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Self-efficacy and its impact on the health behaviours during pregnancy

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Abstract

Self-efficacy and its impact on health behaviours during pregnancy

Background: Health can be strengthened or weakened during transitional phases. Becoming a parent is a profound and important change in one's way of life in which midwives have a very important role to play as healthcare providers. In the sensitive phase beginning from conception through pregnancy and giving birth up to the postpartum period it is important to the health of women and families that they should experience a positive and strengthening start into parenthood. Strengthening a woman during pregnancy can have beneficial effects on childbirth, the postpartum period and the further course of her life.

Aim: This dissertation aims to bring about a knowledge gain in respect of how to enhance health behaviours during pregnancy, with particular regard to women's self-efficacy belief.

Method: In Paper I, *'Changing behaviour in pregnant women: A scoping review'* the woman and the empowering factors in her environment were studied. The design of the scoping review embraced Behaviour Change Programmes (BCPs) in pregnancy and the empowerment components involved. The role of midwives in BCPs was also evaluated.

In Paper II, *'Challenges in applying the short Childbirth Self-Efficacy Inventory (CBSEI-C32) in German'*, the focus was on the mutual understanding between the woman and the midwife. The German-language CBSEI-C32 was examined with regard to its comprehensibility.

In Paper III, *'Challenges in using Mental Contrasting with Implementation Intentions (MCII) for preparation for natural birth: A feasibility study'*, women with a high degree of childbirth self-efficacy belief were examined with regard to their relationship to themselves. MCII and a health-focused information leaflet were utilised experimentally in childbirth preparation.

Results: In Paper I, thirty BCPs that all try to support health behaviour, primarily by a gain in knowledge, were compared. Skills and competencies ($n = 30$), innovation ($n = 30$), goal-setting and goal attainment ($n = 10$), self-efficacy ($n = 9$), reflexive thought ($n = 5$), social support and social capital ($n = 4$), as well as shared decision-making ($n = 1$), were used as empowerment components in programmes designed to effect behavioural change during pregnancy. Midwives were involved in nine studies, but only with supporting tasks such as the distribution of information materials.

As shown in Paper II, a total of six out of ten participants found the CBSEI-C32 interesting or good. Four women noted independently that the CBSEI-C32 was helpful in preparing them mentally for childbirth. However, two items (nos. 4 and 7) in the German short version of the CBSEI were highlighted by participants: these two items made it difficult for some participants ($n = 5$) to understand the behaviours in question. The participating pregnant women also questioned further items of the CBSEI-C32, which they found did not represent contemporary concepts and views of coping with childbirth.

In Paper III, ten primiparous women with high CBSEI-C32 scores applied MCII. The majority did not find MCII to be a helpful tool in preparation for physiological childbirth. The primiparous

women with high CBSEI-C32 scores who were examined showed ambivalent feelings and thoughts towards the birth: on the one hand there was belief in '*the ability to give birth*', while on the other hand there was '*the uncertainty of giving birth*'. The health-focused information leaflet on physiological childbirth was very well received by the participants.

Conclusions: The aim to gain knowledge on increasing health behaviours during pregnancy was achieved. Some evidence was found in the three research projects that self-efficacy beliefs promote health behaviours in pregnant women. The following associations that can support health behaviours were observed:

- i. The woman and her empowering environment: women can be empowered through the interaction and support of professionals in their environment. Individual factors such as motivation should be taken into account. Based on their skills, midwives have great potential to support an empowering environment for women.
- ii. The woman and the midwife: understanding each other is a key component in providing health care. There seems to be a need to improve the German CBSEI-C32 linguistically and to further develop its content in order to be in line with contemporary concepts and views.
- iii. The woman and her relationship to herself: uncertainties which may lead to worries and fears can inhibit a person's coping abilities. Thus positive, health-orientated communication seem to be helpful. For primiparous woman, the MCII does not appear ideal as a labour and birth preparation tool. In order to promote a physiological birth, the strengthening of a woman's self-efficacy belief with a health-orientated attitude seems to be more helpful than dealing with inner obstacles to childbirth.

The overall results suggest that the midwife has an important role to play in promoting health behaviours. Firstly, the midwife supports an empowering environment for the women, e.g. through shared decision-making. Secondly, the midwife supports correct understanding in the women, and that the women too are correctly understood. And thirdly, midwives can strengthen women's self-efficacy beliefs regarding childbirth by using positive and health-orientated language during pregnancy.

Abstrakt

Selbstwirksamkeit und ihre Auswirkung auf das Gesundheitsverhalten während der Schwangerschaft

Hintergrund: In Übergangsphasen kann die Gesundheit gestärkt oder geschwächt werden. Eltern zu werden ist ein tiefgreifender und wichtiger Teil des Lebens, in dem Hebammen eine sehr wichtige Rolle als Gesundheitsfürsorger*innen innehaben. In der sensiblen Phase von der Empfängnis über die Schwangerschaft und die Geburt bis hin zum Wochenbett ist es für die Gesundheit von Frauen und Familien wichtig, einen positiven und stärkenden Start in die Elternschaft zu erleben. Die Stärkung der Frau während der Schwangerschaft kann sich dabei vorteilhaft auf die Geburt, das Wochenbett, sowie den weiteren Lebensverlauf auswirken.

Ziel: Ziel der Dissertation ist es, Erkenntnisse über die Verbesserung des Gesundheitsverhaltens in der Schwangerschaft zu gewinnen, welche insbesondere die Selbstwirksamkeitsüberzeugung von Frauen miteinbezieht.

Methodik: In Paper I, „*Changing behaviour in pregnant women: A scoping review*“, wurde die Frau und ihr stärkendes Umfeld untersucht. Der Scoping Review untersuchte Verhaltensänderungsprogramme in der Schwangerschaft und deren verwendeten Empowerment-Komponenten. Die Rolle der Hebammen in Verhaltensveränderungsprogrammen wurde ebenfalls ermittelt.

In Paper II, „*Challenges in applying the short Childbirth Self-Efficacy Inventory (CBSEI-C32) in German*“ lag der Fokus auf dem gegenseitigen Verstehen zwischen der Frau und der Hebamme. Hierbei wurde die deutsche Kurzform des CBSEI-C32 auf Verständlichkeit untersucht.

In Paper III, „*Challenges in using Mental Contrasting with Implementation Intentions (MCII) for preparation for natural birth: A feasibility study*“, wurden Frauen mit hoher geburtsspezifischer Selbstwirksamkeitsüberzeugung hinsichtlich ihrer Beziehung zu sich selbst untersucht. MCII (auf Deutsch: Mentales Kontrastieren mit Wenn-Dann Plänen) und eine gesundheitsorientierte Informationsbroschüre wurden experimentell für die Geburtsvorbereitung angewendet.

Ergebnisse: In Paper I wurden dreißig Verhaltensänderungsprogramme verglichen, die allesamt versuchen, Gesundheitsverhalten vor allem durch Wissensvermittlung zu unterstützen. Fähigkeiten und Kompetenzen ($n = 30$), Innovation ($n = 30$), Zielsetzung und Zielerreichung ($n = 10$), Selbstwirksamkeit ($n = 9$), reflexives Denken ($n = 5$), soziale Unterstützung und soziales Kapital ($n = 4$), sowie gemeinsame Entscheidungsfindung ($n = 1$) wurden als Empowerment-Komponenten während der Schwangerschaft in den untersuchten Verhaltensänderungsprogrammen verwendet. Hebammen wurden in neun Studien einbezogen, jedoch nur mit unterstützenden Aufgaben wie der Verteilung von Informationsmaterialien.

In Paper II fanden insgesamt sechs von zehn Teilnehmerinnen den CBSEI-C32 interessant oder gut. Dabei merkten vier Frauen eigenständig an, dass der CBSEI-C32 ihnen bei der mentalen Vorbereitung auf die Geburt hilfreich war. Zudem wurden zwei Items (Nummer 4 und 7) der deutschen Kurzfassung des CBSEI von den Teilnehmerinnen hervorgehoben. Diese beiden

Items machten es einigen Teilnehmerinnen ($n = 5$) schwer, das abgefragte Verhalten zu verstehen. Die teilnehmenden Schwangeren hinterfragten weitere Items des CBSEI-C32, da diese nicht zeitgemäße Konzepte und Ansichten zur Geburtsbewältigung repräsentieren.

In Paper III wendeten zehn erstgebärende Frauen mit hohen CBSEI-C32-Werten MCII an. Die Frauen empfanden MCII mehrheitlich nicht als hilfreiches Werkzeug zur Vorbereitung auf eine physiologische Geburt. Die untersuchten erstgebärende Frauen mit hohen CBSEI-C32-Werten wiesen ambivalente Gefühle und Gedanken zur Geburt auf: Auf der einen Seite gab es den Glauben an „die Fähigkeit zu gebären“ und auf der anderen Seite „die Ungewissheit des Gebärens“. Die gesundheitsorientierte Informationsbroschüre zur physiologischen Geburt wurde von den Teilnehmerinnen sehr gut aufgenommen.

Schlussfolgerung: Das Ziel, Erkenntnisse über die Verbesserung des Gesundheitsverhaltens während der Schwangerschaft zu gewinnen, wurde erreicht. In den drei Forschungsprojekten wurden einige Anhaltspunkte dafür gefunden, dass Selbstwirksamkeitsüberzeugungen Gesundheitsverhalten bei schwangeren Frauen fördern. Es wurden folgende Assoziationen beobachtet, die das Gesundheitsverhalten unterstützen können:

- i. Die Frau und ihr stärkendes Umfeld: Frauen können durch die Interaktion und Unterstützung des Umfeldes durch Fachkräfte gestärkt werden. Individuelle Faktoren wie die Motivation sollten berücksichtigt werden. Ein großes Potenzial haben Hebammen aufgrund ihrer Fähigkeiten, ein befähigendes Umfeld für Frauen zu unterstützen.
- ii. Die Frau und die Hebamme: Das gegenseitige Verstehen ist ein wesentlicher Bestandteil in der Gesundheitsversorgung. Es scheint Bedarf zu bestehen, den deutschen CBSEI-C32 sprachlich zu verbessern und inhaltlich weiterzuentwickeln, um aktuellen Konzepten und Ansichten gerecht zu werden.
- iii. Die Beziehung einer Frau zu sich selbst: Unsicherheiten, die zu Sorgen und Ängsten führen, können die eigene Bewältigungsfähigkeit hemmen. Daher scheint eine positive, gesundheitsorientierte Kommunikation hilfreich zu sein. Für erstgebärende Frauen erscheint der MCII als Hilfsmittel zur Geburtsvorbereitung nicht ideal. Um eine physiologische Geburt zu fördern, scheint die Stärkung der Selbstwirksamkeitsüberzeugung mit einer gesundheitsorientierten Ausrichtung hilfreicher als die Auseinandersetzung mit inneren Geburtshindernissen zu sein.

Die Gesamtergebnisse legen nahe, dass der Hebamme eine wichtige Rolle bei der Förderung des Gesundheitsverhaltens zukommt. Erstens unterstützt die Hebamme ein stärkendes Umfeld für die Frauen, z.B. durch gemeinsame Entscheidungsfindung. Zweitens, unterstützt die Hebamme, dass die Frau richtig versteht und richtig verstanden wird. Und drittens können Hebammen durch eine positive und gesundheitsorientierte Sprache während der Schwangerschaft die Selbstwirksamkeitsüberzeugungen von Frauen gegenüber der Geburt stärken.

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List of publications

This thesis '*Self-efficacy and its impact on health behaviours during pregnancy*' is based on three publications.

- Paper I** Zinsser LA, Stoll K, Wieber F, Pehlke-Milde J, Gross MM. Changing behaviour in pregnant women: A scoping review. *Midwifery*. 2020;85:102680 doi:10.1016/j.midw.2020.102680.
- Paper II** Zinsser LA, Schmidt G, Stoll K, Gross MM. Challenges in applying the short Childbirth Self-Efficacy Inventory (CBSEI-C32) in German. *Eur J Midwifery*. 2021;5:18 doi:10.18332/ejm/136453.
- Paper III** Zinsser LA, Stoll K, Gross MM. Challenges in using Mental Contrasting with Implementation Intentions (MCII) for preparation for natural birth: A feasibility study. *Sex Rep Health*. 2021;29:100642 doi:10.1016/j.srhc.2021.100642.

The use and distribution of *Paper I*, in *Midwifery*; *Paper II*, in the *European Journal of Midwifery*; and *Paper III*, in *Sexual & Reproductive Health Care*, is permitted for academic purposes such as a non-commercially published dissertation.

Abbreviations

95% CI	95% Confidence interval
BCPs	Behaviour Change Programmes
BMBF	Bundesministerium für Bildung und Forschung (German Federal Ministry of Education and Research)
CBSEI	Childbirth Self-Efficacy Inventory
CBSEI-C32	Short Childbirth Self-Efficacy Inventory, 32 questions
COM	Capability, Opportunity, Motivation
COM-B	Capability, Opportunity, Motivation and Behaviour
etc.	Et cetera
e.g.	For example
EE	Efficacy expectancy
i.e.	Id est (that is)
II	Implementation Intentions
ISPOR	International Society for Pharmacoeconomics and Outcomes Research
MC	Mental Contrasting
MCII	Mental Contrasting with Implementation Intentions
MD	Mean difference
n	Sample size
nos.	Numbers
OE	Outcome expectancy
p.	Page number
PRISMA	Preferred Reporting Items for Systematic Reviews and Meta-Analyses
PTSD	Post-Traumatic Stress Disorder
RCT	Randomised Controlled Trial
RR	Relative Risk
TTA	Theoretical Thematic Analysis

1.0 Background

Staying healthy in a more and more complex environment is a task for every citizen and a challenge for pregnant women. During transitional phases, such as becoming a parent, long-term health can be strengthened or weakened [1]. The purpose of this dissertation is to bring about a gain in knowledge in respect of how to enhance health behaviours during pregnancy, in order to foster long-term health. The life-changing nature of this phase of becoming a parent motivates women to adopt, or adapt, health behaviours [2]. This gives midwives a unique and significant role in promoting health during this phase of life [2]. The skills and competencies of midwives, and the model of midwifery care, have an important impact on the promotion of health among women [3, 4]. Midwifery care is characteristically woman-centred; it is based on the relationship between the midwife and the woman [5]. Woman-centred care emphasises the tenet of lending enhanced value to women's voices through self-determination and autonomy, both in decision-making and in relation to the woman's own body [6-9]. Despite the fact that woman-centred care is not uniformly conceptualised worldwide [5, 10, 11], the results of international midwifery research are clear: continuous woman-centred care is an important approach to health promotion which, among other things, contributes to women's contentment [3, 11-14]. A midwife views the entire process of conception, pregnancy, giving birth and the postnatal period as healthy and normal [15]. Midwives provide holistic care that supports women's confidence in their physical and mental abilities. What is known as self-efficacy, i.e. belief in one's own ability to act successfully, is strengthened through midwifery care [7, 16].

The characteristics of midwifery care underlying this dissertation serve to promote women's health during the transitional phase to parenthood. First of all, the introduction to the dissertation is intended to create an understanding of the inter-relationships between the health and behavioural aspects that support women during pregnancy and childbirth, and is then followed by a description of the scientific aim and objectives. In the Method section the methodological approaches of the three research projects are described, followed by a short summary of their results and an in-depth discussion. The dissertation concludes with a section dealing with health promoting aspects during pregnancy and also with the implications for midwifery practice and research.

1.1 Fostering long-term health through the experience of physiological childbirth

A physiological childbirth is '*expressed variously as "normal" or "natural", or without technical or pharmacological interventions*' [17, p.6]. If a woman is to experience a physiological birth, it is especially important not to disturb the natural processes of giving birth, so that the woman's own hormonal processes are enabled to function well [18]. In physiological birth the parasympathetic nervous system is activated and supports the release of oxytocin. If fear and stress levels are too high, an increase in the activity of the sympathetic nervous system can occur, and thus a decrease in oxytocin release. Furthermore, pharmacological pain relief can also influence the physiological endocrinal system during labour and birth [18, 19]. This means

that it is important for health promotion that high levels of fear should not be experienced or pharmacological pain relief used in childbirth. This allows the woman's own hormonal cascades to run optimally, so that she can indeed experience a physiological childbirth [1, 19].

To give birth or to be born physiologically, rather than a birth with '*technical or pharmacological interventions*' [17, p.6], e.g. by caesarean section or using epidural analgesia, has many health effects. On the physical level, for example, these include the optimum adaptation of the baby to the environment, which has a positive effect on the breastfeeding period and thus on the bonding and attachment between mother and baby as compared to women experiencing a caesarean section or epidural analgesia [18, 20, 21]. In addition, women experience less loss of blood or fewer infections of the urinary tract, and in subsequent pregnancies fewer complications are reported than after a caesarean section [22-24]. On the mental level, physiological childbirth has a positive effect due to a decreased likelihood of a negative birth experience or traumatic experiences which can lead to mental health problems affecting the overall health of the family. For example, can influence the child's development in the fields of language, motor skills, cognition, sleep, behaviour, etc. can be influenced by the degree of a woman's emotional impairment, as can the woman's partnership [25-28].

The main reasons for preferring a caesarean section to a physiological birth seem to be a previous negative birth experience and a fear of childbirth [29-31]. Sheen and Slade [32], in their meta-synthesis, report six key factors evoking fear of childbirth: '*fear of the unknown, potential for injury, pain, capacity to give birth, losing control and adequacy of support from care providers*' [32, p.2523]. Three out of these six key factors, '*fear of the unknown*', '*capacity to give birth*' and '*losing control*' [32, p.2523], can be categorised as aspects relating to mental preparation for childbirth. These factors are connected to a woman's self-efficacy belief, in line with the theory of Albert Bandura [33]. By contrast, a woman who has a high self-efficacy belief is also able to plan and experience a physiological birth with confidence. Such a woman has the '*belief that physiologic birth can be achieved, based on her view of birth as a normal process and her belief in her body's innate ability to birth, which is supported by social support, knowledge, and information founded on a trusted relationship with a maternity care provider in an environment where the woman feels safe*' [34, p.425]. This could lead to the development of strategies and methods to promote physiological birth approaches that support the woman's confidence in her own ability to undergo physiological birth [34].

1.2 Strengthening health behaviours in childbirth

1.2.1 Support of health behaviours based on the COM-B model

'The adoption of health-related behaviors has been recognized as a powerful element to minimize the occurrence of adverse maternal and perinatal outcomes and, consequently, improve woman and neonate's health.' [35, p.121]. The term '*health behaviours*' applies to factors such as deciding not to drink alcohol during pregnancy in order to support health, or to mental behaviours like a focused and accepting inner attitude when giving birth to support a

physiological childbirth [36, 37]. Michie et al. [38] established a theoretical model named COM-B to explain behaviour. In this model the three criteria '*capability, opportunity and motivation*' (COM) [38, p.1] can act either as drivers or as barriers to a person's *behaviour* (B). Supporting health behaviours through COM-B is explained in the following text using the example of planning a physiological childbirth. Behaviours (B) relate to **capability**: '*psychological capability*' [38, p.1] such as *knowledge* (Does a woman know about methods to cope with contractions?), *skills* (Is the woman mentally able to keep her thoughts focused on the present moment?), or *self-efficacy* (Does the woman have confidence in her own skills?) should be present; '*physical capabilities*' [38, p.1] such as physical fitness (Does the woman have a healthy general condition to be able to give birth?) are needed, too. **Opportunity** is also related to behaviour. '*Physical opportunity*' [38, p.1] stands for access to an antenatal class, '*social opportunity*' [38, p.1] stands for acceptance (Is there encouragement to give birth physiologically in one's own social environment, or is pharmacological or technical support more approved?). **Motivation** is the last aspect; it embraces reflective and automatic motivation. '*Reflective motivation*' [38, p.1] relates to behaviours arising, for example, out of values, beliefs or intentions (Does the woman think that physiological childbirth is beneficial?), while '*automatic motivation*' [38, p.1] influences behaviour through emotions, impulses or feelings (Does the woman feel comfortable with the prospect of experiencing the process of childbirth?). The COM-B model therefore indicates that health behaviour is a multidimensional process [38]. This insight is important for strengthening health behaviours, for example in preventive work such as preparing for a physiological childbirth.

1.2.2 Health behaviours and coping in childbirth

During conception, pregnancy, birth and the postpartum period, unfamiliar physical and mental processes take place which require adaptation and therefore coping strategies [39-42]. Coping is a purposeful action resource which is developed in the course of life [43]. It is dynamic as well as process-orientated [44]. The regulation of emotions is one coping mechanism, known as '*emotion-focused coping*' [33, 45]. During childbirth, for example, the state of mind and the emotions must be handled to be able to manage emotional upheaval [37, 46, 47]. Another coping mechanism is '*problem-focused coping*' [45], which includes seeking for help or information. The search for information, for example, occurs primarily among women in the preparation phase for childbirth [46, 48]. Support during childbirth from the presence of a midwife is also a typical example of '*problem-focused coping*' [34, 46]. Many different coping strategies are used during the birth itself, such as diaphragmatic breathing, vocalisation, believing in one's own abilities, positive thinking, staying in the present moment, keeping mentally calm, receiving support from the partner and from the midwife, massage, water immersion, hypnobirthing etc. [37, 49-51]. Different coping mechanisms are necessary for different phases and dynamics during labour and birth [52]. If the pregnant woman has adequate coping resources available, and she rates the environmental conditions as challenging but not threatening, the environmental conditions can then be associated with positive emotions [33, 44]. For example, at the beginning of a physiological childbirth most women are positively excited and experience feelings of confidence and calmness [18, 53]. As

the labour process progresses, not only does it become more challenging, but at the same time other coping strategies are required. Now the primary assessment of well-being is followed by an assessment of which coping mechanisms can be used to meet the situation, for example starting to use vocalisation [44]. Whitburn et al. [42] report that the successful application of coping mechanisms during childbirth can provide a positive birth experience. It seems advantageous to have a larger selection of coping resources to deal with such challenging situations [54] as giving birth. During maternity care midwives support women as they enhance their coping abilities [4, 7, 55]. For example, if a pregnant woman is fearful about the birth process, she may need support to cope, to learn to deal with the uncertainties of giving birth, through trusting in her own abilities [32, 34]. Through individual midwifery care, women can be helped during pregnancy and childbirth to identify, and activate, individual coping resources such as staying mentally calm or enhancing their own self-efficacy belief [4, 7, 56]. Such coping then brings about a regulation of their emotions and thus influences their health behaviour during pregnancy and childbirth [17, 57].

1.2.3 Health behaviours during maternity care arising from the woman's self-efficacy belief

Research suggests that where a woman has a high level of self-efficacy belief, this exerts positive effects on her behaviours during pregnancy, birth and the postpartum period, on her ability to face challenges and on her mental well-being [33, 58-60]. Self-efficacy supports women's persistence in mastering their own goals and environmental requirements [33]. For example, higher levels of self-efficacy during pregnancy have a positive impact on anxiety and fears related to pregnancy and birth [60-62]. Low self-efficacy involves higher concerns about birth, the woman's own body image, or the baby, and a reduced acceptance of the pregnancy [60]. Moreover, self-efficacy is a well-known determinant for planning the birth mode. Women with high self-efficacy scores have a higher rate of planning to have a vaginal birth as compared to women with low self-efficacy scores, these being a predictor for favouring a caesarean section. Planning to give birth without pharmacological pain relief is also associated with higher self-efficacy scores, as is planning to have a vaginal birth after a caesarean section [60, 62]. Self-efficacy during the birth supports women's coping with labour and birth. High self-efficacy scores are associated with less suffering during labour, and higher birth satisfaction is reported [60]. In the postpartum period, low self-efficacy has a negative impact on the occurrence of posttraumatic stress disorder (PTSD) [63]. PTSD is linked, amongst other things, to a loss of control. An individual with a higher degree of self-efficacy usually experiences a sense of control [26, 33]. In the postpartum period, exclusive breastfeeding and maternal breastfeeding satisfaction are also associated with higher self-efficacy scores [64, 65]. In general, having a high level of self-efficacy belief strongly supports empowerment and the feeling of being in control [33, 66].

In order to strengthen health behaviour at birth, the activation of self-efficacy beliefs during pregnancy is helpful [33]. As described above, research indicates that the perception and activation of self-efficacy beliefs have an influence on planning to have a physiological birth as well as on the application of coping behaviours during labour and birth [33, 58, 62, 67]. The perception and activation of a woman's self-efficacy beliefs can be divided into four main aspects:

- (i) '**Mastery experiences**' [33]: women's own experiences of success are revealed by their reflecting on their own successes. In doing so, the woman recognises the personal resources she has for coping with this situation. An individual case of success is internalised. For example, a woman who has given birth physiologically will be strengthened for her next birth, because she knows that she has managed the labour and birth processes through coping physically, for example by using breathing techniques, and/or through coping with her emotional upheaval [16, 33, 50, 62].
- (ii) '**Vicarious experiences**' [16]: if a woman lacks sufficient success experiences of her own, they can be replaced by *vicarious experiences* of other people. For the social comparison, another similar person (symbolic comparative) is needed. That means that the increase in self-efficacy, or in a belief in one's own abilities, depends on an individual with whom, and with whose talents, one can compare oneself and one's own talents. *Vicarious experiences* can increase the level of motivation and bring about an activation of resources. For example: the personal, positive physiological birth story of a sister can enhance a woman's self-efficacy belief to a level at which she is able to cope with giving birth [16, 33, 68].
- (iii) '**Verbal persuasion**' [16]: another possible way of supporting a woman's belief in her own ability to achieve the goal is *verbal persuasion*. Positive feedback and information (supporting confidence in one's individual capabilities, rather than doubts) from significant individuals can expand the expectations of the individual concerned, so that resources can be activated and perceived: for example a midwife whose words serve to strengthen the pregnant woman. The woman can believe in her ability to give birth physiologically, thanks to the midwife's confidence [16, 33, 67].
- (iv) '**Physiological and affective states**' [33]: *physiological and affective states* can convey information about one's own level of competence. This can affect self-efficacy in dealing with frightening situations. The primary goal is to identify physical sensations as a positive resource to use as a driving force. For example, body tremors will be categorised as providing relaxation, rather than as indicating a state of being feeble [16, 33, 62, 67].

Self-efficacy beliefs and also coping abilities are supported by the midwife if the pregnant woman cannot access them [69]. The woman-centred approach of midwives plays a support-giving role here, as their specific care approach strengthens women. This means that women who are involved in decisions about their care, who have '*belief in [their] own abilities [and] control over situations, self and others*' [7, p.4] are strengthened to feel empowered, which in turn enhances health behaviour at birth [6, 7, 70].

1.3 Aim

To improve maternity care it is important to have the emphasis not only on perinatal outcomes, i.e. morbidity and mortality rates, but also on holistic care, positive experience and health-orientated aspects such as self-efficacy beliefs. Supporting the woman's choices and her confidence in her own abilities during the transitional phase to parenthood is the focus of both the pregnant women themselves and of midwifery practice [4, 7, 8, 14]. The purpose of this dissertation, therefore, is to gain knowledge on the enhancement of health behaviours during pregnancy in order to foster long-term health.

1.3.1 Objectives

- To investigate whether empowerment components were implemented in health promotion programmes in order to support health behaviours during pregnancy (Paper I [71])
- To identify statements about self-efficacy in childbirth that support primiparous women (Paper II [72])
- To investigate if a cognitive behaviour tool applied in preparation for birth is applicable and accepted by pregnant women (Paper III [47])

2.0 Methods

2.1 Methodological approaches

The overall aim of gaining knowledge on the enhancement of health behaviours during pregnancy has been investigated in three studies. The aim of the dissertation led, in addition to the three studies and to a planned randomised controlled trial (RCT) which, however, was rejected by the funding body (BMBF, Bundesministerium für Bildung und Forschung – Federal Ministry for Education and Research). Paper I approached the area of behavioural change during pregnancy in a scoping review [71]. The proposed follow-up RCT was rejected. Instead, a qualitative explorative study of the challenges involved in applying the German version of the CBSEI-32 was carried out (Paper II) [72]; this arose from the feasibility study that was performed in respect of ‘Challenges in using Mental Contrasting with Implementation Intentions (MCII) for preparation for natural birth’ (Paper III) [47]. Table 1 gives a brief summary of the methodological approaches used.

Table 1: Summary of methodological approaches

	Object of research	Design	Analysis
Paper I Changing behaviour in pregnant women: A scoping review [71]	30 Papers on behavioural changes in pregnant women	Scoping review	Descriptive
Proposal to BMBF (rejected) Effects on women’s childbirth self-efficacy and perinatal outcomes: an explorative randomised controlled trial to assess the effect of Mental Contrasting with Implementation Intentions compared to standard care in nulliparous women (Appendix I)	480 healthy pregnant women planning a vaginal birth without pharmacological or technical interventions	Randomised controlled trial	Descriptive; bivariate-, multivariate analysis
Paper II Challenges in applying the short Childbirth Self-Efficacy Inventory (CBSEI-C32) in German [72]	German short Childbirth Self-efficacy Inventory (CBSEI-C32)	Qualitative, explorative	Descriptive
Paper III Challenges in using Mental Contrasting with Implementation Intentions (MCII) for preparation for natural birth: A feasibility study [47]	10 healthy pregnant women planning a vaginal birth without pharmacological or technical interventions	Feasibility study with two follow-ups	Descriptive; deductive theoretical thematic analysis

2.2 *Changing behaviour in pregnant women: A scoping review (Paper I) [71]*

2.2.1 Criteria for selecting studies

The studies selected for this project included peer-reviewed publications which reported on pregnant women of reproductive age participating in Behaviour Change Programmes (BCPs) for health promotion. The studies included aimed to evaluate the effectiveness of changes in behaviour. Excluded were pregnant women who were suffering from substance/drug misuse or those with mental health issues. The reason for excluding the latter is that in such circumstances physical and psychological health are compromised, at least to a certain extent, and may require therapeutic support.

2.2.2 Systematic search

To identify relevant publications on behaviour change in pregnant women, a systematic search was conducted. In order to identify the entire spectrum of publications, four data sources were searched: PubMed, CINAHL, PsycINFO and MIDIRS. To ensure the transparency and objectivity of the systematic search of the Scoping Review, the PRISMA flow diagram was used [73].

2.2.3 Data analysis of studies

The study selection was based on defined criteria (see 2.2.1). The criteria for the extraction of data for the synthesising of information and its interpretation were so determined as to correspond to the research aims. In the first place, this was data depicting the range of BCPs used during pregnancy; in the second place, data depicting midwives' involvement in BCPs; and thirdly, data from which the components of the health promotion features could be determined. In respect of the charting of the data on health promotion, the framework developed by Kliche and Kröger [74] relating to empowerment components was used for the extraction of the data. For the reporting of the results, the data was summarised and ascribed to the aims. The significance of the results of Paper I, '*Changing behaviour in pregnant woman: A scoping review*' [71] was discussed in relation to the aims.

2.3 *Proposal submitted to BMBF (rejected): Effects on women's childbirth self-efficacy and perinatal outcomes: an explorative randomised controlled trial to assess the effect of Mental Contrasting with Implementation Intentions compared to standard care in nulliparous women*

2.3.1 Participants

If this trial had been carried out, primiparous women would have been approached with a view to their being enrolled for it in the third trimester of their pregnancy. They would have been pregnant with a singleton in cephalic presentation and would have had strong natural birth intentions, i.e. expecting to give birth free of both pharmacological medications such as pain relief and of technical interventions such as the artificial rupture of membranes or episiotomy. Women not planning or not able to undergo a vaginal birth (either for medical reasons, e.g. placenta praevia, or electively, e.g. having requested a caesarean section) would

have been excluded either at the time of enrolment or at the onset of childbirth. Multiparous women would also have been excluded in view of their previous birth experience, which could have influenced a request for pharmacological pain relief. Twin pregnancies are associated with higher complications and would also have been excluded.

2.3.2 Planned randomised controlled trial (RCT)

A parallel group design for the RCT was planned. Women would have been allocated randomly to one of two groups, the experimental group and the control group. The experimental group would have used standard antenatal care plus Mental Contrasting with Implementation Intentions (MCII), the control group would have received standard care only. The project would have been conducted as a superiority trial. The trial would have aimed to show that MCII is superior to standard care in reducing requests for pain relief.

2.3.3 Planned data analysis

For the data analysis the programme SPSS would have been used. During the data collection process the data would have been integrated into the SPSS dataset. Cronbach's Alpha would have been calculated for the internal consistency reliability of the scales. Descriptive, bivariate and multivariate calculations were planned. The dependent variable would have been the change of the CBSEI values (baseline value and the value four weeks after intervention) and the independent variable would have been the MCII (yes/no). The preliminary controlled variables would have been age, gravidity, midwifery care during pregnancy, antenatal education, body-mind classes and partnership.

Primary analysis would have been a regression model with all the randomised participating women. Missing values would have been marked and not taken into account further. The regression model would have been allocated the baseline CBSEI score to the MCII Intervention (yes/no), as well as the week of gestation to the baseline modelling. For a secondary analysis the influences of age, gravidity, midwifery care during pregnancy, antenatal education, body/mind classes and partnership would have been included.

A secondary endpoint would have been the difference in the birth intentions (baseline value and the value four weeks after intervention) and also the birth outcome. The secondary endpoint would have been modelled with the MCII Intervention (yes/no) allocation. The draft application to the BMBF for the clinical trial, which was rejected on 28.05.2018, can be found in Appendix I.

2.4 Challenges in applying the short Childbirth Self-Efficacy Inventory (CBSEI-C32) in German (Paper II)[72]

2.4.1 Participants

Between August and October 2018, primiparous women in the third trimester were enrolled. They had to be pregnant with a singleton in cephalic presentation and to have strong

natural birth intentions, i.e. expecting to give birth free of both pharmacological medications such as pain relief and of technical interventions such as the artificial rupture of membranes or episiotomy. Women not planning or not able to undergo a vaginal birth (either for medical reasons, e.g. placenta praevia, or electively, e.g. having requested a caesarean section) would have been excluded either at the time of enrolment or at the onset of childbirth. Multiparous women were also excluded in view of their previous birth experience, which could have influenced a request for pharmacological pain relief. Twin pregnancies are associated with higher complications and were also excluded. After informed consent, 10 pregnant women agreed to participate.

2.4.2 Assessing limitations in the German version of the short Childbirth Self-Efficacy Inventory (CBSEI-C32)

The acceptability and comprehensibility of the CBSEI-C32 items were assessed through two open-ended questions. One question was: 'Wie finden Sie den Fragebogen?' ('How did you find the questionnaire?'). The other question was: 'Gab es Fragen die Sie schwierig fanden zu beantworten?' ('Were there any questions that you found difficult to answer?'). Additionally, participants were invited to provide feedback on what would have helped them to understand any question they had identified more easily.

2.4.3 Data analysis

A qualitative descriptive approach was chosen, as this approach can provide information about the refinement of a questionnaire [75]. The data collected was compiled in tables for each of the CBSEI-C32 items and the comments on the acceptability. The collected data was summarised for the results and discussed on the basis of current scientific knowledge on childbirth and its preparation. The results are described in detail in Paper II: '*Challenges in applying the short Childbirth Self-Efficacy Inventory (CBSEI-C32) in German*' [72].

2.5 Challenges in using Mental Contrasting with Implementation Intentions (MCII) for preparation for natural birth: A feasibility study (Paper III) [47]

2.5.1 Participants

The same sample participated as in the qualitative explorative study, '*Challenges in applying the short Childbirth Self-Efficacy Inventory (CBSEI-C32) in German*' [72]: enrolled were primiparous women in the third trimester. They had to be pregnant with a singleton in cephalic presentation and to have strong natural birth intentions, i.e. expecting to give birth free of both pharmacological medications such as pain relief and of technical interventions such as the artificial rupture of membranes or episiotomy. Women not planning or not able to undergo a vaginal birth (either for medical reasons, e.g. placenta praevia, or electively, e.g. having requested a caesarean section), were excluded either at enrolment or at the onset of childbirth. Multiparous women were also excluded in view of their previous birth experience, which could have influenced a request for pharmacological pain relief. Twin pregnancies are associated with higher complications and were also excluded.

2.5.2 Instruments used in the intervention study

2.5.2.1 Questions regarding sociodemographic characteristics, natural childbirth intentions, childbirth self-efficacy, birth outcomes and intervention-related factors

The survey at baseline (28th and 31st completed weeks of gestation) used the Childbirth Self-Efficacy Inventory (CBSEI-C32) to assess sociodemographic characteristics (e.g. age, estimated due date or gravidity), natural birth intentions and childbirth self-efficacy. Natural birth intentions denote that a pregnant woman expects to be able to manage the natural process of giving birth by herself. No validated German-language instrument could be identified in the literature for assessment. To evaluate natural birth intentions, six questions were developed (see Paper III [47], p.4). These questions were based on a systematic literature review taken from Downe et al. [17], focusing on the women's intentions '*to use one's own physical and psychosocial capacities to labour, and to give birth*' [17, p.9] in their childbirth. Three experts in physiological childbirth and/or midwifery science examined the design of the instrument critically for clarity, relevance and legibility. The self-developed scale was tested by three pregnant women in order to identify non-applicable questions. During the test phase and the expert opinion phase no questions were identified for exclusion. The six questions were evaluated on a six-point Likert scale.

The survey at Follow-up 1 (32nd – 35th completed weeks of gestation) assessed: the usefulness, acceptance and applicability of the study material, the intention to undergo natural birth and the childbirth self-efficacy scores. The survey at Follow-up 2 (six weeks postpartum) assessed the birth outcome and the individual's experience with the intervention.

2.5.2.2. Applying Mental Contrasting with Implementation Intentions (MCII) and a health-focused information leaflet

MCII combines (a) Mental Contrasting (MC) and (b) Implementation Intentions (II). Mental Contrasting puts the future and the reality in context by contrasting the imagined and the actual Implementation Intentions and supports the successful translation of intentions into action [76, 77]. MCII consists of four steps to document the individual's own goal. The four steps - wish, outcome, inner obstacles and plan - are examined in respect of the ideas and writings of each user [76]. MCII works through the component MC, which leads to motivational changes, cognitive changes and changes to one's own responses to reverses [77]. For example, MC helps the participants to cope, because a constructive way of dealing with setbacks is ensured by processing information in the event of setbacks and maintaining personal skills [78]. Research has shown that MC can be successfully used independently of socio-economic status or cultural background, because it is easy to apply, quick and free [79]. The component II refers to specific '*if-then*' plans and is effective through the automation of action control: the critical situation specified in the if-component is easily identified and the related adaptive responses can be initiated [76]. The combination of MC and II is evidence-based and has shown itself to be successful in the field of health behaviours, e.g. healthy eating, physical activity or positive relationship behaviour [79]. The method of behavioural change is well suited to supporting self-

determination and autonomy. It supports individuals in effectively self-regulating their goal-setting and goal-striving efforts. It helps to explore and identify in advance the significance of the participant's own wish. Either this personal wish can be turned into a specific goal (if it is seen as desirable/feasible); or in some cases MCII might lead to a disengagement from the original wish (if it is not seen as desirable/feasible). Such disengagement can help to avoid investing a lot of effort in unattainable goals. This minimises the frustration of negative feedback [76].

Together with MCII the women received an information leaflet, in order to ensure equality of childbirth knowledge within the sample. The health-focused information leaflet about physiological childbirth is to be found in Appendix II. The information leaflet was conceived in line with Antonovsky's concept of salutogenesis [80] and evidence-based knowledge on physiological childbirth. The writing style of the leaflet was salutogenic. The concept of salutogenesis can be summarised as a movement towards health: the focus is on strengthening the different aspects of individual health and health outcomes such as fitness, breastfeeding rates, self-efficacy or empowerment. A focus on potential deficiencies such as disease and risk factors is not of interest. The pursuit of a sense of coherence is an important principle in the salutogenic approach. It embraces (a) *comprehensibility* - an ability to understand events in life, and so experience it as structured and predictable, (b) *manageability* - the belief that one has the resources to shape one's own life, and (c) *meaningfulness* - the belief that there is a reason or purpose in life [80]. The leaflet is structured in four parts. Part One deals with the process of physiological childbirth, explaining the *comprehensibility* and *manageability* of the childbirth process. In Parts Two and Three the advantages for the baby and for the mother are described. These parts cover the *meaningfulness* of the physiological childbirth process. Part Four completes the information leaflet with a brief conclusion. Before the leaflet was used in the feasibility study it was critically examined by an expert panel for clarity, relevance and legibility.

2.5.3 Data analysis

A descriptive analysis of the quantitative data was performed. The qualitative data of the MCII worksheets was analysed using the Theoretical Thematic Analysis (TTA) approach [81]. Albert Bandura's [33] theory of self-efficacy was used to construct the theoretical framework of the TTA. The mental factors primiparous women experience in the preparation phase for childbirth are summarised in themes and subthemes. They are discussed in terms of self-efficacy and the current scientific data. Feedback on the usefulness, acceptability and applicability of the health information leaflet and the MCII as a birth preparation tool was summarised for the results and discussed. The results are described in detail in Paper III, '*Challenges in using Mental Contrasting with Implementation Intentions (MCII) in preparation for natural birth: A feasibility study*' [47].

3.0 Results

3.1 Changing behaviour in pregnant women: A scoping review (Summary Paper I) [71]

A systematic search for literature on the topic of '*Changing behaviour in pregnant women*' identified thirty studies. A summary of these studies showed that education for knowledge gain and information material for women who have no knowledge of specific health behaviours appeared to be effective. This aspect becomes apparent for example in the studies by Al Khamis et al. [82]; Khan et al. [83]; or Shavalli et al. [84]. Behaviour Change Programmes (BCPs) which aimed at changing lifestyle habits, such as weight management, physical activity or smoking, has shown that success requires other aspects to be considered as well. This is particularly evident in two studies on changing complex behaviour: Olson et al. [85] and Gaston & Prapavessis [86]. Olson et al. [85] did not achieve statistical significance with their educational intervention on weight control by pregnant women: Gaston & Prapavessis [86], on the other hand, successfully applied a coping and action planning intervention to physical activity in pregnancy. Amongst other things *verbal persuasion* and *vicarious experience* were used to enhance women's self-efficacy belief. Empowerment can augment abilities and motivation in respect of specific health behaviours. None of the thirty studies specifically focused on empowering pregnant women. The BCPs primarily use the components *skills and competence* ($n = 17$) to try and achieve their health goals. *Goal-setting and attainment* ($n = 7$) was the second most common component used to enhance the healthfulness of women's own behaviours.

Analysis by means of the *Behaviour Change Wheel* shows that the '*sources of behaviour*' identified [38, p.7], also called *COM-B* (*capability, motivation, opportunity, - behaviour*) efficiently summarise the aspects influencing behaviour when they are applied to BCPs in pregnancy. *COM-B* can be used for analysis and decision support with regard to which aspects are to be taken as given and which need to be considered with a view to improving health behaviours. The *COM-B* model should be linked to the '*intervention functions*' ([38, p.7]; see Paper I, Figure 1) as well. The *Behaviour Change Wheel* is applicable to lifestyle-related health behaviours in pregnancy. It provides guidance for improving programmes or tools in pregnancy by reflecting the three categories of *capability, motivation* and *opportunity*.

Midwives were involved in the study programmes in about one third of the studies. Midwives were, however, only used for ancillary activities like recruitment of participants or distribution of material. The potential that midwives have to support health practices on the basis of their professional position and special skills is hardly exploited in BCPs.

3.2 Challenges in applying the short Childbirth Self-Efficacy Inventory (CBSEI-32) in German (Summary Paper II) [72]

Ten pregnant women assessed the German short version of the Childbirth Self-Efficacy Inventory (CBSEI-C32). It was translated into German according to the high standards of the International Society for Pharmacoeconomics and Outcomes Research (ISPOR) in 2012 [87].

Four women determined for themselves that the questionnaire was a helpful tool in preparing for their childbirth. The tool's questions stimulated the women concerned to ponder and think over the process of giving birth. The participants' feedback revealed that in respect of two items (nos. 4 and 7 of the Outcome Expectancy (OE), or nos. 20 and 23 respectively of the Efficacy Expectancy (EE)) it was difficult for them to understand the behaviour described for assessment. Item (nos. 4 OE / 20 EE), '*Mich beherrschen*' ('*Keep myself in control*'), and item (nos. 7 OE / 23 EE), '*Mich ruhig halten*' ('*Keep myself calm*'), could be interpreted in various ways by the participating women. They reported that they were puzzled by the questions, because the concepts and views presented in the Childbirth Self-Efficacy Inventory did not correspond to what they had read and heard during pregnancy about coping with giving birth.

3.3 Challenges in using Mental Contrasting with Implementation Intentions (MCII) for preparation for natural birth: A feasibility study (Summary Paper III) [47]

Ten pregnant women participated in the testing and evaluation of MCII and a self-developed health-focused information leaflet on physiological childbirth. The CBSEI-C32 scores of all participants were high. The self-regulatory method MCII was experimentally applied to childbirth preparation. However, the women did not use MCII in the way they had been instructed to. None of the ten participants repeated it daily. It was reported back that the stated topic (dealing with contractions free of pharmacological pain relief) was unfavourable for use in mental contrasting and for formulating an if-then proposition. The participants commented that they wished they could have chosen the topic for mental contrasting themselves. Participants were asked to assess how helpful MCII was in childbirth preparation; this assessment was carried out twice, antenatally and retrospectively postpartum. Evaluation on a six-point Likert scale showed that MCII was not primarily categorised as being helpful (see Paper III, Table 2, p.5). The qualitative theoretical thematic analysis of the content of the MCII worksheets revealed that there were two main mental aspects to be described: on the one hand there was '*the ability to give birth*' and on the other hand '*the uncertainty of giving birth*' (see Paper III, Table 4, p.7). The women demonstrated their self-efficacy belief, i.e. in their own abilities and a feeling of control in respect of labour and birth. These aspects showed that the participating women were strengthened by childbirth preparedness, confidence in their own behaviour and external support. Fears and worries were aspects of '*the uncertainty of giving birth*'. Pregnant women, undertook the mental contrasting of those features of giving birth that they have no control over, such as heavy labour pains, postpartum haemorrhage or giving birth to a baby with health issues.

The health-focused information leaflet employed was judged entirely positively by the participating women. Thanks to factual description, the health information was easy to understand and was well received. The salutogenic style of the writing answered the question as to what factors promote and maintain health during childbirth and the postpartum period. The content contained in the leaflet appeared to be appropriate to put over the knowledge that it was desired to impart. Suggestions for improvement were the wish for a) more

information on medical interventions and b) a list of further German-language literature to read.

4.0 Discussion

The findings of the dissertation suggest that self-efficacy belief promotes health behaviours in pregnant women. In the case of Paper I, despite the fact that further research into strengthening women's self-efficacy belief through BCPs is needed, the initial results highlight the fact that considering pregnant women's self-efficacy belief could bring about an improvement in their health behaviours. Nine out of thirty studies incorporated self-efficacy, in addition to other empowerment components such as *skills and competencies*, into the interventions to change behaviours during pregnancy. Of these nine studies, seven [86, 88-93] showed statistically significant improvements in health behaviours on the part of the participants. Of the other two studies [94, 95], one [94] encountered attendance problems in the BCP, which makes the results difficult to interpret. The other study, on physical activity [95], reports that all women in the third trimester did less sport, which is most likely due to the increasing physical strain during pregnancy and not to the success or failure of the programme. Furthermore, in Paper II the assessment of the German CBSEI-C32 showed that women did find the CBSEI-C32 helpful to mental preparation for childbirth. With the help of the CBSEI-C32, the participants were able to compare what health behaviours they were already capable of with regard to childbirth, such as breathing in labour. This activates the coping resource, which makes a relevant contribution to strengthening the women's self-efficacy belief regarding childbirth [33, 43]. The participating women did give feedback to the effect that some items of the score did not appear to reflect their health behaviours in respect of childbirth, in particular items nos. 4 OE / 20 EE and 7 OE / 23 EE. This aspect will be discussed in depth in connection with the second objective of this discussion, namely that of *identifying statements about self-efficacy in childbirth that give support to primiparous women*. As for Paper III, self-efficacy was a prerequisite for using the MCII tool. The subject-specific self-efficacy scores (CBSEI-C32) among the participants were high for both labour and birth. In the phase of preparing for a physiological childbirth, primiparous women demonstrated their high degree of self-efficacy belief through their trust in their own '*ability to give birth*' [47, p.1].

In the next section, the aim of this dissertation is discussed on the basis of the three objectives. In the three research projects the following relationships were observed, providing insights into the enhancement of health behaviour: firstly (Paper I), that between the woman and her empowering environment, in which external factors were identified that create a strengthening environment to support health behaviours in the women; secondly (Paper II), the relationship between the woman and the midwife, where mutual understanding is observed and contemporary concepts of and views on how to deal with childbirth are discussed; and thirdly (Paper III), the relationship of a woman to herself, where internal factors in the woman produced enhanced health behaviours in the preparation for a physiological childbirth.

As for the results relating to the first objective of this dissertation, namely *to investigate whether empowerment components were implemented in health promotion programmes in order to support health behaviours during pregnancy*, these findings indicated that in BCPs for pregnant women empowerment components did exist, but were not deliberately used in the programmes (Paper I). This was despite the fact that empowerment is a key component of health, just as much as giving babies a healthy start [14, 96]. As the scoping review Paper I shows, several health programmes focus primarily on physical rather than mental health outcomes such as experience empowerment. Health-related outcomes of empowerment are, for example, having choices through shared decision-making, cognitive goal setting, or an enhanced self-efficacy belief. In BCPs, interdisciplinary cooperation between healthcare professionals such as midwife, nurse, physician, dietician, health coach, health researcher etc. does occur [71]. In such healthcare sectors it is becoming apparent that equality of status between healthcare users and healthcare professionals needs to be significantly enhanced. As things are, power still remains primarily with the healthcare professional [97, 98]. For example, in 2001 the Institute of Medicine [99] suggested applying patient-centred care as a care approach, as one way among others of improving the quality of healthcare. Today, however, there is still a need to discuss balanced powers, whereby power in healthcare is shared more equally between the healthcare professional and the healthcare user, i.e. between the midwife and the woman concerned. This would enhance the satisfaction of women in maternity care and therefore the quality of that care [5, 100]. Leap [70] argued that midwives create an environment in which women feel empowered through a woman-centred approach. In consequence, women experience confidence and self-worth, as their midwives engage them in their care [4, 70]. At the same time, the skills of midwives have not been exploited in any of the BCPs. The WHO [101] clearly states that midwives do play a key role in maintaining health: they promote '*behaviour change through life-course approach*' [101, p.8] and they do empower women [6, 101]. The scoping review reports that midwives were involved in nine out of thirty studies, but only at the basic organisational level of the BCPs (Paper I). This may be one reason why empowerment components were not deliberately made use of in the BCPs during pregnancy. Personalised and respectful care can have a sustained effect on the feeling of empowerment and on future health behaviours [100]. To foster women's health behaviours, an approach that supports the experience of control over one's own care through woman-led decision-making, while respecting values and beliefs, is important. Furthermore, it is important to have control over one's own body, for example in areas such as birth control, abortion and bodily inviolacy [4]. These aspects can be found in a feminist care model [8]. In a feminist care model, there will not merely be '*some shared responsibilities*' [98, p.2], as in a woman-centred or patient-centred approach, but equality of status will be promoted [5, 98]. In a feminist model of care '*women's voice, informed consent, and bodily autonomy*' [8, p. e93] are protected and facilitated in order to empower women. To promote health behaviours by women through empowerment components, Hawke [8] recommended adopting feminist principles into midwifery care and into the concept of woman-centred care [8]. It appears that a feminist care philosophy that is free from domination, and which gives a woman choices [8, 98, 102], could support and encourage pregnant women in their ability to behave autonomously, and thus

result in enhanced health behaviours. Due to the scope of BCPs during pregnancy, where a lot of different healthcare professionals are involved, a feminist model of care may ensure the implementation of empowerment components for the pregnant women. Moreover, it seems advisable to involve midwives with their skills in health promotion programmes during pregnancy, to guarantee empowerment components in BCP interventions.

The results relating to the second objective, namely *to identify statements about self-efficacy in childbirth that support primiparous women*, showed that health-orientated statements about labour and birth seem to give primiparous women more support than does the aspect of keeping themselves under control. In the assessment of the CBSEI-C32 items the following eight statements: (nos. 3 OE / 19 EE) *'use breathing during labour contractions'*, (nos. 6 OE / 22 EE) *'concentrate on an object in the room to distract myself'*, (nos. 8 OE / 24 EE) *'concentrate on thinking about the baby'*, (nos. 10 OE / 26 EE) *'think positive'*, (nos. 12 OE / 28 EE) *'tell myself that I can do it'*, (nos. 13 OE / 29 EE) *'think about others in my family'*, (nos. 14 OE / 30 EE) *'concentrate on getting through one contraction at a time'*, (nos. 16 OE / 32 EE) *'listen to encouragement from the person helping me'* [103, p.340], seem to be representatively supportive self-efficacy statements for primiparous women.

By contrast, for one participant the simultaneous statements (nos. 1 OE / 17 EE) *'relax my body'* and (nos. 2 OE / 18 EE) *'get ready for each contraction'* [103, p.340], did not fit together in combination (Paper II). To apply both statements in combination requires practice in keeping the body relaxed and the mind focused. This specific combination is to be classified among the *physiological and affective states* which are the fourth source of self-efficacy belief, in which *'somatic awareness and response'* [67, p. 80] occur or can be learned. However, each of the CBSEI statements is an independent item, standing only for itself. None of the other participants found these two aspects of self-efficacy worthy of criticism.

Research suggests that relaxation and a focused mind support women in coping with childbirth [37, 104]. No opposing view is found in the literature. In addition, the statement (nos. 9 OE / 25 EE) *'stay on top of each contraction'* [103, p.340], seems too imprecise for the participant's own assessment of childbirth self-efficacy - especially for primiparous women, given that the person who assesses their abilities on the self-efficacy scale is supposed to compare these with their own previous experiences. This item lacks the comparable information required for the formulation of a statement regarding the participant's own comparable performance level. A precise description of the action referred to is important in measuring self-efficacy belief [33]. This becomes obvious with, for example, the item (nos. 3 OE / 19 EE) *'use breathing during labour contractions'* [103, p.340], which allows a very precise assessment. The item (nos. 9 OE / 25 EE) *'stay on top of each contraction'* [103, p.340] therefore seems to be in need of redrafting. The coping behaviour of (nos. 5 OE / 21 EE) *'think about relaxing'* was also questioned. Another of the statements, (nos. 15 OE / 31 EE) *'focus on the person helping me in labour'* [103, p.340], illustrates the change in concepts of childbirth and the gain in scientific knowledge [37, 56]. Nowadays, childbirth education conveys the principle that one should listen to oneself and

one's body, and follow what it suggests [105]. The woman who is giving birth should focus on herself during the contraction, and not on the person helping her [37, 56].

One participant with a positive, health-orientated perspective towards labour and birth wished to have an item about focusing on pauses between the contractions (Paper II). Here it also becomes apparent that the formulation (nos. 11 OE / 27 EE) '*not think about the pain*' [103, p.340], reflects a different concept and view of labour and birth. Instead of focusing on the resources (pauses between the contractions) it is focused on the deficit, the potentially frightening aspect (labour pain) of childbirth. Furthermore, in the German version of the CBSEI there are two items that are to be viewed critically. The meanings of the two items are ambiguous in the German translation: (nos. 4 OE / 20 EE) '*Mich beherrschen*' [86, p.29], original English CBESI item: '*keep myself in control*' [103, p.340]: and (nos. 7 OE / 23 EE) '*Mich ruhig halten*' [86, p.29]; original English CBESI item: '*keep myself calm*' [103, p.340]. During labour and birth women surrender to the birth process [17, 56]. They use vocalisation to cope with labour pain [106, 107]. They intuitively move around while giving birth [56]. Nevertheless, woman want to have control: internally through self-regulation of their emotions and their own behaviour [33, 56]. But external control through the '*feeling of having influence*' [56, p.8], which means having choices, is also necessary in childbirth. In the case of coping with labour and birth, it is of greater importance to learn how to stay mentally calm during the birth process. However, it is not in the nature of childbirth to keep control of oneself or to keep '*quiet*' during labour and birth [37, 56]. These two statements (nos. 4 OE / 20 EE and 7 OE / 23 EE) as translated into German represent neither physiological labour behaviour nor contemporary childbirth concepts or views [17]. With regard to understanding, they demonstrate that mutual understanding was not achieved, at least by these two items of the CBSEI. Mutual understanding is a basic factor in midwifery care [9, 13, 108]. Midwives and maternity scientists as experts can help woman to understand, navigate their way, and feel confident during the transition phase to parenthood [4, 56, 70]. In Paper II, communication between the midwife and the woman about childbirth self-efficacy was technically controlled. In the event of technically controlled communication, via tools such as a questionnaire, email, social media etc., the professional does not communicate face to face to convey content [109]. Nevertheless, it is the task of the midwife to put herself in the position of the woman, to understand and to be understood. In woman-centred care a crucial part of the relationship-building between the midwife and the woman is that they should understand each other [9, 108]. This discussion and Paper II also suggest that concepts and views change over time. Based on prior research this is nothing new. In maternity care changes take place or are established [5, 8, 110, 111]. Consequently, every concept and view should be regularly re-evaluated to assess its accuracy and whether it is up to date.

The results relating to the third objective, namely ***to investigate if a cognitive behaviour tool applied in preparation for birth is applicable and accepted by pregnant women***, showed that MCII does not appear to be promising as a tool for use in childbirth preparation. The intention was to use the cognitive behaviour tool MCII to assist women in a health-orientated way in

their mental preparation during labour and birth. In research project III [47], most of the participating women did not use MCII as instructed. In addition, women reported that MCII was not helpful in their childbirth preparation and they found the four steps of MCII primarily inappropriate for preparing for and dealing with labour and birth (Paper III). For the participating women in Paper III self-determination was important. The predefined goal of mental contrasting and forming an if-then plan was queried. Thus it has to be taken into account that the willingness to get involved in the four steps of MCII may have been reduced [47]. Beyond this, women seemed to avoid engaging in negative aspects of birth, which may result in lower confidence and consequently lower childbirth self-efficacy scores. Given that self-efficacy has an ongoing influence on the self-regulation of emotions, it also has an influence on motivation [33].

To be confident about their own abilities and to experience belief in their control abilities in connection with an uncertain event, primiparous women are in need of coping skills. This means that primiparous women need knowledge, resources and skills in order to self-regulate their emotions and thus their own behaviours [33, 56]. Accordingly, primiparous women may need support to strengthen their self-regulation skills and their coping abilities. These require situation-specific self-efficacy belief with regard to the experienced uncertainty of childbirth [33]. According to the analysis of Mathias et al. [4], midwives support women and prepare them for the uncertainty of birth through a) information transfer, b) teaching skills (cognitive and behavioural) to cope with challenging situations during pregnancy and childbirth, and c) a health-focused perspective towards pregnancy and childbirth, which includes the attitude that a woman can trust in her body's ability to carry a baby, give birth to it and care for it. This would mean that the health-focused perspective towards pregnancy and childbirth is in need of being supported, which is not explicitly done through the four steps of MCII. Consequently, women may first need to strengthen their self-regulation skills, to the extent that they experience birth as an uncertain event, before being able to use MCII. The additional health-focused information leaflet in research project III was insufficient to develop self-regulation skills. Other research also suggests that a one-time transfer of information is not sufficient [4, 71, 112]. Over and above this, mental preparedness is a part of childbirth preparation and should receive attention in the course of the preparation for a physiological childbirth, as the mind-set adds much towards a positive birth experience [37, 113]. The women were, it seems, not supported in adapting their individual mental health states for childbirth by research project III [47]. Based on the findings of research project III and the limited scientific knowledge on mental preparation and mental states for physiological childbirth [114], a different approach to the mental preparation of childbirth seemed to be appropriate. For example, the aim is to reach a mental state during labour and birth that is *'focussed, open and accepting of the inner experience and pain'* [37, p.1029], but this coping skill was not covered either by MCII or by the health-focused information leaflet.

In the following section, other methods are discussed that may teach and support inner states: methods such as mindfulness, hypnobirthing or yoga for childbirth preparation. Through

awareness of the present moment and a non-judgmental attitude, mindfulness programmes aim to decrease stress and to enhance the woman's own well-being. Mindfulness programmes include meditation, gentle yoga positions, body-scan or breathing. Academic findings, however, show that mindfulness can have an influence on anxiety, depression and distress [115]; an initial statistical survey of RCTs, however, showed that at the moment no influence on pain management in childbirth is apparent (RR 0.50, 95% CI (0.20-1.26), $n = 26$) [103]. Hypnobirthing was examined in a Cochrane review [116]. They reported that hypnobirthing does not reduce epidural use (RR 0.81, 95% CI (0.51-1.27), $n = 2817$), but does reduce that of other forms of pharmacological pain relief as compared to a control group (RR 0.73, 95% CI (0.57-0.97), $n = 2916$) [116]. No other differences such as improved coping, vaginal birth or satisfaction with pain relief, were apparent from the statistics [104, 116]. One promising approach to mental preparation could be the use of body-mind intervention yoga. Yoga for pregnant woman can decrease pain intensity in childbirth (MD -6.12, 95% CI (-11.77--0.47), $n = 66$) and increase childbirth satisfaction [104]. Smith et al. [103] report two opposing statistical statements about yoga and the use of epidurals. One study (yoga $n = 33$, control $n = 33$) had no effect on the use of epidurals (RR 0.82, 95% CI (0.49-1.38)), while the other study (yoga $n = 40$, control $n = 43$) did have an effect (RR 0.05, 95% CI (0.01-9.35)). Despite the few studies and the small number of participants, yoga could have the highest potential amongst the methods to support mental preparation. Unlike the other methods, it covers all four aspects of enhancing self-efficacy beliefs. Yoga in pregnancy enhances self-efficacy beliefs through (i) *Mastery experiences*, breathing experience with pain in yoga positions; (ii) *Vicarious experience*, through stories related by the teacher and the participants; (iii) *Verbal persuasion*, through positive affirmations and statements during the teaching; (iv) *Physiological and affective states*, the experience of relaxation and meditation through yoga asanas [67, 112, 117]. Yoga teaches women coping strategies to deal with pain [67] which are not provided by MCII. Yoga is very much a physical practice as compared to mindfulness, hypnobirthing or MCII, which are primarily cognitive methods. Because childbirth is mainly a physical experience, a body/mind intervention such as yoga seems to possess high potential for childbirth preparation; through it, a physical impact can be experienced while the mind is trained to align itself appropriately.

Moreover, the woman and her relationship to herself seem to be supported during pregnancy through a positive and strengthened approach. This is reflected in Paper III, through the very positive feedback from the health-focused information leaflet and also from the publication by Campbell and Nolan [67] through its positive affirmations and statements, and stories told during yoga classes. This aspect of a positive and strengthening approach can be explained through the theory of self-efficacy. Self-efficacy can be enhanced or decreased through positive or negative *verbal persuasion* [33]. As described in Paper III, a critical point with regard to MCII was its ability to deal with the participant's own inner obstacles, which may influence her degree of self-efficacy beliefs. As a final point with regard to woman-centred care as the primary care model in midwifery [70], it is clear that woman-centred care refers to care on an individual basis. Hence, MCII cannot be a standardised procedure. MCII used as a cognitive

behaviour tool in specific cases could then nevertheless be applicable to and accepted by some women.

5.0 Conclusions

This dissertation has affected a gain in knowledge of how to enhance the health behaviours of pregnant women, in order to foster long-term health (Papers I, II, III). In the three research projects the following connections were observed: between the woman and her empowering environment (Paper I), between the woman and the midwife (Paper II), and the relationship of the woman to herself (Paper III).

- i. **The woman and her empowering environment.** Women can be strengthened through interaction with and support from the professional (healthcare) environment. The skills of midwives have a high potential to support an empowering environment for women. Empowerment components, for example self-efficacy beliefs or shared decision-making, should be supported to a greater extent in order to strengthen women in their autonomous health behaviours. At the same time it seems to be important to take into account the women's individual factors, such as motivation (Paper I).
- ii. **The woman and the midwife.** Mutual understanding between the midwife and the woman in matters of health care is important to support women in their health behaviours. It is useful for midwives to listen to women in order to keep up with changing concepts and views. The CBSEI in German may require further testing and adjustment in order to represent contemporary concepts and views, as well as to be understood from the woman's point of view (Paper II).
- iii. **The woman and her relationship to herself.** For a primiparous woman, MCII does not appear ideal as a labour and birth preparation tool. MCII may be helpful to some pregnant women in childbirth preparation or in connection with other health issues. The midwifery model of care implies that MCII can be used on an individual basis for woman-centred care, but not as a routine instrument. Interventions that combine physical and mental aspects may be more beneficial for childbirth preparation than solely cognitive approaches. The participating primiparous women did favour a positive and health-focused approach towards childbirth. Through communication which supports salutogenic aspects (*comprehensibility, manageability* and *meaningfulness*), and thus focuses on what is strengthening and not on what is hindering, women can be supported in their self-efficacy (Paper III).

Midwives have an important role to play for women in enhancing health behaviours during pregnancy. They can support women in their health behaviours by creating a strengthening environment in which the woman's individual needs are met, e.g. through shared decision-making. They hear, understand and give weight to women's voices, in order to sustain their health. And midwives can strengthen women if they communicate using appropriate language. A positive and health-orientated approach during pregnancy can support women's self-efficacy belief and thus empower them in the period of transition to parenthood.

6.0 Implications for midwifery practice

Information transfer to pregnant woman is the basis for developing skills and competencies.

Pregnant women can be supported through empowerment aspects such as giving choices in care. It is thereby important to consider each woman's individual factors (relating to body, mind, behaviour and the environment) in order to enhance health behaviours.

Care for mutual understanding.

It is important to remove uncertainties about giving birth, because worries and fears impair women's self-efficacy belief and thus their coping ability.

Positive health-focused communication is recommended during pregnancy.

Pregnant women prefer to focus on the strengthening aspects in childbirth preparation and not on obstacles.

7.0 Further research

Further studies are needed to observe how the skills of midwives can be integrated into the entire spectrum of health promotion during conception, pregnancy, giving birth and the postpartum period, e.g. in Behaviour Change Programmes (BCPs) during pregnancy in order to utilise the entire professional potential of midwives.

Further development and testing of the Childbirth Self-Efficacy Inventory is needed to support a contemporary and accurate measurement of self-efficacy for labour and birth.

The impact on the mental preparation of pregnant woman of applying salutogenic theory in childbirth preparation needs to be further examined.

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Confirmation

Erklärung

Hiermit erkläre ich, dass ich die Dissertation: „*Self-efficacy and its impact on health behaviours during pregnancy*“, selbstständig verfasst habe. Bei der Anfertigung wurden folgende Hilfen Dritter in Anspruch genommen:

- Prof. Dr. Mechthild M. Groß, an der MHH hat zusammen mit Kathrin Stoll, PhD, Senior Research Fellow an der University of British Columbia in Canada, die methodologische Konzeption der Arbeit durchgängig begleitet.

Ich habe keine entgeltliche Hilfe von Vermittlungs- bzw. Beratungsdiensten (Promotionsberater oder anderer Personen) in Anspruch genommen. Niemand hat von mir unmittelbar oder mittelbar entgeltliche Leistungen für Arbeiten erhalten, die im Zusammenhang mit dem Inhalt der vorgelegten Dissertation stehen. Ich habe die Dissertation an folgenden Institutionen angefertigt:

Forschungs- und Lehrinheit Hebammenwissenschaft / Midwifery Research and Education Unit.

Die Dissertation wurde bisher nicht für eine Prüfung oder Promotion oder für einen ähnlichen Zweck zur Beurteilung eingereicht. Ich versichere, dass ich die vorstehenden Angaben nach bestem Wissen vollständig und der Wahrheit entsprechend gemacht habe.

Ort, Datum

Unterschrift

H. Gehling, A. Grosshennig, L. Zinsser, M.M. Gross. Onset of labour symptoms and their timely intervals in primigravidae: results of a pilot study. Normal labour and birth: 14th Research Conference. Lancashire, UK, 2019.

Publications

Papers

Zinsser LA, Stoll K, Gross MM. Challenges in using Mental Contrasting with Implementation Intentions (MCII) for preparation for natural birth: A feasibility study. Sex Rep Health. 2021;29:100642. DOI: 10.1016/j.srhc.2021.100642.

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Abstract

Zinsser L, Stoll K, Gross MM. Die Einstellung von Hebammen zur Förderung der normalen Geburt (Midwives' attitudes towards the promotion of normal birth). ZGN. 2015. DOI: 10.1055/s-0035-1566488.

Appendix I

Clinical Trial Outline Application – Exploratory Trial

STUDY SYNOPSIS

APPLICANT/COORDINATING INVESTIGATOR	Professor Dr. Mechthild M. Gross, midwife, RM, RN, BSc, MSc, PD (Laura A. Zinsser, midwife, BSc, MSc, cand. rer. biol. hum.) Midwifery Research and Education Unit Hannover Medical School OE 6410, Carl-Neuberg-Str.1, 30625 Hannover Fax: ++49 511 532 6191 Tel: ++49 511 532 6116 Gross.Mechthild@mh-hannover.de
TITLE OF STUDY	Effects on Women's Childbirth Self-efficacy and Perinatal Outcomes: An explorative randomised controlled trial to assess the effect of Mental Contrasting with Implementation Intentions compared to standard care in nulliparous women.
CONDITION	Pregnant nulliparous women
OBJECTIVE(S)	The primary aim is to demonstrate that evidence-based mental contrasting with implementation intentions (MCII) including a self-efficacy component in addition to standard care can enhance childbirth self-efficacy in pregnancy of nulliparous women compared to standard care.
INTERVENTION(S)	<u>Experimental intervention:</u> In addition to standard care during third trimester of pregnancy an information sheet on normal birth and instructions on mental contrasting with implementation intentions (MCII) will be given to women. The MCII includes a self-efficacy component and should be applied autonomously by the woman for four weeks and documented on a work sheet. <u>Control intervention:</u> Standard care and an information sheet on normal birth. <u>Duration of intervention per patient:</u> Four weeks. <u>Follow-up per patient:</u> Birth outcome directly after birth and six weeks post partum.
KEY INCLUSION AND EXCLUSION CRITERIA	<u>Key inclusion criteria:</u> All German-speaking pregnant nulliparous women < 45 years. At enrolment the women will be between 28+0 to 31+0 weeks of gestation <u>Key exclusion criteria:</u> Pregnant women who plan a caesarean section due to any cause as well as multiple pregnancies.
OUTCOME(S)	<u>Primary efficacy endpoint:</u> Change from baseline in the childbirth self-efficacy score (CBSEI-C62) after four weeks of intervention. <u>Key secondary endpoint(s):</u> birth outcome (mode of birth, usage of pain relief, APGAR score), change from baseline of the self-developed birth intention score. <u>Assessment of safety:</u> not applicable.
STUDY TYPE	Explorative, prospective, clinical, two-arm, randomised-controlled trial.
STATISTICAL ANALYSIS	<u>Efficacy:</u> The study-wise type-I-error is set to 5% (two-sided). <u>Description of the primary efficacy analysis and population:</u> The primary analysis will be performed in the intention-to-treat population. An analysis of covariance (ANCOVA) will be applied on the difference in CBSEI-C62 (four weeks after intervention – baseline). CBSEI-C62 at baseline and intervention group will be included in the model. <u>Secondary endpoints:</u> Secondary analysis will be performed descriptively in line with primary analysis.
SAMPLE SIZE	<u>To be assessed for eligibility (approx. n = 177.000)</u> <u>To be allocated to trial (n = 480)</u> <u>To be analysed (n = 480)</u>
TRIAL DURATION	<u>Time for preparation of the trial (months): 7</u> <u>Recruitment period (months): 8</u> <u>First patient in to last patient out (months): 26</u> <u>Time for data clearance and analysis (months): 3</u> <u>Duration of the entire trial (months): 36</u>
PARTICIPATING CENTERS	<u>To be involved (n): none.</u> Recruitment over social media.
OTHER SUBMISSION OF PROPOSAL ELSEWHERE	A previous version of this proposal has been submitted to the Studienstiftung des Deutschen Volkes.

1. RELEVANCE

1.1 PREVALENCE, INCIDENCE, MORTALITY

It is important for pregnant woman to have confidence in their own ability to give birth vaginally. Otherwise the likelihood of preferring a caesarean section is significantly increased [1]. The reason for preferring a caesarean section is fear of labour pain in 73.5% [2]. In fact, fear of childbirth is associated with giving birth via elective caesarean section [3]. In contrast, a high level of childbirth self-efficacy is associated with less prenatal anxiety, more successful pain management during labour and longer hours at home during birth, before moving to the birth place [4].

1.2 BURDEN OF DISEASE

More and more low-risk pregnant women perceive the transition into motherhood as a challenging process. The childbearing period lacks non-medical, health oriented interventions and outcomes. Stress and anxiety in pregnancy can have an impact on the women and the unborn, as well as on the choice of the birth mode. Therefore women may benefit from mind-body interventions [5]. From a socioeconomic point of view low self-efficacy is connected with higher costs for health insurance companies based on the birth mode (caesarean section) and birth interventions such as epidural analgesia [6].

1.3 IMPROVEMENT OF THERAPY / IMPACT OF THE TRIAL

Novelty: A self empowering tool (MCII) that is easy to apply will be tested as an intervention to increase childbirth self-efficacy and natural childbirth intentions. In addition it will be examined whether the recruitment via social media is effective.

Clinical impact: MCII is a cost-efficient and practical tool. It is easy to implement in maternity care and has the potential to increase spontaneous vaginal births and decrease caesarean section rates.

Patient benefit: Empowering a pregnant woman through enhanced childbirth self-efficacy can improve her overall childbirth experience and may help to discover new internal resources for her future life. Moreover, a healthy start into motherhood has a positive effect on the infant's health [7].

Socioeconomic impact: Healthcare costs associated with unfavourable birth outcomes can be lowered through reducing caesarean section and maternal traumatic birth experience, which endangers the infant's and its family's health in both the short and the long term.

1.4 PATIENT INVOLVEMENT

Consumer knowledge (pregnant and postnatal women) are involved for the development of the questionnaire with the aim of clarity, relevance, and legibility.

2. EVIDENCE

Women's self-efficacy during childbirth is part of the success on low interventions and is related to normal births [4]. Self-efficacy is based on the confidence in one's own abilities [8, 9], and as a subject-specific construct it is of high interest in childbirth. The tool to assess childbirth self-efficacy is called childbirth self-efficacy inventory (CBSEI-C62) [10, 11]. Self-efficacy in childbirth is a potential health promotion factor in maternity care, since high self-efficacy has a positive effect on prenatal anxiety, pain management during birth and the hours spent at home during birth, before moving to the chosen birth place [4]. Low self-efficacy is strongly associated with preferring a caesarean section [1, 2]. Mental contrasting with implementation intentions (MCII) may be a useful tool for raising childbirth self-efficacy. MCII is a self-regulation strategy to set individual goals (e.g. normal childbirth) and support their transition into action [12]. MCII is a behaviour change technique that is well suited to support self-determination and autonomy. MCII is easy to apply and can be successfully used independently of the own social economic status or the cultural background [13]. MCII is highly compatible with woman-centred care approaches that nowadays characterize antenatal care [14]. This empowerment aspect of the MCII tool leads to the assumption, that it could be a useful and appropriate tool for maternity care to raise childbirth self-efficacy. MCII has not been tested in childbirth self-efficacy so far. No evidence-based statement can be made about the effects of MCII during pregnancy. A single evidence has been found in general self-efficacy and MCII with participants suffering from mild-to-moderate depression. Fritzsche and colleagues [15] found no significant increase of the global self-efficacy after a short-term intervention of three weeks of MCII. However, they did not use a subject-specific self-efficacy construct, which might explain the missing significances. As mentioned above it is known that self-efficacy is part of the success of MCII, because self-efficacy helps to maintain a new adopted behaviour [16]. The self-

regulation strategy has shown success in the area of health behaviour, interpersonal relations and academic achievements [17–23].

3. JUSTIFICATION OF DESIGN ASPECTS

3.1 CONTROL(S) / COMPARATOR(S)

All women will receive standard of care. That implies that women are cared for by health professionals in accordance to the guideline “Mutterschaftsrichtlinie” [24]. In addition, all women in standard care as well as the intervention group will receive an information sheet on normal birth, ensuring that both trial arms have the same basis of knowledge.

3.2 INCLUSION / EXCLUSION CRITERIA

For generalizability all German speaking pregnant nulliparous women < 45 years are included who are being enrolled between 28+0 to 31+0 weeks of gestation and pregnant with a singleton. Excluded are pregnant women who plan a caesarean section due to any cause (medical or request), since no association with the birth outcome can be made. Multiparous are excluded, because previous birth experience has an influence on the pregnant women [27][26]. Twin pregnancies are associated with higher complications and are also excluded [27].

3.3. INTERVENTION(S)

In addition to standard care the women in the intervention group will receive a self-directed worksheet via post. The worksheet includes the evidence-based four steps of the MCII also known as WOOP (wish, outcome, obstacle, plan), to support normal birth without the need of coaching. The researcher has adjusted the text with respect to the primary outcome: childbirth self-efficacy, as well as the secondary outcome: normal birth [17]. The tool has been screened from one expert (Prof. Dr. Frank Wieber, ZHAW). Standardization of the intervention is given since all women receive the same worksheet. The women are asked to focus on their own MCII plan at least once a week (a reminder E-Mail will be send), for four weeks, until the second data collection has been done. The intervention duration is set to four weeks in order to finish the intervention for all women before physiological birth starts (37+0 - 42+0 weeks of gestation). Former studies also applied a length of four weeks [28][30].

3.4 OUTCOME MEASURES

The primary outcome will be the change in the CBSEI-C62 score between baseline and 4 weeks after intervention [10]. The long version (62 questions) of the tool has been validated in 10 languages, including German. The short version (32 question) is validated in 4 languages [10]. The effect will be measured directly after the invention, because the individual experience during childbirth can have an influence on self-efficacy [31]. Maternal and neonatal birth outcomes (e.g. birth mode, APGAR) and the birth intentions in pregnancy will be examined as secondary outcomes. In midwifery science the perinatal outcome is a standard marker for health. The baseline change in normal birth intentions will be assessed additionally as an indicator whether MCII is promoting normal birth at the same time as the CBSEI-C62. As no validated measure for birth intention is available it will be assessed using a scale developed by the investigator. Maternal and neonatal birth outcomes will be measured using a follow-up questionnaire six weeks postpartum.

3.5 METHODS AGAINST BIAS

An experimental two-arm randomised controlled trial will be performed. After the women gave their informed consent and provided their baseline data, the randomisation will be performed centrally. Blinding of the participants is not possible as no substitute programme is available for the control group. To avoid contamination women in the experimental group will be asked not to share or talk about the intervention with other pregnant women. The absence of contamination will be verified within the questionnaire, i.e. both groups will be asked if they know the intervention. Analyses will be performed in the intention-to-treat (ITT) population, which includes all randomized patients. Sensitivity analyses will be performed in the per protocol (PP) population, i.e. in all women with available outcome data.

3.6 PROPOSED SAMPLE SIZE / POWER CALCULATIONS

The sample size calculation is based on a comprehensive literature search. Within these the randomized controlled trial of a psycho-education intervention by midwives that examine childbirth fear in pregnant woman by Toohill et al. [32] was identified. Beside others the CBSEI-C62 was a secondary endpoint. The time points of CBSEI-C62 assessment were earlier (first assessment between 24 and 29 weeks of gestation, second assessment 4 weeks later between 28 and 34 week of gestation). In the intervention group they observed a mean change of 61 (n=97, standard deviation=87). The change in the control group was substantial smaller (n=91, mean difference=20, standard deviation =93). The respective change in CBSEI-C62 score is 41 and the common standard deviation is about 90. For the sample size estimation we assume a comparable standard deviation, but a more conservative effect of the intervention of 25. The Sample size calculation is based on a two-sided type-I-error of 5% and a power of 80%. On the basis of these assumptions and a two-group t-test of equal means a total of 205 subjects

per group are necessary to be analysed. It is assumed that adjustment for baseline CBSEI-C64 will increase the power. Sample size calculations were performed using nQuery Advisor® 7.0. Up to now no literature on non-compliance for this particular setting could be found. Nevertheless to account for lost-to-follow-up a minimum of 480 woman will be recruited.

3.7 FEASIBILITY OF RECRUITMENT

Pregnant women will be recruited via social media in Germany. Information about the study will be posted via Facebook. Former studies show that recruitment via social media (e.g. Facebook) is comparable to traditional recruitment technique [33–35]. Participants are successfully mobilized for contribution, a broad geographic distribution will be given and a diverse sampling is easy to reach [35–37]. Shere et al. [38] reported quicker recruitment rate for their clinical trial with pregnant women via social media (n=45, in 6 months) compared to traditional recruitment (n=35, 56 month). There were no significant differences reported in age, body weight, gravidity, level of education, employment or marital status. The small recruitment numbers in this study can be eventually explained through the narrow inclusion criteria: no consummation of vitamin supplements, including folic acid. This exploratory study should gain more data on the efficiency of recruitment by social media.

4. STATISTICAL ANALYSIS

The primary analysis will be performed in the intention-to-treat population. Baseline CBSEI-C62 values will be used in the analysis for women who do not provide full information on CBSEI-62 after the intervention (BOCF). BOCF is assumed to be conservative in a superiority trial. The per-protocol (PP) population will be used for sensitivity analysis to confirm the findings of the ITT population. An analysis of covariance (ANCOVA) will be performed for the analysis of the primary endpoint change in CBSEI-62 (4 weeks after intervention – baseline). The intervention group variable (yes vs. no) and the CBSEI-C62 value at baseline will be included in the model. If the lower boundary of the respective 95% confidence interval of the mean difference in CBSEI-C62 (intervention group – control group) is above 0, superiority of the MCII-intervention will be concluded. All secondary analysis will be performed explorative. ANCOVA and logistic regression models will be adjusted in line with primary analysis.

5. ETHICAL CONSIDERATIONS

The outlined clinical trial has been approved by the ethic committee of Hannover Medical School (No.7812_BO_K_2018, 16.5.2018). General ethical considerations include the consideration and compliance with the following standards, laws and provisions: Declaration of Helsinki, EU Commission directive 2005/28/EC “Good clinical practice”, proposal for safeguarding good scientific practice, Niedersächsisches Datenschutzgesetz (NDSG), the Bundesdatenschutzgesetz (BDSG), and the European General Data Protection Regulation (GDPR). German clinical trial registration number: DRKS00013314 (Registration of the number only).

6. STRATEGIES FOR DATA HANDLING

Data collection will be performed in cooperation with the provider: Survey Monkey. Data repository of private and study data will be performed separately. Data will be treated confidentially in consideration of the data protection law of Lower Saxony (NDSG), the Bundesdatenschutzgesetz (BDSG), and the European General Data Protection Regulation (GDPR). Datasets will be available on reasonable requests from official, non-commercial institutions over the Principal/Coordinating Investigator or the Trial Supervisor.

7. TRIAL MANAGEMENT

7.1 MAJOR PARTICIPANTS

#	Name	Affiliation	Responsibility/Role
1	Laura A. Zinsser	Midwifery Research and Education Unit, Hannover Medical School	Principal/Coordinating Investigator
2	Prof. Dr. Mechthild M. Gross	Midwifery Research and Education Unit, Department of Obstetrics & Gynaecology, Hannover Medical School	Trial Supervisor
3	Dr. Anika Grosshennig	Institute of Biostatistics, Hannover Medical School	Trial Statistician

7.2 TRIAL EXPERTISE

Prof. Dr. phil. habil. Mechthild M. Gross, RM, RN, BSc, MSc, PD, is head of the midwifery research and education unit at Hannover Medical School with a focus on interventions during labour and birth. Under her supervision projects have been performed by the German Research Council. More recently she led the German arm of the FP7 funded OptiBIRTH study (ISRCTN10612254). She is supervising all MSc theses at the European Master of Science in Midwifery and is the lead of one working group of the COST Action IS 1405. Dr. Anika Grosshennig is deputy head of the Institute of Biostatistics at Hannover Medical School with a focus on planning and analysis of clinical trials, methodological research on meta-analysis and validation of biomarkers and methods. Laura Zinsser is a doctoral student at Hannover Medical School and validated an instrument on attitudes to promote normal birth.

Selected publications:

Clarke M., Savage G., Smith V., Daly D., Devane D., Gross M.M. et al., 2015. Improving the organisation of maternal health service delivery and optimising childbirth by inscreasing vaginal birth after caesarean section through enhanced woman-centred care (OptiBIRTH trial): study protocol for a randomised controlled trial (ISRCTN10612254). *Trials* 16:542

Hong B, Biertz F, Raab P, Scheinichen D, Ertl P, Großhennig A, Nakamura M, Hermann EJ, Lang JM, Lanfermann H, Krauss J (2015): Normobaric hyperoxia for treatment of pneumocephalus after posterior fossa surgery in the semisitting position: a prospective randomized controlled trial. *PLoS One*. 2015 May 20;10(5):e0125710. doi: 10.1371/journal.pone.0125710. eCollection 2015.

Zinsser L.A., Stoll K., Gross M.M., 2016. Midwives' attitudes towards supporting normal labor and birth – A cross-sectional study in south Germany. *Midwifery* 39:98-102

7.3 TRIAL-SUPPORTING FACILITIES

Midwifery Research and Education Unit and Institute of Biostatistics, Hannover Medical School.

8. FINANCIAL SUMMARY

Item	Costs (€)
Project Manager (E13, 100%, 3 years): (e.g. Study Planning, Protocol preparation, electronic Case Report Form (eCRF), Informed Consent)	247.824,00
Data Manager (E10, 15%, 3 years): Database Set-up and Validation Data Entry, Coding, Conduct of randomization Query Management	30.693,60
Biostatistician (E13, 20%, 3 years): Statistical planning, planning of randomization, analysis	49.564,80
Quality Assurance (e.g. Pre-Study Visits, On-Site Monitoring, Data Monitoring Committee)	10.000,00
Travel (e.g. Trial Committees, Meetings, international conferences)	8000
Materials (postal charges, printings, survey tool)	2500
TOTAL	348.582,40

Co-financing of the trial by a company: not planned

For pharmacological interventions: trial drug under patent protection no; yes, until Date:

For interventions with medical devices: device is CE-certified no; yes

Commercial interest: none

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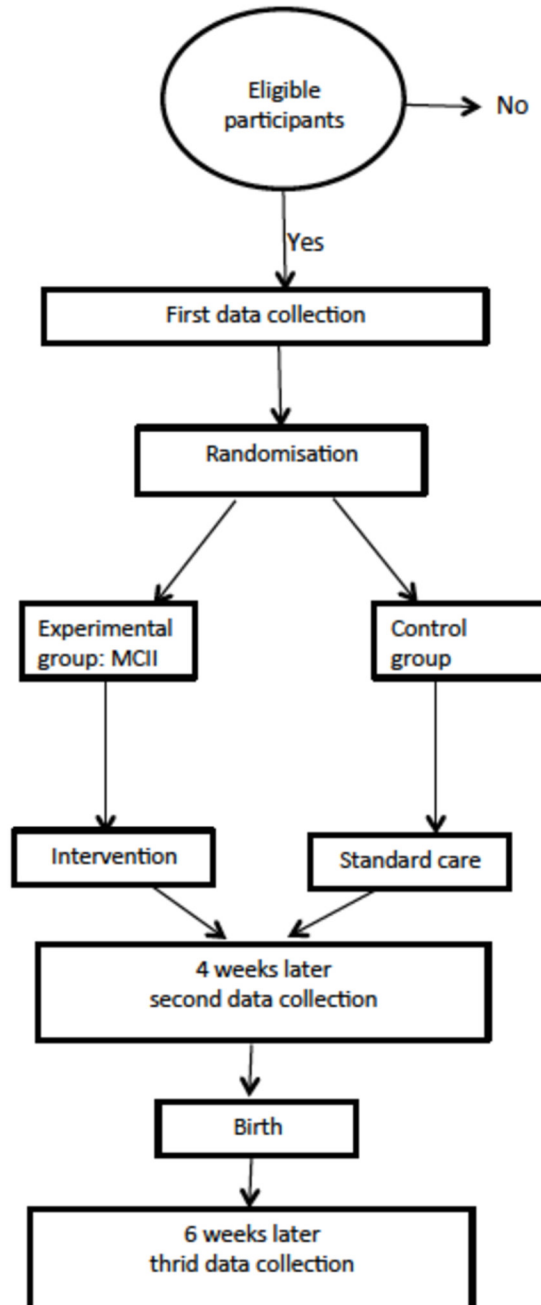
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APPENDICES

1. INTERVENTION SCHEME / TRIAL FLOW

Trial flow of the study: **Effects on Women's Childbirth Self-efficacy and Perinatal Outcomes: An explorative randomised controlled trial to assess the effect of Mental Contrasting with Implementation Intentions compared to standard care in primipara women.**



2. SEARCH STRATEGY

A systematic search strategy was applied to identify relevant literature. The databases Pubmed, CINAHL, Cochrane Library, PsycINFO, MIDRIS, clinicaltrials.gov, DRKS, ICTRP were searched using following search terms: (CBSEI OR childbirth self-efficacy inventory) OR (Self-efficacy AND birth* OR childbirth OR delivery OR pregnan* OR maternity OR labour OR labor). The terms: self-efficacy, birth*, childbirth, delivery, pregnan*, maternity were searched in title search, because too many hits appeared which were not relevant to the topic without limitations (Full text search n=7722; 19. August 2017) and in Title search (n=75; 19. August 2017) search. The search strategy was adjusted for each database. No time limitations were set. Articles with an abstract in English or German were included. Exclusion criteria were full text not available and full text articles excluded with reason not relevant to research topic or low quality. Duplicates were removed. No statistical analyses were performed. Exemplary the search strategy in Pubmed is shown in Table 1. No papers were identified to answer the research question.

Table 1: Pubmed search 24.05.18

Search	Keyword	Hits
#1	CBSEI OR childbirth self-efficacy inventory	35
#2	Self-efficacy (Title)	4858
#3	Birth*(Title) OR childbirth(Title) OR delivery(Title) OR pregnan*(Title) OR maternity(Title) OR labour (Title) OR labor (Title)	386242
#4	MCII OR mental contrasting with implementation intentions	98
#5	#2 AND #3	82
#6	#1 OR #5	92
#7	#6 AND #4	0
#8	#4 AND self-efficacy	2

Appendix II

Information über die Vorteile einer natürlichen Geburt

Geburt ist ein natürlicher und perfekt ausgeklügelter Prozess

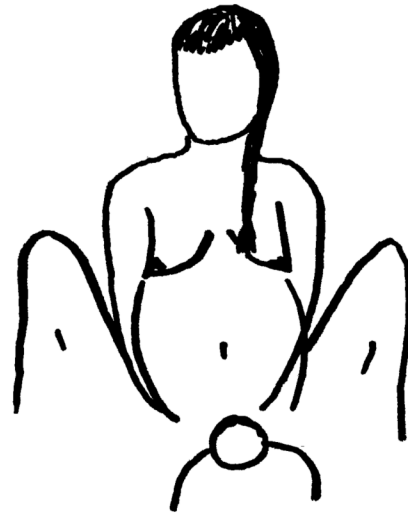
Frauen haben die Fähigkeit zum Gebären.

Der normale Geburtsprozess ist einfach: Gegen Ende der Schwangerschaft beginnt die Gebärmutter stetig mehr und mehr auf Oxytocin zu reagieren. Dieses Hormon ist bekannt als Liebeshormon und sorgt unter anderem auch für Wehen.

Beim Gebären spielt der Wehenschmerz eine wichtige Rolle, damit die Geburt weiter fortschreitet. Endorphine (Glückshormone) werden ausgeschüttet, die der Gebärenden helfen mit den Wehen umgehen zu können. Die Wehenpausen sind hilfreich dafür, dass eine Geburt machbar ist. Die Endorphine sorgen für den teilweise „traumähnlichen“ Zustand beim Gebären. Stresshormone unterbrechen dagegen den Geburtsprozess oder verlangsamen ihn. Daher ist es sehr wichtig, dass eine Frau sich mit den begleitenden Menschen an ihrem Geburtsort sicher und wohl fühlt [1]. Wissenschaftler haben festgestellt, dass der Wehenschmerz in der ersten Phase der Geburt durch die Entspannung der Gebärenden angenehmer wahrgenommen wird [2].

Kurz bevor das Baby geboren wird, bekommt die Gebärende einen Pressdrang, dem sie intuitiv folgt. Das Baby tritt tiefer in der Wehe, um dann in der Wehenpause wieder etwas hochzurutschen. Dieser natürliche Vorgang sorgt für den Schutz des Gewebes und des Beckenbodens, damit durch die Geburt weniger bis keine Verletzungen auftreten. Das Baby wird mit einem hohen Endorphin- und Katecholamin-Level geboren, was es ruhig und wachsam macht. Der ununterbrochene Haut-auf-Haut-Kontakt (Bonding) zwischen Mutter und Baby direkt nach der Geburt löst weitere Oxytocinausschüttungen aus. Das Hormon sorgt für ein regelrechtes „Liebe auf den ersten Blick“ – Erlebnis bei der Mutter. Auch die Milchspende wird unterstützt, was für ein erfolgreiches Stillen förderlich ist. Es ist zudem bekannt, dass weniger starke Blutungen direkt nach der Geburt auftreten, wenn das Baby auf der Haut der Mutter liegt [3].

Eine Schmerzerleichterung (z. B. PDA) beim Gebären verändert das hormonelle System bei Mutter und Kind. Dadurch wird oft weitere



medizinische Unterstützung erforderlich [3]. Diese Eingriffe unterbrechen den natürlichen Geburtsverlauf, bringen die hormonelle Orchestrierung aus dem Takt und sorgen für weitere unfreiwillige Eingriffe, die unter anderem in einen Kaiserschnitt münden können. Ein Kaiserschnitt hat nachgewiesene Kurz- und Langzeitrisiken für Mutter und Kind, wie z.B. Anpassungsstörungen des neugeborenen Kindes an seine Umwelt oder ein erhöhter Blutverlust bei der Mutter [4,5].

Je weniger medizinische Eingriffe wie z.B. Schmerzmedikamente gegeben sind, desto erfolgreicher gebärt eine Frau. Dadurch findet der Geburtsprozess natürlich und aus eigener Kraft statt [6].

Vorteile einer natürlichen Geburt für das Kind

Eine natürliche Geburt wirkt sich positiv auf die Gesundheit des Kindes aus. Ein Vorteil, wenn das Kind vaginal geboren wird, ist das sofort angeschlossene Kuschneln (Bonding) nach der Geburt. Das Bonding ist wichtig für den Bindungsaufbau und für die zukünftige Stillbeziehung. Es ist wissenschaftlich nachgewiesen, dass die Mutter-Kind-Interaktion noch ein Jahr später positiv geprägt ist durch das Bonding. Der sofortige, ununterbrochene Haut-auf-Haut-Kontakt nach der Geburt sorgt dafür, dass das Kind weniger Stress erfährt, es besser die eigene Körpertemperatur halten kann, es wärmer ist, das Herz regelmäßiger schlägt, die Atmung gleichmäßiger ist und das Neugeborene sogar weniger weint. Ebenso besteht eine geringere Gefahr einer Unter-

zuckerung nach der Geburt, da weniger Still Schwierigkeiten gegeben sind [7,8].

Im Vergleich zu einem Baby das per Kaiserschnitt geboren wurde, bekommt ein Baby das vaginal geboren ist, ein für das Immunsystem stärkendes, natürliches Bakterienmuster im Darm [9]. Dadurch stellt eine vaginale Geburt eine Allergieprävention dar [10]. Dies gilt im Übrigen auch für das Stillen [11].

Vorteile einer natürlichen Geburt für die Mutter

Durch eine vaginale Geburt des Kindes stellt sich bei der Mutter eine höhere Zufriedenheit ein. Frauen und auch Männer die eine natürliche Geburt (ohne Schmerzmittel) miterlebt haben, berichten vermehrt von einer positiven Erfahrung [12].

Gesundheitliche Vorteile für die Frau können auch beobachtet werden: Es treten statistisch gesehen deutlich weniger Wundinfektionen und Thromboembolien auf. Des Weiteren ist der Blutverlust geringer. Eine geringere Einnahme von Schmerzmittel nach der Geburt und eine kürzere Verweildauer im Krankenhaus ist bei einer vaginalen Geburt ebenfalls gegeben [5,13,14]. Auch eine kürzere Regenerationszeit und weniger Schmerzen im Wochenbett sind die Regel [15].

Nach einer normalen Geburt sind auch langfristig gesundheitliche Vorteile zu erwarten, da es bei künftigen Schwangerschaften und Geburten z.B. seltener zu Frühgeburten oder zu Lösungsstörungen des Mutterkuchens kommt [16].

Fazit

Für die Gesundheit und das Wohlbefinden von Mutter und Kind ist eine natürliche Geburt auf jeden Fall zu bevorzugen.

Jede Frau, jedes Baby ist einzigartig. So ist auch die Geburt ein einzigartiger Prozess. Nur in wenigen Fällen kann es zu Situationen kommen, die medizinische Hilfe oder einen Kaiserschnitt erforderlich machen [17].

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Appendix III

Role of co-authors for Paper I, II, III

Paper I

LZ: conceptualization, developed the search methodology, performed literature search, selected the studies, performed data analysis, writing the first draft. *LZ, KS*: extracted data. *KS, FW, JPM, MMG*: critical reviewed the manuscript, together with *LZ* the manuscript was revised and edited. *MMG and KS* supervised the project.

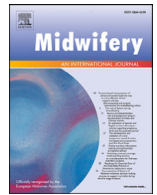
Paper II

LZ: planned the study and performed the analysis. *LZ*: wrote the first draft of the manuscript, which was revised and further developed together with *GS, KS, MMG*. *MMG* supervised the research process.

Paper III

LZ: conceptualization, methodology, designing instruments, data collection, data analysis, validation, writing the first draft. *LZ, KS, MMG*: writing, review, editing. *MMG and KS* supervised the project.

Paper I



Review article

Changing behaviour in pregnant women: A scoping review

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ABSTRACT

Objectives: Behaviour change programmes (BCPs) for pregnant women are frequently implemented as part of health promotion initiatives. At present, little is known about the types of behaviour change programmes that are being implemented and whether these programmes are designed and delivered in accordance with the principles of high quality maternity care. In this scoping review, we provide an overview of existing interventions related to behaviour change in pregnancy with a particular emphasis on programmes that include empowerment components to promote autonomy and woman-led decision-making.

Methods: A systematic search strategy was applied to check for relevant papers in August 2017 and again in October 2018.

Results: Thirty studies met the criteria for inclusion. These studies addressed weight management, smoking cessation, general health education, nutrition, physical activity, alcohol consumption and dental health. The main approach was knowledge gain through education. More than half of the studies ($n = 17$) included three or more aspects of empowerment as part of the intervention. The main aspect used to foster women's empowerment was skills and competencies. In nine studies midwives were involved, but not as programme leaders.

Conclusions: Education for knowledge gain was found to be the prevailing approach in behaviour change programmes. Empowerment aspects were not a specific focus of the behaviour change programmes. This review draws attention to the need to design interventions that empower women, which may be beneficial through their life. As midwives provide maternal healthcare worldwide, they are well-suited to develop, manage, implement or assist in BCPs.

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Introduction

Improving health and wellbeing is a major goal in health-care all over the world (WHO, 2015). Midwives and other health-care professionals play a key role in educating women about healthy pregnancies (WHO, 2013a). During the course of pregnancy, women may experience a variety of psychological changes, including developing the motivation to change their lifestyle habits

(Lindqvist et al., 2017). To support behaviour change through a life-course approach and to implement the WHO strategy for strengthening nursing and midwifery towards the achievement of the “Health 2020” goals (WHO, 2015, p.4), it is important for health-care professionals to increase their knowledge of behaviour change programmes (BCPs) during pregnancy.

In antenatal healthcare, different health promotion interventions have been developed and tested (Boyle et al., 2012; Muktabhant et al., 2015). Most interventions target lifestyle changes during pregnancy, e.g. managing excessive gestational weight gain by means of diet or physical activity (Hill et al., 2016; Swift et al., 2017). Other common areas targeted by interventions are antenatal substance use e.g. smoking cessation pro-

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grammes (Boyd and Windsor, 2003; El-Mohandes et al., 2011) or knowledge gaps, e.g. on nutrition habits to prevent toxoplasmosis (Carter et al., 1989). These interventions are intended to increase health literacy and promote lifestyle changes that will positively affect mother and baby not only during childbirth, but also across the course of their lives.

Midwives are experts in childbirth, antenatal and postnatal care, and in an ideal position to support health promotion during pregnancy (ICM, 2019). In most high-income countries, midwives provide the majority of maternity care (Shaw et al., 2016). The benefits of midwife-led antenatal care are well documented (Dowswell et al., 2015; Renfrew et al., 2014). Midwives collaborate with other healthcare professionals and health workers, which is valued by both sides (Aquino et al., 2016). In addition to clinical competencies many midwives are trained to consider psychosocial factors when providing care to pregnant women, and this additional training positions them well to develop, manage, implement or support BCPs. These skills include effective interpersonal communication between women, families and healthcare providers, and support of women's autonomy as well as strategies to strengthen and empower women's abilities (ICM, 2019). At the present time, however, little is yet known about the involvement of midwives in BCPs for pregnant women.

Midwifery care is known to increase women's confidence in their ability to give birth through one to one support and an overall woman-centred approach of the midwifery model of care (Neerland et al., 2018). For example, women need to have the ability to make decisions autonomously (Kabeer, 1999, 2005). In midwifery care, women's right to self-determination and their autonomy to make decisions about their care is supported and respected (Hermansson and Martensson, 2011). Empowerment in maternity care is closely linked to the concepts of autonomy and self-efficacy, which means that women have the ability to make decisions and have a sense of control over themselves and what happens (Nieuwenhuijze and Leahy-Warren, 2019; Kliche and Kröger, 2008). Woman-centred care emphasizes the need for self-determination and autonomy in decision-making and is generally linked to women feeling more empowered (Brady et al., 2019). Strong childbirth self-efficacy and feeling empowered during pregnancy can have many positive effects, e.g. it might increase women's motivation and ability to manage one own's health (Fumagalli et al., 2015).

Various factors play a role in women's motivation regarding changes to their health-related behaviours. In respect to knowledge gain through health education, a Cochrane review by Chamberlain et al. (2017) of over 100 trials relating to interventions to give up smoking during pregnancy observed a non-significant impact of knowledge gain on smoking cessation. The effect was even smaller when the education was part of a broader health intervention during maternity care. However, when education-based interventions were combined with supplementary components such as counselling, pregnant women benefited more from the interventions. While many counselling interventions were effective, Chamberlain et al. (2017) indicated that individual psychosocial behavioural interventions (e.g. motivational interviewing, self-supportive materials, advice from midwives, nurses and physicians, telephone counselling) were the most effective ones. Notwithstanding these findings, several factors call into question whether the findings can be translated into practice. For example, while some psychosocial interventions have shown success, the evidence is still limited. Furthermore, the role of factors such as diverse cultural and socio-economic backgrounds on the success of the psychosocial interventions is unknown (Chamberlain et al., 2017). In addition to these factors, other studies have emphasised the importance of meeting the needs and expectations of people who are planning to change their lifestyle habits (Gaston and Pra-

pavessis, 2014; Grol et al., 2005). Behaviour change may be affected by individual and environmental factors such as access to health related knowledge or individual outcome expectations, like self-efficacy (Araújo-Soares et al., 2019). The latter can be defined as the consideration of how easy or challenging it will be to make a change, in order to produce a desired outcome that will result in long-term success (Middleton et al., 2013). For instance, the relevance of self-efficacy beliefs has been demonstrated in a Swedish study, where pregnant women were more motivated to change their lifestyles when they felt confident about their chances of succeeding (Lindqvist et al., 2017; Brenning et al., 2015).

Another aspect that might increase the effectiveness of BCPs during pregnancy but is often overlooked is an enhancement of the degree to which women have choices and are able to make decisions throughout the BCP. Facilitating self-determination and autonomy in decision-making for pregnant women is one of the key concepts in midwifery care (WHO, 2013a; Renfrew et al., 2014) and a primary component of respectful maternity care that is linked to more positive birth experiences for women and improved health outcomes (Vedam et al., 2017; Kabeer, 1999).

One of the main goals of the scoping review was to explore whether BCPs include components of empowerment, self-determination and agency. A helpful framework for identifying whether these elements were included in the programmes was proposed by Kliche and Kröger (2008). These writers identified eight dimensions of empowerment in prevention and health promotion: *skills and competencies, innovation, goal-setting and attainment, self-efficacy, reflexive thought, social support and social capital, shared decision-making* that enable health promotion. These dimensions contribute to strengthening women during pregnancy, through the attributes of personal change, enabling process, and self-determination (Castro et al., 2016).

Changes in behaviour during pregnancy are of great interest on a care- and health promotion level. To understand and analyse barriers and drivers for successful behaviour change in practice, we introduce an overarching model on behavioural change, which is called "*Behaviour Change Wheel*" (Fig. 1). It can be used by health care professionals, to guide practice. The *Behaviour Change Wheel* was developed, based on 19 frameworks of behaviour change identified by Michie et al. (2011) in a systematic literature review. The wheel consists of three circles: the inner, the middle, and the outer circle. The *outer circle* includes seven "policy categories" such as childbirth-related guidelines, regulations or environmental/social planning that represent the context-related conditions, which affect behaviour and in respect of which political boundaries might ease or hinder behaviour change (Michie et al., 2011). An example would be the WHO guideline (2013b) on "tobacco use and second-hand smoke exposure in pregnancy", which provides evidence-based recommendations to reduce exposure to tobacco smoke. This guideline, referring to service provision in antenatal care, serves as an exemplary document for the *outer circle* of the *Behaviour Change Wheel*.

To pursue the same example further, the *middle circle* of the *Behaviour Change Wheel* (Michie et al., 2011) then lists procedures to promote smoking cessation in pregnancy, including "intervention functions" such as training, education, persuasion, coercion (e.g. through legislation or taxation), incentivisation, restrictions, modelling, enablement, and environmental restructuring. For example, in the Cochrane review on smoking cessation (Chamberlain et al., 2017) the intervention strategies were mainly based on counselling ($n = 54$), which in the *Behaviour Change Wheel* falls under the category of "persuasion"; the second biggest group ($n = 12$) falls into the category of "applying health education". Offering incentives was used in thirteen studies, and in one study training was provided to help pregnant women to change their smoking behaviour.

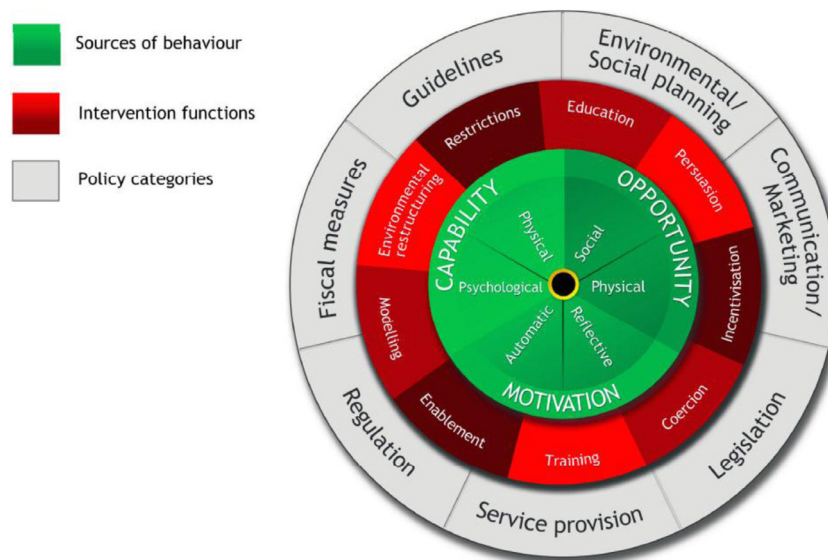


Fig. 1. Behaviour Change Wheel according to Michie et al., 2011 (reproduced with the permission of the author).

The wheel's *inner circle* is labelled source of behaviour as well as “COM-B Model” and differentiates capability, opportunity, and motivation as behavioural determinants (Michie et al., 2011). *Capability* refers to the physical and psychological ability of the individual to engage in activities that lead to behaviour change, *opportunity* describes contextual factors that may support or hinder behaviour change, and *motivation* refers to reflective and automatic processes that direct the subject in the direction of the intended behaviour or away from it. For example, evidence from the Cochrane review on smoking cessation (Chamberlain et al., 2017) demonstrated that counselling interventions (e.g. cognitive interventions) are most likely to be successful in stopping smoking (with a success rate of 37%), followed by incentives. These counselling interventions include social, emotional and mental factors aimed precisely at supporting and motivating pregnant women to stop smoking. These aspects are listed in the COM-B Model of the inner circle, please see Fig. 1.

This scoping review's primary goal is to provide an overview of the effectiveness of behaviour change programmes that are currently used during pregnancy and to describe which components of the Behaviour Change Wheel are addressed in the intervention programmes. The secondary aim is to identify the current areas of midwifery involvement in BCPs. And thirdly, the scoping review focusses on the dimensions of health promotion identified by Kliche and Kröger (2008).

Methods

We conducted a scoping review to map the broad area of BCPs during pregnancy and to identify all potential boundaries of BCP in order to be able to facilitate autonomy for pregnant women. The scoping review methods were informed by guidelines outlined by Arksey and O'Malley (2005). The PRISMA flow diagram and checklist (Moher et al., 2009, 2015) were used in this paper, to ensure authors complied with best practice guidelines for conducting scoping reviews.

Search strategies

The electronic databases CINAHL, PubMed, PsycINFO and MIDIRS were searched in August 2017 in order to identify relevant papers. The search was updated in October 2018. The search

terms were: *tool* OR *intervention* OR *program** OR *training* OR *session* OR *preparation* OR *workshop* OR *class* OR *education* AND *behaviour change* OR *behavior change* AND *maternity* OR *pregnan** OR *prenatal* OR *antenatal*. No time limit was imposed regarding the year of the publication. Search terms were limited to titles and abstracts, because more than 3,200 records were identified when search terms were applied to all fields. MeSH terms were applied in the initial phase of the search strategy but did not improve the search and were not utilised in the final search strategy.

Inclusion and exclusion criteria

To qualify for inclusion, studies had to be written in English or German. Articles had to address the topic “*Behaviour change programmes during pregnancy*” and were excluded if the topic was not reflected in the title or the abstract. BCPs focusing on pregnant women with mental health disorders and/or substance use issues were excluded from the review, because the therapeutic needs of women affected by these conditions are unique, and were outside the scope of this review (Institute of Medicine, 2015). Articles were included which aimed to evaluate the effectiveness of the behaviour intervention. We only included original studies.

Selection process

The systematic literature search carried out on 6 October 2018 yielded 876 results. After removing duplicates, 663 studies remained. After a screening of the titles and abstracts 614 studies were excluded as they did not fulfil the inclusion criteria. Thus, 49 studies were fully assessed for eligibility: nineteen studies were excluded because they did not describe original studies or did not emphasise the effectiveness of the interventions observed. Consequently, 30 studies were included in the scoping review (see Fig. 2, Table 1).

Data extraction

Following the procedure described by Arksey and O'Malley (2005), a multidisciplinary team of researchers with expertise in the fields of midwifery, psychology and public health carried out a rigorous literature search process. The first author (LZ) screened all titles and abstracts. This approach has been

Table 1
Study characteristics on behaviour change programmes in maternity care.

Reference & Country	Study type	Total number of participants (Intervention/Control)	Investigated topic during women's pregnancy	Formats of the programme	Intervention delivered by	Intervention length of time	Maternity-related outcome
Al Khamis et al., 2017 ; Kuwait	RCT (three arms)	90 (30/32/28)	Dental health adherence	Education, lecture & pamphlets	Self-directed, i.e. booklet, information sheet, planning	4 weeks	Tooth brushing and flossing showed no significant differences in Plaque index ($p=.693$) and Gingival index ($p=.717$) between groups. Simple information sheet improved the frequency of using the floss ($p=.001$) and the toothbrush ($p=.003$) in all groups
Arefi et al., 2015; Iran	Quasi-experimental study	140 (70/70)	Reducing caesarean sections	Education, not described	Not mentioned	Not mentioned	Intervention for reducing caesarean section rate showed a significant drop in the intervention group ($p<.001$) vs control, attitudes towards childbirth ($p=.001$), knowledge ($p=.001$) and enabling factors ($p<.001$) changed significantly in intervention group vs control
Baker, 2011; USA	Observational study, pilot	600	Weight management of pregnant women	Health coaching	Healthy weight advisors	Min. of four visits during pregnancy, 4 visits between 0–6 months postpartum and regular contact between 6–24 months pp (i.e. number of visits not specified)	Intervention for obese pregnant women showed at 38 weeks of gestation mean weight gain of 7.27 kg ($n = 75$, $SD=5.66$) by women with pre-pregnancy BMI >30, compared to average general weight gain in pregnancy 10–12.5 kg
Boyd and Windsor, 2003; USA	RCT, pilot	240 (120/120)	Nutrition of pregnant women	Education, lecture	Peer educator (similar to the target population), 3-month training from the partners for life programme	8 consecutive weekly sessions of 60 min. each	The aim to change dietary behaviour of low-income pregnant women showed a significant improvement in dietary behaviour and nutrition knowledge compared to standard care, length of the programme was found to be a problem for participant attrition
Bryce et al., 2009; UK	Action research study	79	Smoking cessation in pregnancy	Health coaching	Midwives	Visits by midwife throughout pregnancy. Start one week after the first appointment by the midwife, amount of contacts are not mentioned	Intervention with ≤ 25 -year-old pregnant women on quitting smoking was linked to 22.8% having stopped smoking and 30.4% cut down by the 3rd month. By the 12th month 16.5% had stopped smoking, from them 7.6% had already quit smoking before the 12th months
Carter et al., 1989; Canada	RCT	52 (26/26)	Prevention of toxoplasmosis	Education, lecture	Antenatal educator	10 min. of education, embedded within antenatal education class	Intervention for prevention of congenital toxoplasmosis showed better behaviour in pet hygiene ($p<.05$) in intervention group vs control group, both groups had the same food hygiene and personal hygiene scores
Crawford-Williams et al., 2016; Australia	RCT	96 (49/47)	Alcohol consumption of pregnant women	Education, pamphlet	Self-directed, i.e. received booklet	No time specified; participants were asked to read booklet and use recipes	Intervention to change attitudes, behaviour and knowledge on alcohol consumption in pregnancy showed improved knowledge ($p<.001$) and attitudes towards drinking during pregnancy ($p=.017$) in intervention group vs control, no differences were found between the two groups with regard to abstaining from drinking ($p=.077$)
Currie et al., 2015; Ireland	RCT	109 (55/54)	Physical activity of pregnant women	Health coaching	Researcher, trained in delivering physical activity consultations	Three face to face physical activity consultations (one per trimester)	Intervention on physical activity during pregnancy showed no differences in physical activity between the groups ($p>.5$), physical activity declined with advanced pregnancy in both groups ($p<.001$)
El-Mohandes et al., 2011; USA	RCT	500 (262/238)	Smoking cessation in pregnancy	Cognitive behavioural therapy	Fieldwork staff	10-sessions delivered during prenatal (8 sessions) and postpartum (2 booster sessions) care visits sessions were 35 min. long	Relapse and smoking cessation intervention for African-American smokers showed no differences in smoking behaviour during pregnancy, the intervention group were less likely to relapse post partal period ($p=.053^{**}$) ** p value <0.10
Gaston and Prapavessis, 2014; Canada	RCT (three arms)	60 (21/19/20)	Physical activity of pregnant women	Health coaching, with action planning	Research investigator (Psychologist)	All groups: 25 min. PowerPoint slide show on exercise during pregnancy. Group I, II & III: 20 min. attention-control slides information on nutrition in pregnancy. Group II & III: 10 min. action planning intervention. Group III: 20 min. combined planning (identify barriers)	Intervention for promoting physical activity showed increased physical activity in groups II & III ($p<.001$) vs control group I

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Table 1 (continued)

Reference & Country	Study type	Total number of participants (Intervention/Control)	Investigated topic during women's pregnancy	Formats of the programme	Intervention delivered by	Intervention length of time	Maternity-related outcome
Gesell et al., 2015; USA	RCT	87 (44/43)	Weight management of pregnant women	Education, lecture (social learning theory)	Trained healthcare provider (bilingual)	12 weekly 90-min. group sessions (8–10 women and one facilitator) + three 30 min. home visits	Intervention on preventing excessive weight gain by Latina women showed no differences in weight gain by overweight ($p=.227$) and obese ($p=.434$) women, but in normal weight women a positive intervention effect was shown ($p=.036$) vs control condition
Hayman et al., 2017; Australia	RCT	77 (39/38)	Physical activity of pregnant women	Health coaching, (social cognitive theory)	Self-directed, i.e. web-based	4 weeks	Intervention on physical activity reported more viewed pages on the website ($p<.05$), reported a higher personal relevance of website ($p<.05$) and had increased physical activity ($p<.05$) in the intervention vs standard information group
Herring et al., 2017; USA	RCT	56 (27/29)	Weight management of pregnant women and postpartum	Health coaching	Health coach	1) Daily skill- building text messages tailored to each behavioural goal; 2) weekly Facebook posts with links to websites and videos; and 3) weekly to monthly 15-min. scripted calls	Intervention for preventing weight retention amongst African-American showed that six months postpartum there was a greater likelihood of being at or below early pregnancy weight ($p=.04$) in the intervention group. No difference was found at 12 months postpartum ($p=.83$) vs control group
Hill et al., 2016; Australia	Quasi-experimental study	267 (116/131)	Weight management of pregnant women	Health coaching	Health coach	4 individual HC (each 1 h long) and two group HC/educational sessions (each 2 h long)	Intervention to prevent excessive gestational weight gain showed no differences in weight gain at 36 weeks of gestation ($p=.089$), control group had lesser weight gain in the first trimester ($p<.001$) In the second trimester differences in coping strategies for weight management ($p=.028$) were found in the intervention group, no differences in body attitudes or dietary and physical activity motivation vs control condition
Hughes et al., 2017; USA	RCT	187 (124/63)	Risk behaviour for maternal cytomegalovirus (CMV)	Motivational interviewing + Education, information	Research assistant	5 min. information video + < 5 min. motivational interviewing. + weekly text messages	Intervention on risk behaviour for CMV showed a modest increase in behaviour compliance vs control care that are informed in a standardised way by means of a brochure ($p=.007$), reported change in severity, susceptibility, self-efficacy, perceived norms ($p<.05$) were found in the intervention group
Kaufman et al., 2017; Tanzania	Post-hoc evaluation	1708	Antenatal care attendance and birth planning	Campaign (social cognitive theory)	TV spots, billboards, magazine articles, advertisements, radio spots, promotional materials, health facility	TV 3 spots per station per day. 4–12 radio spots on 19 national and regional radio stations per day, 3400 health facilities with promotional materials (campaign messages on stickers, t-shirts, bags), free text messages	35.1% of women attending antenatal care or postnatal care (past 6 months) had contact with the campaign in the last month. The more contact the women had with the messages of the campaign the more they planned for their birth ($p=.001$), greater contact with messages showed an increase in antenatal care visits ($p=.004$), timing of first antenatal care visit or HIV tests was not associated with the exposure

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Table 1 (continued)

Reference & Country	Study type	Total number of participants (Intervention/Control)	Investigated topic during women's pregnancy	Formats of the programme	Intervention delivered by	Intervention length of time	Maternity-related outcome
Kendall et al., 2017; USA	Controlled study	550 (312/238)	Nutrition of pregnant women	Education, lecture	Trained peer educators	2.5 h of instruction embedded within 8 lesson curriculum about Eating Smart and Being Active	Intervention to protect against food-borne illnesses in pregnancy, showed in both groups improvement behaviour in food safety. Pathogen-specific intervention had an improvement ($p < .01$) for foods at high risk for safety in usage of the thermometer, refrigeration and consumption in the treatment group
Khan et al., 2013; India	Controlled study	200 (100/100)	Behaviour change amongst pregnant women regarding neonatal care	Education, counselling + pamphlet	Research investigator (Medicine)	6–8 visits each 30–35 min.	Intervention about neonatal care in India showed an improvement in delivery practices, warm room, ($p < .05$), decreases removal of vernix ($p < .05$), delayed bathing of baby ($p < .05$) breastfeeding practices on 7 and 28 days postpartum ($p < .05$), increased knowledge of physiological conditions of baby ($p < .05$) were found in the intervention group vs control group
Lau et al., 2014; Africa	Mixed method study	206 (102/104)	Health education in pregnancy, general	Education, information	Health care workers	3–4 text messages per week	Intervention on antenatal health promotion showed a high loss of follow up (43%), no statistical differences between knowledge level about pregnancy and childbirth were found ($p > .05$) between the intervention and the control group
Naughton et al., 2015; UK	Controlled study	174	Smoking cessation in pregnancy	Health coaching (cognitive behaviour therapy)	Self-help intervention, automated text messages	Self-help leaflet + 80 text messages over 11 weeks	Intervention on prevention strategies against smoking showed that leaflet and text message self-help supports quitting smoking, strategies like avoiding spending time with other smokers ($p = .02$) and self-talk, e.g. "I can do it" ($p = .04$), are helpful for smoking cessation
Olson et al., 2018; USA	RCT	1689 (1126/563)	Weight management of pregnant women	Education, information	Website (self-directed)	Access on website 199 days	The electronic intervention on excessive gestational weight gain did not show any differences vs placebo control group ($p = .12$)
Osterman et al., 2014; USA	RCT	122 (62/60)	Alcohol consumption of pregnant women	Motivational interviewing	Researcher, certified psychiatric-mental health clinical nurse specialist trained in MI	25–30 min. Motivational interviewing	Intervention to decrease alcohol consumption showed no differences between drinking behaviour between intervention and control group, increased autonomous motivation for decreasing drinking behaviour ($p < .05$) in Intervention group
Poston et al., 2013; UK	RCT, pilot	183 (94/89)	Weight management of obese pregnant women	Health coaching	Health trainers	8 weekly group sessions	Intervention to reduce dietary glycaemic load and saturated fat intake, and increase physical activity showed a reduced saturated fat load (-1.6% energy, 95% CI -2.8 to -0.3) and dietary glycaemic intake (-33 energy, 95% CI -47 to -20), no differences in physical activity compared to standard care, attendance dropped over the sessions
Rasouli et al., 2017; Iran	RCT (three arms)	234 (78/78/78)	Childbirth preparation in pregnancy	Motivational interviewing	Midwife counsellor	8 sessions childbirth preparation classes	Childbirth preparation increased with the intervention to encourage the participation in childbirth preparation classes ($p < .001$), the intervention group considered childbirth preparation to be more important than the control group ($p < .001$) did

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Table 1 (continued)

Reference & Country	Study type	Total number of participants (Intervention/Control)	Investigated topic during women's pregnancy	Formats of the programme	Intervention delivered by	Intervention length of time	Maternity-related outcome
Secker-Walker et al., 1998; USA	RCT	276 (135/141)	Smoking cessation in pregnancy	Education, counselling	Physician + counselling nurse	One Structured advice from physician + 5 individual counselling	Intervention for reducing or quitting smoking showed a reduction or quitting at all time points (second visit $p=.02$, 36th week of gestation $p<.01$, 1 year postpartum $p=.02$) a significant difference between the intervention group and the control group who received a self-help booklet
Shivalli et al., 2015; India	Quasiexperimental study	86 (45/41)	Nutrition of pregnant women	Education, counselling, visual reinforcement material	Not mentioned	3 home visits over 12 weeks + reminder materials	Intervention for enhancement of the iron-folate and dietary intake showed in the intervention group a 50% reduction in anaemia, a higher weight gain ($p<.01$) and an increased protein intake ($p<.05$) compared to control group without education on dietary and iron-folate intake
Villadsen et al., 2016; Ethiopia	Effectiveness study	1357	Health education in pregnancy, general (facility level intervention)	Education, pamphlet	Health care providers	Folder with education material introduced in first antenatal care visit; usage through antenatal care	Intervention on strengthening antenatal care showed a positive effect on preventive health check-ups for the infant (OR 2.4, CI 95% 1.5–3.5) and breastfeeding practices (OR 3.0, 95% CI 1.4–3.6) increased in the intervention group vs control group, no effects on immunisation coverage were found between the groups, a negative impact on the frequency of antenatal visits was identified in the intervention group with information on danger signs in pregnancy, healthy behaviour, antenatal care
Wilkinson and McIntyre, 2012; Australia	RCT	242 (113/129)	Health education in pregnancy, general	Education, lecture + pamphlet	Maternity dieticians	60 min. workshop	Intervention tried to influence a healthy pregnancy start through good nutrition, physical activity and knowledge of guideline on gestational weight gain and smoking, the intervention had higher diet quality ($p=.027$), increased fruit ($p=.004$) and vegetable ($p=.006$) intake vs standard care and met the fruit guideline ($p<.001$)
Wilkinson et al., 2010; Australia	Quasi-experimental study	304 (163/141)	Health education in pregnancy, general	Education, pamphlet	Self-directed with the possibility to seek assistance from doctor/midwife	Interactive booklet for 3 month	Intervention on smoking, fruit & vegetable servings, physical activity measured an increase intake of fruit in the intervention group vs control condition ($p=.05$), no differences were found in other health behaviour guidelines for the intervention group
Windsor et al., 2014; USA	Quasi-experimental study	518 (259/259)	Smoking cessation in pregnancy	Education, counselling	Trained provider to deliver intervention and systematic reinforcement by all providers	1) Assessment 2) manual to quit smoking 3) 8 min. counselling video 4) providing SCRIPT method during antenatal visit 5) promotion of telephone counselling sessions 6) encouragement of non-smoking home policy	Intervention treatment on quitting and reducing smoking showed a significant cessation rate ($p<.001$) and reduction rate for smoking ($p<.001$) in the intervention group vs control

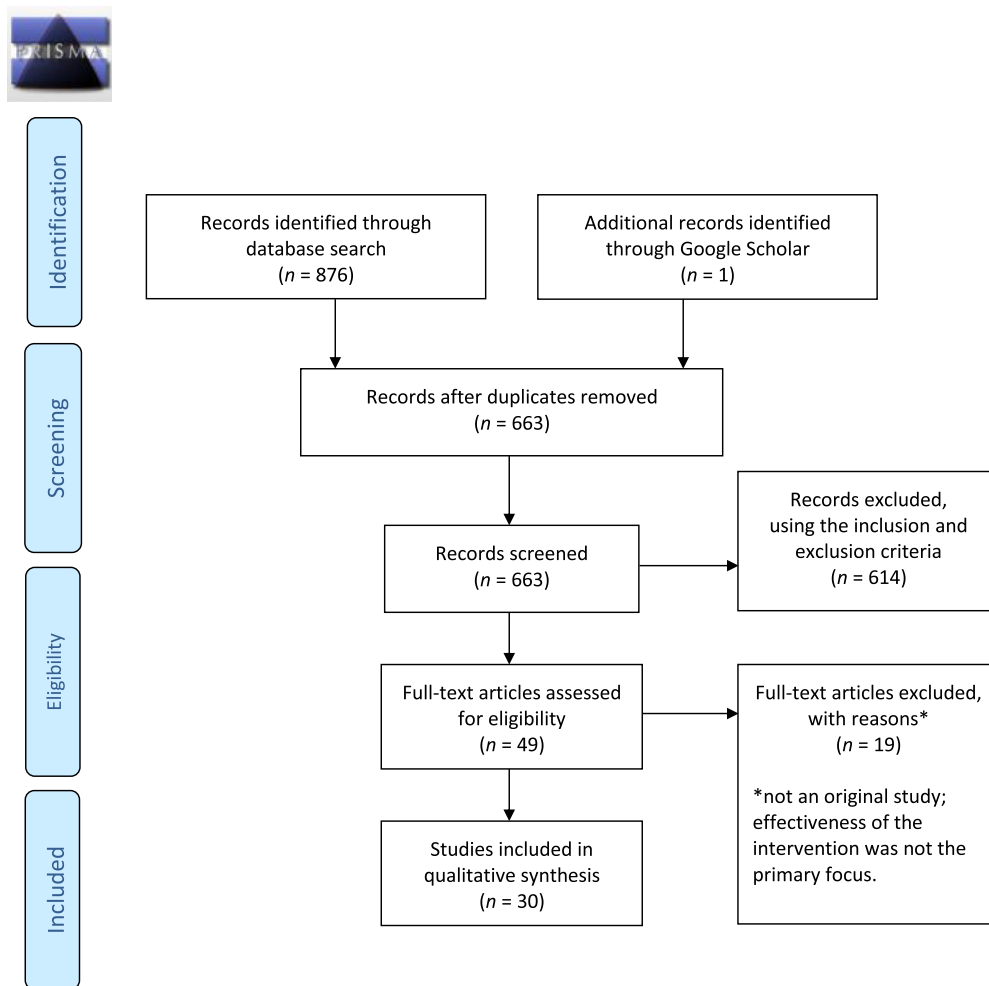


Fig. 2. PRISMA Flow Diagram for the scoping review: Behaviour change in pregnant women.

found in 64% of scoping reviews (Tricco et al., 2016) and is considered to be in line with common practice in scoping reviews. Inclusion and exclusion criteria were applied and the reasons for inclusion/exclusion were documented and duplicates removed. The PRISMA flow diagram was used to report the four phases of the scoping review process. Fig. 2 shows the flow diagram of the scoping review in October 2018. Study characteristics were extracted from the articles included ($n = 30$) and entered into a table (Table 1). Data extraction involved two authors (LZ, KS); one author (LZ) extracted the data into a table, the second author (KS) checked the abstracted data afterwards. The following data points were extracted and synthesised from each article: author(s), year of publication, study setting, study design, intervention(s) and outcome(s). BCPs were assigned to the following categories: education, health coaching, cognitive behavioural therapy, motivational interviewing and public awareness campaigns. The effectiveness or success of the individual BCPs is listed in Table 1, in the column headed “maternity-related outcomes”. The empowerment dimensions identified in the studies are listed in Table 2. The various tasks of midwives in BCPs were reviewed, listed and summarised in Table 1. Midwifery involvement in BCPs are described in detail in the results section.

Data analysis

The data extracted from the 30 studies were reviewed to identify different behaviour change approaches. The eight empower-

ment dimensions of health promotion and preventive healthcare defined by Kliche and Kröger (2008) were applied to the selected studies. These are: 1) *skills and competencies*, which refer to personal knowledge and skills for obtaining and understanding health information, social skills or self-directed learning; 2) *innovation*, which covers motivation for change in situations of uncertainty; 3) *goal-setting and goal attainment*, which is relevant in terms of motivation and prioritising skills; 4) *self-efficacy*, the confidence of individuals in their ability to succeed; 5) *healthcare utilisation*, which stands for the person's orientation in the healthcare system and includes health awareness; 6) *reflexive thought*, the capability to undertake critical consideration of their own lives, behaviours and attitudes; 7) *social support and social capital*, which refers to the help and support provided by the woman's community; and finally 8) *shared decision-making*, the ability to participate in decision-making processes and to develop an informed opinion.

The analysis in this scoping review is descriptive. It investigates the different BCP interventions while asking whether they apply key aspects of the Behaviour Change Wheel and support the autonomy and empowerment of women.

Results

Synthesis of results

The 30 studies included were published between 1989 and 2018 (see Table 1). Of these, 22 were conducted in high-income coun-

Table 2

Empowerment dimensions from the healthcare setting, based on Kliche and Kröger (2008), used in behaviour change programmes.

	Skills and competencies	Innovation	Goal-setting and goal attainment	Self-efficacy	Reflexive thought	Social support and social capital	Shared decision-making	Healthcare utilisation
Al Khamis et al., 2017	X	X	X					
Arefi et al., 2015	X	X						
Baker, 2011	X	X						
Boyd and Windsor, 2003	X	X					X	
Bryce et al., 2009	X	X						
Carter et al., 1989	X	X						
Crawford-Williams et al., 2016	X	X						
Currie et al., 2015	X	X	X	X	X	X		
El-Mohandes et al., 2011	X	X						
Gaston and Prapavessis, 2014	X	X	X	X				
Gesell et al., 2015	X	X	X	X	X	X		
Hayman et al., 2017	X	X	X			X		
Herring et al., 2017	X	X		X				
Hill et al., 2016	X	X						
Hughes et al., 2017	X	X		X				
Kaufman et al., 2017	X	X		X				
Kendall et al., 2017	X	X						
Khan et al., 2013	X	X						
Lau et al., 2014	X	X						
Naughton et al., 2015	X	X				X		
Olson et al., 2018	X	X	X		X			
Osterman et al., 2014	X	X		X				
Poston et al., 2013	X	X	X					
Rasouli et al., 2017	X	X		X				
Secker-Walker et al., 1998	X	X	X					
Shivalli et al., 2015	X	X						
Villadsen et al., 2016	X	X						
Wilkinson and McIntyre, 2012	X	X	X	X	X			
Wilkinson et al., 2010	X	X	X		X			
Windsor et al., 2014	X	X						

tries (Baker, 2011; Boyd and Windsor, 2003; Bryce et al., 2009; Carter et al., 1989; Crawford-Williams et al., 2016; Currie et al., 2015; El-Mohandes et al., 2011; Gaston and Prapavessis, 2014; Gesell et al., 2015; Hayman et al., 2017; Herring et al., 2017; Hill et al., 2016; Hughes et al., 2017; Kendall et al., 2017; Naughton et al., 2015; Olson et al., 2018; Osterman et al., 2014; Poston et al., 2013; Secker-Walker et al., 1998; Wilkinson and McIntyre, 2012; Wilkinson et al., 2010; Windsor et al., 2014). The most frequent study design was a randomised control trial, applied in 17 studies (Al Khamis et al., 2017; Boyd and Windsor, 2003; Carter et al., 1989; Crawford-Williams et al., 2016; Currie et al., 2015; El-Mohandes et al., 2011; Gaston and Prapavessis, 2014; Gesell et al., 2015; Hayman et al., 2017; Herring et al., 2017; Hill et al., 2016; Hughes et al., 2017; Kendall et al., 2017; Naughton et al., 2015; Olson et al., 2018; Osterman et al., 2014; Poston et al., 2013; Secker-Walker et al., 1998; Wilkinson and McIntyre, 2012; Wilkinson et al., 2010; Windsor et al., 2014), three controlled studies with (Kendall et al., 2017; Khan et al., 2013) or without (Naughton et al., 2015) a control group, one observational study without a control group (Baker, 2011), one action research study without a control group (Bryce et al., 2009), one mixed-method study (Lau et al., 2014), one effectiveness study without a control group (Villadsen et al., 2016), and one post-hoc evaluation (Kaufman et al., 2017). The most frequent study setting was the United States ($n = 11$), followed by Australia ($n = 5$).

The most frequently reported interventions were educational interventions, which were used in 16 studies (Al Khamis et al., 2017; Arefi et al., 2015; Boyd and Windsor, 2003; Carter et al., 1989; Crawford-Williams et al., 2016; Gesell et al., 2015; Kendall et al., 2017; Khan et al., 2013; Lau et al., 2014; Olson et al., 2018; Secker-Walker et al., 1998; Shivalli et al., 2015; Villadsen et al., 2016; Wilkinson and McIntyre, 2012; Wilkinson et al., 2010; Windsor et al., 2014). Next, there were

nine health-coaching interventions (Baker, 2011; Bryce et al., 2009; Currie et al., 2015; Gaston and Prapavessis, 2014; Hayman et al., 2017; Herring et al., 2017; Hill et al., 2016; Naughton et al., 2015; Poston et al., 2013), three motivational interviewing formats (Hughes et al., 2017; Osterman et al., 2014; Rasouli et al., 2017), one cognitive behavioural therapy intervention (El-Mohandes et al., 2011), and one national social and behavioural change campaign (Kaufman et al., 2017). Educational interventions were based on information material, lectures or counselling. Specifically, booklets (Al Khamis et al., 2017; Crawford-Williams et al., 2016; Khan et al., 2013; Villadsen et al., 2016; Wilkinson et al., 2012, 2010), videos (Hughes et al., 2017; Windsor et al., 2014), visual reinforcement material (containing pictures and encouraging messages, Shivalli et al., 2015), a website (Olson et al., 2018), lectures (Al Khamis et al., 2017; Boyd and Windsor, 2003; Carter et al., 1989; Gesell et al., 2015; Kendall et al., 2017; Wilkinson and McIntyre, 2012), text messages (Hughes et al., 2017; Kaufman et al., 2017; Lau et al., 2014), individual counselling (Khan et al., 2013; Secker-Walker et al., 1989; Shivalli et al., 2015; Windsor et al., 2014) and TV and radio advertising (Kaufman et al., 2017) were used to transfer information. One study did not specify the nature of the educational intervention (Arefi et al., 2015). Health-coaching interventions were based on advice from professionals (Baker, 2011; Currie et al., 2015; Hayman et al., 2017; Hill et al., 2016; Poston et al., 2013); one study utilised additional face-to-face advice (Bryce et al., 2009) and one study applied text message self-help support for health coaching (Naughton et al., 2015). Motivational interviewing was used as an intervention to decrease alcohol consumption during pregnancy (Osterman et al., 2014), to stress the importance of antenatal classes (Rasouli et al., 2017), and to reduce the risk of maternal cytomegalovirus infections (Hughes et al., 2017).

The most frequent maternity-related health outcome of the programmes was weight management, which was assessed in six studies (Baker, 2011; Gesell et al., 2015; Herring et al., 2017;

Hill et al., 2016; Olson et al., 2018; Poston et al., 2013). Five programmes targeted smoking cessation (Bryce et al., 2009; El-Mohandes et al., 2011; Naughton et al., 2015; Secker-Walker et al., 1998; Windsor et al., 2014), four interventions aimed to increase health literacy in pregnancy (Lau et al., 2014; Villadsen et al., 2016; Wilkinson and McIntyre, 2012; Wilkinson et al., 2010), three studies focused on healthy nutrition practices for pregnant women (Boyd and Windsor, 2003; Kendall et al., 2017; Shivalli et al., 2015), three on exercises for physical activity in pregnancy (Currie et al., 2015; Gaston and Prapavessis, 2014; Hayman et al., 2017), two on reducing alcohol consumption (Crawford-Williams et al., 2016; Osterman et al., 2014), one on improving dental health (Al Khamis et al., 2017), one on reducing caesarean sections (Arefi et al., 2015), one on the prevention of toxoplasmosis (Carter et al., 1989), one on the prevention of cytomegalovirus (Hughes et al., 2017), one on up-to-date neonatal care practices (Khan et al., 2013), and two on childbirth preparation (Kaufman et al., 2017; Rasouli et al., 2017) (see Table 1).

The interventions and programmes generally started between the first and second trimester, except for three studies which included women in the third trimester (Arefi et al., 2015; Osterman et al., 2014; Villadsen et al., 2016). Most of the programmes were conducted with individual participants ($n = 20$) (Al Khamis et al., 2017; Bryce et al., 2009; Crawford-Williams et al., 2016; Currie et al., 2015; El-Mohandes et al., 2011; Gaston and Prapavessis, 2014; Hayman et al., 2017; Herring et al., 2017; Hughes et al., 2017; Khan et al., 2013; Lau et al., 2014; Naughton et al., 2015; Olson et al., 2018; Osterman et al., 2014; Rasouli et al., 2017; Secker-Walker et al., 1998; Shivalli et al., 2015; Villadsen et al., 2016; Wilkinson et al., 2010; Windsor et al., 2014), three were group-based (Boyd and Windsor, 2003; Gesell et al., 2015; Kendall et al., 2017), five were split into individual and group units (Baker, 2011; Carter et al., 1989; Hill et al., 2016; Poston et al., 2013; Wilkinson and McIntyre, 2012), one was a regional campaign (Kaufman et al., 2017) and one study did not specify the exact programme characteristics (Arefi et al., 2015).

Midwives were involved in nine out of 30 BCPs: in four studies, midwives had a role in the BCP, e.g. through the distribution of information material or assessments (Bryce et al., 2009; Hill et al., 2016; Lau et al., 2014; Wilkinson and McIntyre, 2012). In five studies, midwives recruited women to participate in the intervention (Baker, 2011; Currie et al., 2015; Naughton et al., 2015; Poston et al., 2013; Wilkinson et al., 2010). Midwives did not lead, or implement any of the antenatal BCPs described in the selected studies.

Strategies for behaviour change during pregnancy

In 14 studies (Al Khamis et al., 2017; Arefi et al., 2015; Boyd and Windsor, 2003; Carter et al., 1989; Crawford-Williams et al., 2016; Gesell et al., 2015; Hughes et al., 2017; Kendall et al., 2017; Khan et al., 2013; Olson et al., 2018; Shivalli et al., 2015; Villadsen et al., 2016; Wilkinson and McIntyre, 2012; Wilkinson et al., 2010), education for knowledge gain and informational material were the strategies primarily applied to promote behaviour change during pregnancy. One of the “intervention functions” from the *Behaviour Change Wheel* (Michie et al., 2011) is *education*. For example, Al Khamis et al. (2017) used a dental hygiene leaflet and a booklet with dental health information as well as personal dental health education in dental hygiene techniques. Boyd and Windsor’s (2003) intervention group received eight lessons (60 min. each) on healthy nutrition during pregnancy as well as for the newborn baby and postpartum.

Interactive education through psychosocial support (e.g. health coaching) was applied in 13 studies (Baker 2011; Bryce et al., 2009; Currie et al., 2015; Gaston and Prapavessis, 2014; Herring et al.,

2017; Hill et al., 2016; Lau et al., 2014; Naughton et al., 2015; Osterman et al., 2014; Poston et al., 2013; Rasouli et al., 2017; Secker-Walker et al., 1998; Windsor et al., 2014). For example, in one study (Baker, 2011) home visits were conducted to jointly identify behaviour change goals (diet and physical activity), followed by individual support. The support provided aimed to achieve the health goals and to stimulate changes six to 24 months postpartum. In the intervention group of another study Poston et al. (2013), a health trainer conducted one individual training session followed by an eight-week group exercise, to promote healthy nutrition during pregnancy.

From the perspective of the *Behaviour Change Wheel* (Michie et al., 2011), these examples employ interventions that can be categorized as “intervention functions” (i.e., the middle circle). The *outer circle*, which includes organisational categories typical of the structure of the healthcare system, is not brought up in any of the studies. The *inner circle*, the *COM-B Model*, was not deliberately drawn on, neither in the education for knowledge gain nor in the informational material interventions but a link to the capabilities determinant can be assumed. Psychosocial support through individual conversations and/or training sessions, however, involved components of capability, opportunity, and motivation in interactive education, example through the delivering of text messages, this was evident in thirteen studies (Baker, 2011; Bryce et al., 2009; Currie et al., 2015; Gaston and Prapavessis, 2014; Herring et al., 2017; Hill et al., 2016; Lau et al., 2014; Naughton et al., 2015; Osterman et al., 2014; Poston et al., 2013; Rasouli et al., 2017; Secker-Walker et al., 1998; Windsor et al., 2014). In these studies, the interaction between the professional and the client that took place as part of the psychosocial interventions are not described in detail; therefore, no in-depth evaluation of the embedded features of the *COM-B Model* is possible.

Empowerment component in behaviour change programmes during pregnancy

All studies included the empowerment dimensions of *skills and competencies* and *innovation*. Seventeen studies (Al Khamis et al., 2017; Boyd and Windsor, 2003; Currie et al., 2015; Gaston and Prapavessis, 2014; Gesell et al., 2015; Hayman et al., 2017; Herring et al., 2017; Hughes et al., 2017; Kaufman et al., 2017; Naughton et al., 2015; Olson et al., 2018; Osterman et al., 2014; Poston et al., 2013; Rasouli et al., 2017; Secker-Walker et al., 1998; Wilkinson and McIntyre, 2012; Windsor et al., 2014) featured three or more dimensions by which the pregnant women were assisted in their behaviour changes (see Table 2). The dimensions found in the intervention designs varied broadly. The ranking of the frequency with which the dimensions were found in the studies was as follows, from most to least frequent: *skills and competencies*, *innovation*, *goal-setting and attainment*, *self-efficacy*, *reflexive thought*, *social support and social capital*, and *shared decision-making*. The following paragraphs detail the studies according to these dimensions.

Skills and competencies

In all 30 studies, the skills and competencies aspect was present in the BCP during pregnancy. Across all the different behaviour change technique formats, the participating women were provided with support to develop new skills and competencies in the health topics concerned (see Table 1). Four of the programmes had an explicit focus on self-directed learning: Al Khamis et al. (2017), Crawford-Williams et al. (2016), Hayman et al. (2017), Olson et al. (2018).

Innovation

The innovation aspect was found in all studies, thanks to the women's openness to changing their own behaviour despite the uncertainty of the outcome. Innovation is defined by Kliche and Kröger (2008) as the willingness of people to be open to reflect on and change/experiment with their behaviours and environment. The participating women were all willing to experiment with their own behaviour. In thirteen studies (Baker, 2011; Bryce et al., 2009; Crawford-Williams et al., 2016; El-Mohandes et al., 2011; Gesell et al., 2015; Hayman et al., 2017; Kaufman et al., 2017; Naughton et al., 2015; Osterman et al., 2014; Poston et al., 2013; Shivalli et al., 2015; Wilkinson and McIntyre, 2012; Windsor et al., 2014) the women were willing to use the behaviour change programme to experiment with their human environments (partner, family, friends, or work colleagues). For example: In the study by Baker (2011) obese pregnant women had health visits for weight management during pregnancy. The women's environments (families) were recruited to assist in the programme and did cooperate in terms of meal times and healthier food choices for the whole family. This intervention had benefits for the whole family, e.g. the children in the households ate fewer sweets. In another study, Windsor et al. (2014) encouraged the pregnant women to implement a smoke-free home policy. In that study, which is also included in the review by Chamberlain et al. (2017), the participating women were willing to experiment together with the people living with them in order to stop smoking.

Goal-setting and attainment

The empowerment intervention goal-setting and attainment was briefly mentioned without further description in seven studies (Al Kahmis et al., 2017; Gesell et al., 2015; Hayman et al., 2017; Olson et al., 2018; Secker-Walker et al., 1998; Wilkinson and McIntyre, 2012; Windsor et al., 2010). In a further three studies – Currie et al. (2015), Gaston and Prapavessis (2014), Poston et al., 2013 – goal-setting was the central feature of behaviour change techniques during pregnancy. These studies included clear descriptions of the procedures of the interventions. One of these three studies (Poston et al., 2013) had an incremental goal-setting approach. Each week pre-specified goals relating to time, diet and activities for the weight management of obese pregnant women were set and reviewed. The other two studies (Currie et al., 2015; Gaston and Prapavessis, 2014) did not focus on incremental goals, but offered women the opportunity of modifying a goal if it was not met during the intervention period. In four studies (Al Kahmis et al., 2017; Currie et al., 2015; Gaston and Prapavessis, 2014; Hayman et al., 2017) goal-setting was combined with autonomous planning in the form of developing a plan for goal attainment during pregnancy. In three of these four studies – Al Khamis et al. (2017), Currie et al. (2015), Gaston and Prapavessis (2014) – the participating women were asked to develop a written plan to determine when, where and how they would implement their new practices (e.g. physical activity, brushing their teeth and cleaning them with dental floss). The remaining one of these four studies, Hayman et al. (2017), did not describe the action planning in detail.

Self-efficacy

In nine studies (Currie et al., 2015; Gaston and Prapavessis, 2014; Gesell et al., 2015; Herring et al., 2017; Hughes et al., 2017; Kaufman et al., 2017; Osterman et al., 2014; Rasouli et al., 2017; Wilkinson and McIntyre, 2012) the intervention aimed to increase self-efficacy for a healthier behaviour. Motivational interviewing was used in three studies: Hughes et al. (2017), Osterman et al. (2014), and Rasouli et al. (2017). Two studies, Gesell et al. (2015) and Wilkinson & McIntyre (2012), based their interventions on a theory that had a component of increasing

self-efficacy, but did not describe these components in detail. Osterman et al. (2014) tried to raise self-efficacy via structured support to find appropriate goals for the individual drinking behaviour of the pregnant women concerned. This structured support was provided by outside help, positive feedback and neutral information. Herring et al. (2017) arranged weekly to monthly calls by a health coach to support self-efficacy. Currie et al. (2015) used three steps to support self-efficacy: 1) *task self-efficacy*, including the furnishing of information and discussion; 2) *copied self-efficacy*, including goal-setting and action planning; and 3) *recovery self-efficacy*, including following up on action planning with reviews of the goals. Gaston and Prapavessis (2014) asked the pregnant participants to compose a written account of their own experiences of success (*mastery experience*); verbal persuasion and vicarious experience were also incorporated into the intervention in order to increase self-efficacy, followed by information acquisition and individual action planning.

Reflexive thought

Self-monitoring was applied in five studies (Currie et al., 2015; Gesell et al., 2015; Olson et al., 2018; Wilkinson and McIntyre, 2012; Wilkinson et al., 2010) to implement reflexive thought. In two studies (Wilkinson and McIntyre, 2012; Wilkinson et al., 2010) the self-monitoring activity was conducted through tasks in a booklet, in order to create an awareness of health behaviours such as physical activity and nutrition during pregnancy. Gesell et al. (2015) used social learning theory for their skill-based intervention on weight management in pregnancy: self-monitoring is one component of this theory. In the study by Currie et al. (2015) the participating women reflected on physical activities they had previously enjoyed, and these were made subjects for discussion during pregnancy. In one study by Olson et al. (2018), pregnant women self-monitored their weight management, but specific details about how this was done were not included in the description.

Social support and social capital

Building supportive social networks (family and friends) was part of the intervention in four studies (Currie et al., 2015; Gesell et al., 2015; Hayman et al., 2017; Naughton et al., 2015). In two studies, Gesell et al. (2015) and Hayman et al. (2017), the pregnant women were taught social skills through programme modules. Hayman et al. (2017) utilised social cognitive theory in respect of the area of physical activity; Gesell et al. (2015), focusing on the prevention of extensive weight gain in pregnancy, concentrated in each session on building supportive networks through friends and family. In the study findings of Naughton et al. (2015) it is briefly mentioned that interventions that pay attention to social support (e.g. avoiding contact with other smokers) are beneficial for women and help them to stop smoking in pregnancy. No further information was reported (Naughton et al., 2015). Currie et al. (2015) encouraged the participating women to think about family members and friends whom they might involve to help them achieve their physical activity goals in pregnancy (Currie et al., 2015).

Shared decision-making

Boyd and Windsor (2003) gave consideration to the question of how to make decisions in the area of maternal and child nutritional health. During the eight weeks of one-hour antenatal nutrition lessons, one focal area, alongside seven others, was that of decision-making. No specific description of how this empowerment content was realised was reported in the publication.

Discussion

Behaviour-change interventions or programmes during maternity care vary widely. Some interventions are tailored to a single health issue, e.g. giving up smoking or managing weight gain during pregnancy (Herring et al., 2017; Naughton et al., 2015), while others can be applied more broadly (Lau et al., 2014; Villadsen et al., 2016; Wilkinson and McIntyre, 2012; Wilkinson et al., 2010). The behaviour-change interventions showed varying levels of success (see Table 1).

The majority of the studies selected for this review focused on health-related behaviours that can lead to health problems, while the remainder emphasised staying healthy with a health-related outcome. It is pivotal to support people in learning to protect and improve their own health (i.e. acquiring high health literacy). Healthcare professionals and health scientists have a major role to play in bringing about this important change of focus. Health promotion, disease prevention and people-centred care are cornerstones of wellbeing and health equity the enhancement of population equality (WHO, 2015). An emphasis on staying healthy in health research and in day-to-day practice in the field of healthcare leads to beneficial health-related outcomes. In other words, health promotion through the empowerment of pregnant women can have long lasting positive impacts for family health (Azenha et al., 2013).

With respect to the first aim of this scoping review, namely to investigate the effectiveness of behaviour change programmes, the findings reveal that education has been the dominant approach to changing women's health behaviour during pregnancy. However, psychosocial interventions are more effective, according to the Cochrane review by Chamberlain et al. (2017), who conclude that only education activities have no significant effects on giving up smoking. It is thus advisable not only to provide information – as twelve studies did – but also to apply interventions that include opportunities for learning new behaviour-change skills (Nutbeam, 2000). This aspect of selecting interventions based on actions, analysis and mechanisms of behaviour which are required to correct is also supported by the *Behaviour Change Wheel* (Michie et al., 2011), in which education is only one of the intervention functions together with persuasion, incentivisation, coercion, training, enablement, modelling, environmental restructuring and restrictions – functions that could also be used to foster the effectiveness of behaviour-change interventions during maternity care. It must be noted in this context that coercion refers to government policies and legislation that discourage unhealthy behaviours, e.g. high taxation of tobacco products or restrictions on where smoking is allowed in public spaces. Moreover, the *COM-B Model*, in the inner circle of the wheel, could also be considered as an effective promoter of behaviour change, as it takes individual as well as environmental factors into account. Examining *capability*, *opportunity* and *motivation* can be helpful in analysing barriers to behaviour change (Michie et al., 2011). In the 30 studies, it was only possible to infer how the *COM-B Model* was embedded in the psychosocial interventions because descriptions of the programmes were often not detailed enough. Chamberlain et al. (2017) showed that cognitive interventions were the most effective way of stopping smoking, but it has not yet been possible to generalise this statement independently of individuals' backgrounds, which makes its transfer into practice difficult. BCP need to test programmes with pregnant women from diverse cultural and socio-economic backgrounds.

Of the 30 studies covered by this scoping review, seventeen included empowerment dimensions in addition to knowledge gain and skills. It was often difficult to extract different empowerment components from the studies as some authors did not provide enough details about the interventions. In these seventeen studies

three or more empowerment dimensions were identified as supporting behaviour change. No study used all eight empowerment dimensions of Kliche and Kröger (2008). The empowerment dimensions may be helpful in judging and developing components for BCPs in healthcare. The eight dimensions can be transferred into actual practice in order to achieve and maintain the long-term achievement of WHO's "Health 2020" policy, of empowering people in the fields of health behaviour and self-care. The empowerment of women in particular could greatly benefit them in the further course of their lives (Stuckelberger, 2010). Behaviour change through empowerment of pregnant women highlights the fact that women are able to use their own resources to bring about change and cope with challenges along the way. Overall, BCPs for pregnant women that include more than only *skills and competencies* as an empowerment component are promising, and future studies ought to examine the efficacy and mechanisms of success associated with additional empowerment components of antenatal BCPs, in order to further support healthy living. Moreover, conceptual relations between the Behaviour Change Wheel and the empowerment concepts might be explored in detail.

With respect to the research question on the role of midwives in BCPs, up until now, midwives have rarely been involved in BCPs. The World Health Organization Europe (WHO, 2013a) states that a key role in implementing improvements to health is the promotion of "behaviour change throughout the whole of life", these efforts need to be supported by health care professionals like midwives and nurses. Midwives can play a major role in transforming life, because they form an element in the health promotion structures at a turning point in women's lives. Midwives could be important in BCPs: they are caregivers for women during pregnancy and childbirth and in the postnatal phase and can easily build up connections to other health professions. Midwives provide care that is already aligned with many components that promote behaviour change, such as supporting self-efficacy and shared decision-making. Midwives and nurses are trained to improve health and wellbeing as well as in enhancing health equity in a sensitive way (WHO, 2013a). For these reasons, midwives should be more involved in BCPs, in order to develop, manage, implement or support BCPs during maternity care.

Strengths and limitations

The PRISMA flow diagram (Fig. 2) was used to depict the process by which studies were selected for inclusion in this scoping review (Moher et al., 2009, 2015). In the scoping review, the quality of the studies was not assessed. Due to the methodological limitations of a scoping review, lower quality studies were included. The included studies were screened and selected by one author only. This is a common approach in scoping reviews (Tricco et al., 2016). However, we may have overseen some important aspects in the various studies. Despite these limitations, the present review closes the current knowledge gap by providing an overview of existing behaviour change strategies during pregnancy, of empowerment strategies and of how midwives are involved in BCPs.

Conclusion

A key finding of this scoping review on BCPs during pregnancy was that BCPs are based either on education for knowledge gain and informational material or on interactive education through support. The empowerment dimensions *skills and competencies* were used in all studies. To increase the empowerment of women in the healthcare setting, more empowerment dimensions should be applied. Such empowerment could benefit the women concerned throughout the further course of their lives. Midwives might be well-suited to develop, manage, implement or assist in

BCPs, because they play a major role in maternity care and their practice aligns with principles that are shown to improve success of BCPs. Nowadays, midwives as the key healthcare providers in maternity care are rarely involved in BCPs during pregnancy. A starting point for improving health-promoting behaviours among pregnant women seems to be education. As a next step, programmes ought to include additional interventions in support of behaviour change as outlined in the *COM-B Model* of the *Behaviour Change Wheel*, including individual and environmental factors. As a final step, the BCPs should be screened for empowerment dimensions, and supplemented if necessary.

Ethical approval

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Declaration of Competing Interest

No conflict of interest.

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Paper II

Challenges in applying the short Childbirth Self-Efficacy Inventory (CBSEI-C32) in German

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ABSTRACT

INTRODUCTION This study aimed to review and pilot-test feedback from childbearing women who completed the German short version of the Childbirth Self-Efficacy Inventory (CBSEI-C32), which is widely used and validated in different languages.

METHODS Ten pregnant nulliparas, who planned a natural childbirth, completed the German CBSEI-C32 and provided comments about the comprehensibility of the tool.

RESULTS When applying the standardized translated German CBSEI-C32, we discovered that women generally gave positive feedback, and reported that the items made them think about coping strategies for labor and birth. Some pregnant woman had problems in understanding two items: 'Mich beherrschen' (original English item: 'Keep myself in control'), and 'Mich ruhig halten' (original English item: 'Keep myself calm'). Some of the items were not comprehensible for pregnant women and might not represent contemporary concepts of childbirth self-efficacy.

CONCLUSIONS Two items of the German CBSEI-C32 were interpreted ambiguously by the pilot testers. The CBSEI should be checked to identify which items could serve as the basis for a new questionnaire because there are clear and appropriate coping strategies when dealing with labour pain such as item 3 on breathing. These could be complemented with other coping behaviours that are positively worded and serve to empower rather than restrain women. For measuring self-efficacy beliefs in childbirth nowadays, it appears that health-oriented aspects, such as concentrating on the pauses between contractions or mentally staying in the present moment, are more important for women than focusing on control during childbirth.

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KEYWORDS

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INTRODUCTION

Self-efficacy in childbirth

Childbirth self-efficacy beliefs refer to confidence in one's abilities to cope with childbirth^{1,2}. Self-efficacy is part of the health-oriented concept of salutogenesis and is identified as a health resource, based on its association with performance and coping¹. When faced with difficult situations, people with lower self-efficacy have higher levels of anxiety and self-doubts, and they try to avoid challenging environmental demands, compared to people with higher self-efficacy scores³. Research with childbearing women has shown that high childbirth self-efficacy is related to a reduced likelihood of requesting a caesarean birth⁴, reduced prenatal anxiety, and reduced need for pain management during labor and birth^{5,6}. It is also positively associated with emotional wellbeing during pregnancy⁷. To measure self-efficacy, researchers have developed context-sensitive scales. Apart

from a general self-efficacy score⁸, there are, for example, scales for pain self-efficacy⁹, parenting self-efficacy¹⁰, breastfeeding self-efficacy¹¹ and childbirth self-efficacy².

Development of the Childbirth Self-Efficacy Inventory

Lowe² created a comprehensive tool to assess childbirth self-efficacy which is called Childbirth Self-Efficacy Inventory (CBSEI). The inventory contains 16 statements which were first introduced in 1993. It was developed based on the experience of 23 nulliparas and 25 multiparas who gave birth spontaneously. Within 48 hours postpartum semi-structured interviews were carried out. The strategies that women used to cope with labor and birth were categorized into nine behaviors: thinking, concentration/distractio, support, control, breathing, relaxation, emotive, self-encouragement, and uncategorized. Four experts

(with expertise of self-efficacy theory and/or childbirth) evaluated the items. The category emotive, which includes for example, screaming, getting angry etc. was excluded. Finally, 16 items were pilot tested with 76 women, followed by the application of the measure to a larger sample of 287 nulliparas, and 95 multiparas (n=382)². The final CBSEI is divided into outcome expectancies (OE, how helpful one believes the behavior to be) and efficacy expectancies (EE, how confident one is that one can enact the behavior). Each set of questions for OE and EE were asked for the first stage (15 questions) and second stage (16 questions) of labor, for a total of four scales. The CBSEI is widely used and has been translated into different languages, like Chinese, Farsi, Arabic, Swedish, Greek, and German^{5,12-17}. A short version exists with a total of 32 questions for the second stage of labor and birth (CBSEI-C32)^{5,17}. This leads to a reduction of complexity of the CBSEI, for the user^{13,17}. Questions 1–16 are asked once for the OE and the same questions are asked for the EE (questions 17–32; Table 1).

German version of the CBSEI and CBSEI-C32

The German version of the CBSEI was translated by a midwifery graduate student in 2012. Psychometric properties of the CBSEI and CBSEI-C32 were tested with 123 nulliparas and 32 multiparas (n=155). The translation was carried out according to the high standards of the International Society for Pharmacoeconomics and Outcomes Research (ISPOR). Two forward and two backward translations were undertaken. The cross-cultural

adaption was ensured by two native speakers^{17,18}. As part of the development of the German version of the CBSEI, eight pregnant women participated in cognitive debriefing via a questionnaire in an antenatal class. They assigned scores ranging from 1 = ‘very good’ to 6 = ‘insufficient’ regarding the language and content intelligibility of items. The questionnaire also offered space for alternative suggestions for wording of the items. Some women took advantage of the opportunity and wrote down alternative formulations for two items. This means for example, for ‘An andere Familienmitglieder denken’ (original: ‘Think about others in my family’)⁵ a change into ‘An meine Familie denken’ (in English: ‘Think about my family’) was suggested (Schmidt G. et al., 2015¹⁷ and Zinsser LA, Stoll K, Gross MM, unpublished data, 2021). In the cognitive debriefing, three items (numbers: 3, 13 and 16 in the OE subscale) had a mean value over 2.0 points (calculated from the points 1 to 6), and one of them (item 16) was changed in its sentence structure: ‘Auf die Ermutigung der Person, die mir hilft, hören’ into ‘Auf die Ermutigung der Person hören, die mir hilft’. For both questionnaires (CBSEI, CBSEI-C32), reliability and one-dimensionality could be confirmed. The short version of the CBSEI in particular, was perceived as user-friendly by participants.

In the current study¹⁹, it was considered whether the CBSEI-C32 should be included for the measurement of self-efficacy. During the pilot phase, possible difficulties in using the German version of the CBSEI-C32 became apparent. These are discussed in this article. Specifically, we

Table 1. CBSEI-C32 items for the second stage of labor

Number ^a		English Items*	German Items**
OE	EE		
1	17	Relax my body.	Meinen Körper entspannen.
2	18	Get ready for each contraction.	Mich auf jede Wehe vorbereiten.
3	19	Use breathing during labor contractions.	Während der Wehe gezielt atmen.
4	20	Keep myself in control.	Mich beherrschen.
5	21	Think about relaxing.	An Entspannung denken.
6	22	Concentrate on an object in the room to distract myself.	Mich auf ein Objekt im Raum konzentrieren, um mich abzulenken.
7	23	Keep myself calm.	Mich ruhig halten.
8	24	Concentrate on thinking about the baby.	Meine Gedanken auf das Baby richten.
9	25	Stay on top of each contraction.	Jede Wehe meistern.
10	26	Think positive.	Positiv denken.
11	27	Not think about the pain.	Nicht an die Schmerzen denken.
12	28	Tell myself that I can do it.	Mir selber zureden, dass ich es schaffe.
13	29	Think about others in my family.	An andere Familienmitglieder denken.
14	30	Concentrate on getting through one contraction at a time.	Mich auf jede Wehe einzeln konzentrieren.
15	31	Focus on the person helping me in labor.	Meine Aufmerksamkeit auf die Person richten, die mir während der Geburt beisteht.
16	32	Listen to encouragement from the person helping me.	Auf die Ermutigung der Person hören, die mir hilft.

a Questionnaire number of the Outcome Expectancy (OE)/Efficacy Expectancy (EE). * Ip et al.⁵ and ** Schmidt et al.¹⁷.

explore whether some of the CBSEI items might need to be changed, in order to reflect contemporary conceptualizations of coping with labor and birth, and health-oriented statements, so that the items are easier to understand for childbearing women.

METHODS

Convenience sampling was used to recruit nulliparas, who planned a natural birth, free from pharmacological or technological interventions, as part of a pilot project to improve childbirth preparation. Between 28+0 and 31+0 weeks of gestation, ten women completed the German short version of the CBSEI¹⁹. To evaluate how women felt about using the CBSEI-C32 tool and whether any questions were difficult to answer, two open-ended questions were added. Responses to these questions provided insight into the acceptability and comprehensibility of the German CBSEI-C32 among nulliparas in the pilot study and allowed us to assess whether participants understood the items and corresponding behavior being queried.

RESULTS

Sociodemographic characteristics

The pregnant women were aged 26–37 years and expecting their first child. All but one had 12 or 13 years of secondary education. All participants attended antenatal class.

Acceptability of the German CBSEI-C32

In general, the inventory was positively rated. Six out of ten women (W1, W2, W3, W7, W9, W10) gave feedback that they found the CBSEI items good or interesting. Four women noted that completing the items helped them prepare for childbirth (W2, W3, W7, W9):

'Good, also as mental preparation for the birth.' (W7)

The Likert scale with 1 to 10 points from the CBSEI was criticized by three women (W1, W3, W9). They wished to have a smaller range of response options, to make it easier to complete the scale.

Comprehensibility of the German CBSEI-C32

Of the ten participants, six (W1, W3, W4, W5, W8, W9) reported problems with the comprehension of some questions.

With one item of the CBSEI-C32: Number 7 on the OE subscale, and on the EE subscale number 23, five participants (W3, W4, W5, W8, W9) had problems understanding the item 'Keep myself calm'⁵ which was translated into 'Mich ruhig halten'¹⁷. The word 'calm' in this context can be interpreted as meaning that the woman remains relaxed, rather than becomes nervous or upset, even in a difficult situation, which reflects coping on a cognitive and emotional level. The German translation could be back-translated into: 'Keep myself quiet' (to make no or not much noise) and it could also be understood as: 'Keep myself steady' (not moving; firmly held in a particular position)²⁰. While answering the items one woman asked:

'Keep calm in the sense of not moving?' (W3)

While another participating woman asked:

'What does it mean: pull myself together or use

techniques to calm me down and focus on breathing?' (W9)

The meaning of the German translation of the item seemed to be difficult to understand and ambiguous as women interpreted the statement primarily as a physical not cognitive action.

A potential problem was also raised with item 4. The statement confused three women (W4, W8, W9). The original statement 'Keep myself in control'⁵ can be interpreted as having the ability or power to behave as you want, for example, to remain calm in challenging situations. The German translation can be understood and interpreted in different ways with regard to women's behavior during birth. 'Mich beherrschen'¹⁷ can be also understood and back translated as 'To contain yourself or to control strong feelings'²⁰. Participants asked how they should interpret this statement. One woman asked:

'What does "beherrschen" (in English: control) mean: pull together, e.g. not screaming or vocal toning when I feel like it?' (W9)

Another woman was wondering:

'Must I do that?' (W4)

Six items (numbers: 1, 2, 5, 9, 11 and 15), were difficult to understand for one or two women. It was unclear what kind of action should be implemented based on the assessed statement, such as item 9 ('Stay on top of each contraction')⁵ or 15 ('Focus on the person helping me in labor')⁵. The participants made no suggestions for improvement of the items. Some items did not make sense to pregnant women in the pilot study, e.g. item number 1 in combination with number 2 ('Relax my body' and 'Get ready for each contraction'). These items were seen as a contradiction, as well as number 5 ('Think about relaxing') and 11 ('Not think about pain')⁵. For these items, the language did not seem to be a problem, but the content itself and the coping behavior the items described were queried. One woman (W4) did not see the point to prepare for the next rhythmic contraction to come, but preferred instead to focus on the pauses between the contractions.

DISCUSSION

Potential issues with the user-friendliness of the German version of the CBSEI were identified through pilot testing with ten first time mothers who completed the CBSEI-C32. The results also draw into question whether some items represent contemporary constructions of childbirth. The feedback from the participating women offers the opportunity to better understand how the items are understood by users and whether the statements of the CBSEI can be transferred to the behavior to be implemented for labor and birth. A rigorous translation process was chosen to minimize possible sources of error for the German version of the CBSEI. In the initial cognitive debriefing that was done in 2012, items 4 and 7 were not identified as problematic. They had low scores (<2.0) which means 'good/B' in school grades. There were neither too many missing values, nor were the average scores lower than for the other items. In the pilot study carried out in 2018, the statements of the women showed that items 4 and 7 from the German CBSEI-C32

could be interpreted and answered in different ways. It should be noted that there are no right or wrong answers to the CBSEI questionnaire, but rather the items assess one's own estimation of abilities. But in order to measure childbirth self-efficacy reliably, a clear understanding of the items is important. According to Lowe², the two items in question are central features of the construct of childbirth self-efficacy (relaxation, control). Women's feedback on the general use of the questionnaire was positive in both studies (Zinsser LA et al., 2020¹⁹ and Zinsser LA, Stoll K, Gross MM, unpublished data, 2021), however, in the pilot study two participants did not complete the questionnaire due to comprehension problems (Zinsser LA, Stoll K, Gross MM, unpublished data, 2021).

The participating women and the authors are questioning if some items of the CBSEI measure contemporary constructions/views of childbirth self-efficacy. The tool itself is over 25 years old and much has changed during this time. For example, childbirth preparation is evolving, the role of partners is more prominent, and a higher value is placed on women making decisions about their own care²¹. Also, the kind of care that pregnant women experience has shifted more towards a health-oriented focus, as can be seen through the health literacy movement²² and the focus on keeping birth normal²³. As mentioned in the results, one woman (W4) criticized the phrasing of the coping statements, and would have preferred a more health-oriented approach. Also, the feedback that was given about other items (1, 2, 5 and 11) indicates that some of the coping strategies for labor and birth did not resonate with the pregnant woman in the pilot study. It is possible that other aspects are more important nowadays to prepare for childbirth, and to acquire and increase childbirth self-efficacy. For example, midwifery science has identified that it is important to stay in the present moment and accept childbirth pain. An open, focused and accepting mind is helpful for successful coping; this appears to be a key concept^{24,25}. Yet no statement in the CBSEI assesses this aspect. It should be considered whether some CBSEI items need to be revised or new items added, in consideration of current evidence on effective coping mechanisms. Because self-efficacy is a theoretically driven construct, the statements must address self-efficacy in labor and birth¹. It might be worthwhile to use a modified expert review process, to assess the relevance and clarity of each CBSEI item with a contemporary diverse group of nulliparas and multiparas, and enable participants to identify missing items. This process might occur over several rounds, with women actively participating in revision of items deemed to be less relevant or clear. Generation of new items could also be informed via a systematic review of the literature about the concept of childbirth self-efficacy. These new items could then be assessed for clarity and relevance by either a diverse group of childbearing women or content experts, or both, and include assessment of related concepts such as confidence²⁶. A concept analysis on supporting confidence of childbearing women was published in 2018²⁷. Because the concept analysis is not solely focused on self-efficacy, it can

only serve as an orientation to identify aspects that support self-efficacy in childbirth. For example, the finding from Neerland²⁷, that women's confidence is supported through a 'safe environment', is not reflected in the theory of self-efficacy¹, in contrast to topics like knowledge or belief in the body's innate ability to birth, that Neerland²⁷ identified. We need to keep in mind that research for identifying individual coping strategies for dealing with labor and birth, especially in low intervention birth settings (home and birth center), can help refine the CBSEI. The CBSEI should be checked to identify which items could serve as the basis for a new questionnaire, because there are clear and appropriate coping strategies when dealing with labor pain, such as item 3 on breathing. These could be complemented with other coping behaviors that are positively worded and serve to empower rather than restrain women. However, aspects of empowerment are often not the focus of health programs²⁸.

The statements from the women, about the 10-point Likert scale of the CBSEI items being too onerous, are understandable from the side of user-friendliness. From a scientific position, Bandura²⁹ points out the importance of having a wider range of response options, to enable more nuanced assessment. Nevertheless, it is advisable to test the CBSEI with fewer response options, in order to simplify application of the scale. Internal consistency reliability of the scale is likely to still be high.

Strengths and limitations

A strength of this study is that the participants were able to critically question the CBSEI statements and that feedback was similar. For example, 5 of 10 participants had difficulty understanding item 7. This consistency is reassuring and instills confidence in the findings. The German version of the short CBSEI was only tested with nulliparas because the planned intervention study was restricted to nulliparas. This is a strength of the study as nulliparas have no previous experience with childbirth and there is value in examining the reactions of nulliparas to the translated CBSEI items rather than conflating their responses with those of multiparas who might view the items in the context of previous experiences. The small sample size, although typical of pilot tests, must be seen as a limitation of the study as results based on larger sample sizes might have yielded additional feedback.

CONCLUSIONS

The CBSEI-C32 is a valid tool and should be used as long as there is no alternative to measure childbirth self-efficacy. The German CBSEI-C32 should be tested without any changes to the items, because results from the pilot study described in this study are based on a small sample size. Future testing of the CBSEI should include nulliparas as well as multiparas, with different sociodemographic backgrounds. In order to be internationally comparable, adaptations are sometimes necessary but should be kept to a minimum.

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CONFLICTS OF INTEREST

The authors have completed and submitted the ICMJE Form for Disclosure of Potential Conflicts of Interest and none was reported.

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ETHICAL APPROVAL AND INFORMED CONSENT

The Ethics Committee at Hannover Medical School, Germany, approved the study (No. 7812_BO_K_2018) on 16 May 2018. Informed consent was obtained from each study participant prior to data collection. To ensure data confidentiality, data were collected without identifying information, such as name or address.

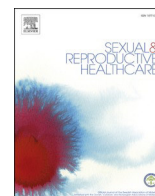
DATA AVAILABILITY

The data supporting this research is available from the authors on reasonable request.

PROVENANCE AND PEER REVIEW

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Paper III



Challenges in using Mental Contrasting with Implementation Intentions (MCII) for preparation for natural birth: A feasibility study

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ABSTRACT

Objective: Women who plan a natural birth can benefit from strategies and/or resources that help them prepare for and cope with labour pain. This study aims to identify the feasibility of using Mental Contrasting with Implementation Intentions (MCII) for preparation of primiparous women for natural childbirth. Secondary aims are to test the acceptability of a health-focused information leaflet, and to describe how participants with high natural birth intentions cognitively prepare for birth.

Methods: In third trimester, ten primiparous women participated in this interventional study with follow-up. A health-focused information leaflet on physiological childbirth, MCII, a mental strategy that helps people achieve a desired goal by envisioning obstacles and how to overcome them, and a researcher-developed questionnaire which contained the CBSEI-C32, was used. Survey data were analysed using a combination of descriptive statistics and deductive theoretical thematic analysis.

Results: The health-focused leaflet was exclusively judged positively. Nine women did not use MCII as instructed, they did not find it helpful for childbirth preparation and wished to have a more positive, health-focused approach towards childbirth. Two themes emerged from the participants' responses: '*the ability to give birth*' which was supported through childbirth preparedness, coping strategies, confidence and external supports and '*the uncertainty of giving birth*' which included fears and worries about possible adverse events and the baby's health.

Conclusion: MCII was not a promising tool for natural childbirth preparation among primiparous women in Germany. Our findings show that women prefer a positive, health-focused approach, rather than thinking about overcoming obstacles, when they prepare for childbirth.

Introduction

A spontaneous vaginal birth, free from interventions (natural birth) is the healthiest option for the majority of pregnant women [1]. During a natural birth, hormones are well coordinated. They are interconnected with physical as well as emotional changes, which support the mother and the baby [2]. Endorphins are produced through contractions and help the woman cope with childbirth pain. When the baby is born, a high level of endorphins and catecholamines are released in the baby. These hormones ensure that the baby is calm and alert, which helps in adapting to the extra uterine environment and supports breastfeeding initiation. A natural birth facilitates immediate, uninterrupted skin-to-skin contact (bonding) for at least one hour after birth which is proven to be extremely important. This intensive bonding supports breastfeeding initiation as well as the attachment between the mother and the baby [2–4]. Natural childbirth has many other positive health-related impacts like a faster recovery time for the woman, a reduced risk of wound infections as well as exposure to maternal bacteria to strengthen the newborn's immune system [5,6]. Childbirth self-efficacy,

i.e. a person's belief that they can cope with labour and birth [7] facilitates natural childbirth and tends to be higher in multiparous women because previous childbirth experience is the strongest source of childbirth self-efficacy [7,8]. Achieving a natural birth can be challenging for primiparous women as they do not have prior experience to fall back on. They can benefit from cognitive strategies that help them prepare for birth.

Coping as a cognitive and behavioural effort

Childbirth itself is painful. Women who plan for a birth without pharmacological pain relief anticipate to follow their own bodily processes and use their own strength when giving birth [9]. While there is high interest in natural childbirth among women, rates of any pharmacological pain relief during labour, and other interventions like induction of labour or episiotomy, that might disturb natural birth, remain high in Germany (nulliparous women: any pharmacological pain relief 54.4%) and other countries (49.8–89.8%) [10]. In healthcare, medical interventions are mainly offered as a solution for coping with childbirth

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pain or to accelerate the birth process. Alternative solutions are needed for a natural birth. Behaviours, like diaphragmatic breathing, are one coping strategy for childbirth pain, as well as cognitive aspects such as 'letting go' ([11], p. 4) which includes giving up control, working with the contractions, relaxing and trusting the body's abilities [11]. Coping is enacted through strategies to successfully handle environmental/internal demands. It begins when something is challenging, harmful or threatening. At the same time coping is a life-long process that can be changed and developed through all phases of life [12]. As Folkman [12] states for the external (environmental) and/or internal (inside a person's mind) demands behavioural and cognitive efforts are needed for coping. There are numerous coping strategies such as problem-solving, support seeking, positive cognitive restructuring, distraction, or avoidance [12]. Because giving birth can be a long and overwhelming process, with different dynamics and setbacks, it is important to stay on track with the cognitive and behavioural efforts until the child is born, especially for women who intend to give birth without pharmacological pain relief [13].

Preparing for natural childbirth

Mental and physical preparedness is an important part of natural birth [14,15]. Whitburn et al. [16] describe two mental states during childbirth: one is open, focussed, and receptive to the internal experience of labour pain. The other state has a negative orientation towards labour pain and is catastrophising it. There can be distractions as well as self-judgment. During birth women seemed to shift between the two states of mind [16]. Coping strategies previously developed during the course of life are beneficial in pregnancy and childbirth. Mental coping skills can promote natural childbirth [16] and the benefits of previously acquired coping strategies are higher emotional strength which can be applied to diverse life situations. For example, in childbirth the individual experience of fatigue and the length of labour are related to the physical attributes and the mindset of the woman [15]. Women with sufficient coping abilities have a higher potential to maintain a positive attitude towards giving birth, and to have a positive birth experience [4]. General coping strategies in childbirth vary from being open-minded, staying in the present moment, support through a partner and/or midwife, talking to the baby, accepting the pain, being prepared for complications, applying specific relaxation techniques like hypnobirthing, listening to self-selected music, thinking about others who have coped well with giving birth, et cetera [16–19]. Moreover, it is essential to consider and discuss the personal resources (skills and self-efficacy) that are associated with coping in childbirth, in advance. Self-efficacy beliefs and self-doubts have been shown to overrule the effect of skills, because a person relies more on their beliefs concerning their own capabilities than other factors [8]. Self-efficacy can be classified as part of the umbrella concept of salutogenesis, because it is a health resource [20]. Self-efficacy can have a positive impact on people's actions, and affect attitudes and motivation. High self-efficacy beliefs help with mastering difficult tasks rather than avoiding them, and are associated with a high level of effort in order to reach a set goal [8]. Several studies demonstrated the relevance of childbirth self-efficacy for the birth process and outcomes. It has been found to be associated with knowledge of childbirth, reduced prenatal anxiety, reduced need for pain management during birth and more hours at home during early labour before seeking professional help [19,21–23]. While a robust body of literature has been published about the association between childbirth self-efficacy and labour and birth outcomes, more research is needed to understand prenatal interventions or strategies that could increase or decrease childbirth self-efficacy and facilitate natural childbirth.

A cognitive and behavioural tool: Mental Contrasting with Implementation Intentions (MCII)

Strategies and tools that support women's natural birth intentions

are needed, particularly those that combine cognition and behaviour [24]. Such tools can motivate and support pregnant women to cope with labour and birth pain. In a scoping review [24] one tool was identified that might be appropriate to help prepare pregnant women to archive the goal of natural birth: the MCII. MCII is a behaviour change strategy that has the potential to increase women's ability to cope with labour pain, and to improve their satisfaction with childbirth. The tool MCII can regulate the action, affect and cognition of a person to reach a goal (i.e. childbirth free of pharmacological pain relief) under challenging circumstances [25]. MCII has been successful in the area of health behaviour (e.g. physical activity), interpersonal relations (e.g. integrative bargaining), and academic achievements (e.g. improved academic performance) [26–28]. MCII helps individuals to set personal goals and supports translation of goals into action [29]. MCII also helps to explore and identify the importance of their wish. The personal wish can either be turned into a specific goal (if it is seen as desirable/feasible) or, in some cases, MCII might also lead to a disengagement from the original wish if it is not seen as desirable/feasible anymore after thinking about it in depth. Such disengagement can help to avoid investing a lot of effort into unattainable goals, thereby minimising frustration [25]. High self-efficacy beliefs and being motivated to achieve a goal is a pre-condition of using MCII [28,29]. MCII comprises four sequential steps: First, an individual thinks about a personal wish (e.g. to think of labour contractions as something beneficial). Second, the person envisions the positive outcomes of this wish coming true (e.g. to cope well with labour contractions). In a third step the outcome is mentally contrasted with the present state which serves to identify obstacles (e.g. fear of severe pain during birth) that have to be mastered to attain the desired outcome. In the fourth step, the individual plans when, where, and how they want to prepare and act in order to attain their goal in the format "If I encounter situation Y, then I will initiate action Z!" ([30], p.1, [25]) e.g., if the labour pain is severe and I'm afraid, I will relax my body and remember to trust in my body innate abilities.

Although MCII has not been tested with pregnant women, it could be a useful and appropriate tool for women who are motivated to have a natural childbirth. MCII could help women prepare for childbirth (e.g. develop and practice coping strategies) and be ready for difficult situations (e.g. unexpected intensity of labour pain) based on identifying potential obstacles and planning how to overcome them. Using MCII might strengthen women's autonomy and confidence as they prepare for childbirth. Further, how women engage with MCII can provide insights into internal aspects (thoughts, feelings) that women deal with, when they prepare for a natural childbirth [25].

The aim of this study is to identify the feasibility of using Mental Contrasting with Implementation Intentions (MCII) for preparation of primiparous women for natural childbirth. Secondary aims are to test the acceptability of a health-focused information leaflet, and to describe how participants with high natural birth intentions cognitively prepare for birth.

Methods

Study design

The findings from feasibility studies help to determine if further investment in the research project is recommended [31]. The setting for this feasibility study were community-based antenatal education classes [32]. Both quantitative and qualitative data were analysed as part of the intervention with follow-up study. Quantitative data refers to participants' responses to pre-defined response options, i.e. about their childbirth self-efficacy beliefs and the usefulness and applicability of the MCII for childbirth preparation. Qualitative data refers to text data, i.e. written responses on the survey and MCII worksheets, about the acceptance of the MCII and a health-focused information leaflet on physiological childbirth; and mental barriers and facilitators when preparing for childbirth.

Participants

Inclusion and exclusion criteria

Eligible women were German speaking primiparous women with strong intentions for natural childbirth. Women who were not eligible for a vaginal birth (medical or request) at enrolment were excluded. To avoid bias, multiparous women were excluded because they had a previous birth experience, which has an influence on self-efficacy beliefs and coping abilities. Twin pregnancies and non-cephalic presentations are associated with higher complications during pregnancy and childbirth and were excluded as well.

Recruitment of primiparous women

Standard antenatal care in Germany generally includes eleven prenatal appointments by the due date [33]. Until 32 + 0 weeks of gestation women have prenatal check-ups every four weeks, after 32 + 0 weeks of gestation the check-ups take place every two weeks. Antenatal care in Germany is provided by community-based midwives and/or gynaecologists. Antenatal education classes are offered for every woman, to increase childbirth knowledge and promote health. The classes are financed by health insurance plans. In Germany, each birth is attended by a midwife. In birth centres and at home childbirth is midwife-led, in contrast when giving birth in a hospital a physician is in attendance as well. Continuity of care is mainly found in birth centres and births at

home, occasionally in hospitals with an independent midwife.

Because MCII is typically used by people who are motivated to achieve a certain goal, we only recruited women with natural birth intentions. To recruit women who met the inclusion criteria convenience sampling was applied. Based on the feasibility study design, and plans to analyse text data a sample size of six to twelve participants was planned in order to achieve an adequate data saturation [34]. Sixteen women who participated in antenatal education classes offered in two urban midwife-led birth centres in Germany were invited to participate between August and October 2018. Ten women agreed to participate.

Data collection

In Fig. 1 the data collection process is illustrated. The baseline assessment started between the 28th and 31st completed week of gestation. The women received a questionnaire with a) sociodemographic questions, b) questions about natural childbirth intentions and c) the German version of the short form of the Childbirth Self-Efficacy Inventory (CBSEI-C32) [35]. The second data collection (Follow-up 1) took place four weeks after the introduction of MCII, 32nd – 35th weeks of gestation. This time the survey included questions about the acceptability of study materials and the MCII, including questions about how helpful participants found the MCII for childbirth preparation. The German CBSEI-C32 was again administered.

The third data collection (Follow-up 2) was around six weeks postpartum. Women were asked about how helpful the MCII was for

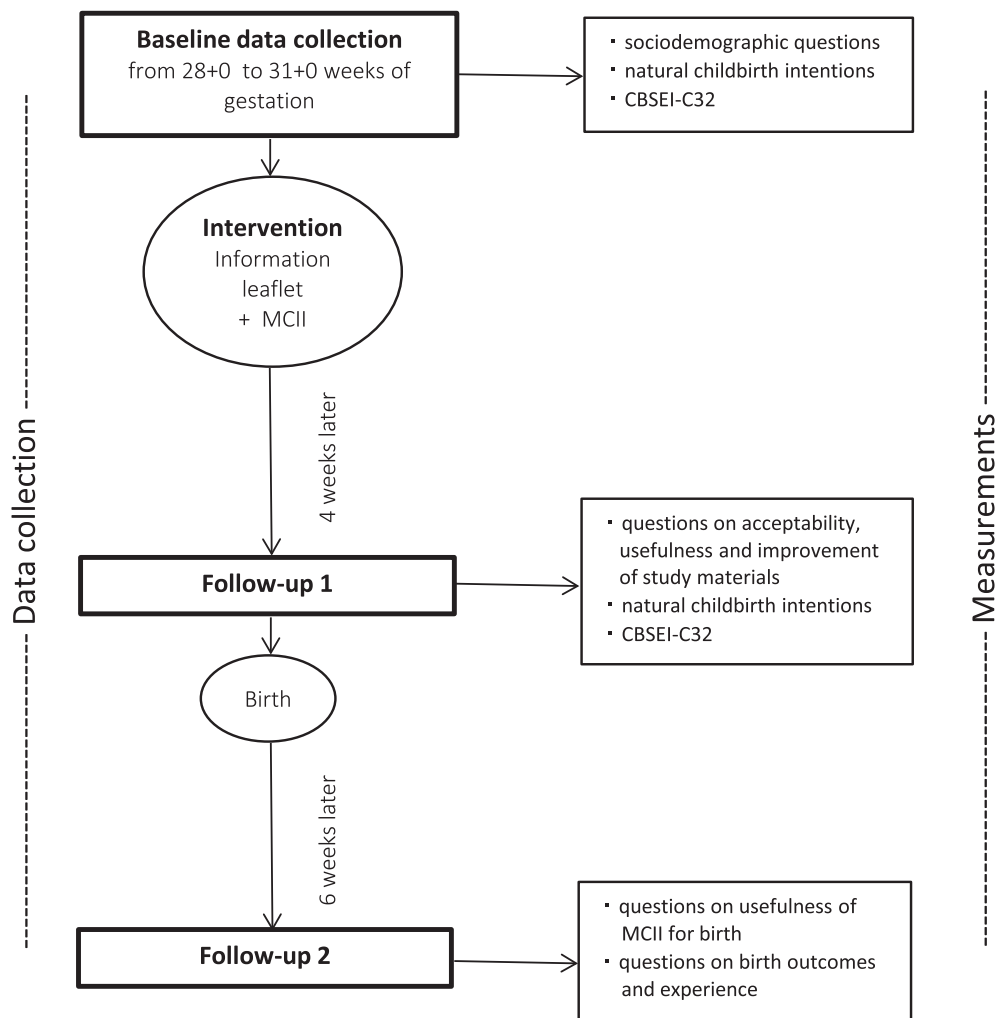


Fig. 1. Data collection and measurements.

childbirth and other questions about place of birth, birth outcomes from mother and baby, like pain relief, birth mode, 5 min APGAR score and childbirth satisfaction were evaluated.

Study materials

Natural childbirth intentions

Natural childbirth intentions were measured with six items developed by the authors that were added together to generate a summary score. Each question had six Likert response options and scale scores have a hypothetical range of 6–36 points. The point range was divided equally by three, to identify the upper tercile which we defined as high natural birth intentions. High natural birth intentions were scores between 27 and 36 points, medium intentions between 16 and 26 points and low intentions from 6 to 15 points. The six questions were as follows: 1) I want a vaginal birth. 2) I want a vaginal birth, because it is important to me to consciously experience how the baby is born through me. 3) I want a natural childbirth, without medication for birth induction or augmentation and no medical pain relief. 4) I want to give birth relying solely on my physical and mental strength. 5) I want to have as few interventions as possible. 6) I want to give birth without pain medication.

Short Childbirth Self-Efficacy Inventory (CBSEI-C32)

Questions 1–16 assess the *Outcome Expectancies* (OE) of the second stage of labour, i.e., the degree to which the expected results will occur. Questions 17–32 assess the *Efficacy Expectancies* (EE) of the second stage of labour, i.e., the belief of the own ability to successfully apply the expected behaviour. The CBSEI-C32 scores range from 16 to 160 for both OE and for the EE [35].

Health-focused information leaflet

To provide each participant with the same knowledge all primiparous women received an information leaflet on physiological childbirth at baseline. The leaflet was sent by post.

It is based on evidence-based knowledge about physiological childbirth and was written from a salutogenic perspective to ensure childbearing women understand the health benefits of physiological childbirth and see it as a feasible and achievable outcome. The theory of salutogenesis includes the comprehensibility (what is happening during a physiological childbirth?), manageability (what can I do to have a physiological childbirth?) and meaningfulness (why is physiological childbirth important?) which means that cognitive, behavioral and spiritual/emotional health aspects are taken into account [36].

The leaflet is structured in four parts: 1) the physiological birth process, 2) the advantages for the child, 3) the advantages for the mother, 4) and a short conclusion (900 words in total). It was prepared by the first author and screened by one midwife, one midwifery scientist, and two primiparous women for clarity, relevance, and legibility.

Mental Contrasting with Implementation Intentions (MCII)

In addition to the leaflet the participants received a worksheet in hardcopy form which included the evidence-based four steps of the MCII also known as WOOP (*wish, outcome, obstacle, plan*). The prepared worksheet was designed based on the model of the WOOP kit from <http://woopmylife.org> [25,37]. The MCII worksheet instructs the participants to write down their goals, expected outcomes, obstacles and a plan of how to overcome the obstacle with respect to *dealing with contractions free of pharmacological pain relief*. To help women complete the MCII introductions were given, e.g. “*When it gets tricky during birth, I overcome the obstacle as I...*”. Only in step two (*outcome*) and three (*obstacle*), the participants were asked additionally to express their own thoughts

vividly and to write these thoughts down. No examples on the topic: *dealing with contractions free of pharmacological pain relief*, were provided, as participating women were meant to come up with their individual wish, obstacle, and plan for coping with birth contractions. The primiparous women were free to discuss their MCII with their midwife or gynaecologist. During the planning phase of the feasibility study, the worksheet was screened by three experts of MCII (in self-regulation, future thinking and motivational psychology) to ensure the worksheet was created in accordance with the four MCII steps. The intelligibility of the worksheet was screened by two primiparous women. The pregnant women had no objections or suggestions for improvement. The feedback by the three experts was related to the instructions for the MCII steps which were condensed to have fewer sentences and more questions to help participants with self-reflection. The worksheet was prepared as a self-directed tool. Help with filling out the MCII worksheet was offered by the first author, but it was not requested from the participants. The primiparous women were asked to recall the four steps of their MCII worksheet daily for a period of four weeks. A daily repetition was chosen based on the recommendation of the WOOP-Kit [37] and previous applications of the MCII. For example, Stadler et al. [26] instructed participants to repeat the MCII four-times within 24 hours. Participants were asked to send the MCII worksheets back to the first author.

Ethics

The Ethics committee at Hannover Medical School, Germany, approved the study in May 2018, No. 7812_BO_K_2018. This study was carried out according to the principles of the Declaration of Helsinki. Informed consent was obtained from each study participant prior to data collection. The primiparous women were informed that the participation is voluntary and that they can withdraw from the study at any time. In support of women, who might have experienced negative emotions after birth as a result of not being able to fulfil their wish, contact details of the first author were provided for optional support. To protect the anonymity of the participants pseudonyms were used in this study.

Quantitative data analysis

Quantitative data were collected with three questionnaires, starting with a baseline assessment, follow by two follow-up surveys (four weeks after the intervention and six weeks postpartum). Descriptive analyses were carried out for the scales and the sociodemographic variables as well as for factors related to childbirth (Table 1). SPSS version 26 was used for the statistical analysis. Cohen’s *d* effect size is interpreted as small ($d = 0.2$), medium ($d = 0.5$) or large ($d = 0.8$), for the differences between the CBSEI-C32 scores before and after the intervention of MCII.

Qualitative data analysis

Since the goal of the qualitative analysis was to better understand how primiparous women cognitively prepare for birth Albert Bandura’s theory of self-efficacy [8] was used as a framework. Self-efficacy beliefs are known to promote natural childbirth, and have an impact on people’s actions, affect states and motivation. Theoretical thematic analysis (TTA) was used to derive meaning from the qualitative data. TTA is a type of thematic analysis that is “guided by an existing theory and theoretical concepts (as well as by the researcher’s standpoint, disciplinary knowledge and epistemology)” ([38], p.175). Using a theoretical framework enhances the interpretative power of thematic analysis while leaving space for emerging codes. The first author developed the codebook (Table 2), based on a review of the literature on general self-efficacy, childbirth self-efficacy, and practical experience. Two researchers independently reviewed and coded the data (double coding), [39]. We followed best practice guidelines for TTA [40] such as repeated reading to become familiarised with the data, application of codes, note taking throughout the analysis process, identification of major themes,

Table 1
Prenatal and postnatal characteristics of primiparous women (n = 10).

Participant	Luisa	Katharina	Rebecca	Theresa	Sarah	Julia	Eva	Annika	Pia	Angela
Gravida/Para	I/0	I/0	I/0	II/0	I/0	II/0	I/0	I/0	I/0	I/0
Residence	Urban	Urban	Rural	Rural	Rural	Rural	Urban	Urban	Urban	Urban
School education	University entrance qualification	University entrance qualification	University entrance qualification	University entrance qualification	University entrance qualification	Completed secondary school	University entrance qualification	University entrance qualification	University entrance qualification	University entrance qualification
8 weeks antenatal education, partner participated	Yes, all evenings	Yes, two evenings	Yes, all evenings	Yes, two evenings	Yes, all evenings	Yes, all evenings	Yes, all evenings	Yes, all evenings	Yes, two evenings	Yes, all evenings
Other childbirth preparation	Yoga, Hypno-birthing	Yoga, Fitness course	Yoga, Swimming	Hypno-birthing	Autogenic training, Fitness course	Breathing course	/	Hypno-birthing	Yoga, Hypno-birthing	Yoga, Meditation, Breathing course
Midwifery care in pregnancy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Birth place, planned	Birth centre	Birth centre	Birth centre	Birth centre	Hospital	Hospital	Birth centre	Hospital	Birth centre	Birth centre
Birth place, actual	Birth centre	Hospital	/	Birth centre	/	Hospital	Birth centre	Hospital	Birth centre	Birth centre
Gestational age at birth (weeks)	39 + 5	40 + 2	/	40 + 2	/	40 + 1	39 + 5	41 + 4	39 + 3	40 + 0
Pain relief	No	No	/	No	/	No	No	Yes, nitrous oxide & epidural	No	No
Episiotomy	No	No	/	No	/	No	No	No	No	No
Mode of birth	Vaginal birth	Vaginal birth	/	Vaginal birth	/	Vaginal birth	Vaginal birth	Vaginal birth	Vaginal birth	Vaginal birth
Sex of baby	Male	Female	/	Male	/	Female	Female	Female	Male	Female
Birth weight	3560	3005	/	3650	/	3410	3580	3275	3320	3780
5 min APGAR	10	10	/	10	/	10	9	10	9	10
Intensive neonatal care	No	No	/	No	/	No	No	No	No	No
Midwifery care during birth	Yes	Yes	/	Yes	/	Yes	Yes	Yes	Yes	Yes
Satisfaction with birth experience ^a	Medium	Low	/	Medium	/	High	Medium	Medium	High	High
Positive birth experience ^b	Disagree	Disagree	/	Slightly agree	/	Strongly agree	Slightly disagree	Slightly disagree	Strongly agree	Strongly agree
Exclusive breastfeeding six weeks postpartum	Yes	Yes	/	Yes	/	Yes	Yes	Yes	Yes	Yes
MCI helpful for giving birth, antenatal ^b	Slightly agree	Disagree	/	Slightly agree	Slightly agree	Slightly disagree	Slightly disagree	Strongly agree	Disagree	/
MCI helpful for giving birth, postpartum ^b	Slightly agree	Disagree	/	Disagree	/	Slightly disagree	Disagree	Agree	Strongly disagree	Agree

/ Missing values, participant stopped participating in the study

^a Three-point Likert Scale

^b Six-point Likert Scale

Table 2
Extract of the theory-driven codebook.

Code	External Supports
Reference	Bandura, 1997; Schwartz et al., 2015
Definition	External supports refer to people who provide support during labour.
Description	External supports might be partners, doulas, midwives, family members or friends. These people might provide encouragement, emotional support, and physical contact (e.g. massage). For example: the birth companion is supporting a woman with breathing during contractions.
Code	Worries and fears
Reference	Bandura, 1997; Carlsson et al., 2015; Schwartz et al., 2015
Definition	Worry is defined as a state of anxiety and uncertainty over actual or potential problems. Fear is a feeling that arises when a person is worried or afraid of something.
Description	Worries and fears about childbirth can lead to distress-related thoughts and physical reactions. Childbirth related fears and worries include interventions during birth, childbirth pain, and negative birth outcomes. For example: a woman is fearful of the intensity of childbirth pain and as a result she anticipates contractions with fear.
Code	Feeling in control of one's behaviour
Reference	Bandura, 1997
Definition	Refers to the belief that one can exercise control over a behaviour.
Description	To feel in control expresses itself as lowered stress reactions and the ability to manage situations. For example, a woman expresses that she can influence her behaviour, like staying calm during childbirth.

based on codes and a review of themes against the data, to validate that the themes accurately reflect the data [40]. In the results section quotes are reproduced, to support the themes and subthemes.

Results

Description of the sample

Ten primiparous women agreed to participate in the feasibility study and participated in the baseline assessment; eight women completed the study and provided data at all three time points; one withdrew after four weeks of participation and one person withdrew in the postpartum period. The primiparous women ($n = 10$) were between 26 and 37 years old, all had German citizenship. One woman had nine years of school education, the others had twelve or thirteen years, which leads to a university entrance qualification. All women were in a relationship and attended antenatal education classes with their partners. They had all received standard pregnancy care from midwives and none reported pregnancy complications. The ten women scored high (30–36 points) in their natural childbirth intentions. Seven women planned to give birth in a birth centre and three at the hospital. All participating women stated that they had trust in their chosen birth setting (Table 1).

Baseline assessment and first follow-up: CBSEI-C32

Of the ten participants, two did not answer items 4, 7, 20, and 23, due to problems with understanding these items. Therefore, these scores from the primiparous women could not be included. Changes in the CBSEI-C32 scores pre- and post- intervention showed a medium effect (Table 3).

Table 3
Mean scores and effect size of CBSEI-C32 score at baseline and follow up ($n = 8$).

Description	Mean	SD	Cohen's d	Effect size r
CBSEI-C32 OE, Baseline	118.1	15.4	0.663	0.315
CBSEI-C32 OE, Follow-up 1	130.1	20.4		
CBSEI-C32 EE, Baseline	113.6	14.1	0.772	0.360
CBSEI-C32 EE, Follow-up 1	125.8	17.2		

Outcome Expectancies (OE), Efficacy Expectancies (EE)

Second follow-up, six weeks after childbirth

Childbirth experience (e.g. satisfaction) and physical outcomes (e.g. mode of birth, 5 min APGAR scores) are listed in Table 1. Seven women felt well prepared for their birth, one woman was varying between yes and no, the other two women had stopped participating in the second follow-up on the assessment of the feasibility and acceptability of the study materials. All participating women experienced a vaginal birth. One woman made use of nitrous oxide followed by epidural analgesia in the hospital. The others did not use pharmacological pain relief. All women stated that during labour and birth the midwife had been with them for as long and as often as they had wished for.

Usefulness, acceptance and applicability of MCII for childbirth preparation

Eight women rated how helpful the MCII was for childbirth preparation: four felt that the tool was not helpful, three persons found it slightly helpful and one rated the MCII as being helpful in preparing for childbirth (Table 1). None of the participants repeated the worksheet daily. Only one woman (Sarah) had repeated it once a week for the suggested four weeks. The other women indicated that they filled-in the MCII and did not bring it to their mind again.

Several women made comments or asked questions about the pre-defined topic for the MCII. The women wished to have the option to choose which topic they wanted to work on. It was suggested to widen the focus to address the birth process as a whole.

"Why is it only focused on contractions? Yes, contractions are central, but other pregnant people might want to prioritize different issues" (Luisa).

"It is possible that one might think of additional aspects and wishes with regards to the birth process" (Sarah).

To mentally contrast an outcome for the rhythmic recurrence of contractions may be challenging for women as shown in the response below.

"Difficult, [...] I found step two [of the tool MCII] hard, because it is difficult to imagine an outcome for every contraction" (Pia).

After childbirth the women were asked if the preparation with MCII was helpful while giving birth. Five women felt that the tool was not helpful, one person found it slightly helpful and two rated the MCII as being helpful for giving birth. Two women (Sarah, Pia) rated the helpfulness of the tool even lower than during pregnancy. Instead the wish to have a health focused, positive approach to birth preparation was mentioned.

"I approach the birth positively and do not want to think through potential problems. Thinking through it once was ok" (Eva).

"As I said, why always direct [my thoughts] to the possibility of pain and not to the positive?" (Theresa).

Usefulness, acceptance and applicability of the health-focused information leaflet

Exclusively positive feedback was given about the content and the length of the health-focused information leaflet. The description of childbirth in a health focused, positive way without technical terms was informative and supportive for understanding the importance of natural childbirth.

"Encouraging and informative. Factual, without creating panic or demonizing anything" (Eva).

"Very good, because the advantages of a natural birth are described and women who consider pharmacological pain relief are more aware of the effects" (Sarah).

The participating primiparous women were asked if the leaflet could be improved in any way. Three suggestions were given to the first author: adding information on medical indications of interventions, adding information about the positive aspects of a caesarean section and adding a list which refers to further literature for information on childbirth in the German language (the reference list of the information

leaflet included primarily international scientific publications).

Mental aspects for natural childbirth preparation

After reading three MCII worksheets, 90% of the deductive codes of the codebook had appeared. The saturation point was reached after six MCII worksheets, i.e. all codes were repeatedly identified. The pre-defined sentences of the MCII worksheet are marked in square brackets. One major objective of the theoretical thematic analysis was to better understand mental barriers and facilitators that were identified by primiparous women when preparing for natural childbirth, using the MCII. Two main themes were identified in the data: I) *the ability to give birth* for which important aspects were *childbirth preparedness, trust in their own behaviour, and external supports*, and II) *the uncertainty of giving birth* indicating that women were dealing with *fears and worries*, as they prepare and plan for a natural childbirth (Table 4).

I) The ability to give birth

Among participants childbirth is seen as a manageable and natural process. Women’s ability to give birth is achieved through *childbirth preparedness, trust in their own behaviour, and external supports*.

The ability to give birth: role of *childbirth preparedness*

To prepare for giving birth, knowledge on the topic of childbirth is needed.

“Unfortunately, even before pregnancy, I have heard far too often that contractions are always and irrevocably connected with pain” (Rebecca).

The knowledge of what a woman might experience when giving birth is essential for the preparation. It helps women know what is needed for mental and physical coping during natural birth. One woman (Pia) wrote about the importance to “exercise beforehand” in order to overcome her own obstacle, because her own thoughts prevent her from being in the present moment.

Aspects that women wrote about when using the MCII included how to prepare to give birth free of pharmacological pain relief, including techniques like relaxation or breathing.

“[The best result would be] keep breathing and trust the body” (Pia).

“[When it gets tricky during birth, I overcome the obstacle as I] ... relax myself and trust in my own body” (Luisa).

Mental preparation was especially used as a coping strategy. The acceptance towards contractions and birth pain as an important physiological mechanism during childbirth was demonstrated through the responses. Primarily, contractions were seen from a positive point of view. The mental emphasis on contractions as natural and rhythmic bodywork becomes clear through the word ‘birth-wave’. The wording signals a shift from negative associations towards neutral ones.

“... to see the contractions as beneficial, useful and empowering” (Luisa).

“... consider the contractions as waves, which will guide my child softly into this world” (Rebecca).

“... to cope with the pain of contractions, to accept it and to use it” (Pia).

The ability to give birth: Role of *trust in their own behaviour*

Women felt capable to give birth without pain relief. They felt that they were in control of their upcoming birth, even if it will get difficult, in order to demonstrate enough strength, energy and endurance to give

Table 4
Themes and sub-themes from the MCII worksheet.

Themes	Sub-themes
The ability to give birth	Childbirth preparedness Trust in own behaviour External supports
The uncertainty of giving birth	Worries and fears

birth. Confidence and trust in their own physical abilities are characteristics of self-efficacy beliefs.

“[When it gets tricky during birth, I overcome the obstacle as I] ... once again muster all the strength” (Sarah).

“To make contractions bearable by breathing properly” (Julia).

The ability to give birth: role of *external supports*

An important coping strategy to feel prepared for a natural childbirth was the external supports provided by the partner or the midwife.

“[When it gets tricky during birth, I overcome the obstacle as I] ... speak to my partner and practice [...]. It would be a problem if he could not show any strength in this moment” (Pia).

“Support by an experienced midwife, who gave birth to children herself” (Sarah).

II) The uncertainty of giving birth

The main theme *the uncertainty of giving birth* can best be described as *fears and worries* that were encountered when women used the MCII and thought in step 3 about their inner own obstacles. To give birth is an unknown event for primiparous women. Fears and worries as well as hopes for labour and birth emerge during pregnancy. Birth is imagined as something unpredictable, something you do not have control over. Negative future thinking can happen, escalating to catastrophising.

The uncertainty of giving birth: role of *fears and worries*

Women notice the lack of control over some childbirth aspects, like postpartum haemorrhage. Negative birth stories women hear, can cause negative birth impressions.

“You hear many bad or traumatic stories about birth, with respect to complications. I am afraid that such a thing can happen to me or rather that I can’t get rid of these thoughts during birth and that the birth is not over yet and something unforeseeable might still happen. For example, that the placenta will not detach and that I will bleed heavily” (Luisa).

“I don’t want to count my blessings too early, because something could still go wrong. I overcome my obstacle by taking one step at a time and ideally knowing ahead of time where I am headed” (Katharina).

Fears and worries about the unknown intensity of labour pain were described and how that might lead to use of pain relief.

“That strong pain sensations lead to a quick decision to take pain medications” (Sarah).

Catastrophising was found in some women’s responses. The mental focus of the topic contractions drifted towards negative thoughts about the baby’s health.

“[My central inner obstacle is] the fear that my baby will be born sick” (Julia).

Another woman is formulating the worry of the baby’s health in another MCII step:

“[The best result would be] a healthy and happy baby and I would be thankful for this small wonder” (Katharina).

Discussion

Our findings suggest that primiparous women who are planning to give birth naturally did not want to think in depth about obstacles during labour and birth. They preferred more support in strengthening their ability to give birth and favoured a positive, and health-focused approach to preparing for natural birth rather than envisioning mental obstacles.

Usability of MCII and the health-focused information leaflet for childbirth preparation

During the planning stages of the study, MCII as a cognitive tool was identified to have a high potential to support pregnant women with natural birth intentions. Yet, results indicated that it is not a suitable strategy for preparation for a natural childbirth. First, the assessment of MCII as a childbirth preparation tool showed that women did not find

the tool as helpful for the preparation on birth contractions as expected. Second, MCII was not applied as instructed. Third, participants stated that they did not like to focus on obstacles, although identifying inner obstacles is a central part of the MCII. The women preferred to avoid focusing on problems and wished to have a positive approach to preparing for childbirth. This is a barrier to introducing MCII for childbirth preparation. Hallgren et al. [41], observed in their study on childbirth education that “woman seemed to avoid thoughts about the dark side” (p.133). For the unborn child, adverse early life experiences, including maternal stress e.g. from negative thoughts, can have lifelong effects on behaviour and health. During pregnancy, the well-being of the mother is important with regard to the epigenetic consequences [42]. Women might have wishes or expectations of childbirth that will not be fulfilled. This can contribute to negative birth experiences [43,44]. The reluctance of women with natural birth intentions to envision obstacles that might negatively affect their birth experience could possibly explain why some women are not well prepared for events that unfold during labour and birth. It also indicates that prenatal interventions should be tested that shift women’s cognitive and behavioural focus towards enablers rather than detractors of a desired outcome. Alende Prates et al. [45] argue that the preparation of the mind by means of positive thoughts is an important care ritual during pregnancy. Positive thoughts can lead to positive attitudes, which can function as a catalyst for coping with labour and birth. Finally, in this study MCII was used to support preparation for childbirth, which can be an event that is characterized by uncertainty and lack of control. Prior to that MCII was primarily tested and recommended in situations where participants were motivated to make a change and had direct control over a behaviour, such as healthy eating [26]. In future studies using the MCII in the context of pregnancy and childbirth, the MCII may need more flexible adaptation and implementation to fit this context. For example, the MCII might work very well for pregnant women who are motivated to quit smoking, eat healthier, exercise more or hope to increase other specific health-oriented behaviours.

The health-focused information leaflet was perceived very positively by women, in terms of content and length. The positive reaction of participants to the leaflet warrants more extensive pilot testing. Women mentioned they would enjoy reading more information about interventions in childbirth. However, it is important to present this information in a way that does not exacerbate fears and worries about birth. This can be done through communication based on the theory of salutogenesis which strengthen peoples’ own resources and emphasizes health and wellbeing rather than avoiding adverse outcomes [36]. Information about interventions are framed then by the process of action, self-determination, values, and goals of care during pregnancy, birth and postnatal care. This enables realistic expectations, and confidence to successfully and autonomously master challenges, such as induction of labour or other interventions. The feeling of control in care and in one’s own behaviour can increase [36]. In general, it seems that a sensitive, positive, and health-focused perspective is a good and appropriate way to provide information during pregnancy.

Scale on natural childbirth intentions

No negative feedback was given about the six-point Likert scale that measures natural childbirth intentions. We assume the scale is easy to use, and that the questions were clear. Future studies with more participants might examine the reliability and validity of the scale and use it either as an independent or dependent variable in studies about birth intentions.

Changes in CBSEI-C32 scores

The assessed CBSEI-C32 scores increased in follow-up 1. A doctoral thesis [46] collected data from the EE subscale of the CBSEI-C32. In this thesis Kish [46] reports that primiparous women have a significant

increase in CBSEI scores over the course of pregnancy ($N = 46$, $t = -3.45$, $p < .001$), which correlates with knowledge gain ($n = 46$, $r = 0.394$, $p = .007$). In our study, in between the two data collection points (baseline and follow-up 1), all women had antenatal education once a week, where information was given and skills were taught. Due to the poor usage of MCII by the participants, we must conclude that MCII was not the variable that increased the CBSEI-C32 scores.

Childbirth preparation and its mental aspects

The qualitative analysis of the four steps of the MCII offered insight into mental barriers and facilitators when planning a natural childbirth. Primiparous women had already developed confidence in their capability to deal with labour and birth as evidenced by the theme *the ability to give birth*. This means that the women believed they can apply their own abilities under a novel set of conditions, which implies high childbirth self-efficacy according to Albert Bandura [8]. *Trust in their own behaviour* seemed to empower women for the upcoming childbirth. In a concept analysis on confidence for natural childbirth, Neerland [47] wrote that women trust their bodies and their ability to give birth when they are confident. For *mental preparedness* midwives and other maternity care providers should support women to develop coping strategies during pregnancy, such as being in the present moment, or staying calm when fear is rising. Both coping skills and self-efficacy beliefs are required, to successfully manage the challenging situation of giving birth [8,16]. Whitburn et al. [15] emphasize the importance of conceptualizing pain as productive, to bring the baby closer to being born. *External supports* from partners, family members, friends or care providers enhance feelings of safety during labour and birth and are important mental aspects for parturition [13]. Research shows that midwifery support in maternity care has been linked to feelings of control and empowerment for childbearing women [13]. Further, midwifery care is associated with a higher likelihood of experiencing a physiological birth, decreased use of pharmacological pain relief, shorter birth duration, better 5 min Apgar scores, and longer duration of exclusive breastfeeding, compared to physician-led care [48–50]. Midwives see normalcy in childbirth on a continuum that is linked to women’s physiologic capacity and life circumstances and highly influenced by contextual factors such as birth environments [51]. As the predominant birth culture has a narrow definition of normal and often pathologizes pregnancy and birth [51] the salutogenic approach used by many midwives strengthens inner resilience and supports confidence and autonomy of childbearing women [36]. The primiparous women felt that they chose a supportive and safe birth environment, which is an essential part of preparing for childbirth.

The uncertainty of giving birth was the other overarching theme that emerged from the data and included references to *fears and worries*. Birth stories from other women made the primiparous women feel insecure. Research showed that negative birth stories from family, friends and negative media representations about birth are associated with fear of birth and insecurities [52]. It is unclear if women planning a natural childbirth are verbalizing their uncertainties and fears clearly towards their healthcare provider. Mulcahy and Sayage [53] note that it is important for healthcare providers to listen carefully to parents, because their concerns are often stated in a vague and indirect way. In addition, we think it is important to reassure women that adverse outcomes are rare, to reduce stress and anxiety. After the individual health assessment, it is recommended to focus on the positive health components, which can strengthen the resilience of pregnant women.

Finally, the themes identified through TTA help to expand our understanding of how primiparous women plan for a natural childbirth. The applied framework has shown that women’s self-efficacy beliefs are important in affirming a positive and optimistic mind-set towards labour and birth. Based on the theory of self-efficacy it is essential for healthcare providers to communicate with pregnant women in a way that strengthens rather than reduces individual self-efficacy beliefs. Tools

and strategies that support women from moving from the 'uncertainty' to the 'ability' of giving birth are useful. In line with these principles is the salutogenic and health-focused approach of midwives [36]. Research is needed about developing and testing tools and strategies to increase childbirth self-efficacy and support women to cope with uncertainties.

Strengths and limitations

The small sample size prevented assessment of reliability of the included scales. The consistently positive feedback about the items that measure natural childbirth intentions is promising.

The qualitative data are more generalizable, transferable and meaningful because they aligned well with constructs from self-efficacy theory. This fit between the data and theory enhances the internal validity and reliability of the results. Moreover, the development of a codebook that was theoretically grounded and informed by practical experience and the decision to perform double coding contributed to the rigour of the coding process [39]. The saturation point was reached after six transcripts which further supports the validity of the coding framework. The qualitative analysis of the MCII worksheet has unveiled more knowledge about how primiparous women plan and prepare for a natural childbirth. The results from the current study can inform the development and testing of maternity care practices, tools and strategies that support natural birth intentions and help women cope with labour pain. Finally, the way that primiparous women with high childbirth self-efficacy think about and prepare for birth can help other women develop a more positive and confident view towards labour and birth, and enhance their coping [54].

Conclusion

Primiparous women with strong natural childbirth intentions expressed their ability to give birth and at the same time uncertainties about birth. Because participants identified several challenges with the MCII, no further research investment for the tool MCII is advisable for natural childbirth preparation. MCII could for example be tested during pregnancy to prevent excessive weight gain or to quit smoking. Results from the feasibility study highlight the importance of delivering childbirth information in a sensitive, positive, and health-oriented manner. Primiparous women can benefit from support in strengthening their self-efficacy beliefs, rather than being confronted with their individual obstacles towards giving birth. Further research with MCII may be of interest for behaviour change in the antenatal- and postnatal period. From the perspective of the theory of self-efficacy, it is important for health-care providers to strengthen women's self-efficacy beliefs for labour and birth, especially if pregnant women have not been able to develop coping resources through previous experience. This research has also given insight into the fears and worries of women who are motivated to go through the natural processes of giving birth free from pharmacological pain relief. Therefore, it is important that care providers encourage women to discuss the source of their fears and worries and support women in moving from the 'uncertainty' towards the 'ability' of giving birth.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.srhc.2021.100642>.

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