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A REVISED VERSION OF THE MULTIDIMENSIONAL HEALTH LOCUS OF CONTROL SCALES FOR LABOUR AND DELIVERY (MHLC-LD-R)

Development and Psychometric Evaluation

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Background: The aim of the present study was to develop and psychometrically investigate a revised version of the Multidimensional Health Locus of Control Scales for Labour and Delivery (MHLC-LD). The rationale for this development was the need to assess labour and delivery specific health-related control beliefs regardless of the respondent's reproductive stage or role in giving birth (e.g., woman in reproductive age but not pregnant, expectant mother, support person, spouse, health care provider).

Methods: Altogether, 991 women ($M_{\text{age}} = 26.45$ years, $SD = 5.42$) completed the online survey, 767 (77.4%) of whom were pregnant. Beyond the newly developed, revised version of the Multidimensional Health Locus of Control Scales for Labour and Delivery (MHLC-LD-R), the test battery included items measuring sociodemographic characteristics, self-rated health, general health-related control beliefs, attitudes toward certain birth-related issues, and level of fulfilment with regards to autonomy and competence needs.

Results: Confirmatory factor analyses supported a three-factor solution representing internal-, chance-, and health care professional-related control beliefs. The internal consistency of each 4-item subscale was good. The analyses to test construct validity supported the convergent and divergent validity of the MHLC-LD-R dimensions.

Conclusion: The MHLC-LD-R is an economic and psychometrically adequate tool to assess delivery-related control beliefs regardless of the individual's actual stage in the reproductive life cycle or role in giving birth. Further research is needed using the instrument with partners and other relevant actors in the process of labour and delivery.

Keywords: control beliefs, labour and delivery, test development, validity, reliability

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1. Introduction

People hold a wide range of beliefs regarding those factors that presumably determine their health, that is, they have different health-related locus of control beliefs. The multidimensional model of health control beliefs assumes that people can attribute their health status to three broad classes of agents: to themselves (internal control beliefs), to important others (e.g., doctors and other professionals or the persons' relatives), and to chance or fate (WALLSTON & WALLSTON 1982). A large body of evidence shows that individual differences in control beliefs – especially high internal and low chance-related ones – are among the key psychological factors that can be linked to more beneficial health processes and better outcomes (INDELICATO et al. 2017; MIAZGOWSKI et al. in press).

Previous findings, using the general forms¹ of the Multidimensional Health Locus of Control Scales [MHLC; (WALLSTON et al. 1978)], revealed that perceived health-related control influenced the course of chronic diseases (RUFFIN et al. 2012) and health behaviours in both healthy (HELMER et al. 2012) and ill populations (YI & KIM 2013). Health-related control beliefs were also linked to adherence with treatment regimens (CHRISTENSEN et al. 2010; RYDLEWSKA et al. 2013), adjustment to and improvement in chronic diseases after rehabilitation (WALDRON et al. 2010; KEEDY et al. 2014), and they could partly explain the variance regarding ethnic differences in certain mental disorders (VAN DIJK et al. 2013).

Besides their effect on the course of different diseases, control beliefs may play an important role in the course of normal health-related processes like pregnancy and delivery as well. While the use of one of the MHLC Scales (the most often used instruments to assess health-specific control beliefs) in pregnant women is not without precedence in the literature, there may be concerns about their use in this particular population (STEVENS et al. 2011). For instance, the A and B Forms target general beliefs about health and illness, which are not necessarily informative with regards to the specific condition of pregnancy and delivery. Form C on the other hand has been developed to assess control beliefs in individuals with an existing chronic condition (WALLSTON et al. 1994), while labour and delivery themselves are not diseases but temporary healthy processes; therefore, several items of this scale are difficult to interpret for expectant women. This notion is also supported by the fact that the psychometric properties of the MHLC Scales, when employed with pregnant women, were poor (JOMEEN & MARTIN 2005; IP & MARTIN 2006).

These considerations led to the development of a delivery-specific measurement tool to assess individuals' control beliefs regarding labour and delivery [Multidimensional Health Locus of Control Scales for Labour and Delivery – MHLC-LD;

¹ The term 'general forms' refers here to the A and B forms of the MHLC Scales, which are identical in content and differ only in wording to support study designs with repeated assessments. The A and B forms of the MHLC Scales are general in the sense that the items do not focus on any specific disease or condition but on health in general (in contrast to Form C or D).

(STEVENS et al. 2011)]. However, the wording of this tool is based on the C Form of the Multidimensional Health Locus of Control Scales putting more emphasis on potential medical complications than natural, delivery-related processes and outcomes. More importantly, the MHLC-LD uses first person form; therefore, its items can be answered by the expectant mothers only but not others (e.g., spouse, health care professional) whose control beliefs might also influence the outcomes of giving birth or delivery-related decisions (e.g. setting for giving birth).

The aim of the present study was to develop and psychometrically investigate a revised version of the Multidimensional Health Locus of Control Scales for Labour and Delivery. Our expectations toward the new tool were that it 1) does not overemphasise potential medical complications in the course of giving birth and 2) can be administered not only to expectant mothers but every individual who might have an impact on delivery-related outcomes or decisions.

2. Methods

2.1. Sample and Procedure

The study protocol has been approved by the Research Ethics Board of Semmelweis University and all participants gave informed consent for their participation. Altogether, 991 women – who were invited to participate through social media advertisements – completed the Hungarian-language online survey. The mean age of the respondents was 26.45 years ($SD = 5.42$), 767 (77.4%) of whom were pregnant. The largest part of the sample consisted of women with a college or university level education (57.4%), followed by high school graduates (39.1%) and participants with elementary education (3.5%). In terms of marital status, 27.2% of the participants were married, 26.9% lived in a common-law relationship, 24.5% were single, while 21.3% reported another marital / relationship status (e.g., dating).

2.2. Development of the Revised Version of the Multidimensional Health Locus of Control Scales for Labour and Delivery (MHLC-LD-R)

In contrast to the original MHLC-LD, wording of the MHLC-LD-R items were based on Form A (and not Form C) of the MHLC Scales. While the original number of items was retained when developing the item pool of the new scale, wording was modified to reflect delivery-specific content (e.g., ‘health’ was changed to ‘delivery’). In addition, instead of first person, third person singular was applied throughout the items having items refer to ‘a pregnant woman’ and ‘her delivery’, or ‘delivery outcomes’. This approach allows assessing control beliefs regarding birth in a wide range of respondents, not only pregnant women. The final version of the MHLC-LD-R can be found in the Appendix at the end of the article.

2.3. Measures

Beyond measuring sociodemographic characteristics, numerous ad hoc questions were developed to assess willingness to give birth in hospital or at home (6-point rating scale), number of children planned, and preferred age for first delivery. Educational attainment was rated on a 5-point scale ranging from less than elementary school to university degree. To estimate the participants' subjective evaluation of their health status, the following question was used: 'Taken as a whole, how would you rate your health status (1 = very bad, 2 = bad, 3 = average, 4 = good, 5 = excellent)?'. General health-related control beliefs were assessed by Form A of the Multidimensional Health Locus of Control (MHLC) Scales (WALLSTON et al. 1978). Cronbach's alpha for the 6-item Internal, Chance, and Powerful Others Scales were 0.81, 0.73, and 0.67, respectively.

The Birth Attitudes Scale (SALLAY et al. 2015) was used to assess attitudes toward labour and delivery and becoming a mother in general. The 9-item Fearful Attitudes Subscale ($\alpha = 0.89$) captures both general and specific (e.g., medical complications) fears regarding delivery. The 5-item Approaching Attitudes Subscale ($\alpha = 0.79$) captures cognitive openness to childbirth and related themes (e.g., being well-informed). Finally, the 4-item Distancing Attitudes Subscale ($\alpha = 0.72$) assesses avoidance regarding childbirth-related thoughts and fantasies. All items are rated on a 7-point scale ranging from 'not at all' to 'very much'. Finally, level of satisfaction with basic psychological needs was measured by the items assessing autonomy ($\alpha = 0.77$) and competence ($\alpha = 0.67$) from the Basic Psychological Needs Scale (BPNS; LA GUARDIA et al. 2000). Both subscales contain three items which are rated on a 7-point scale ranging from 'not at all' to 'very much'.

2.4. Statistical Analyses

Confirmatory factor analyses were conducted by Mplus 7.1, while all other statistical procedures were carried out using the SPSS 23 software. The data set did not contain missing values. Considering the non-normal distribution of the observed variables, the robust likelihood estimation method was used when conducting the confirmatory factor analyses. Model fit was evaluated based on the chi-square test (non-significant results indicating adequate fit), the Tucker-Lewis and Comparative Fit Indexes (TLI and CFI, respectively; values between 0.90 and 0.95 indicate acceptable fit, while values greater than 0.95 suggest good fit), the root mean square error of approximation (RMSEA; values below 0.08 indicate an acceptable fit, while values below 0.05 indicate a good fit), and the standardised root mean square residual (SRMR; values less than 0.08 indicating appropriate fit) (HU & BENTLER 1999).

Measurement invariance of the final model across pregnancy status has also been tested by comparing models representing 1) configural invariance (same factor structure imposed across groups); 2) metric invariance (configural invariance + factor loadings and intercepts are constrained to be equal across groups); and 3) scalar

invariance (metric invariance + latent means are constrained to be equal across groups). When comparing the nested models forming the sequence of invariance tests, common guidelines for samples with adequate sample size ($N \geq 300$) were considered suggesting that models can be seen as providing a similar degree of fit as long as changes in CFI and TLI remain under 0.01 and alterations in RMSEA remain under 0.015 between a less and a more restrictive model (CHEN 2007).

Considering the ordinal nature or non-normal distribution of the variables studied, bivariate relationships during convergent and divergent validity testing were examined by calculating Spearman correlation coefficients, while the general linear model was used for multivariate testing employing delivery-related attitudes as the dependent variables.

3. Results

3.1. Factor Structure, Internal Consistency, and Item Analysis

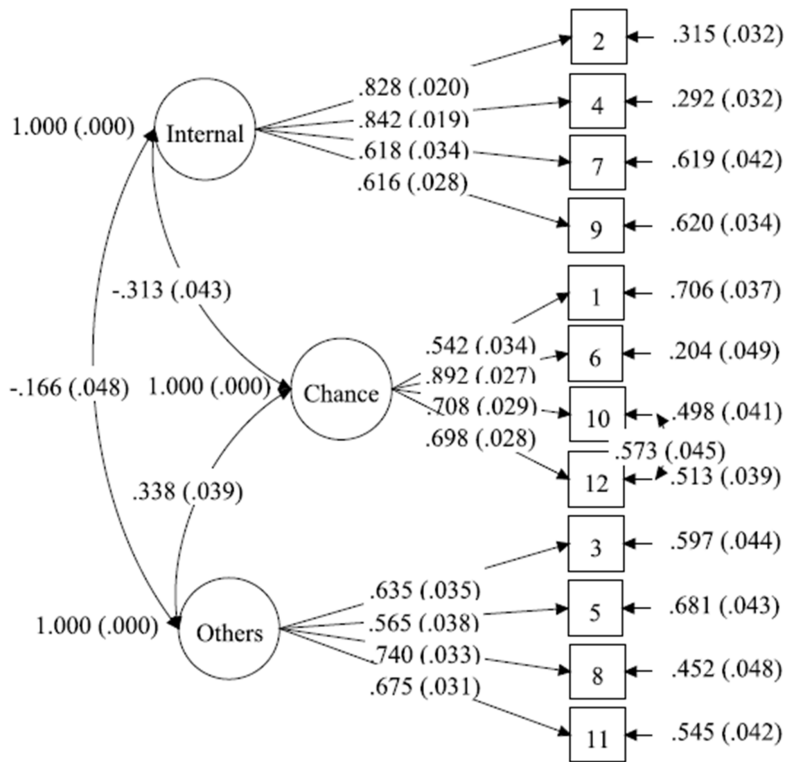
First, all 18 items were investigated through item analysis and factor analytic techniques. Items with the lowest item-total correlations and factor loadings were eliminated to improve internal consistency and to attain a clear factor structure. The final, 12-item version of the scale was then investigated by confirmatory factor analysis. The first model resulted in suboptimal model fit indices ($\chi^2 = 323.18$, $p < 0.001$, CFI = 0.908, TLI = 0.881, RMSEA = 0.074, 90% CI_{RMSEA} = 0.066 – 0.081, SRMR = 0.062); therefore, modification indices (MI) calculated by Mplus were considered to improve the model. Following the cut-off criteria equal to or higher than 50, a single covariance between two error terms were incorporated into the second model (*Figure 1*). The error terms correlated were those of items 10 and 12 (MI = 106.21), both containing the word ‘luck’ in contrast to the other items of the Chance Subscale. The fit indices of this final model proved to be acceptable ($\chi^2 = 239.12$, $p < 0.001$, CFI = 0.936, TLI = 0.916, RMSEA = 0.062, 90% CI_{RMSEA} = 0.054 – 0.070, SRMR = 0.050). Results of the item analysis and internal consistency characteristics for the final 12-item scale are presented in *Table 1*.

Results of the analysis regarding measurement invariance showed that adding invariance constraints on the factor structure did not cause a decrease in model fit larger than the recommended cut-off scores for changes in fit indices (Δ CFI = 0.006, Δ TLI = 0.008; Δ RMSEA = 0.003), suggesting configural invariance across pregnancy status. The same was true when adding further invariance constraints on factor loadings and intercepts (Δ CFI = 0.005, Δ TLI < 0.001; Δ RMSEA < 0.001), and finally on factor loadings, intercepts, and latent means (Δ CFI = 0.010, Δ TLI = 0.001; Δ RMSEA < 0.001).

Table 1
Results of the item analysis for the revised version of the Multidimensional Health Locus of Control Scales for Labour and Delivery (MHLC-LD-R)

<i>Subscale</i>	<i>Item #</i>	<i>Mean</i>	<i>SD</i>	<i>Skewness</i>	<i>Kurtosis</i>	<i>Corrected item-total correlation*</i>	<i>Cronbach's alpha if item deleted[†]</i>
<i>Internal</i>	Item 2	3.582	1.053	-0.215	0.124	0.690	0.752
$\alpha = 0.821$	Item 4	3.570	1.029	-0.178	0.053	0.708	0.742
$M = 14.76$	Item 7	3.740	0.930	-0.375	0.668	0.592	0.797
$SD = 3.21$	Item 9	3.865	0.963	-0.454	0.554	0.586	0.799
<i>Chance</i>	Item 1	2.501	1.095	0.664	0.557	0.448	0.866
$\alpha = 0.826$	Item 6	2.585	1.136	0.441	-0.127	0.712	0.752
$M = 9.95$	Item 10	2.450	1.170	0.535	-0.119	0.741	0.737
$SD = 3.63$	Item 12	2.410	1.081	0.455	-0.100	0.722	0.749
<i>Health care professionals</i>	Item 3	3.950	1.309	-0.355	-0.468	0.554	0.685
$\alpha = 0.744$	Item 5	4.495	1.061	-0.638	0.377	0.507	0.703
$M = 15.64$	Item 8	3.750	0.999	-0.619	0.675	0.580	0.667
$SD = 3.33$	Item 11	3.446	1.028	-0.322	0.060	0.535	0.689

*: Refers to the 4-item subscale (not the 12-item total scale)



Note: Displayed values are standardised coefficients (all $ps \leq 0.001$) with corresponding standard errors. The term 'health care professionals' is substituted on the figure with 'others' to improve visibility.

Figure 1
 Factor structure of the revised version of the Multidimensional Health Locus of Control Scales for Labour and Delivery (MHLC-LD-R)

3.2. Convergent and Divergent Validity

Results of the bivariate analyses (Table 2) regarding convergent and divergent validity showed that those with stronger internal delivery-related control beliefs planned a somewhat higher number of children and an age for delivery closer to their actual age. Further, they were less willing to undergo planned caesarean birth in hospital but more ready to give birth at home. They also reached higher scores on the Internal, and lower scores on the Chance Scale measuring general health locus of control. Finally, they also reported higher levels of autonomy and competence, less fearful- and distancing – but rather more open attitudes regarding giving birth.

Higher scores on the Chance and Health Care Professionals Scales of the MHLC-LD-R were associated with lower number of planned children and a planned

Table 2
Bivariate relationship of the MHLC-LD-R domains with the other variables (Spearman correlations)

	<i>Delivery-related locus of control / internal</i>	<i>Delivery-related locus of control / chance</i>	<i>Delivery-related locus of control / health care professionals</i>
<i>Difference between planned age at first delivery and current age</i>	-0.174***	0.158***	0.317***
<i>Number of children planned</i>	0.079*	-0.145***	-0.132***
<i>Willingness to undergo planned caesarean birth in hospital</i>	-0.268***	0.259***	0.341***
<i>Willingness to give birth at home</i>	0.212***	-0.210***	-0.432***
<i>General health-related locus of control – internal</i>	0.402***	-0.253***	-0.067*
<i>General health-related locus of control – chance</i>	-0.109***	0.473***	0.113***
<i>General health-related locus of control – others</i>	-0.035 ^{NS}	0.213***	0.424***
<i>Need for autonomy</i>	0.165***	-0.209***	-0.084**
<i>Need for competence</i>	0.204***	-0.179***	-0.078*
<i>Fearful attitudes regarding giving birth</i>	-0.236***	0.304***	0.190***
<i>Approaching attitudes regarding giving birth</i>	0.236***	-0.114***	-0.142***
<i>Distancing attitudes regarding giving birth</i>	-0.184***	0.177***	0.050 ^{NS}

^{NS}: $p \geq 0.05$, *: $p < 0.05$, **: $p < 0.01$, ***: $p < 0.001$; Refers to the 4-item subscale (not the 12-item total scale)

date for the first delivery further in time. Respondents with higher Chance and Health Care Professionals scores on the MHLC-LD-R were also more willing to give birth in hospital and less willing to deliver at home. In addition, they scored lower on the Internal Scale and higher on the Chance and Others Scales measuring general health locus of control. Further, they reached lower scores on the scales measuring autonomy and competence, while reporting more intense fear and a less approaching attitude regarding giving birth. Finally, they were different regarding distancing attitudes toward giving birth: while those with higher chance scores were more likely to report distancing attitudes, no relationship could be observed between distancing and the degree of attributed control to health care professionals.

The multivariate analyses (*Table 3*) indicated that all MHLC-LD-R subscale scores were significant in predicting birth-related fear even when controlling for the dimensions of general health locus of control, age, educational level, and self-rated health. The results were similar regarding approaching and distancing attitudes toward giving birth, with the exception of scores on the Chance Subscale in relation to approaching attitudes, and scores on the Health Care Professionals Subscale with regard to distancing attitudes, which were not significant in predicting the dependent variables when adjusting for all the covariates.

4. Discussion

Control beliefs regarding labour and delivery might affect the psychological experience and physiological process of child birth as well as decisions regarding number of children in a family or health care service utilisation (e.g., hospital, birth centre or private home as the setting for labour and delivery, involvement of physicians or nurses vs. midwives or other health care professionals). The aim of the present study was to propose a new, economic assessment tool with appropriate psychometric characteristics to measure delivery-related control beliefs in a larger variety of respondents than the previously existing assessment tool (MHLC-LD).

The 12-item MHLC-LD-R proved to have a factor structure consistent with theoretical predictions and adequate reliability characteristics. The bivariate analyses to test construct validity supported the convergent and divergent validity of the MHLC-LD-R dimensions, while in the multivariate analyses, scores of the new measure were most often stronger predictors of birth-related attitudes than the general health locus of control dimensions, supporting the superiority of a delivery-specific assessment tool over a measure of general health-related control beliefs when predicting birth-related variables.

Limitations of the present study need to be acknowledged as well. First, the sample included women without previous delivery experience exclusively; an experience which could have obviously influenced how an individual understands her role in the process of giving birth. The overrepresentation of highly educated respondents also limits the generalisability of the findings. Involving men and other significant others in pregnant women's social networks into future research is also needed to better

Table 3
The role of delivery-specific and general health-related control beliefs in predicting delivery-related attitudes (general linear model)

	Fearful attitudes regarding giving birth		Approaching attitudes regarding giving birth		Distancing attitudes regarding giving birth	
	F	p	F	p	F	p
Age	0.058	0.810	2.137	0.144	0.056	0.813
		< 0.001		0.002		< 0.001
Education	0.584	0.445	12.744	< 0.001	0.274	0.601
		0.001		0.013		< 0.001
Self-rated health	20.105	< 0.001	8.199	0.004	0.820	0.365
		0.020		0.008		0.001
General health-related locus of control – internal	0.678	0.410	5.595	0.018	0.235	0.628
		0.001		0.006		< 0.001
General health-related locus of control – chance	2.514	0.113	4.589	0.032	0.040	0.842
		0.003		0.005		< 0.001
General health-related locus of control – powerful others	2.000	0.158	7.897	0.005	2.840	0.092
		0.002		0.008		0.003
Delivery-related locus of control – internal	19.949	< 0.001	24.065	< 0.001	11.517	0.001
		0.020		0.024		0.012
Delivery-related locus of control – chance	24.344	< 0.001	0.753	0.386	8.511	0.004
		0.024		0.001		0.009
Delivery-related locus of control – health care professionals	6.074	0.014	37.206	< 0.001	0.765	0.382
		0.006		0.037		0.001
Model characteristics	20.104	< 0.001	13.820	< 0.001	4.755	< 0.001
		0.157		0.113		0.042

understand if and how their beliefs influence expectant mothers' decisions on labour and delivery-related issues. Finally, reliability indicators for two of the used scales (MHLC / Others Subscale, BPNS / Competence Subscale) were below the suggested threshold, which – although acceptable when considering the low number of items – warrants careful interpretation of the data resulting from the use of these tools. Despite these limitations, the revised version of the Multidimensional Health Locus of Control Scales for Labour and Delivery seems to be an economic and psychometrically adequate tool to assess birth-related control beliefs regardless of the individual's actual stage in the reproductive life cycle or role in labour and delivery.

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Appendix

Full text of the revised version of the Multidimensional Health Locus of Control Scales for Labour and Delivery (MHLC-LD-R)

Item #	Subscale	Item in Hungarian	Item in English*
Instruction		A következőkben különböző állításokat talál, melyek sokféle véleményt tükröznek a szüléssel kapcsolatban. Nincsenek helyes vagy helytelen válaszok közöttük, minden egyes állítással sokan egyetértenek, míg sokan nem. Kérjük, jelezze minden állítással kapcsolatban egyetértésének vagy egyet nem értésének mértékét.	Below you will read different belief statements reflecting various opinions about giving birth. There are no right or wrong answers; regarding each item there are plenty of people who agree while many others disagree. Please rate the level of your agreement or disagreement concerning each statement.
1	Chance	Mindegy, mit tesz a várandós nő, mert a szülést úgysem lehet befolyásolni.	No matter what the expectant woman does, the process of birth cannot be influenced.
2	Internal	Elsősorban a várandós nőn múlik, hogy hogyan sikerül a szülése.	The pregnant woman herself is the main factor that influences the outcome of the delivery.
3	Health Care Professionals	A várandós nőnek gyakran fel kell keresnie az orvosát, mert ez a legbiztosabb módja annak, hogy minden rendben legyen a szülése körül.	Having regular contact with her physician/obstetrician is the best way for the pregnant woman to make sure that everything will be fine around her labour and delivery.
4	Internal	Magán a várandós nőn múlik, hogy hogyan alakul a szülése.	It is the pregnant woman who is in control of her birth outcomes.
5	Health Care Professionals	Amikor a várandós nőnek kérdése van a szüléssel kapcsolatban, a válaszáért orvoshoz vagy más szakemberhez érdemes fordulnia.	Whenever a pregnant woman has questions about labour and delivery, she should consult a medically trained professional.
6	Chance	Úgy tűnik, nagyrészt véletlenek befolyásolják, hogy a szülés milyen lesz.	It seems that the quality of birth is mainly influenced by chance.
7	Internal	A szülés folyamatára leginkább az van hatással, hogy a várandós nő mit tesz.	The main thing which affects the process of birth is what the pregnant woman herself does.

<i>Item #</i>	<i>Subscale</i>	<i>Item in Hungarian</i>	<i>Item in English*</i>
8	Health Care Professionals	A szülés sikeres lefolyása az egészségügyi szakemberektől függ.	Health professionals control the outcomes of birth.
9	Internal	Ha a várandós nő jól felkészül, akkor jó lesz a szülése.	If an expectant woman makes the right preparations, birth outcomes will be fine.
10	Chance	Nagyrészt a szerencsén múlik, hogy hogyan zajlik le a szülés.	Luck plays the major role in determining how delivery runs its course.
11	Health Care Professionals	Ha minden rendben van a szüléssel, az azért van, mert az orvos vagy a nővér mindent megtesz, amit lehetséges.	When everything turns out to be fine with a birth, it's because doctors, nurses have been doing everything possible.
12	Chance	Az, hogy jól alakul-e a szülés, leginkább a jószerencsén múlik.	A decent birth process is largely a matter of luck.
Rating scale		(1) Egyáltalán nem értek egyet / (2) Nem értek egyet / (3) Kevésbé értek egyet / (4) Inkább egyet értek / (5) Egyet értek / (6) Teljesen egyet értek	(1) Strongly disagree / (2) Moderately disagree / (3) Slightly disagree / (4) Slightly agree / (5) Moderately agree / (6) Strongly agree

* Data presented in the current study resulted from the administration of the Hungarian-language items only. The English-language text in the present table is only the translation of the Hungarian-language items whose psychometric investigation is yet to occur.