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Factors Associated with the Initiation of Breastfeeding in Asthmatic Families: The Attitude–Social Influence–Self-Efficacy Model

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ABSTRACT

Background: **Exclusive breastfeeding for the first 6 months postpartum is promoted internationally as the preferred method of feeding infants. Infants of parents with a history of asthma in particular could benefit from a longer period (6 months) of breastfeeding, because this may reduce the chance of developing an allergic disease. The aim of this study was to identify psychosocial behavioral determinants of the intended duration and actual initiation of breastfeeding in families with a predisposition to asthma.**

Methods: **This prospective study was part of a randomized trial in which breastfeeding for 6 months was promoted. The 89 women participating completed a breastfeeding questionnaire based on the Attitude–Social Influence–Self-Efficacy model in the second trimester of their pregnancy. This served as the baseline measurement.**

Results: **Multiple linear and logistic regression analyses showed that attitudinal beliefs were significantly associated with the intended duration to breastfeed ($p = 0.01$) and the intention was the strongest predictor for the actual initiation of breastfeeding (OR: 8.2; 95% CI: 1.5 to 44.3).**

Conclusion: **Breastfeeding promotion needs to focus on the health advantages and other advantages of breastfeeding for 6 months, especially in high-risk groups, in order to increase the intention to breastfeed, which appeared to be a strong predictor for actual behavior.**

INTRODUCTION

In The Netherlands, the prevalence of childhood asthma varies from 3% to 5% and is the most common chronic childhood disease seen in general practice.[1,2] Because the etiology of asthma is multifactorial, with genetic predisposition, immunologic profile, and allergic sensitization playing major roles,[3] it is biologically plausible that breastfeeding may offer some protection against the occurrence of asthma by decreasing allergic sensitization and/or modulating the infant's immune system.[4] Several review and birth cohort studies, evaluating the association between breastfeeding and asthma and/or other respiratory illnesses, have shown consistently protective effects, particularly with exclusive breastfeeding for at least 6 months after birth.[5,6] Some studies showed that the protective effect of exclusive breastfeeding is even stronger if a family history of allergic disease is present.[7,8] Nevertheless, some con-

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troversy about the protective effect of breastfeeding against asthma remains, because a few studies found no association or even the suggestion that breastfeeding is associated with an increased risk for childhood asthma in the presence of maternal asthma.[9,10] Considering that the World Health Organization (WHO) recommends exclusive breastfeeding for the first 6 months postpartum, as breastfeeding offers many additional health benefits,[11,12] and the assumed protective effect in predisposed children, it seems important that parents with a history of asthma breastfeed exclusively for the first 6 months. Nevertheless, the average breastfeeding duration in the Netherlands remains far below the level of the recommended 6 months. The latest figures show that only 15% of Dutch women breastfeed their child exclusively at the age of 6 months.[13]

Although various studies have reported on demographic and psychosocial factors influencing breastfeeding behavior (e.g., age, education, ethnicity, knowledge, parity, motivation, and intention), much of contemporary breastfeeding research lacks a theoretic framework as foundation.[14,15]

In the past 20 years, the Theory of Reasoned Action (TRA)[16–18] and its revised version, the Theory of Planned Behavior (TPB),[19–27] were the most frequently applied social cognition models in breastfeeding studies. In these studies, attitudinal beliefs and perceived behavioral control often were found to be the significant predictors of feeding intentions and behavior and the explained variance of intention ranged from 23% to 60%. Furthermore, the self-efficacy theory[28] has received attention in several breastfeeding studies. Maternal breastfeeding confidence appeared to be a powerful predictor for both breastfeeding initiation and duration.[28–31] A potentially informative model used to describe the determinants of breastfeeding behavior is the social-psychological Attitude–Social Influence–Self-Efficacy model (ASE model).[32,33] This model has been successfully applied in several studies to explain various aspects of preventive health behavior, such as fruit and vegetable consumption,[34] breast cancer screening,[35] and smoking cessation,[36] and recently also in predicting breastfeeding initiation.[37] The ASE model has been influenced by several social cognition models and concepts, such as the TRA[16] and TPB,[19] concepts of social pressure[38] and Bandura's Social Learning Theory (SLT) and his constructs of modeling and self-efficacy[39] (Fig. 1). The ASE model states, just as does the TRA[18,19] and its successor the TPB,[23] that behavior is a function of a person's intention. In the ASE model it is assumed that three types of proximal cognitive variables primarily determine behavioral intention: attitudinal beliefs (and emotions), social influences (social norms, social support and social pressure, and modeling), and self-

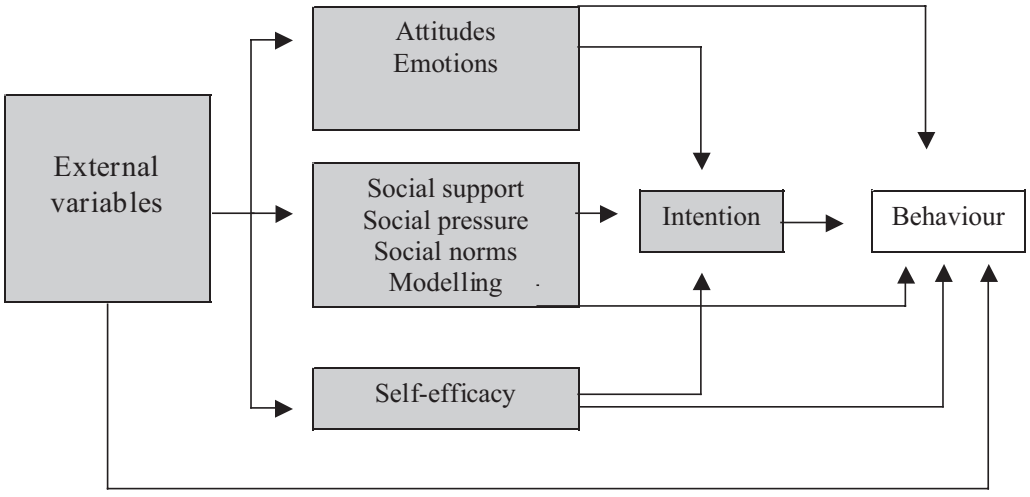

FIG. 1. The ASE model. (From: De Vries H, Mudde AN. Predicting stage transitions for smoking cessation applying the Attitude-Social influence-Efficacy model. *Psychol Health* 1998;13:369–385.)

efficacy expectations. The model also postulates that intention predicts subsequent behavior. Furthermore, the distal or external variables, such as behavioral factors (e.g., previous experience and knowledge) and sociodemographic variables (e.g., age, educational level) are assumed to be moderated by the three proximal factors (attitudinal beliefs, social influences, and self-efficacy). Nevertheless, it has been acknowledged that behaviors that have become habitual or were experienced before (past behavior) may have a direct effect on future behavior as well.[36,40] The ASE model and TPB partly overlap with respect to the concepts that are integrated, but differ in the way these concepts are measured; especially perceived behavioral control (PBC) and self-efficacy expectations.[33] The PBC is a multidimensional construct and includes both perceptions of difficulty and perceptions of control over the behavior. Nevertheless, Ajzen[41] argued that the PBC and self-efficacy constructs are "quite similar." The ASE model uses the construct of self-efficacy instead of the PBC since in many studies it appeared that measures tapping solely perceived difficulty (self-efficacy) tend to be more predictive with both intentions and behavior than measures that tap both perceived controllability and difficulty.[42,43]

The purpose of this article is to examine the associations between both the variables of the ASE model and the intended duration and actual initiation of breastfeeding in women who expect a child at high risk of developing an allergic disease. The results of this study could be used to inform existing breastfeeding promotion programs, which subsequently can be tested for improvement in breastfeeding rates.

METHODS

Participants and study design

The study was started in 2002 in southeastern Netherlands. Families were eligible when: (a) the mothers were less than 7 months pregnant; and (b) at least one first-degree relative (mother, biological father, or sibling) had asthma that had been diagnosed by a doctor. Families were recruited by means of advertisements in local papers and posters in the practices of participating midwives. A family was excluded in case of intrauterine or neonatal death, serious birth defects (illness or malformation), breast surgery that made mothers unable to breastfeed, major language barriers, or moving outside the Netherlands.

Cluster randomization at the family practice level was carried out because the intervention could not be performed blindly and to avoid communication between the two study groups. A family practice was assigned using a randomization list prepared by the statistical advisor when the first potential participant of a particular practice received information about the study. It was not possible to randomize after consent of the participant because the study information differed for both groups. Once the family practice had been allocated randomly as either a control or intervention practice, every family recruited afterward that also attended a particular practice was automatically assigned to the same group. This cluster-randomized design resulted in 89 participating families who attended 84 different practices. The analyses were based at the individual level rather than the cluster level because this is an almost one-to-one match.

The families in the intervention group of the trial were visited twice prenatally and once postnatally. During the visits the trained research assistant provided basic information about breastfeeding and asthma and other allergies (including a leaflet based on experiences of the target group and the social-psychological ASE model). The nutritional message was to breastfeed exclusively for 6 months and postpone solid foods until the child had reached the age of 6 months. The families in the control group received the usual care according to the guidelines of the Dutch College of General Practitioners,[44] in which breastfeeding is recommended for 6 months to all babies in the Netherlands.

The ASE breastfeeding questionnaires were mailed to the participants (control and intervention group) and were completed early in pregnancy (between the third and sixth month) prior to exposure to the study intervention, and were collected during the first home visit, which took place before the seventh month of pregnancy. Written informed consent was obtained

from all participants. The Medical Ethical Committee of Maastricht University and the Maastricht University Hospital approved the study.

Data collection

The ASE questionnaire on breastfeeding behavior[45] was developed on the basis of a literature search and two previous studies. The literature search, using Psychlit and Medline, identified additional important behavioral, psychosocial, and external determinants regarding the intention to breastfeed. The first study identified salient beliefs regarding breastfeeding among asthmatic families through seven focus group interviews.[45] The most important influencing factors regarding initiation and continuation of breastfeeding were health advantages for the baby, bonding, social support, modeling, knowledge about all the aspects of breastfeeding, and breastfeeding confidence.[45] This needs assessment gave meaning to the ASE concepts and external determinants. As a result they were translated into measurable variables. In the second study, the questionnaire was piloted for readability and comprehensibility among 150 Dutch-speaking women who had a history of asthma and were pregnant or had recently given birth. The items needed only minimum adjustment as a result of the received comments. Exploratory factor analysis was conducted to summarize patterns of correlations among items and determine the plausible underlying structures of the questionnaire. The Kaiser-Meyer-Olkin measure of sampling adequacy exceeded the recommended 0.60 and a factor loading of 0.32 was required for an item to be retained for further analysis.[46] More detailed information about the factor analysis is described elsewhere.[47] The internal consistency estimates of the various concepts, using Cronbach alpha, ranged from 0.79 to 0.89.[47] The prenatal breastfeeding questionnaire assessed the following variables.

Definitions of the predictor variables

ASE attitudinal beliefs. A bipolar five-point scale was used to assess the positive and negative attitudinal beliefs (29 items) about breastfeeding behavior with end points of *totally agree* (+2) and *totally disagree* (−2). The positive attitudinal beliefs referred to what women might expect to gain by breastfeeding exclusively for 6 months, such as, "Breastfeeding for 6 months will protect my child from developing eczema." The negative beliefs contained statements about negative consequences of breastfeeding for 6 months. An example is "Breastfeeding my child for 6 months requires a lot of effort" ($\alpha = 0.87$).

Positive and negative emotions (10 items) were measured on five-point scales and contained the end points *never* (1) and *very often* (5). Women reported to what extent they anticipated positive or negative emotions regarding succeeding or failing to breastfeed exclusively for 6 months, for example, "If I succeeded in breastfeeding for 6 months I would feel very proud" ($\alpha = 0.91$). A mean score was calculated for the attitudinal beliefs and emotions.

ASE social influences. Social norms were measured on bipolar five-point scores by one general item and 11 subquestions assessing the normative beliefs of significant other people regarding breastfeeding ($\alpha = 0.86$). An example is, "My mother thinks I should really breastfeed my child (+2) or should really not breastfeed my child" (−2). A mean score was calculated for each participant.

The extent of social support that women expected if they intended to breastfeed was measured on bipolar five-point scales (five questions), with endpoints of *totally agree* (+2) and *totally disagree* (−2). An example is, "If I breastfeed my child, I can expect to receive enough practical help" ($\alpha = 0.71$).

Social pressure was measured by one general item and four subquestions on a five-point scale with end points *never* (5) and *very often* (1). An example is, "Has anyone ever put pressure on you to bottle feed your child?" ($\alpha = 0.73$). A mean score was calculated for both constructs.

Modeling was assessed by six questions, forming one modeling index score (*yes/no*; 0 to 6). This measured whether respondents knew other women who had breastfed their child, such as their mother, sister, or a colleague.

ASE self-efficacy expectations

Self-efficacy expectations were assessed by means of 16 items in which respondents were asked to evaluate how certain they were to breast-

feed for 6 months during different situations (e.g., when their child is sick, during holidays, when the mother is not feeling well), on bipolar five-point likelihood scales with end points of *very certain* (+2) and *very uncertain* (−2) ($\alpha = 0.92$). A mean score was calculated for the 16 items.

ASE Intention

The item "Do you intend to breastfeed your child?" measured intention on a dichotomous scale (*yes/no*).

Breastfeeding knowledge

Breastfeeding knowledge was measured by 20 multiple choice questions (*right/wrong/don't know*). Item content included techniques for nursing a newborn, nutrition during lactation, milk supply, sore nipples, the law concerning breastfeeding during work time, and safe milk storage. Possible scores on the test ranged from 0 to 20, with a higher score reflecting greater knowledge about breastfeeding.

Previous breastfeeding experience

Two items were used to measure the women's previous breastfeeding experience, "*Did you ever breastfeed in the past*?" and "*How many weeks did you breastfeed your previous child*?" The two questions resulted in three categories: (a) no, primiparous; (b) multiparous (0 to 5 weeks breastfeeding experience); and (c) multiparous (>6 weeks breastfeeding experience).

Sociodemographic variables

Information was obtained from the questionnaire about sociodemographic variables, such as maternal age, maternal educational level, maternal intended future employment status, duration of maternity leave, maternal smoking status, if the choice for breastfeeding or formula was made before pregnancy, and asthma level. Information about the following biomedical factors was gathered during a home visit 3 months postpartum: method of delivery, infant gender, infant birth weight, and place of delivery.

Definition of the outcome variables

Intended duration. Intended duration of breastfeeding was measured by asking the women to state the number of weeks they intended to exclusively breastfeed their child (number of weeks/do not know yet). Women who responded with "I do not know yet" were considered to have zero weeks of intention.

Initiation of breastfeeding. The initiation of breastfeeding was measured by a self-report diary card that had been used in a previous study.[48] The breastfeeding questionnaire, which was filled in at 3 months postpartum, contained control questions about breastfeeding behavior. The diary cards were matched with the control questions in order to provide reliable and valid outcomes.

Statistical analyses

Values of Cronbach alpha were computed to evaluate the internal consistency of the attitudinal beliefs, social influences, and self-efficacy scores. Since this study contained 89 participants it was necessary to reduce the number of variables to be entered into the final analysis. Therefore, a multiple linear regression analysis with backward elimination was carried out to determine which external determinants were significant predictors of the intended duration to breastfeed. The same procedure was carried out for the three main constructs of the ASE variables. The significant external variables (*knowledge* and *choice breastfeeding before pregnancy*) and the three ASE variables (*attitudes*, *social norm*, and *self-efficacy*) were entered in two blocks in the final model.

Multiple logistic regression analyses with backward elimination were carried out in order to determine which external and ASE variables were significant predictors of the initiation of breastfeeding. The significant external variables (*previous experience, maternal smoking, intended employment status, knowledge*, and *exposure to intervention*), the ASE variables (*attitudes, social norm*, and *self-efficacy*), and *intention to breastfeed* were entered in three blocks. The variable *intention to breastfeed* appeared to be more associated to the actual initiation than the variable *intended duration*. According to the ASE model, intention mediates the ASE variables and, therefore, could not be entered in a model with the ASE variables together, so the final regression

TABLE 1. SOCIODEMOGRAPHIC AND PSYCHOSOCIAL CHARACTERISTICS OF THE PARTICIPATING MOTHER-INFANT PAIRS BY RANDOMIZATION (n = 89), SCALES, NUMBER OF ITEMS, ITEM RANGE, MEAN (SD), AND CRONBACH ALPHAS

	Intervention (n = *44*)	*Control* (n = *45*)	*Scale*	*Number of items*	*Item range*	*Cronbach alpha*
Maternal age at birth of child	31 (4.1)	31.9 (3.6)				
Maternal education level*						
Low	1 (2.3)	4 (8.9)				
Intermediate	19 (43.3)	17 (37.8)				
High	24 (54.4)	24 (53.3)				
Return to work after maternity leave (yes)	39 (88.6)	39 (86.7)				
Duration of leave after birth (in weeks)	13.9 (4.9)	14.7 (11.3)				
Hours work after leave (per week)	19.4 (10.1)	18.1 (10.1)				
Asthma level						
Single (mother, father, or sibling)	43 (97.7)	44 (97.8)				
Double (mother and father and/or sibling)	1 (2.3)	1 (2.2)				
Smoking during pregnancy (yes)	2 (4.5)	2 (4.4)				
Breastfeeding experience						
Primiparous	23 (52.3)	14 (31.1)				
0–5 weeks experience	5 (11.4)	10 (22.2)				
>6 weeks experience	16 (36.4)	21 (46.7)				
Infant feeding decision made before pregnancy	31 (70.5)	29 (64.4)				
Medical setting of birth**						
Home	14 (31.8)	18 (40.9)				
Hospital	30 (68.2)	26 (59.1)				
Delivery**						
Vaginal	34 (77.3)	41 (93.2)				
Caesarean	10 (22.7)	3 (6.8)				
Birth weight in grams	3388 (590)	3470 (484)				
Gender of infant						
Boy†	19 (43.2)	24 (53.3)				
Girl	25 (56.8)	22 (46.7)				
Intention to initiate breastfeeding	37 (84.1)	40 (88.9)				
Intended duration to breastfeed in weeks	13.2 (15.5)	17.7 (22.9)				
Attitudes	0.42 (0.60)	0.52 (0.50)	+2 to −2[a]	29	−1.2–1.8	0.87
Emotions	2.8 (0.89)	2.9 (0.89)	1 to 5[b]	10	1.3–5	0.91
Social norms	0.68 (0.57)	0.65 (0.46)	+2 to 2[c]	12	−0.42–2	0.86
Social support	1.25 (0.54)	1.11 (0.76)	+2 to 2[d]	5	−1–2	0.71
Social pressure	4.5 (0.5)	4.7 (0.47)	1–5[e]	5	2.8–5	0.73
Modelling	2.5 (1.5)	2.7 (1.2)	0–6	6	0–6	NA
Self-efficacy	0.55 (0.71)	0.78 (0.55)	+2 to 2[f]	14	−1.6–2	0.92
Breastfeeding knowledge	13.7 (3.5)	13.9 (3.2)	0–20	20	6–20	NA

Figures are numbers with percentages or SD in brackets unless otherwise listed.

*Low = completed primary school and vocational school; intermediate = completed intermediate secondary or vocational school: high = completed the highest level of secondary or vocational school or university.

**One missing value.

†Total of 92 children because of three sets of twins.

[a]+2 = I totally agree; −2 = I totally disagree with advantages or with disadvantages of breastfeeding.

[b]1 = never; 5 = I very often experience negative or positive emotions concerning breastfeeding.

[c]+2 = I should really breastfeed my child; −2 = I should really not breastfeed my child.

[d]+2 = I totally agree; −2 = I totally disagree that I receive enough social support.

[e]5 = never; 1 = I very often felt social pressure concerning breastfeeding.

[f]+2 = I am very certain about breastfeeding for 6 months; −2 = I am very uncertain about breastfeeding for 6 months.

NA = Not applicable.

analysis was performed with the significant external variables and intention to breastfeed in order to predict breastfeeding initiation. The baseline data from the intervention and control groups were combined for predicting the intention to breastfeed for 6 months since the data were collected prior to commencement of the study intervention. The exposure to the intervention program was treated as a possible confounder in predicting the actual initiation.

Statistical significance was assumed for *p*-values ≤ 0.05. All statistical analyses were performed using SPSS version 11.0.

RESULTS

Characteristics of participants

A total of 113 families indicated interest in the study and received information. The following participants were excluded: families with no family history of asthma according to their general practitioner ($n = 2$), women who had experienced a miscarriage ($n = 2$), and women who had had breast surgery and were unable to breastfeed ($n = 3$). Seventeen families did not give consent for a variety of reasons. The characteristics of the 89 participating women are presented by randomization in Table 1.

Maternal age in both groups was around 31 years, and the educational level was rather high in both groups (around 54% could be regarded as having a high level of education). Almost 87% of the women in both groups had a positive intention to start breastfeeding and the average intended duration to breastfeed was around 13 weeks for the women in the intervention group and almost 18 weeks for the women in the control group. Furthermore, the majority of women (67%) made their choice for breastfeeding or formula before pregnancy and only a few women in this study smoked during their pregnancy (4%). Most of the women intended to return to work after their maternity leave (87%) for an average of 19 hours per week, after a mean of 14 weeks of maternity leave after birth.

Predictors of intended duration to breastfeed

According to the final multiple linear regression analysis, only the attitudinal beliefs appeared to be significantly associated with the intended duration to breastfeed ($p = 0.01$) (Table 2).

Predictors of breastfeeding initiation

The intention to breastfeed taken early in pregnancy was predictive for the actual initiation of breastfeeding. All women intending to breastfeed actually started with breastfeeding (78/89). The strongest independent predictor among the external determinants in the multivariate logistic regression was the level of breastfeeding knowledge, measured in the second trimester of pregnancy and, thus, was not influenced by the intervention program. None of the variables appeared to make a significant contribution to initiation when the three ASE factors were added. The final model with in-

Table 2. Results of Multiple Linear Regression Analyses with Intended Breastfeeding Duration in Weeks as Dependent Variable, Beta, SE (Standard Error), *t*, *p*-Values ($n = 89$)

Variable	*Beta*	*SE*	t	p
Block 1				
Breastfeeding knowledge	2.1	0.61	3.5	0.00*
Choice for breastfeeding made before pregnancy	7.7	4.3	1.8	0.08
Block 2				
Breastfeeding knowledge	0.72	0.68	1.1	0.29
Choice for breastfeeding made before pregnancy	−0.78	4.5	−0.17	0.86
Attitudes	14.6	5.4	2.7	0.01*
Social norm	0.35	3.9	0.09	0.92
Self-efficacy	3.7	4.6	0.79	0.43

$R^2 = 0.34$, $F = 8.6$; $df = 5, 83$, $p = 0.00$.
*$p \leq 0.01$.

tention as a determinant controlling for the external variables showed that intention was the significant predictor of breastfeeding initiation (OR: 8.2, 95% CI:1.5 to 44.3, $p = 0.02$) (Table 3).

DISCUSSION

Breastfeeding exclusively for 6 months is important preventive health behavior, despite the controversy about the outcomes of studies investigating the association between asthma and the protective effect of breastfeeding. From a public health point of view, even a small protective effect would be important, because asthma is a highly prevalent chronic disease in children.[3]

The objective of the present study was to examine prospectively which variables of the ASE model predict the intended duration and the actual initiation of breastfeeding in asthmatic families. The attitudinal beliefs were associated significantly with intended duration and the breastfeeding intention was, in general, predictive for actual behavior. It is difficult to compare the results of this study with other studies, because the target group here consisted of families in which a history of asthma was present a target group rarely before studied. The authors do not believe that this is a limitation of this study as it is particularly this high-risk group that might benefit from breastfeeding.[9,10] Furthermore, many studies measured solely the

Table 3. Results of Hierarchical Multiple Regression Analyses with Actual Initiation as Dependent Variable, Bs, Odds Ratios (OR), 95% Confidence Interval (95% CI) ($n = 89$)

Variable	*B*	*OR*	*95% CI*
Block 1			
Primiparous	Reference	Reference	Reference
Multiparous (0–5 weeks experience)	−1.5	0.23	0.05–1.1
Multiparous (>6 weeks experience)	0.70	2	0.33–12.4
Breastfeeding knowledge	0.26	1.3	1–1.6*
Maternal smoking	0.26	0.11	0.01–1.3
Intended working status	0.07	1.1	0.99–1.2
Exposure to intervention group	0.49	1.6	0.46–5.7
Block 2			
Primiparous	Reference	Reference	Reference
Multiparous (0–5 weeks experience)	−1.1	0.32	0.06–1.8
Multiparous (>6 weeks experience)	−0.07	0.93	0.12–7.1
Breastfeeding knowledge	0.09	1.1	0.82–1.4
Maternal smoking	−1.6	0.21	0.02–2.9
Intended working status	0.06	1.1	0.98–1.2
Exposure to intervention group	0.61	1.8	0.46–7.4
Attitudes	1.5	4.5	0.47–42.5
Social norm	0.73	2.1	0.32–13.6
Self-efficacy	0.012	1.1	0.17–7.5
Block 3			
Primiparous	Reference	Reference	Reference
Multiparous (0–5 weeks experience)	−1.3	0.28	0.05–1.5
Multiparous (>6 weeks experience)	0.29	1.3	0.19–9.4
Breastfeeding knowledge	0.18	1.2	0.93–1.5
Maternal smoking	−2.1	0.12	0.01–1.6
Intended working status	0.06	1.1	0.98–1.2
Exposure to intervention group	0.82	2.3	0.56–9.3
Intention to initiate breastfeeding	2.1	8.2	1.5–44.3*

*$p < 0.05$.

intention to breastfeed and not the intended duration of breastfeeding. Because the target group in this study might benefit from exclusive breastfeeding for a longer period (6 months), the researchers were especially interested in the determinants of long-term exclusive breastfeeding intention. Moreover, breastfeeding for at least 6 months requires other skills than breastfeeding for a few weeks, for example, managing the combination of return to work and breastfeeding.[49] In most studies, returning to work appeared to be a barrier for starting and continuing to breastfeed.[49,51] This study also showed that the intention to breastfeed, in general, was predictive for actual behavior instead of the intended duration to breastfeed. Therefore, it seems that women who have a positive intention to breastfeed do, in general, start breastfeeding but do not necessarily have plans to breastfeed for a longer period of time. Finally, in contrast to many other studies, the definition "exclusive breastfeeding," as proposed in the recommendations made by the WHO, was used. Unfortunately, many studies used the less strict definition of breastfeeding, such as "any breastfeeding." Different definitions complicate the comparison of studies; furthermore, the benefits of exclusive long-term breastfeeding are well known.[17,20,25]

As mentioned, this study showed that maternal breastfeeding attitudes appeared to be a significant predictor of the intended breastfeeding duration. This finding is consistent with those of other studies in different populations.[17,18,25] Nevertheless, most of these previous studies, which used a theoretical framework, showed that social norms and perceived behavioral control also were predictors of intention. An explanation could be that the outcome of those previous studies was the intention to breastfeed in general, rather than the intended duration to breastfeed, and that the target group in this study were highly educated, nonsmoking asthmatic families, which were very motivated to breastfeed for a longer period of time, but had possibly an unrealistic positive view about long-term breastfeeding. The authors' pilot study[45] revealed that the majority of first-time mothers thought that breastfeeding is a natural behavior that does not need much preparatory behavior. It could be that this unrealistic confidence (in first-time mothers) resulted, for instance, in their scores at self-efficacy items not being discriminative enough to produce a significant predictor for intention. On the other hand, the construct of perceived behavioral control measures the perceived difficulty of the desired behavior as well as the perceived ability of control. Therefore, it is difficult to compare the results with studies that used the PBC construct.

In the authors' study group, 88% of the women actually started to breastfeed. This percentage is comparable with national initiation rates. Furthermore, this study showed that a positive intention to breastfeed is significantly associated with actual behavior, in line with the assumption of the ASE model. Several previous studies also confirmed that intention is strongly associated with actual behavior.[15,37] Preliminary data show that the authors' newly developed educational breastfeeding program appeared to be effective in promoting exclusive breastfeeding for 6 months (48% vs. 27%, $p = 0.03$). The complete results of the trial are described elsewhere.

A limitation of this study is the open character of recruitment, on a volunteer basis, which may have contributed to the relatively high level of education of the mothers (54% had a high level of education) and the low number of mothers who smoked during pregnancy (approximately 5%). This may have had a positive influence on the motivation to start breastfeeding and may have restricted the external validity of this study. Despite this limitation, the present findings provide support for the belief that it is important that breastfeeding educational programs motivate families early in pregnancy to breastfeed in order to increase breastfeeding intentions, since this study provided evidence that a positive intention is a strong predictor for actual behavior.

Further research should answer the question whether the variable *intended duration* is a better predictor for long-term breastfeeding duration instead of the variable *intention to breastfeed*.

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