal populations.

5.2. Limitations

The literature search for this REA was limited to high quality articles published in English from the year 2010 onwards and there may have been relevant studies dated before this cut off period.

Publications were only included if they could be located online and we did not contact authors or search grey databases for additional studies.

Extraction of findings was completed using a formal data extraction template. These were completed by individual co-authors and while some cross-checking of individual studies was conducted we did not carry out a concordance analysis to check coder agreement.

While we have indicated whether interventions significantly improved outcomes, we did not undertake extensive analysis of the quality of the studies measuring these outcomes. We did not complete a formal Risk of Bias analysis, as is typical in a systematic review. As a result, the analysis is not as complete as it would be in a systematic review.

5.3. Conclusion

People are beginning to use technology in all sorts of ways to support children and families in all kinds of areas. Web-based learning programs, interactive websites, online therapies, and text messaging are all widely used. Smartphone and tablet interventions may increasingly be used, but formal evaluations are not yet common in the literature.

Information technology interventions are delivered as stand-alone, self-directed programs, but also as adjuncts to existing face-to-face programs. Some interventions are delivered primarily via information technology, but with additional phone, text message, or email support from therapists and coaches.

Parent support via information technology is a new and rapidly developing space. Information technology-based interventions are potentially effective, and may be especially useful when resources are constrained and need can't be met with traditional approaches. There is a growing body of research, some of it very good, suggesting that information technology can be used to improve a wide range of parent and child outcomes. However, this research is still in its infancy, especially for newer platforms. **This review should be updated in three to five years to search for new evaluations of existing and developing information technology platforms.**

Nearly all information technology modes seem to work for some populations and some outcomes. Simple interventions appear to work well for simple outcomes (e.g. text messages for reminders and prompts) but may be less good for more complex behaviour change. Information technology may be of use in different phases of the change process (the knowledge to behaviour change continuum). Some studies suggested that information technology interventions were more effective at changing attitudes and knowledge than changing behaviour.

The effectiveness of information technology-based interventions is wholly dependent on the effectiveness of the underlying approach. In cases where research compared an evidence-based intervention delivered face-to-face to one delivered online we found, the online version performed similarly.

Information technology-based interventions compare favourably to face-to-face interventions in many instances, and this is highly significant because they may represent a less expensive option for delivery, especially those that are stand-alone and self-directed. In the absence of extensive cost-benefit comparisons of face-to-face and online interventions, this is a question which remains to be determined.

There is still much to learn about the best application of different technologies. The target group and purpose need to be well aligned; for example, complex behavioural change is unlikely from light touch approaches such as text messaging.

Delivering online therapy may work best with personalised feedback from a therapist or coach; however, many interventions were successfully delivered entirely independent of live feedback. If personalised feedback is used, it can be standardised or provided asynchronously (that is, therapists need not be available to respond in real time and can make some use of pre-prepared responses) meaning that online therapy is less resource-intensive than face-to-face therapy. It can also be offered to more participants, and participants who cannot or will not attend agencies.

Interactive websites and web-based learning programs tend to offer additional non-IT support such as telephone or email contact, and in some cases even face-to-face support. There may be sound reasons for offering this, but it is also worth considering, and evaluating, if this extra support is necessary as some programs were delivered successfully without it.

Interactive websites appear to work better for improving knowledge and changing attitudes than static, information-only sites. Caution must be exercised, as changed attitudes and knowledge may not translate into changed actions and outcomes.

Interactive text messages may be useful for filling some service gaps in areas with poor access to services; but populations with poor access to services may also have limited access to computer equipment, mobile phones, and good internet connections.

It is still early days culturally for parental engagement in online programs, even though parental use of information websites is extremely high. Engagement with particular target groups and with parents generally is still an issue. This is true for face-to-face programs as well, but the challenge of finding the right information in the online sphere is an issue that warrants consideration in future research. However, all kinds of people are participating in information technology parent support and attrition seems comparable to that of traditional face-to-face approaches and may have lesser cost implications.

User perception matters: parent and therapist ratings of child outcomes may not always align, with some studies showing that parents perceived no improvement in the outcomes for their child from online interventions compared with face-to-face therapies, although children themselves did perceive an improvement.

There appears to be value in embedding or connecting the use of information technology-based interventions to face-to-face services, and in applying and using principles of effective design to online and information technology-based interventions.

At this stage, it makes sense to think of information technology-based interventions as supplementing and supporting frontline face-to-face services. Every person helped by an online solution, is one fewer client for more expensive face-to-face services.

5.4. Implications for policy and practice

When deciding if and how to choose an existing or create a new information technology-based intervention for parents or families, the following points should be considered:

- ***Online therapies, interactive websites and web-based learning show promise***

Several promising options for parent and child outcomes were identified in this review, particularly online therapies, interactive websites, and web-based learning programs. For simpler outcomes, text messaging can be a useful approach.

- ***There is no clear information about crucial features of effective information technology support interventions***

There is no clear pattern to which features are crucial to the effectiveness of information technology-based support. Online therapies which provided extensive contact with therapists and coaches were effective for some populations and outcomes, but less successful for others. Conversely, in some evaluations an information-only site worked as well as a more complex and interactive program. The current evidence does not allow us to say with certainty whether offline resources or interactivity in conjunction with information-technology are necessary for program success.

- ***Choice of underlying intervention is key to choosing the most appropriate information technology platform.***

The choice of underlying intervention should take priority over the choice of information technology platform: use programs with an established evidence base. Some platforms will be more appropriate than others for any given interventions: for example, interventions targeting complex behaviours are less likely to be successfully delivered by a relatively simple platform.

such as text messaging. Furthermore, an ineffective intervention will remain ineffective regardless of how it is delivered. The intervention, not the delivery mode, is key.

- ***Supplementary, non-technology-based support may be beneficial in conjunction with information technology***

It may be helpful to provide other support, such as an initial home visit to familiarise participants with the program technology, or regular phone calls, or email contact. This can increase the customisability of the intervention and aid in engaging participants.

- ***Reminders delivered by information technology may prompt participation and engagement***

Less intensive support, such as reminder emails or text messages, may improve participation and engagement. These could be automated messages requiring no response or they could allow an option for participants to reply which may be beneficial for engagement.

- ***Changing attitudes and knowledge is not the same as changing behaviour***

While changing parents' attitudes and knowledge is a worthwhile aim, caution should be exercised in assuming that this will translate to changed behaviour. An online intervention—for example, an interactive website—may be effective at improving knowledge and changing attitudes without necessarily changing behaviour.

- ***Reliable access to suitable information technology infrastructure and services is variable***

Not all sectors of the population have equal access to information technology resources, including equipment and internet coverage. Subsidising this access either completely or partially may improve parents' willingness and ability to complete the intervention.

- ***There is a gap in the evidence for diverse Australian populations***

There is very limited evidence for the effectiveness of information technology-based interventions in Australian culturally and linguistically diverse populations. Further research is needed to determine acceptability and efficacy of such interventions for diverse participants, and the best strategies for engaging and retaining participants.

- ***Evidence for newer technologies has yet to emerge but may be captured by an updated review***

Interventions delivered by relatively new information technologies such as smartphones and tablets do not appear to have been rigorously evaluated to date. There is currently no clear picture of their benefits for participants, but this is likely to become available in the three to five years following publication of this report. A brief rapid evidence assessment conducted in the future, covering only the years since publication, would capture any new information about these recent technologies.

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