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Fostering childbirth education on upright positions and mobility during labor in nulliparous women

Hanna Borer[1] and Ilana Dubovi[1*]

Abstract

Background Upright labor positions and movement during labor have a positive effect on childbirth, yet the predominant labor positions are still horizontal. Therefore, it is important to explore how it is possible to improve childbirth education, particularly its instructional design, to strengthen women's self-efficacy toward the use of upright positions and mobility during labor. The aim of the study was to evaluate the impact of an instructional approach based on a cognitive engagement ICAP (Interactive, Constructive, Active, Passive) framework on the development of knowledge, attitudes, and self-efficacy expectations toward upright positions and mobility during labor.

Methods A prospective quasi-experimental study was conducted among nulliparous women from the ultra-orthodox Jewish community ($n=74$). While the control group ($n=34$) participated in routine childbirth education, the intervention group ($n=36$) learned with childbirth education that included interactive and constructive cognitive engagement activities. Participants in both groups completed a set of questionnaires regarding knowledge, attitudes, and self-efficacy.

Results The post-test analysis revealed that women in the intervention group compared to the control group gained significantly higher knowledge scores ($p<0.05$), more positive attitudes ($p<0.001$), and stronger self-efficacy expectations toward upright positions and mobility during labor ($p<0.01$).

Conclusions The findings suggest that by fostering women's cognitive engagement levels during childbirth education toward the interactive and constructive modes of the ICAP framework, women's self-efficacy to move during labor and to use upright positions can be induced. These results can serve as a foundation to improve the overall effectiveness of childbirth instruction.

Trial registration The study was registered retrospectively.

Keywords ICAP framework, Cognitive engagement, Childbirth education, Upright positions, Labor, Mobility

Background

Upright labor positions and movement during labor have demonstrated various positive effects on the process and outcomes of childbirth. In a Cochrane meta-analysis including 25 trials, upright positions were shown to be associated with a shorter first stage of labor, a reduction in cesarean birth incidence, and fewer newborn admissions to the neonatal intensive care unit [1]. Further reviews and meta-analyses have demonstrated a

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relation between upright labor positions and a shorter second stage of labor, a reduction in episiotomies, and fewer abnormal fetal heart rate patterns [2–7]. Moreover, a growing body of evidence reports that mobility and upright positions during labor might foster more positive childbirth experiences, perceptions of childbirth as less traumatic, and increased comfort levels [8, 9]. Building upon this evidence the World Health Organization (WHO) and other international obstetric societies have released recommendations and guidelines stating that women should be encouraged to be mobile and adopt comfortable positions of their choice, including upright positions [10, 11].

However, to date, and despite the evidence, the predominant labor and birth positions are still horizontal. A recent NHS maternity survey reported that in England on 2021 only 16% of women stated that they gave birth while standing, squatting, or kneeling [12]. This finding is in alignment with previous studies to show that mobility restrictions and horizontal positions for childbirth are still predominant worldwide [13, 14]. This gap yielded many new studies aiming to support maternal positions during labor, focusing mainly on midwives' training and healthcare system barriers [15, 16]. As a woman's self-belief and confidence in her childbirth abilities can influence both her inclinations towards certain birthing positions and her responsiveness to a midwife's encouragement for upright positions—factors that subsequently affect labor [17–20]—this study concentrates on pregnant women. Particularly, this study seeks to evaluate how it is possible to induce women's self-efficacy, attitudes, and knowledge on mobility and upright positions via childbirth education.

Formal childbirth education was developed about 80 years ago to help women play an active role in labor and be able to apply nonpharmacological approaches to cope with pain [21]. Today, the scope of childbirth education is broader and focuses on providing information about the physiology of labor, the mode of birth, management of pain, emotional issues during labor, the postpartum period, and the early weeks of motherhood. Though high-quality evidence on the outcomes of participation in childbirth education classes is still limited and inconsistent, there are some recent studies that are pointing toward childbirth classes' clear benefits. A Cochrane review analyzed 29 trials to conclude that participation in childbirth classes may reduce the rate of cesarean Sects [22]. Moreover, a recent systematic review and meta-analysis of 23 studies found that in addition to the reduced risk of a cesarean birth and the use of epidural anesthesia, childbirth education is associated also with improved childbirth self-efficacy and reduced maternal stress [23]. Importantly, Shand, Lewis-Jones [24] in their prospective study found out that not only the attendance at childbirth education impacted birth outcomes but also the type of instruction that was provided during the classes.

Since research into the instructional design of childbirth education is scarce, the current study is grounded on the extensive body of educational research which has long recognized that instructional design plays a vital role in the learning process and learning outcomes. As the main goal of childbirth education is to empower women and their partners to play an *active role* in the co-partnership with the midwife during labor, similarly, during childbirth classes, the future parents should be also learning *actively*. "Active learning" does not necessarily require hands-on participation but is typically defined as learning that requires cognitive engagement and is often segregated into two types, "active" or "passive" [25]. However, Chi and Wylie [26] segregated active learning into four types, proposing the Interactive-Constructive-Active–Passive (ICAP) instructional framework to induce cognitive engagement.

The ICAP framework operationalizes and differentiates a four-level hierarchy of cognitive engagement that can be supported by the instruction [27] as interactive, constructive, active, or passive. Specifically, the ICAP postulates that interactive and constructive engagement levels include instructional design that supports learners' generation of new information beyond the information that was already provided. The difference between the two is that *interactive* engagement involves co-generative collaborative behaviors such as debate or a joint dialogue with other learners. While *constructive* engagement involves individual generative behaviors, without collaborating with others, such as providing self-explanations. Interactive and constructive modes are superior to the successive modes of active engagement and passive engagement. *Active* engagement is marked by manipulating some parts of learning materials such as highlighting or underlining text; and *passive* engagement entails receiving information only, for example by listening to a lecture. Recent research, both in K-12 school instruction, higher education, and medical education, has demonstrated that instruction based on the cognitive engagement ICAP hierarchy was able to predict learning outcomes [27–29]. Building upon the effectiveness of ICAP interactive and constructive instructional modes, the present study sought to evaluate its impact on childbirth education effectiveness. Particularly, since self-efficacy is shown to be strongly related to a person's performance and behavior [30, 31], this study explores how instruction based on the ICAP framework might strengthen women's self-efficacy toward upright positions and mobility during labor.

Methods

Research design and participants

The study employed a quasi-experimental design, with an intervention and a control group, to examine the impact of the instructional approach to empower pregnant women to use upright positions and mobility during labor (Fig. 1). To reduce the diffusion between the intervention and control groups, and to prevent any resentful demoralization of the controls, we employed an alternating recruitment strategy which is often used in educational interventions [32, 33]. Each time a control group was filled (comprising up to 12 women), the subsequent recruitment phase would focus on populating the intervention group, and vice versa.

The inclusion criteria included nulliparous and low-risk women who participated in 8 childbirth classes and agreed to participate in the study. We referred to low-risk pregnancy as a singleton gestation absent of factors predisposing the mother, fetus, or newborn to adverse outcomes or complicated birth [34, 35]. Exclusion criteria included women who did not attend the four classes or had a high-risk pregnancy. The recruitment took place from January 2021 to March 2022. Each class was attended by 6–12 women and was funded by the local health maintenance organization. Informed consent was received from all the participants who were then assigned to one of the study's groups. The setting was a maternity care center in an ultra-orthodox area of a city in Israel. The ultra-orthodox community comprises about 13% of the total Israeli population [36] and is characterized by strict adherence to the Jewish religion [37]. We chose to study this community due to its high demand for in-person childbirth education programs and for its particular characteristics that are suited for this study, as follows: Firstly, this community is closed and conservative with minimal exposure to online/electronic media (i.e., television, newspapers/magazines, the Internet, and smartphones). Thus, compared to non-orthodox women who are exposed to various kinds of media and online information, for ultra-orthodox women, childbirth classes are the main opportunity to get prepared for labor. Secondly, the ultra-orthodox family identity is grounded on pregnancy and birth, thus the fertility rate is high with 6.6 children on average per woman; three times the OECD average of 2.1 [36, 38]. Lastly, a growing number of ultra-orthodox women are studying and working [36, 39], which poses the childbirth educational intervention as an opportunity to empower these women even further.

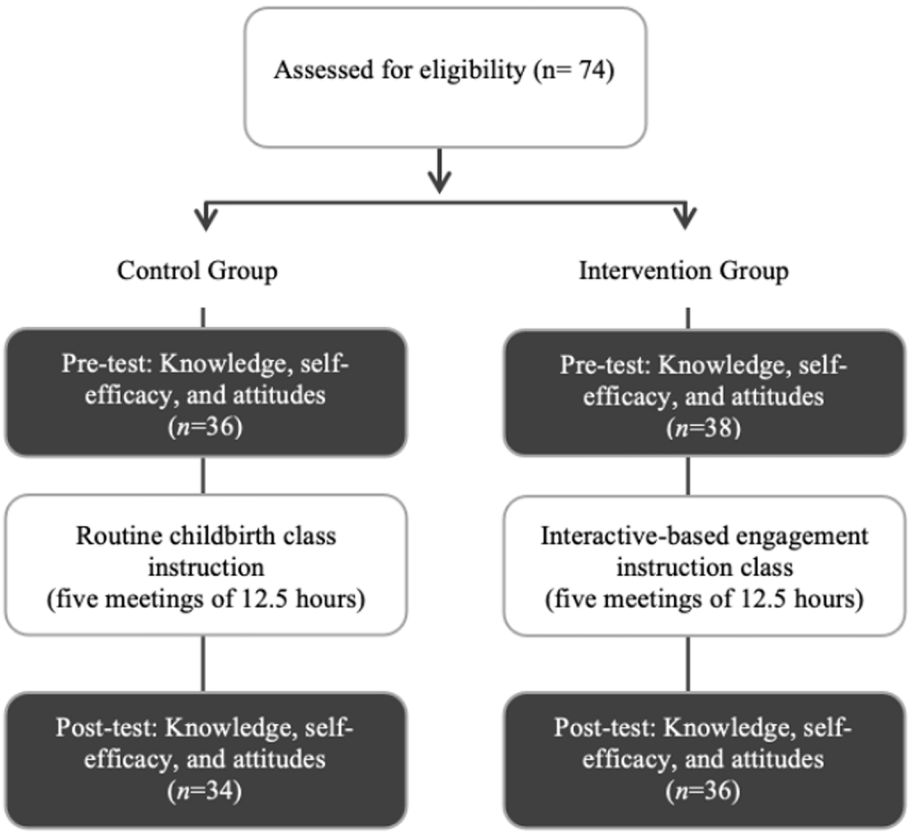

Fig. 1 Flow chart of the study design and procedure

The university's ethics committee approved the study (#0001776–2).

Research procedure

All participants were assigned either to the control group that received the routine childbirth class instruction or to the intervention group that received interactive-based engagement instruction (Fig. 1). Both groups received the same content via a childbirth class that consisted of five meetings (a total of 12.5 h) given by a nurse midwife. The course curriculum was constructed based on antenatal education standards [40, 41].

On recruitment, women in the control group received a routine instructional approach which was based on lectures, videos, discussions, and practice/rehearsals (Table 1). This routine instructional approach according to ICAP was predominantly based on a passive engagement approach. The intervention group received the same content as the control group, however, the content regarding upright positions and mobility was instructed using the ICAP constructive-interactive engagement modes (Table 1). Particularly, during the third meeting, participants in the intervention group learned with two activities based on the *discovery-learning approach* [42]. In discovery learning instead of being told or provided with the information, learners work collaboratively in pairs to construct the information by themselves via exploration and inquiry. Thus, during the first activity, to underline the importance of upright positions, women were asked to measure and compare the external transverse diameter of the pelvic outlet (the transverse diameter between the ischial tuberosities) across various labor positions [43]. Learning with this activity helped women identify which position expands the most pelvic diameters to facilitate labor. During the second activity, to represent the importance of mobility during labor, women were introduced to an elbow shape plumbing pipe and a balloon with water. The women were then asked to find the quickest and easiest way to pass the balloon through the narrow pipe. Eventually, the women noticed that the gravity and mobilization of the pipe supported the best balloon transfer. Finally, during the fourth meeting (Table 1), the women in the intervention group participated in a *role-playing debate* during which they had to defend and justify their opinions on mobility and upright positions during labor. As debating by providing arguments and contra-arguments clarifies and refines ideas, it was assumed that this learning activity would foster self-efficacy.

Both the control and intervention groups completed identical questionnaires at the beginning of the childbirth course (pre-test) and again at the end of the fifth meeting (post-test). The questionnaires included one concerning sociodemographic characteristics and three others concerning respectfully self-efficacy, attitudes, and knowledge of upright positions and mobility during labor.

Data collection instruments

The Childbirth Self-Efficacy Inventory (CBSEI)

This was developed by Lowe [44, 45] according to Bandura [46] self-efficacy theory, to evaluate the following two domains in relation to labor: (1) *outcome expectancy* which is defined as a belief that a given behavior will enhance coping with labor; and (2) *self-efficacy*

Table 1 Main topics covered by the childbirth course with two different instructional approaches toward labor positions and mobility

Meeting #	Topics covered	Instructional approach	
		Control group	Intervention group
1	• Anatomy and physiology of labor • Preparation for labor (e.g., perineal massage) • Healthy lifestyle	Lecture	
2	• The three stages of labor; how to know when you are in labor • What are the options concerning medications, assistant birth, and other interventions	Lecture & Video	
	• Comfort techniques to relieve the pain such as hydrotherapy, breathing, guided imagery, relaxation, and massage	Practicing the comfort techniques	
3	• Three principles for comfort labor: balance, relaxation, and mobility	Lecture & Videos	
	• Labor positions and mobility across labor stages	Practicing different labor positions	**Discovery-based instruction**
4	• What will happen in the hospital; a virtual visit to the delivery room	Video & Discussion	
	• Guidance to make informed decisions about labor positions and mobility; anesthesia; assistant birth; and common medical procedures	Lecture	**Role-play based learning**
5	• Breastfeeding and infant care • Early postpartum period • Personal and relationship issues	Lecture & Video	

expectancy which is defined as confidence to perform specific behaviors during labor. Following permission that was granted by the author [44], the CBSEI was translated and adapted for this study to include 13 items concerning behaviors such as relaxation, breathing exercises, and support from a companion, and 5 items concerning upright positions and mobility (e.g., "sit on the birth ball and rock your pelvis side to side"). The questionnaire was translated from English to Hebrew by a health professional using a forward-and-backward translation approach. For the outcome expectancy domain, the participants were asked to rank on a 1–10 Likert scale 18 listed behaviors for how much they can help to cope with labor. For the self-efficacy expectancy domain, the participants were asked to rank the level of their confidence in applying these same 18 behaviors during labor. The overall range of rankings for each domain ranges between 18 and 180. Cronbach's alpha yielded a good internal consistency score of 0.89 for the outcome expectation domain and 0.93 for the self-efficacy expectancy domain, similar to previous reports [44, 47].

Attitudes towards upright positions and mobility during labor

This questionnaire was constructed according to Ajzen [30], which defines attitudes as the positive or negative evaluation of certain behavior. Face validity was performed by eleven expert judges (eight midwives and three faculty members). The respondents were requested to indicate their attitudes to each of 6 items on a seven-point Osgood differential semantic scale, where 1 represents negative attitudes and 7 represents positive attitudes. A sample item: "pelvic movement or rocking while dancing" with possible responses ranging from "slow down labor" to "promote progression of labor". Alpha Cronbach for the entire questionnaire was 0.67, which can be considered acceptable [48].

Knowledge questionnaire about labor positions and mobility

A knowledge questionnaire was developed by the authors to assess the participants' knowledge of upright positions and mobility during labor. The questionnaire includes 10 multiple-choice items which were developed based on the Cochrane and systematic reviews evidence-based recommendations for women's positions and mobility during labor [1, 3, 49]. Face validity was performed by eleven expert judges (eight midwives and three faculty members). An example item asks, "What is the best practice regarding labor dance during the first stage of labor?" The possible choices are: "Labor dancing is efficient mostly between the contractions"; "Labor dancing is efficient mostly during the contractions"; "Labor dancing is efficient between and during the contractions"; or "Labor dancing is not advisable". Another example is: "What is true about the kneeling position?" with possible answers as follows: "It might increase the risk for cesarean delivery"; "The contractions might be more painful"; "There are fewer assisted or instrumental deliveries"; or "The length of the first labor stage is similar to horizontal positions". Analysis of the questionnaire using Cronbach alpha yielded a good internal consistency score of 0.539, an acceptable for knowledge evaluation tools [50].

Data analysis

The questionnaires' pre- and post-scores were analyzed using descriptive statistics (mean and standard deviation [SD]). Interaction effects between the control and intervention groups were evaluated using two-way repeated measures analysis of variances (ANOVAs). Independent sample t-tests were carried out to detect significant differences between the two groups. Finally, to evaluate associations between the participants' characteristics, knowledge, attitudes, and self-efficacy of upright positions and mobility during labor, we used a bivariate parametric correlation analysis.

Data was analyzed using SPSS (version 27, IBM Corporation, Armonk, New York).

Results

A total of 74 nulliparous women were enrolled in the study. Of these, four women were unable to attend the childbirth classes due to pregnancy-related complications (preterm labor or bed rest). Consequently, 34 nulliparous women were assigned to the intervention group and 36 to the control group. A prior statistical power analysis was performed for sample-size estimation using G*Power software (version 3.1). With an alpha of 0.05 to detect a medium-sized effect ($f=0.25$) and a power ($1-\beta$) set on 0.80, a sample of approximately 68 participants was calculated as being satisfactory to perform repeated measures ANOVA comparisons between the two groups. Thus, our final sample size of 70 is adequate.

At the recruitment, all participants were at an advanced stage of pregnancy, on average 32 ± 3.4 weeks of gestational. Overall, the majority of women were working (96%), and the most common occupation was teaching (49%). Table 2 describes the participants' characteristics across the two study groups. To account for the possible difference in preliminary knowledge or experience between the two study groups, all participants were asked whether they ever assisted a friend during labor. The majority responded that they were never present or assisted labor, 94% from the intervention group and 100% from the control, with no significant difference ($\chi^2=2.180$, $p=0.14$). In addition, the women were asked whether they had ever heard about mobility and upright

Table 2 Comparisons between the intervention and control groups at recruitment ($n=70$) on socio-demographic characteristics

Variables at recruitment	*Control (n = 36)*	*Intervention (n = 34)*	*Statistics*[a]
Current age (years)	22.8 ± 1.8	24.5 ± 5.2	t = -2.41, p < 0.05
Gestational age (weeks)	31.8 ± 3.5	32.3 ± 3.4	t = -0.58, p = 0.56
Family income			χ^2 = 0.58, p = 0.75
Average and above	8 (22)	9 (27)	
Average	11 (31)	12 (35)	
Less than average	17 (47)	13 (38)	
Education level			χ^2 = 9.24, p<0.05
Academic degree	3 (8)	11 (32)	
Vocational diploma	27 (75)	14 (41)	
High school diploma	6 (17)	9 (27)	
Education (years)	13.7 ± 1.1	13.9 ± 1.3	t = -0.56, p = 0.57
Employment			χ^2 = 0.42, p = 0.51
Employee	35 (97)	32 (94)	
Unemployed	1 (3)	2 (6)	
Occupation			χ^2 = 6.09, p = 0.23
Teaching	17 (47)	17 (50)	
Administration /Sales	6 (17)	6 (18)	
Computer science	3 (8)	2 (6)	
Accountancy	5 (14)	2 (6)	
Health	0	4 (11)	
Other	4 (11)	2 (6)	
Missing	1 (3)	1 (3)	

Numbers represent *n* (%) or Mean ± SD

[a] Based on chi-square test or independent sample *t*-test where appropriate

positions during labor. Most women responded that they had heard previously about mobility and upright positions during labor, with no significant difference between intervention and control groups (94% vs. 92%, respectfully, $\chi^2 = 0.158$, $p = 0.69$).

In accordance with previous studies [44, 51], our results showed that overall, women rated their CBSEI outcome expectations significantly higher than their CBSEI self-efficacy expectations, both for the pre-post tests (139 ± 18 vs. 120 ± 25, $t = 7.54$, $p < 0.001$, respectively), as well as for the post-test (159 ± 18 vs. 147 ± 22, $t = 5.82$, $p < 0.001$, respectively).

When looking into the differences between the study groups, the pre-test scores of CBSEI self-efficacy expectations, CBSEI outcome expectations, knowledge, and attitudes were comparable (t = -1.07, $p = 0.25$; t = -0.85, $p = 0.39$; t = -0.15, $p = 0.88$; $t = 1.62$, $p = 0.11$, respectively; Table 3). Following childbirth education, both the intervention and control groups improved for all the measures (self-efficacy, attitudes, and knowledge; Table 3).

Table 3 Intervention and control within-group comparison ($n=70$)

		Control group (n = 36)			*Intervention group (n = 34)*		
		Pre-test	*Post-test*	*paired t test*	*Pre-test*	*Post-test*	*paired t test*
CBSEI	Self-efficacy expectations	117 ± 23	139 ± 22	t = -6.03***	122 ± 28	155 ± 21	t = -7.95***
	Outcome expectations	137 ± 21	151 ± 18	t = -4.47***	141 ± 32	167 ± 13	t = -10.22***
Knowledge		56 ± 18	75 ± 14	t = -7.19***	56 ± 22	89 ± 13	t = -7.48***
Attitudes		4.6 ± 0.75	5.3 ± 0.79	t = -5.06***	4.3 ± 0.94	6.4 ± 0.54	t = -12.48***

Data are presented in Mean ± SD

*** $p < 0.001$

The analysis revealed that the participants in the intervention group obtained significantly higher self-efficacy, attitudes, and knowledge post-test scores than those in the control group (Fig. 2). A two-way repeated measures ANOVA with a Greenhouse–Geisser correction confirmed significant interactions between the study groups in CBSEI self-efficacy change ($F(1, 68) = 4.835$, $p < 0.05$), with partial $\eta_p^2 = 0.08$ (medium effect size); CBSEI outcome expectations change ($F(1, 68) = 8.232$, $p < 0.01$), with partial $\eta_p^2 = 0.11$ (medium-large effect size); Attitudes change ($F(1, 68) = 36.983$, $p < 0.001$), with partial $\eta_p^2 = 0.35$ (large effect size); Knowledge change ($F(1, 68) = 6.566$, $p < 0.05$), with partial $\eta_p^2 = 0.09$ (medium effect size).

Since CBSEI self-efficacy has been shown to be strongly associated with labor outcomes, we evaluated how the participants' attitudes and knowledge of upright positions and mobility during labor, and their sociodemographic characteristics impacted CBSEI self-efficacy. The analysis showed that CBSEI self-efficacy was significantly associated with the participants' pre-test knowledge level of upright positions and mobility (Table 4; $r = 0.406$, $p < 0.001$); as well as with their pre-test attitudes toward upright positions and mobility (Table 4; $r = 0.44$,

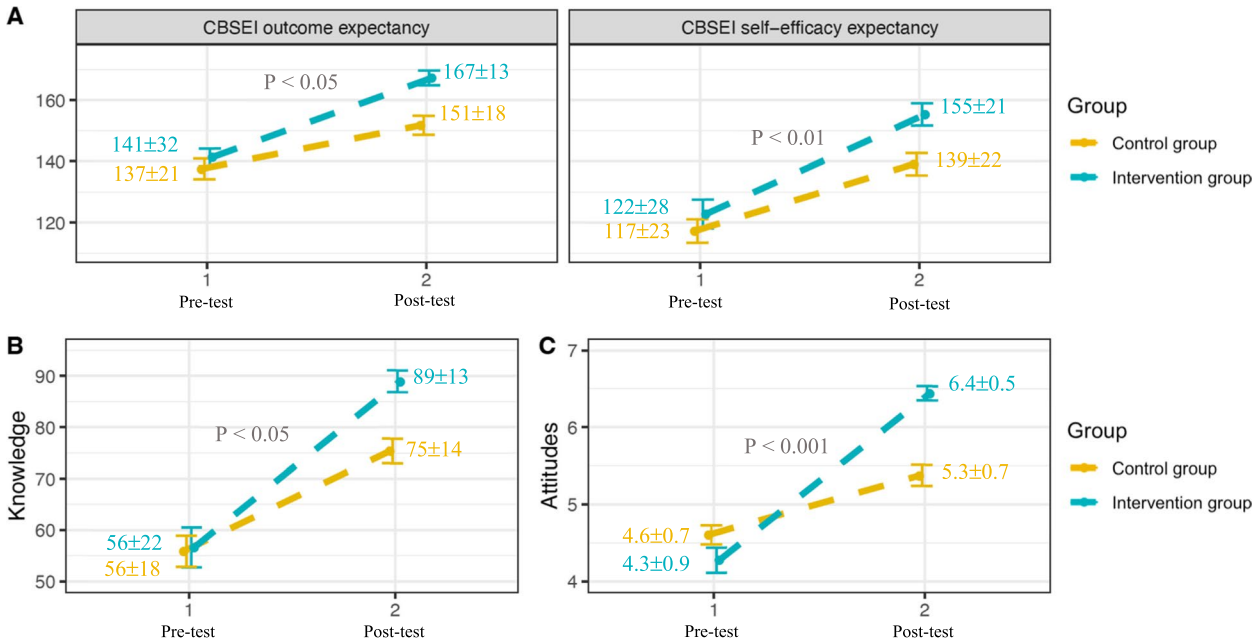

Fig. 2 Graphical representation of the interaction effect between the study groups and changes in CBSEI outcome expectancy and CBSEI self-efficacy expectancy (**A**), knowledge (**B**) and attitudes (**C**) of upright positions and mobility during labor

Table 4 Bivariate intercorrelations between the pre-test CBSEI self-efficacy, attitudes and knowledge scores of upright positions and mobility during labor, and the participants' sociodemographic characteristics ($n = 70$)

Variable		1	2	3	4	5	6	7
CBSEI	1. Self-efficacy expectations	–						
	2. Outcome expectations	.547***	–					
3. Knowledge		.406***	.281*	–				
4. Attitudes		.334**	.189	.308**	–			
5. Age		-.102	.052	.063	0.005	–		
6. Education (years)		.068	-.013	-.023	.033	.107	–	
7. Family income		.132	.052	-.113	.003	.197	-.092	–

Data represents the Pearson r or Spearman r_s

* $p < 0.05$

** $p < 0.01$

*** $p < 0.001$

$p < 0.001$). Similarly, also at the post-test, CBSEI self-efficacy was associated with knowledge ($r = 0.349$, $p < 0.001$) and attitudes ($r = 0.397$, $p < 0.001$).

Discussion

Childbirth education is an important intervention that may affect the labor and birth experience. Following the recent calls to provide evidence-based childbirth education practices [52, 53], this study focused on educational pedagogy to promote the use of upright positions and mobility during labor. To the best of our knowledge, our study is the first to show the significant positive impact of theory-based educational pedagogy in childbirth education. The current study demonstrates how inclusion of active learning activities to engage minds while participating in childbirth classes can support women to improve their knowledge, attitudes, and self-efficacy to be mobile and adopt comfortable positions of their choice, including upright positions. As a body of knowledge has shown that the level of perceived self-efficacy is strongly related to an individual's intention to perform a behavior [30, 31, 54], strengthened self-efficacy to be mobile and do take upright positions was our most important finding.

This study conceptualizes active learning experiences via the ICAP framework for cognitive engagement. Active learning is often described in terms of Kolb's experiential learning cycle to postulate that concrete experiences are essential to provide a basis for learning [55]. In contrast to the common perception, concrete experiences, as suggested by the ICAP cognitive engagement theory, do not require hands-on participation but may be derived from minds-on engaging experiences [26, 27]. The cognitive engagement theory predicts that the more learners are cognitively engaged with their instructional experiences, the better their learning outcomes will be [56]. Consistent with previous studies [57], this study's findings demonstrated that learning with discovery-based and role-play activities followed by a collaborative dialogue, shifted women's cognitive engagement from passive to constructive and interactive modes. This, in turn, fostered women's knowledge about upright labor positions and mobility significantly higher than that of the control condition where women learned with the passive cognitive engagement mode. This advantage of the ICAP framework for cognitive engagement to foster childbirth education has notable financial and accessibility benefits, suggesting that even without expensive educational technology or the need to change the curriculum, learning can be maximized.

Learning with the ICAP constructive and interactive cognitive engagement modes, as the current study's findings show, fostered not only knowledge levels, but also induced more positive attitudes and self-efficacy expectations toward the use of upright positions and mobility during labor, compared to the control group. Self-efficacy is a dynamic cognitive process in which the individual evaluates her/his capabilities to cope with different realities, influence events, and execute required behaviors [31, 58]. The Theory of Planned Behavior (TPB) suggests that both self-efficacy and attitudes toward the behavior strongly influence an individual's behavioral intentions [30, 54]. From this, we may deduce that childbirth preparation which includes activities to induce cognitive engagement, might aspire women to have a stronger inclination to be more proactive consumers, willing to influence their labor process.

The findings demonstrate an overall significant association between knowledge, attitudes and self-efficacy expectations. Namely, higher knowledge levels and more positive attitudes were related to the development of stronger self-efficacy toward the ability to use upright positions and mobility during labor. This finding is in alignment with the Social Cognitive Theory which suggests that self-efficacy expectancies might be gained from personal experience with a situation or event, vicarious experience, or information about the experience [59]. Obviously, the majority of nulliparous women do not have previous personal childbirth experience to develop self-efficacy and therefore turn to childbirth preparation as the main source of their self-efficacy. This is true especially for the ultra-orthodox Jewish women participants in this study who do not have access to alternative sources of information such as online or television media sources.

Strengths and limitations

Despite the advantages of our quasi-experimental study to compare the effectiveness of instructional approaches, a few limitations should be taken into consideration. To minimize diffusion between the intervention and control groups and to avoid any feelings of resentful demoralization among participants, we chose not to employ random assignment. This decision, however, could potentially introduce bias into our findings. To counteract this and mitigate potential bias, we employed a sequential recruitment strategy. Specifically, we filled each control group class (comprising up to 12 women) before recruiting for the intervention group, alternating in this manner throughout the recruitment process. Additionally, we conducted pretest evaluations of knowledge, attitudes, and self-efficacy to ensure that there were no significant initial differences between the groups. The study was conducted among a specific and homogenous community of ultra-orthodox Jewish women. Larger-scale

studies that involve a more representative sample of the diverse public is recommended. In addition, the current study evaluated only self-efficacy and attitudes toward upright positions, further studies should involve an assessment of women's actual labor experience and their medical records to account for delivery outcomes. Finally, we evaluated only immediate knowledge, further studies should incorporate also a delayed post-test to assess the long-term effect. Therefore, these limitations warrant further studies to be conducted to validate the findings.

Conclusion

There are two main practical implications to the study's findings. First, childbirth self-efficacy can be modified by antenatal education. This makes childbirth education to be a crucial tool in supporting women-centered care. Second, childbirth education processes can be scaled up and maximized when constructive and interactive activities of cognitive engagement are involved.

This study evaluated in-person education; however, the findings can be relevant to online childbirth education as well. Since both in-person and online childbirth classes are predominantly based on one-way lectures, which according to the ICAP theoretical framework is a passive mode of engagement, this encourages minimal learning outcomes. We propose that this passive instructional approach can be shifted from passive to higher cognitive engagement mode by encouraging learners to generate new knowledge beyond what is provided (for example, drawing concept maps, taking notes in one's own words); and by supporting debate or collaborative dialogue with other learners.

Abbreviations

ICAP framework	Interactive, Constructive, Active, Passive framework
CBSEI	The Childbirth Self-Efficacy Inventory

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Authors' contribution

The first author, Hanna Borer, is a midwife and a student in the master's nursing program at Tel-Aviv University who collected, and acquainted the data, provided insight into the data analysis, and drafted the manuscript. The second author, Ilana Dubovi, is RN and Assistant Professor at Tel-Aviv University who facilitated the collection of the data, analyzed, and interpreted the data and its interpretation, and conceptualized and drafted the manuscript. All authors read and provided critical revisions to the manuscript.

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None.

Availability of data and materials

Data are available upon request to the corresponding author.

Declarations

Ethics approval and consent to participate

Tel-Aviv University ethics committee approved the study and its protocol (#0001776–2). Written informed consent was obtained from all women before the study, and all responses were kept anonymous and confidential. All methods in the study were performed following all ethical guidelines and regulations relating to the protection of research participants.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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