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Psychosocial Predictors of Parental Participation in Ultrasound Screening for Developmental Dysplasia of the Hip

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Ultrasound screening for developmental dysplasia of the hip (DDH) is an innovation in preventive child health care in the Netherlands. Parental participation in the screening will be essential for the success of implementation of the screening. The aim of the current study was to investigate whether psychosocial factors (attitude, subjective norm, self-efficacy, perceived susceptibility, perceived severity, perceived effectiveness) predicted parental participation in the screening. A cross-sectional survey was conducted. Using a questionnaire, several background variables (organization, sociodemographic variables, and knowledge) and psychosocial variables were collected. Blockwise logistic regression was used to analyze the relations. A total of 703 questionnaires of participating parents (response 61.7%) and 393 questionnaires of nonparticipating parents were received (response 37.2%). When controlling for the background variables, attitude, subjective norm, self-efficacy, perceived susceptibility, and perceived effectiveness predicted parental participation in the screening ($p < .05$). Perceived severity of the dysplasia did not predict participation ($p > .05$). Psychosocial determinants influenced parental participation in the ultrasound screening for DDH. Emphasizing the positive aspects of the screening, highlighting the effectiveness, removing practical barriers, and being conscious of the influential role of child health care professionals on decision making are areas to focus on when organizing the ultrasound screening for DDH. Health care policy decision makers and child health care professionals should consider these determinants in order to stimulate parental participation.

Keywords: health behavior, health psychology, participation, child health, parents

Screening for developmental dysplasia of the hip (DDH) is important to prevent adverse effects in the development of the infant. Early detection of DDH is part of the preventive child health care (CHC) program in the Netherlands. The current screening is performed by a CHC physician and takes place several times during the first year of life. The protocol consists of physical examination of the hip and identification of risk factors (family history of DDH and breech position in the last trimester of pregnancy and/or at birth). In German-speaking countries, the golden standard for screening for DDH is based on ultrasound examination of the hips (Dorn & Neumann, 2005). Advantages of ultrasound screening for DDH include a high detection rate and a low referral rate (Roovers, Boere-Boonekamp, Castelein, Zielhuis, & Kerkhoff, 2005) and a reduction in operative procedures because of early detection (Clegg, Bache, & Raut, 1999; von Kries et al., 2003).

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Based on the positive outcomes associated with ultrasound screening for DDH in the Netherlands (Roovers et al., 2005), a pilot implementation was set up to gain insight into the feasibility and (cost)effectiveness of ultrasound screening at the age of 3 months in preventive CHC. Although participation rates in preventive CHC are generally very high, with almost 95% of the parents visiting the CHC center on a regular basis (Verbrugge, 1990; Verloove-Vanhorick & Reijneveld, 2007), it is unknown whether parents will participate in this new screening. As it is not part of the regular well-child visits, parents had to make a separate decision to attend the ultrasound screening. Therefore, it is very relevant to assess the determinants related to the (non)participation of parents in the screening.

Several theories describe psychosocial determinants that influence the performance of (health) behaviors. The theory of planned behavior (Ajzen, 1991) suggests that intentions and (health) behaviors can be explained by three key determinants: attitude toward the behavior, subjective norm, and self-efficacy. These factors are considered to influence the intention to behave accordingly and to actually realize the behavior. The first factor describes the attitude toward the behavior, which is related to the set of a person's positive and negative beliefs about performance of a particular behavior (Fishbein & Ajzen, 1975). The second factor is the subjective norm, which includes the likelihood that important others approve or disapprove the behavior and the motivation to comply with these individuals or groups. The last factor is self-efficacy, which refers to the perceived capability of carrying out a particular behavior. The general assumption of the theory of planned behavior is that the more positive the attitude and subjective norm regarding the behavior are and the greater the self-efficacy is, the stronger the intention should be to perform the health behavior. Sociodemographic factors and knowledge are assumed to indirectly influence health behaviors through the psychosocial determinants (Brug, Schaalma, Kok, Meertens, & Van der Molen, 2003). Having knowledge about a health risk can be a precondition for performing the behavior, but is often not sufficient for actual performance.

Other factors often associated with the performance of health behaviors are the perceived susceptibility/vulnerability and the perceived severity of the health problem, as described in theories such as the health belief model (Rosenstock, 2005; Rosenstock, Strecher, & Becker, 1988) and the protection motivation theory (Rogers, 1975, 1983). These theories propose that people who consider themselves at risk for a particular condition and who perceive the condition as serious have a higher motivation to prevent themselves against this risk. Another central determinant in the health belief model and the protection motivation theory is the perceived effectiveness of the health behavior to reduce the risk. People who perceive the health behavior as effective are more likely to perform the particular behavior.

The determinants described in the various psychosocial models have been successfully used to predict health intentions and behaviors, such as screening for cholesterol (Deskins et al., 2006), screening for Down Syndrome (Michie, Dormandy, French, & Marteau, 2004), vaccination against the human papillomavirus (Dempsey, Zimet, Davis, & Koutsky, 2006; Ogilvie et al., 2007), reduction of childhood fever with medications (Walsh, Edwards, & Fraser, 2009), and mammography screening (Tolma, Reininger, Evans, & Ureda, 2006). All these health behaviors involve individual decisions.

The aim of the present study was to predict participation in the ultrasound screening for DDH of parents as representative of the infants by applying psychosocial determinants described in the theory of planned behavior, the health belief model, and the protection motivation theory (see Figure 1). We hypothesized a positive relationship between screening participation and attitude, subjective norm, self-efficacy, perceived susceptibility, perceived severity, and perceived effectiveness. In addition, we included several background variables in the model to test for possible other influencing factors: the organization in which the screening was performed, sociodemographic variables, and parents' knowledge of DDH and of ultrasound screening. Information about the factors that determine parental participation is relevant

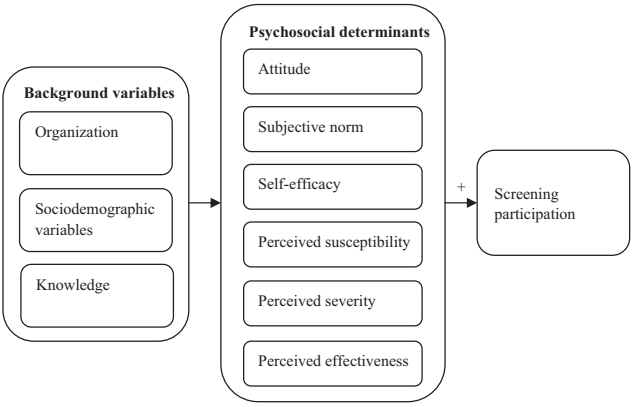

Figure 1. Predicting parental screening participation from psychosocial determinants.

to improve future participation in ultrasound screening for DDH.

Method

Participants and Procedure

The study population consisted of parents of all infants aged 3 months who were invited for an ultrasound screening at a CHC center of two CHC organizations between November 2007 and April 2009. One of the organizations was located in a rural area (organization A) and the other organization was located in an urban area (organization B). We included a sample of the parents that participated in the screening and all parents who had decided not to participate in the screening.

A questionnaire to measure the background variables and the psychosocial determinants was developed in several feedback rounds with a team of health care professionals, comprising an epidemiologist and CHC physician, an expert in implementation of innovations in CHC and an orthopedic surgeon. The psychosocial determinants regarding the screening were derived from the validated models of health behavior: the theory of planned behavior, the health belief model and the protection motivation theory, and were adapted to this specific screening behavior.

A pretest was performed among seven parents visiting a CHC center to assess the comprehensibility of the questionnaire and to register the required time to fill it out.

The ultrasound screener handed out the questionnaire after the screening to 1,140 parents participating in May and June 2008 and in November and December 2008; 622 of these parents (54.6%) visited organization A and 518 parents (45.4%) organization B.

Since the group of nonparticipants was expected to be much smaller than the group of participating parents, it was decided to include the parents of all infants who did not participate in the screening during the research period (November 2007 to April 2009). The questionnaire was sent to the home address of these 1,057 nonparticipating parents when their infant was 6 months old. Of these parents, 263 (24.9%) visited organization A and 794 (75.1%) organization B.

Measures

Screening participation. Participation in the screening could be determined based on registration of (non)participation at the CHC center during the ultrasound screening and on informed-consent forms that were filled out by all parents of newborns. This variable was scored 0 "did not participate in the screening" and 1 "participated in the screening."

Background variables. The organization in which the screening was performed was used as a background predictor for participation, since screening procedures might have differed between the organizations (1 = organization A, 2 = organization B). Furthermore, the following sociodemographic variables were collected

from the parents: age, educational level (low, middle, and high) and the country of birth of both parents. The last background variable was parental knowledge, which was assessed with two measures. First, parents were asked whether they were aware of the information brochure that was given to them at their first well-child visit to the CHC center. They had four answering options: (1) "No, I do not know the brochure," (2) "Yes, I know the brochure but I never read it," (3) "Yes, I read the brochure superficially" and (4) "Yes, I read the brochure in depth." A dichotomous score was created based on these answering options (1 = did not read the brochure, 2 = did read the brochure). The second measure was the content knowledge about DDH and ultrasound screening. Since reading of the information brochure is not a precondition for content knowledge, this measure was assessed separately. Content knowledge was measured by asking parents to answer three questions (the correct answer is underlined). The first question was: "If 1,000 infants will be screened for hip dysplasia, in how many cases hip dysplasia will be diagnosed?" Parents had five answering options: (1) "10," (2) "30," (3) "50," (4) "100," and (5) "I don't know." The second question was: "How is the screening being performed?" There were three possible answers: (1) "with X-ray," (2) "with ultrasound," and (3) "I don't know." The last question was: "If the outcome of the screening at the CHC center is abnormal, this definitely means that the infant suffers from hip dysplasia." Again, there were three answering options: (1) "true," (2) "false," and (3) "I don't know." The questions were rated as 1 "false" or 2 "good." An answer "I don't know" was considered false and therefore was rated with 1. Scores were accumulated, leading to a continuous score ranging from 3 to 6, with a higher score denoting more knowledge. The use of several multiple choice response options, instead of correct versus incorrect answering options, is in concordance with a study from Macek et al. (2010), in which knowledge related to oral health literacy was assessed.

Attitude. Attitude was measured with a 7-item scale, which was based on the attitude construct of the theory of planned behavior. Items were designed as adjective pairs, as suggested by Ajzen (2002), and were partly based on items used in research focusing on screening behavior and which showed high reliability (Michie et al., 2004). Parents were asked to rate their attitude about ultrasound screening for DDH in response to the following question: "For me, ultrasound screening for hip dysplasia is . . ." by rating 1–5 on seven items anchoring: "very bad—very good," "very frightening—not frightening," "not useful—very useful," "very unimportant—very important," "very unsafe—very safe," "not obvious—very obvious" and "not comforting—very comforting." Scores were accumulated and averaged, with a higher score denoting a more positive attitude. This 7-item concept had a high internal consistency ($\alpha = .89$).

Subjective norm. Subjective norm was measured by first asking parents to rate from 1 *definitely no* to 5 *definitely yes* on the following question: "To what extent did the following people expect you to participate in the ultrasound screening: (1) your partner and (2) the health care professionals at the CHC center?" The rationale for choosing these groups of important people, is based on a study on screening for Down's syndrome, in which health professionals (doctors and midwives) and the partner were defined as the ones relevant for influencing screening behavior (Michie et al., 2004). Second, parents were asked to rate 1 *very little* to 5 *very much* on the following question: "Considering participation in the ultrasound screening, how seriously did you take the opinion of the following people: (1) your partner and (2) the health care professionals at the CHC center?" To determine the subjective norm for the influence of the partner and the health care professionals, the score on the first item was multiplied by the score on the second item for both groups. Subsequently, these two scores were counted up leading to a total score on subjective norm with a higher score denoting a higher subjective norm. This form of scoring, by creating a summed score of the subjective norm, is recommended by Francis et al. (2004).

Self-efficacy. Self-efficacy was assessed by a 2-item scale ranging from 1 *totally disagree* to 5 *totally agree*: "I expected that I had to arrange a lot to participate in the screening with my infant" and "I expected that it would cost me a lot of time to participate in the screening with my infant." These items were based on a study by Kauffman-de Boer et al. (2006), in which parents reported practical problems, such as

time constraints and not possessing a car, when visiting CHC. Because the respondents already participated in the screening, no questions were added to measure whether they expected to be able to overcome these two barriers. The scores on these items were reversed, with a higher score implying a higher self-efficacy. This concept had a good internal consistency ($\alpha = .81$).

Perceived susceptibility. Perceived susceptibility, or the subjective risk of getting a condition (Rosenstock, 2005), was measured with one item: "How high did you, before the screening, think the chances were that your infant was suffering from hip dysplasia?" There were eight answering options anchoring (1) *chance of 1 on 10.000* to (8) *chance of 1 on 5*. Therefore, a higher score on this item implied a higher perceived susceptibility. Numerical measurement is frequently used as a measurement of perceived risk in relation to screening behavior (Katapodi, Lee, Facione, & Dodd, 2004).

Perceived severity. Perceived severity of DDH was measured with three items focusing on clinical consequences of DDH and the feelings of parents related to having an infant with DDH. Assessing the worry of mothers regarding their child's health as a measure of perceived severity was also used in a study focusing on visits to pediatric clinic services (Becker, Nathanson, Drachman, & Kirscht, 1977). The scales ranged from 1 *totally disagree* to 5 *totally agree*: "If hip dysplasia is diagnosed in an infant this is very severe," "Hip dysplasia has several negative consequences for the development of the infant," and "The idea that my infant could have hip dysplasia made me very anxious." The higher the average score on this concept, the more severe parents perceived DDH. The scale had sufficient internal consistency ($\alpha = .63$).

Perceived effectiveness. Since ultrasound screening is an alternative for the current physical screening, the items measuring perceived effectiveness focused not only on the effectiveness of the ultrasound screening, but also compared the two methods of screening. Perceived effectiveness was measured with three items on a 5-point scale ranging from 1 *totally disagree* to 5 *totally agree*: "Ultrasound screening is a good method to detect hip dysplasia," "I have more trust in ultrasound screening for detection of hip dysplasia than in the current screening for hip dysplasia at the child health care center," and "With ultrasound screening the chances are higher that hip dysplasia will be detected compared to the current screening at the child health care center." The sum of these items was averaged and a higher score denoted a higher perceived effectiveness. The alpha of this scale was 0.76.

Data Analyses

Means, standard deviations and frequencies were calculated for all variables. Chi-square tests and independent sample *t* tests were used to compare the results of the participants and nonparticipants. Bivariate associations between (non)participation, the background variables and the psychosocial variables were examined using Pearson's correlation coefficients and Phi tests. To investigate whether the psychosocial determinants predicted parental participation, a two-step blockwise logistic regression was performed. In this analysis, participation in the screening was regressed on the psychosocial determinants after controlling for the effects of the organization, sociodemographic variables, and knowledge. Multiple imputation was used to handle missing data ($n = 432$, 39.4%) for all variables with one or more missing values, resulting in five complete datasets.

Results

Participants

In total, 703 questionnaires of participating parents were returned (response 61.7%). In organization A, 427 questionnaires were sent back (response 68.6%) and in organization B, 276 questionnaires (response 53.3%). The response rate of the nonparticipants was 37.2%, with 393 questionnaires received. In organization A, 123 questionnaires were sent back (response 46.8%) and in organization B, 270 questionnaires (response 34.0%).

Table 1 shows the sociodemographic characteristics of the participants and nonparticipants. There was a significant association between educational level of the parents and participation in the screening. Additional chi-square tests showed that parents with a high educational level had a significant higher chance to be a nonparticipant than parents with a middle or a low educational level. The average age of the mothers and fathers in the participants group

Table 1
Sociodemographic Characteristics of the Participants and Nonparticipants

Characteristic	Participants		Nonparticipants		
	N	%	*N*	%	
Educational level mother					
Low	139	20.1	50	13.0	
Middle	239	34.6	115	29.9	
High	312	45.2	219	57.0	χ^2 (2, N = 1,074) = 15.73, $p < .001$
Educational level father					
Low	176	25.9	60	16.1	
Middle	227	33.4	100	26.9	
High	277	40.7	212	57.0	χ^2 (2, N = 1,052) = 27.13, $p < .001$
Country of birth mother					
The Netherlands	654	93.3	359	91.8	
Turkey, Morocco, DA, Surinam	10	1.4	9	2.3	
Other country	37	5.3	23	5.9	χ^2 (2, N = 1,092) = 1.33, p = .51
Country of birth father					
The Netherlands	647	93.2	344	91.0	
Turkey, Morocco, DA, Surinam	18	2.6	9	2.4	
Other country	29	4.2	25	6.6	χ^2 (2, N = 1,072) = 3.06, p = .22

Note. DA = Dutch Antilles.

was 31.53 (SD = 4.38) and 34.30 (SD = 5.13), respectively. In the nonparticipants group, the average age of the mothers was 32.78 (SD = 4.28) and of the fathers 34.92 (SD = 4.73). The difference between the average age of the mothers in the two groups was significant $t(1086)$ = 4.54, $p < .001$. The average age of the fathers also differed significantly $t(1073)$ = 1.94, p = .05. The majority of the parents in both groups originated from the Netherlands.

Descriptive Statistics and Correlations

The descriptive statistics for the psychosocial variables are presented in Table 2. The independent t test showed that parents who participated in the screening were significantly more likely to have a positive attitude toward the screening compared to parents who did not participate. Moreover, participating parents also perceived a higher social pressure to participate in the screening and they scored higher on self-efficacy. Finally, there was a significant difference between participating and nonparticipating parents in the perception of effectiveness of the screening. Parents who participated believed the screening to be more effective than the current screening method, compared to parents who did not participate.

In the participant group, 68.9% (n = 483) of the parents read the information brochure, compared to 51.0% (n = 198) of the parents in the nonparticipant group. This difference was significant $\chi^2(1, N = 1{,}089) = 34.05$, $p < .001$. There was also a significant association between

Table 2
Descriptive Statistics for the Psychosocial Determinants of the Participants and Nonparticipants

Measure	Participants			Nonparticipants			
	N	*M*	*SD*	*N*	*M*	*SD*	
Attitude	672	4.52	0.50	366	4.09	0.77	$t(1036) = -10.80$, $p < .001$
Subjective norm	547	28.85	9.78	255	22.51	10.41	$t(800) = -8.39$, $p < .001$
Self-efficacy	691	4.01	0.80	339	3.66	1.04	$t(1028) = -6.08$, $p < .001$
Perceived susceptibility	679	3.16	2.06	324	3.10	2.07	$t(1001) = -0.43$, p = .66
Perceived severity	699	2.96	0.76	376	3.00	0.79	$t(1073) = 0.50$, p = .62
Perceived effectiveness	699	4.05	0.62	374	3.69	0.76	$t(1071) = -8.43$, $p < .001$

content knowledge and participation $\chi^2(3, N = 1{,}061) = 53.98$, $p < .001$. Of the parents participating in the screening, 5.8% ($n = 40$) scored three points, 27.1% ($n = 187$) had four points, 49.1% ($n = 339$) scored five points and 18.0% ($n = 124$) scored six points. For the nonparticipating parents this was 18.9% ($n = 70$), 28.3% ($n = 105$), 43.7% ($n = 162$), and 9.2% ($n = 34$), respectively. Additional chi-square tests showed that all scores, except for the comparison between score four and five differed significantly between the participants and nonparticipants.

In Table 3, Pearson's correlations between the background variables, the psychosocial determinants and screening participation are presented. Participation was marginally related with the background variables. Small to medium relations were found between participation and the psychosocial determinants. Perceived susceptibility and perceived severity were not significantly correlated with participation in the screening.

Psychosocial Predictors of Parental Participation in Ultrasound Screening

Using the model in Figure 1, a two-step blockwise logistic regression was performed (see Table 4). Results showed that a positive attitude concerning the screening positively influences parental participation. Moreover, parents who participated in the screening were significantly more likely to have perceived social pressure from their partner and/or from health care professionals at the CHC center to visit the screening. A positive influence of self-efficacy on participation was also found. The higher the perceived capability of visiting the screening, the higher the chance was that parents participated. There was a negative relation between participation in the screening and perceived susceptibility. The less parents perceived their infant to be at risk for DDH, the higher the chances were that they participated in the screening. Finally, if parents thought that ultrasound screening was effective for detection of DDH, the chances were higher that they decided to participate. Perceived severity of DDH did not significantly influence participation in the screening.

Table 3
Pearson's Bivariate Correlations for Relations Between Independent Variables and Parental Participation in the Screening

Measure	1	2	3	4	5	6a	6b	7	8	9	10	11	12
1. Organization	.17**												
2. Age mother	.10**	.67**											
3. Age father	.40**	.19**	.10**										
4. Educational level mother	.42**	.17**	.08**	.59**									
5. Educational level father	−.11**	−.01	.00	.00	−.06*								
6a. Reading of brochure	−.06*	.06*	.09**	.19**	.13**	.22**							
6b. Content knowledge	−.16**	−.09**	−.07*	−.09**	−.08*	.03	.08*						
7. Atitude	−.12**	−.13**	−.08*	−.07*	−.03	.06	.02	.32**					
8. Subjective norm	−.05	.00	.03	−.05	−.05	.00	.06	.28**	.13**				
9. Self-efficacy	−.14**	−.13**	−.07*	−.12**	−.09**	−.04	.00	.14**	.13**	.01			
10. Perceived susceptibility	.10**	.02	.00	−.11**	−.07*	−.07*	−.16**	.04	.10**	−.07*	−.01		
11. Perceived severity	−.08*	−.02	−.04	−.03	−.03	.05	.11**	.51**	.25**	.20**	.14**	.17**	
12. Perceived effectiveness	−.28**	−.14**	−.06	−.12**	−.16**	.18**	.20**	.32**	.28**	.19**	.01	−.02	.25**
13. Participation in screening													

Note. Codes: organization 1 = organization A, 2 = organization B; reading of the brochure 1 = did not read the brochure, 2 = did read the brochure; participation 0 = did not participate in the screening, 1 = participated in the screening. Associations between two dichotomous variables (organization, reading of brochure and participation) were calculated with Phi tests.

* $p < .05$. ** $p < .01$.

Table 4
Blockwise Logistic Regression Predicting Parental Participation in Ultrasound Screening for DDH (N = 1,096)

	Step 1				Step 2			
Predictor variable	B	*SE*	OR	95% CI	B	*SE*	OR	95% CI
Organization	−.99**	.16	0.37	0.27–0.51	−.95**	.18	0.39	0.27–0.55
Age mother	−.07*	.02	0.94	0.90–0.98	−.06*	.02	0.94	0.90–0.99
Age father	.02	.02	1.02	0.98–1.05	.02	.02	1.02	0.98–1.06
Educational level mother								
Low								
Middle	−.30	.24	0.74	0.46–1.20	−.38	.26	0.69	0.41–1.15
High	−.20	.26	0.82	0.50–1.35	−.19	.28	0.83	0.48–1.42
Educational level father								
Low								
Middle	−.17	.23	0.85	0.54–1.34	−.31	.25	0.74	0.45–1.19
High	−.35	.25	0.70	0.43–1.15	−.45	.26	0.64	0.38–1.07
Reading of brochure	.52**	.14	1.68	1.27–2.21	.55**	.15	1.73	1.28–2.34
Content knowledge	.49**	.09	1.63	1.37–1.94	.45**	.10	1.56	1.29–1.89
Attitude					.65**	.15	1.91	1.42–2.57
Subjective norm					.04**	.01	1.04	1.03–1.06
Self-efficacy					.22*	.09	1.25	1.05–1.48
Perceived susceptibility					−.11*	.04	0.89	0.83–0.96
Perceived severity					−.04	.10	0.97	0.79–1.18
Perceived effectiveness					.34*	.13	1.41	1.09–1.82

Note. Codes: organization 1 = organization A, 2 = organization B; reading of the brochure 1 = did not read the brochure, 2 = did read the brochure. R Squared = .24 (Cox & Snell), .33 (Nagelkerke).
* $p < .05$. ** $p < .001$.

Of the background variables, the age of the mother negatively influenced participation. Moreover, parents who visited the rural organization had a higher chance to participate in the screening compared to parents who visited the urban organization. Finally, a positive association was found between knowledge and participation: parents who read the information brochure and who had more content knowledge were more likely to participate.

Discussion

The findings of this study provide strong empirical support for the influence of psychosocial determinants on parental participation in ultrasound screening for DDH. A positive attitude, a high subjective norm, a high self-efficacy, a low perceived susceptibility and a high perceived effectiveness were positively associated with parental participation in the screening. Perceived severity was not predictive of participation. These findings remained statistically significant after controlling for the organization, sociodemographic variables, and knowledge.

A positive attitude was the strongest predictor of participation in the screening. This is supported by literature on the effects of attitude on intentions and behaviors of parents concerning their infants' health (Dempsey et al., 2006; Ogilvie et al., 2007; Walsh et al., 2009).

The finding that subjective norms significantly predicted participation is consistent with literature on the importance of the opinions of the partner and nurses/midwives on new mothers' choices for breastfeeding and bottle-feeding (Swanson & Power, 2005). Given that ultrasound screening is an innovation in preventive CHC in the Netherlands, the finding that subjective norms influence participation was consistent with our expectations. Parents might want to discuss the new screening method with others and subsequently base their decision to participate on their advices and opinions.

Parents' self-efficacy positively influenced participation in the screening. However, in this respect a critical note should be made. We measured only part of the construct *self-efficacy*, namely perceived barriers to participate in the screening. Perceived self-efficacy to be able to

overcome these barriers was not measured because participants had already decided to participate in the screening. In a study by Kauffman-de Boer et al. (2006), focusing on neonatal hearing screening, the authors found that some of the parents, who did not visit their regular CHC center for the screening, experienced practical problems. They reported longer traveling times, not possessing a car, and problems with the planning of feeding. In our study, some of the parents also visited another CHC center for the screening than for regular well-child visits, which might have led to comparable constraints.

It is surprising that a low perceived susceptibility leads to a higher chance to participate in the screening. An explanation for this finding might lie in the organization of the screening. Infants with risk factors for DDH (family history of DDH and breech position in the last trimester of pregnancy and/or at birth) may have been identified after birth by the pediatrician and referred for diagnostic imaging in the hospital. Subsequently, it is likely that this group of parents did not visit the ultrasound screening at 3 months at the CHC center and were therefore considered as nonparticipants. Another reason for the negative association between participation and perceived susceptibility might be the retrospective design of the study. Parents who had already participated in the screening were being asked how likely it was that their infant would suffer from DDH. Since the outcome of the screening was already known and most parents received a satisfactory result, this might have decreased the perceived susceptibility.

This study did not reveal any influence of perceived severity on participation in the screening. A meta-analysis by Janz and Becker (1984) showed that this determinant was the smallest predictor of preventive health behaviors. One explanation for perceived severity being a poor predictor might be that parents perceive the screening more as a way of confirmation of their infants' health and less as a way of detection of DDH. Severity of the disease might then be expected to play only a minor role in prediction of screening uptake. In a study focusing on parents' views on newborn hearing screening, it was found that parents were positive about the screening independent of their ideas about the magnitude of the handicap (Magnuson & Hergils, 1999). Parents stated that there were diseases of greater magnitude and, therefore, had not given much attention to hearing problems. Subsequently, they perceived the screening more as a measure of security and less as a means for detection of serious health problems.

Perceived effectiveness of the screening was a good predictor for screening uptake. When parents compared physical screening with ultrasound screening for DDH and the outcome of this comparison was positive for ultrasound screening, they participated in the screening more often. Other literature found that perceived effectiveness was an important predictor for decisions on human papillomavirus vaccination policies (Brabin, Roberts, Farzaneh, & Kitchener, 2006) and breast cancer screening (Sutton, Bickler, Sancho-Aldridge, & Saidi, 1994).

The organization, age of the mother, and parental knowledge were found to be significantly related to parental participation. Infants of younger mothers were more likely to participate in the screening, which is in line with other literature on the influence of parents' age on participation in preventive child health examinations (Yu et al., 2002). Parents' educational level differed significantly between participants and nonparticipants. However, when including this variable into the regression model, this effect diminished and was not found to be significant.

Overall, when relating the sociodemographic characteristics to participation in the screening, a tendency can be observed in which nonparticipation is related to older, higher educated parents who live in an urban area. When we relate these sociodemographic characteristics to the psychosocial determinants, several trends can be distinguished. For example, the subjective norm is lower in nonparticipants compared to the participants. An explanation for this can be that the older and higher educated parents may feel more on a par with the medical opinion of the health professionals. This is in accordance with Street (1991), who found that the more educated and older people are more opinionated and more affectively expressive compared to lower educated and younger people, which is probably due to a sense of equality between health care provider and patient. Moreover, the nonparticipants showed a lower self-efficacy compared to the participants. Given the

fact that self-efficacy was assessed with items related to time constraints of the parents, this result can be interpreted in the light of the sociodemographic characteristics. As educational level is positively related to employment status (Leufkens & Souren, 2011), parents who work more hours might perceive themselves as less able to visit the screening, leading ultimately to a lower self-efficacy. Since these interpretations are tentative and based on indirect results, future research is warranted to study these relationships in more depth.

Parents who visited the organization in the urban area less often visited the screening compared to residents of the rural area. This might be explained by the different invitation strategies of the organizations. In the organization situated in the rural area, parents received a letter at home in which a date and location of the screening were described. If they did not want to participate, they had to consult the secretary of the CHC organization (opting out). In the organization located in the urban area, an appointment for the screening was made at the CHC center. The CHC assistant asked the parents whether they wanted to participate and if they agreed an appointment was planned (opting in). The nature of this invitation strategy might have looked more noncommittal to parents. In general, opting out is more effective for the recruitment of people than an opting-in approach (Kokkedee, 1992; Mutch & King, 1985). Reading of the information brochure and content knowledge about DDH and the screening positively influenced participation. This is supported by other studies on the positive role of knowledge on vaccination for the human papillomavirus (Kahn et al., 2008; Ogilvie et al., 2007).

From a theoretical point of view, we can conclude that the proposed model (see Figure 1), which was based on the validated models of health behavior, is a useful framework to predict parental decision making regarding their infant's health. The decisions to use CHC services probably stem from the same considerations as individual decision making in health care. Attitude, subjective norm, self-efficacy, perceived susceptibility, and perceived effectiveness not only predict individual decision making but can, given the results of this study, also be applied to parental decision making. Taking into consideration the organization of the Dutch health care system in which the coverage of visits to the CHC center is 95% (Verbrugge, 1990; Verloove-Vanhorick & Reijneveld, 2007), it is possible that parents visit the screening without consciously considering the pros and cons of participation. The proposed model provides insight into the psychosocial determinants underlying this, possible unconscious, parental decision-making process.

The results of this study have some important practical implications for health care policy decision makers and CHC professionals. Interventions focusing on maximization of screening uptake in ultrasound screening for DDH should include parents' beliefs about the screening. For example, information provision to parents can highlight the effectiveness of the screening for detection of DDH and emphasize the positive aspects of the screening. Barriers that might hinder participation, such as time constraints, should also be considered so parents' perception of control over participation in the screening can be enhanced. The influence of normative beliefs on participation indicates the important role of CHC physicians, CHC nurses and assistants in informing parents about the positive aspects of participation in the screening. Discussing the benefits associated with the screening and answering questions can be useful in stimulating screening uptake.

This study benefited from measuring the actual behavior of the parents instead of the intention to perform the behavior or the self-reported behavior. However, we should also take into account the limitations of this study when interpreting the results. First, the response rate of the nonparticipants was relatively low (37%) compared to the response rate of the participants (62%). In more studies on (non)participation, a low response rate of nonparticipants was found (Aro, De Koning, Absetz, & Schreck, 1999; Tacken et al., 2007). This might diminish the generalizability of the results, since it is not known whether the responders of the nonparticipating group are a good representation of all nonparticipants. A second limitation concerns the cross-sectional nature of this study, so causal claims cannot be made. The psychosocial determinants may influence decisions about participation, but could also follow from the behavior of the parents. Third, high-risk infants who did not visit the ultrasound screening at the CHC center but who instead

visited the hospital were represented in the nonparticipant group. The outcomes of this group may not reflect the outcomes of the rest of the nonparticipants, since these parents decided to have the hips of their infant examined in a hospital setting. Last, a "self-developed" questionnaire survey was used to assess parental screening behavior. Although the concepts measured in the questionnaire were based on several theories predicting health behavior, such as the theory of planned behavior, the questionnaire was not standardized. However, the use of a self-developed questionnaire made it possible to adapt the questions to this specific (new) screening method and this specific population.

In conclusion, this study provides empirical support for the predictive ability of the psychosocial model concerning participation in ultrasound screening for DDH. Health care policy decision makers and CHC professionals should consider these determinants when organizing the screening in order to stimulate optimal parental screening participation.

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