

# A systematic literature review of computer-based behavioural change interventions to inform the design of an online VBAC intervention for the OptiBIRTH European randomised trial (project HEALTH – F3 – 2012-305208)

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## Abstract

**Aim.** The aim of this research was to systematically review computer-based, behaviour change (BC) interventions during pregnancy and their design components in order to determine their best application within the context of the OptiBIRTH intervention.

**Design.** A systematic literature review was undertaken using the *Cochrane collaboration guidelines for systematic reviews of health promotion and public health interventions*. Literature searches were conducted in: Ovid MEDLINE, PubMed, Cochrane Library, Embase, PsycINFO, from database inception to June 2015. Cochrane Risk of Bias criteria was applied to assess the methodological quality and a taxonomy of BC techniques was used to appraise the interventions.

**PICO.** Participants included healthy pregnant women who were  $\geq 18$  years old. The types of intervention used were computer-based interventions designed to facilitate a BC approach in a sample of pregnant women. The comparison was routine antenatal care. The primary outcome included improved health behaviour(s), as an indicator of the intention behind the intervention design.

**Results.** A total of 343 papers were identified through database-searching and hand-searching methods; 80 duplicates were removed. From the remaining 263 papers, 244 did not explicitly address the subject under review. Therefore, 19 full-text articles were assessed for eligibility; 16 did not meet eligibility criteria and were excluded at this stage. This resulted in a total of three studies being selected for inclusion in this review (Jackson et al, 2011; Tzilos et al, 2011; Tsoh et al, 2010). The computer-based interventions were designed to bring about BC in relation to alcohol consumption, smoking or diet and exercise during pregnancy. Interventions delivered varied between two types: purely computer delivered (Tzilos et al, 2011) or a combination of both computer plus face-to-face input (Jackson et al, 2011; Tsoh et al, 2010). Techniques used included motivational interviewing, problem-solving cognitive dissonance and goal setting. Types of measurement outcomes varied but were all self-reported behavioural outcomes. Statistically significant improvements in behavioural outcomes were seen in the interventions by Jackson et al (2011) and Tsoh et al (2010), but not Tzilos et al (2011). The GRADE analysis identified that all studies combined lacked blinding and relied on self-reported data therefore increasing risk of bias.

**Conclusion.** This systematic review reports on the best available evidence and theory to design an online component of a complex intervention for use in an RCT to enhance women's shared decision-making experience about vaginal births after caesarean (VBAC). The review reports the differences between the observed BC approach and that of a decision-making approach: BC techniques are applied when a predetermined, directional goal is evidentially understood by the clinicians as being focused on a more healthy option. As a result, techniques designed to create dissonance are considered appropriate. Shared decision-making, however, is conceptually different, in that the goal is to facilitate a woman in discovering the best direction of travel for her as a person. Therefore, the authors argue that it is crucial for healthcare professionals designing complex healthcare interventions (either BC techniques or shared decision-making) to ensure that a person's self-determination is respected through having access to relevant and understandable information and healthcare professionals who understand a woman's motivation. However, it is not possible to draw firm conclusions from three studies and there is a requirement for further research.

**Key words:** VBAC, technology, pregnancy, information technology, decision-making, midwifery, systematic review, evidence-based midwifery

## Introduction

The *European perinatal health report* (EURO-PERISTAT Project, 2010) noted widespread concern over the rising CS rates. Pointing out the morbidity, mortality and economical costs associated with conducting unnecessary CS, healthcare professionals were urged to increase the number of vaginal births after caesarean (VBAC). Responding to this challenge, a consortium of researchers and clinicians within Europe set out in 2012 to design and test a complex intervention, that would have the capability of reducing the CS rates, but at the same time optimise women's childbirth experiences, through the provision of enhanced woman-centred care. In addition to a clinically based, face-to-face component, the intervention design was to include the development of a woman-centred, online portal and three mobile applications that would facilitate women in a shared decision-making process (OptiBIRTH Project, 2012).

As experts within the technology-based work package discussed the design of the online intervention component, the lack of conclusive evidence that equated optimisation of women's birth experiences with an increase in VBAC rates, began to create a design challenge. Keeping in mind that the women would have online access prior to meeting their clinicians, the challenge was whether the online resources should aim to:

- Influence all women towards VBAC by designing a behavioural change (BC) solution, or:
- Empower women to experience a personally optimal birth by enabling them to engage more meaningfully in the face-to-face shared decision-making process.

In step with the Medical Research Council (2009) guidance on developing a complex intervention, there was a need to consider the rationale and theoretical relevancy of the online component of the complex intervention from the outset; with reference to existing evidence, theory and, if necessary, supplementary stakeholder research.

A systematic review that explored VBAC (Lundgren et al, 2012) and preliminary qualitative research with women and their care providers was conducted by Work Package 2 of the consortium to identify what women and service users wanted to know about VBAC and repeat CS. The results of the review and the qualitative research were used to guide the design of the face-to-face intervention and the creative brief was provided to the technology-based design team so that the components could be aligned. This creative brief indicated that women wanted to know more about the different options available to them, engage with other women making similar decisions and be able to communicate their thoughts and feelings to their healthcare professionals.

However, exploration of the literature provided little evidence about how to design an online component of a complex face-to-face shared decision-making intervention. For example, Glyn et al (2012) outlined a shared decision-making model based on the theory of self-determination (Deci and Ryan, 2000). However, the design principles focused on a process of choice

option, decision and person-orientated talking within the clinical environment that could not be easily translated or replicated in an online environment. Therefore, the research team set out to find the best available evidence and theory to guide the design of an online component of a shared decision-making intervention.

## Background

A review of the literature demonstrated that the goal of a shared decision-making intervention differs from that of a BC intervention. Decision-making is a 'medical decision-making process by which patients and providers consider outcome probabilities and patient preferences in order to reach a healthcare decision based on mutual agreement' (Frosch and Kaplan, 1999: 285). According to Moulton and King (2010), sufficient clinical evidence exists that demonstrates when patients are fully informed, they are unlikely to choose surgery as an option.

However, the authors also point out that decision-making requires a process of integration and unambiguous communication between the service provider and the patient. When this happens, the patient's needs and the physician's ethical obligations are met. Research has demonstrated that when asked, most patients equate the concept of decision-making with that of shared decision-making. From this perspective, when service users engage in a decision-making process, they perceive the role of professionals to be more than providing evidence-based information (evidence-based informed choice).

Many decision-aid trials were available that demonstrated from a non-maternity care context, that when patients were offered elective surgery as a viable option, they would remain more risk-averse to surgery than the clinicians who were advising them (Stacey et al, 2014). However, insufficient evidence of this risk-averse phenomenon in pregnant women (when offered repeat CS as a viable and balanced option alongside VBAC) was available to direct the design team. A systematic review that investigated women's lived experience of VBAC demonstrated that the choices presented to women during pregnancy and birth often remained unclear and contrasting (Lundgren et al, 2012).

According to NICE (2014), the goal of a BC intervention is to help people change their behaviour to improve their health. Based on the premise that an individual's current behaviour is contributing to less optimal health, intervention designers have access to BC implementation models such as Oinas-Kukkonen and Harjuma (2009), or a behaviour change taxonomy by Michie et al (2013). Techniques include communicating to an individual the health consequences of their existing behaviour (outcome expectancies); promoting the visibility of positive reference groups (descriptive norms); enhancing social approval for positive health behaviours (subjective norms); personal and moral norms (moral commitment to changing behaviour) and relapse prevention (should they face conflicting goals). In summary, the focus of

a BC intervention is to purposely direct and influence individuals towards making a positive shift away from an unhealthy behaviour, towards a healthier alternative. In this context, the role of the intervention designer is, therefore, to create an intervention that influences the individual's capacity, capability, opportunity and motivation to change their behaviour.

While the definitional and conceptual differences between a BC and shared decision-making approach may seem apparent, 'blurring' of the two approaches can easily exist when translating theory to practice within a caring context. In other words, the rationale, in terms of what changes are expected, and how change is to be achieved, may not be clear from the outset. For example, in the case of designing the technology component of the OptiBIRTH intervention, increasing the rate of VBAC (as a public health issue), is amenable to the application of BC techniques, especially since pregnancy is known to be a 'teachable moment' (Phelan, 2010). It could therefore be argued that a caring attitude is best realised through positively influencing women towards VBAC, by implementing BC strategies, such as restricting CS, persuading women to choose VBAC, or even 'coercing' women by creating an expectation of punishment or cost, if they chose repeat CS (higher morbidity). Yet the NICE (2007) guidance warns healthcare professionals about the dangers of implementing BC techniques without thinking through how the 'apparently negative health behaviours' could have positive psychological, social and physical benefits to a person, from both a social and cultural perspective. Current NICE BC guidance (2014) therefore recommends that BC practitioners implement a person-centeredness that is conceptually more akin to that of a shared decision-making approach.

However, in order to successfully deliver a shared decision-making programme of care, healthcare practitioners must pay attention to a number of critical components; these include issues of quality, safety of care, transparency of information and balancing their role as an expert in health, with the need to protect the autonomy of those in their care (Barry and Edgman-Levitan, 2012).

#### *The design challenge*

As the technology-based design team became more conscious of the potential for goal conflict between the two aims of the OptiBIRTH project (to increase VBAC rates), and to provide women with a personally optimal birth experience (should that be a repeat CS), the need to identify the 'self-determination' design components of the online intervention became paramount. As recommended by the MRC (2009), and already outlined, preliminary research with women and their care providers was conducted to determine women's needs (Lundgren et al, 2012). The challenge facing the team was to identify how key decision-making techniques should be implemented in the online environment that would support women in using the information provided in collaboration with their healthcare professionals.

#### *The review*

The aim and objectives of this systematic review were to:

- Systematically review computer-based, BC interventions during pregnancy and their design components in order to determine their best application within the context of the OptiBIRTH intervention
- Assess the methodological quality of the intervention programmes that used BC techniques with a population of pregnant women
- Evaluate the effectiveness of these interventions in relation to the defined outcomes
- Describe BC components of the successful interventions using a BC taxonomy.

Objectives one and two were designed to produce a critical appraisal of the studies retrieved with regard to methodological quality and rigour. Once methodological quality and rigour was determined, objectives three and four were specifically designed to describe the BC components of 'successful interventions' using BC techniques and the context of their application.

#### *Review process*

PRISMA guidelines (Moher et al, 2009) and the *Cochrane collaboration guidelines for systematic reviews of health promotion and public health interventions* (Armstrong et al, 2007) were used as a framework for this review. Three stages of review were conducted:

- Cochrane Risk of Bias criteria was applied to assess the methodological quality of included studies
- GRADE was used to provide an overall quality score across the studies
- In order to identify the BC strategies associated with the implementation of the interventions, the taxonomy of BC techniques by Michie et al (2013) was applied.

#### *Search methods*

Literature searches were conducted bi-weekly from April 2014 to June 2015 using the following electronic databases: MEDLINE Ovid, PubMed, Cochrane Library, EMBASE and PsycINFO. All databases were searched from inception to ensure that this type of review had not already been completed.

The following terms were searched using different combinations: 'web-based', 'internet', 'online', 'e-health', 'e-learning', 'virtual learning', 'mobile technology', 'pregnancy', 'behaviour' and 'lifestyle'. The initial search strategy was developed in MEDLINE Ovid using a combination of medical subject headings and natural language key words.

This was then modified to meet the requirements of the additional databases. Grey literature, theses and searches by hand of relevant journals and reference lists, along with citation tracking were undertaken to ensure a complete collection of all relevant literature.

#### *Inclusion criteria*

As the use of computer technology for public health interventions is fairly novel and rapidly evolving, only

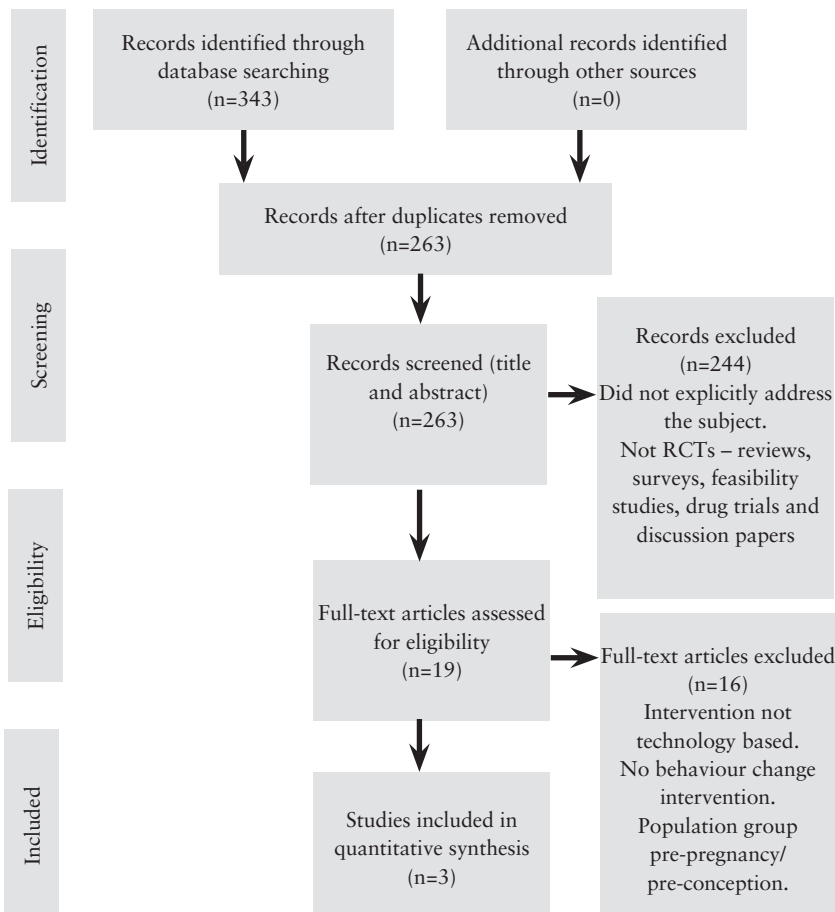
**Table 1. GRADE scoring for all three included studies using the outcome ‘behaviour change’**

Type of evidence <sup>a</sup>	Quality points <sup>b</sup>	Consistency <sup>c</sup>	Directness <sup>d</sup>	Effect size <sup>e</sup>	Overall quality of evidence <sup>f</sup>
4	-1	0	-1	0	2 – very low
<i>a. All studies were RCTs.</i>					
<i>b. Lack of blinding and reliance on self-reported data.</i>					
<i>c. Consistency was found in that both interventions (Jackson et al, 2011; Tsoh et al, 2010) that consisted of computer-assisted counselling plus face-to-face support reported significant improvements in behaviour. One study, consisting of computer-assisted counselling only, reported no significant results.</i>					
<i>d. One study (Jackson et al, 2011) included participants who were from a low-income background and ethnically diverse.</i>					

peer-reviewed papers published in the last 10 years were considered for inclusion in this review. The other inclusion criteria applied were:

- Types of participants: the study population included healthy pregnant women who were ≥18 years old
- Types of intervention: computer-based interventions designed to facilitate a BC approach in a sample of pregnant women
- Comparison: routine antenatal care
- Types of outcomes: the primary outcome included

**Figure 1. PRISMA 2009 flow diagram**



improved health behaviour, as an indicator of the intention behind the intervention design

- Study design: only randomised controlled trials (RCTs) were selected as this review was conducted to inform an intervention design that would be tested using an RCT.

#### Exclusion criteria

Studies where only an abstract was available were excluded, as sufficient detail was needed to identify any BC techniques used.

#### Identification and data extraction of papers

Papers were initially screened by two reviewers using titles and abstracts. Studies that did not meet the inclusion criteria were excluded. An independent review by two authors identified

the remaining full-text articles according to the pre-determined inclusion and exclusion criteria. Differences between reviewers were resolved through discussion with the research team until consensus was reached. Relevant citations were entered into Review Manager (version 5).

#### Quality appraisal

The methodological quality of all RCTs was assessed using the Cochrane Risk of Bias criteria. This tool includes criteria for assessing sequence generation, allocation concealment, blinding of participants, personnel and outcome assessors, incomplete outcome data, selective outcome reporting and other sources of bias. Cochrane Risk of Bias criteria was assessed using two authors independently. Any disagreements were resolved with the remaining team members. This process was repeated when GRADE was used to appraise the evidence across the selected studies (see Table 1).

#### Data synthesis

In order to inform further intervention design, all of the researchers systematically mapped the ‘persuasive features and mechanisms’ embedded into the interventions (Kelders et al, 2012; Lehto and Oinas-Kukkonen, 2011). Each selected study was therefore read in detail and coded using Michie et al’s (2012) BC technique taxonomy; two authors independently evaluated the studies and the remaining two authors provided additional input in cases where there was any disparity.

## Results

#### Study selection

Overall, a total of 343 articles were identified through database-searching and hand-searching methods; 80 duplicates were removed. From the remaining 263

**Table 2. Characteristics of studies that applied computer-based BC techniques during pregnancy**

Study	Participants	Intervention	Comparison	Outcome measures	Results/conclusion
Tzilos et al, 2011	50 pregnant women at <36 weeks' gestation	Brief (15-20mins) computer-delivered intervention (tailored to pregnant women), including a brief educational component. If women reported having quit, the narrator would present information on relapse prevention 'my plan to remain abstinent', while asking the woman to provide the reasons or benefits of this change. Remaining women were asked about their current willingness to quit, leading to a bifurcated treatment response – a goal of immediate abstinence would move quickly to phase two of MI (primarily goal setting), those who did not want to quit were given elements of phase one of MI (pros and cons, normal feedback).	Standard antenatal care, administered questions on TV show preferences and brief videos of popular shows to account for time effects and facilitating blinding of investigator	Changes in alcohol consumption 30 days after the single session intervention	No effect of treatment on alcohol use at follow up (p=0.71)
Tsoh et al, 2010	42 participants enrolled in the HIP programme who reported smoking cigarettes in the past 30 days and were <26 weeks pregnant	A multimedia, interactive intervention delivered on a laptop computer. An actor delivered interactive risk-reduction messages to simulate an ideal discussion with a prenatal healthcare professional, providing non-judgemental counselling (motivational interviewing). Tailored messages to the participant risk profile and intention to change. After each intervention session, the programme automatically printed two documents: (a) a cueing sheet for providers, which offered a summary of the patient's risk profile and suggested risk-reduction counselling statements; and (b) an educational worksheet for participants with questions for self-reflection, harm reduction tips, and local resources. The cueing sheet was placed in the patient's medical record for the provider's use during the prenatal appointment. All providers received a brief orientation to the use of the cueing sheets.	Standard antenatal care	Smoking cessation outcomes including self-reported 30-day abstinence, decrease from baseline in number of days smoked in the past 30 days, and decrease from baseline in the number of cigarettes smoked on a typical day	Intervention participants were more likely to receive provider advice on tobacco use prenatal visits (60.9% vs. 15.8%, p=0.003). A significant decrease in the number of days smoked and in cigarettes smoked per day. The 30-day abstinence rate at two months post-baseline was 2.5 times greater in the intervention group; the difference was not significant (26.1% vs. 10.5%, p=0.12)
Jackson et al, 2011	327 low-income, ethnically-diverse pregnant women <26 weeks' gestation	It conducts in-depth behavioural risk assessments, delivers tailored counselling messages and produces printed output for both the patient and clinician, which offers a summary of the patient's risk profile and suggests counselling statements. An educational worksheet, which corresponds with information presented by the video doctor and includes questions for self-reflection is printed for the patient to keep. Dietary counselling focused on increasing intake of fruit and vegetables and whole grains, increasing healthful versus unhealthful fats and decreasing sugary foods. The video doctor emphasised dietary and exercise behaviour changes over weight gain. The video doctor portion required 10 to 15 minutes to complete. The participant then proceeded to her prenatal care appointment and returned briefly to the research assistant to report whether nutrition, exercise, or weight had been discussed and to obtain the computer-generated educational worksheet specific to the patient's risk profile.	Standard antenatal care	Self-reported servings per day or week of healthful foods (for example, fruit and vegetables) and unhealthful foods (for example, sweets), and exercise duration and frequency	In the video doctor group (n=158), there were statistically significant increases from baseline in exercise (+28 min), intake of fruit and vegetables, whole grains, fish, avocado and nuts, and significant decreases in intake of sugary foods, refined grains, high-fat meats, fried foods, solid fats, and fast food. In contrast, there were no changes from baseline for any of these outcomes in the usual care group (n=163)

papers, 244 did not explicitly address the subject under review. Therefore, 19 full-text articles were assessed for eligibility. A total of 16 articles did not meet eligibility criteria and were excluded at this stage. This resulted in a total of three studies being selected for inclusion in this review (see Figure 1).

#### Study characteristics

In summary, all participants involved in each of the three interventions were pregnant, however gestation varied. Studies by Jackson et al (2011) and Tsoh et al (2010) involved women who were <26 weeks' gestation, however, the study by Tzilos et al involved women <36 weeks' gestation. Interventions delivered varied between two types: purely computer-delivered (Tzilos et al, 2011) or a combination of both computer plus face-to-face input (Jackson et al, 2011; Tsoh et al, 2010). Types of measurement outcomes varied, but were all self-reported behavioural outcomes. Statistically significant improvements in behavioural outcomes were seen in the interventions by Jackson et al (2011) and Tsoh et al (2010), but not in the intervention by Tzilos et al (2011). A more detailed description of the characteristics of included studies is provided in Table 2.

#### Participants

This review contains studies that included a total of 419 pregnant women. The overall mean age across the studies was 26.6 years. For women included in the intervention, age ranged from 20 to 34 years. For women in the control groups, their age ranged from 21 to 33 years. No significant differences in age were found between intervention and control groups across all three studies.

#### Interventions

All three interventions were described as brief: two consisted of two 15-minute sessions, plus provider cueing prior to antenatal appointments and one consisted of a single session of 15 to 20 minutes. All three interventions were delivered on laptops, one of which was touchscreen.

Behavioural outcomes varied, with Jackson et al (2011) stating self-reported consumption of healthy and unhealthy foods, exercise duration and intensity, knowledge of food, knowledge of weight gain guidelines and weight gain above that stated in the guidelines issued by the Institute of Medicine (IOM).

Tsoh et al (2010) reported smoking cessation outcomes, including self-reported 30-day abstinence, the reduction in the number of days smoked in the last 30 days and the reduction in the number of cigarettes smoked in the last 30 days. Tzilos et al (2011) reported on changes in alcohol consumption in the 30 days after receiving the intervention. Both interventions by Jackson et al (2011) and Tsoh et al (2010) were part of a larger study called the Health in Pregnancy (HIP) study and were based on the principles of motivational interviewing as a BC technique.

The intervention by Tzilos et al (2011) was based on the stages of a change model and, therefore, aimed to tailor the information provided to the needs of the pregnant women

involved. In relation to the control groups, Jackson et al (2011) and Tsoh et al (2010) compared the intervention group with women receiving usual antenatal care.

Women in the control group in the Tzilos et al (2011) study were asked questions about TV show preferences and given a leaflet as a means of accounting for any effects of interaction. The acceptability of these interventions appear to be high, with retention rates from 74% to 93% follow-up at two months, with an average retention rate of 84%.

#### Risk of bias within studies

**Sequence generation:** All three studies were assigned a low risk of bias for sequence generation; in that each study described a computer-randomisation method as a means of generating the allocation of participants to either the intervention or control group. The study by Tsoh et al (2010) stratified the sample based on risk combination before computer randomisation took place.

**Allocation concealment:** It was not possible to ascertain whether allocation sequence was sufficiently concealed due to the lack of detail provided in each paper.

**Blinding:** A high risk of bias for the blinding of participants, personnel and outcome assessors was assigned to studies by Jackson et al (2011) and Tzilos et al (2011). Although one study (Tzilos et al, 2011) reported an equivalent level and duration of interactivity for the control group and the intervention group which facilitated blinding of the investigator, there was no blinding of participants. Being aware of the purpose of the study may have influenced self-reported alcohol intake and therefore, social desirability bias may have occurred.

**Selective outcome reporting:** A low risk of bias was assigned in relation to selective outcome reporting for all three studies. Published articles included all expected outcomes, including those that were pre-specified.

**Table 3. Risk of bias summary: review authors' judgements about each risk of bias item for each included study**

	Jackson et al, 2011	Tsoh et al, 2010	Tzilos et al, 2011
Random sequence generation (selection bias)	+	+	+
Allocation concealment (selection bias)			
Blinding of participant and personnel (performance bias)	–		–
Blinding of outcome assessment (detection bias)	–		–
Incomplete outcome data (attrition bias)	+	+	+
Selective reporting (reporting bias)	+	+	+
Other bias	–	–	–

**Other sources of bias:** All three studies relied on self-reported outcome measures to assess effectiveness. The results should be interpreted with caution. Social desirability bias is likely to play a role, especially as behaviours such as smoking and alcohol consumption are deemed as socially unacceptable during pregnancy. However, as self-reported measures were assessed via computer, this may have reduced the risk of bias (with the exception of the study by Tzilos et al (2011) where follow up occurred via a telephone interview). Risks of bias outcomes are detailed in Table 3. The GRADE analysis was used to compare the studies selected and to assess the overall consistency of results, methodological flaws, outcomes and generalisability. The authors' evaluation identified that all studies combined lacked blinding and relied on self-reported data, increasing risk of bias. However, consistency was observed in relation to the use of counselling and in particular computer-based counselling (see Table 1).

#### *Synthesis of results*

Due to the lack of detail provided in published papers, it was not possible to identify every BCT used. However, the two studies reporting successful BC outcomes were based on the principles of motivational interviewing and BCTs implemented within the motivational interviewing process included problem-solving and application of the incompatible beliefs technique. Problem-solving for women included helping them to identify the factors that influenced their individual behaviours and providing them with strategies for overcoming their perceived barriers or challenges (Oinas-Kukkonen and Harjuman, 2009).

Examples of this in the study by Jackson et al (2011) involved the discussion of a patient's concerns or problems and encouraging them to make a decision to change their behaviour. A key principle of motivational interviewing is to develop discrepancy, to create discomfort or cognitive dissonance, which, in turn, leads to behaviour change. 'Incompatible beliefs' is a technique which draws attention to discrepancies that exist between current or past behaviour and self-image to create discomfort (Michie et al, 2013). The study by Tzilos et al (2011) also implemented problem-solving in the form of relapse prevention. A range of other techniques, including information about health consequences, goal setting (behaviour), pros and cons, action planning and feedback on behaviour were also implemented. Details of BCTs implemented in each study are shown in Table 2.

#### *Effect of intervention on behavioural outcomes*

As already pointed out, different behavioural outcomes were used to assess the effectiveness of all three interventions; in relation to alcohol consumption, smoking cessation and diet and exercise (see Table 2). The study by Jackson et al (2011) reported significantly improved outcomes for the intervention group, compared to usual care. These included improvements in exercise intensity and duration, consumption of healthy food, such as fruit and vegetables, and the reduced consumption of unhealthy

foods, such as sugary and high fat foods. The study by Tsoh et al (2010) also reported improved behavioural outcomes for the intervention group. For example, the intervention resulted in a significantly greater decrease in the number of days the participant smoked and the number of cigarettes smoked per day. In addition, the 30-day abstinence rate at two months post-baseline was 2.5 times greater in the intervention group. However, this difference was not significant. The study by Tzilos et al (2011) reported significant decreases in reported quantity of alcohol use at one-month follow up in all participants.

In total, 72% of participants reported some drinking at baseline and only 10% reported any drinking at follow up. Analysis showed no effect of the intervention on alcohol use at follow up.

#### **Discussion**

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The authors set out to obtain the best evidence possible to inform the research design for their technologically supported intervention in the OptiBIRTH study.

Three RCTs were identified that involved brief (lasting 10 to 20 minutes) computer-based counselling. The aim of the brief, computer-based interventions, as described by the authors, was to achieve some degree of BC in relation to alcohol consumption, smoking or diet and exercise during pregnancy. Although each trial demonstrated sufficient quality to be included in the systematic review, concerns over the blinding of participants and the use of self-reported outcomes may challenge the reliability and validity of the effectiveness of the interventions. However, if delivered alongside routine antenatal care, it appeared that the interventions were both feasible and acceptable.

Interventions by Jackson et al (2011) and Tsoh et al (2010) reported significantly improved health behaviour outcomes in a short space of time (<smoking and >diet and exercise), while Tzilos et al (2011) reported no sustained treatment effect on alcohol consumption. Due to the heterogeneity of these studies it is not possible to conclude why two of the BC interventions appeared to be more successful than the other (this may be important in the broader context as it may result in a good impact on health and economic savings). However, it should be noted that motivational interviewing was the main BC approach used and it is the approach most used in BC literature as it has been reported to successfully change behaviour in different areas of healthcare (Rubak et al, 2005).

#### *Reflecting on the implementation design of BC techniques (as opposed to shared decision-making)*

By reviewing the most commonly reported BC techniques in the three trials, the evidence indicates that the main implementation purpose of the BC interventions was to nudge or influence pregnant women (whose behaviours were evidentially considered by health professionals to be suboptimal) in a predetermined direction, towards a healthier option.

The techniques implemented within a motivational interviewing context, therefore, included problem setting,

problem-solving and exploration of women's incompatible beliefs (including the pros and cons of failing to change their behaviour). Although the BC technique interventions were seen to have the potential to improve health behaviours in pregnant women, especially when combined with face-to-face tailored advice, the lack of fidelity information makes it difficult to identify how the reported BC techniques were in fact applied. For example, although clinicians may, within a BC context, explore women's motivation in terms of 'Do you know what matters?' and 'Does it matter to you?', effective implementation requires that women's right to be self-determined within a motivational interviewing context is respected (Miller and Rollnick, 2012).

According to self-determination theorists (Deci and Ryan, 2000), when an individual experiences greater autonomy, competency and sense of relatedness, they are more likely to internalise the extrinsic motivations that support the suggested behavioural goal.

As a result of this, they tend to apply greater effort, stability and persistence in relation to achieving their personally-relevant goal. However, ensuring that self-determination is sufficiently respected within the clinical environment is not always straightforward. The potential to rob women of their autonomy (by communicating a sense of obligation) or their competency (by communicating the required information in a non-user-friendly format) remains a challenge for public health practitioners (Patrick and Williams, 2012). Therefore, it follows that more detailed information is required to determine how the reported BC was achieved in the studies reviewed and how pregnancy, as a 'teachable moment' (Phelan, 2010) may have influenced women's motivation and volition to internalise the suggested predetermined goal.

According to the literature, the purpose of shared decision-making is very different, in that it aims to achieve mutual agreement between a clinician and a woman, as to the optimal direction of travel for her. Described as the 'pinnacle of person-centred care', (Barry and Edgman-Levitan, 2012: 780) shared decision-making involves techniques where the practitioner steps back from their position of professional authority, into a context where both the practitioner and the patient share information; the practitioner offers options to the patient (describing both the risks and benefits), and the patient expresses both their values and preferences, so that together the practitioner and patient can accommodate the optimal plan of care.

The underpinning philosophy of shared decision-making is, therefore, that there is no one, single best option; but that an individual woman's optimal choice emerges through a process of woman-practitioner discussion.

Key to effective shared decision-making discussions is, therefore, the woman's opportunity to access clearly presented information about the choices available to her, which in turn increases her understanding of what might be optimal for her. As there is no predetermined directional shift, it follows that, unlike BC where the practitioner asks 'Does it matter to you?', the role of the practitioner in this context is to ask 'What matters most to you?'

Similar to the implementation of a BC intervention, the principles of self-determination remain paramount. However, it is the difference in the purpose of the implementation that appears to determine how the practitioner communicates and delivers real, woman-centred care. In order for women to fully engage in a decision-making process, BC techniques (such as creating cognitive dissonance) ought to be avoided. Therefore, the key implementation components of a successful shared decision-making intervention are 'the perceived and actual fairness of the choices offered, the accuracy of the information and the balancing and clarity of the information provided' (Kasper et al, 1992: 183).

Upon completion of this systematic review, a computer-based, decision-making intervention was designed, for which the design team aimed to create an environment of non-dissonance that could enable women, in partnership with their healthcare professionals, to choose and plan their optimal birth. The evidence from Work Package 2 (systematic review and creative brief following focus groups) combined with this review data led to the development of a non-counselling, shared decision-making technology design. Further details about the design of the resulting online portal and the three sequential, motivational applications for pregnant women are published elsewhere (Stockdale et al, 2014).

### **Limitations**

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Even though this systematic review provided the design team with initial confidence in the appropriateness of designing a shared decision-making intervention, there are important limitations that must be taken into consideration. Ideally, a systematic review that mapped the design components of shared decision-making, online/technologies applied during pregnancy would have been more beneficial.

However, extensive searching of the databases failed to identify studies that employed a taxonomy or model capable of demonstrating the application of the main components of shared decision-making in an online environment.

As a result, this study was contextually bound, in that it was conducted to establish when it is appropriate to use a BC approach during pregnancy using an online/technology-based format. The eligibility criteria excluded non-RCT papers and this is a limitation that needs to be acknowledged.

### **Conclusion**

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This systematic review reports on the best available evidence and theory to design an online component of a complex intervention for use in an RCT to enhance women's decision-making about VBAC. The review reports the differences between the observed BC approach and that of a decision-making approach: BC techniques are applied when a predetermined, directional goal is evidentially understood by the clinicians as being focused on a more healthy option. As a result, techniques designed to create dissonance are considered appropriate. Shared decision-making (or decision-making), however,



is conceptually different, in that the goal is to facilitate a woman in discovering the best direction of travel for her. Therefore, the authors of this paper would argue that it is crucial for healthcare professionals designing complex healthcare interventions (either BC techniques

or shared decision-making) to ensure that a person's self-determination (including their autonomy) and access to relevant and understandable information are respected. However, it is not possible to draw firm conclusions from three studies and there is a requirement for further research.

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