

## Research letters

## Effects of framing on teratogenic risk perception in pregnant women

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We examined the effects of information presentation (framing) on women's perception of fetal risk, and their intention to use a safe drug during pregnancy. Half the women received negatively-framed information (1–3% chance of having a malformed child), the other half received positively-framed information (97–99% chance of having a normal child). Women in the negative group had a significantly higher perception of teratogenic risk (14.9%) than those in the positive group (8.3%),  $p=0.0484$ , and were less likely to want to take the drug. These findings suggest that health professionals and policy makers need to carefully consider how information is best presented.

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Since the thalidomide disaster, every drug has been perceived as potentially harmful for the fetus. In fact, less than 30 medicinal drugs have been shown to be teratogenic if used in the recommended doses. Services such as Motherisk attempt to distribute this information to the public. The Motherisk Program is a counselling service based in Toronto, Canada, which provides evidence-based information to pregnant women (or women contemplating pregnancy) and their health-care professionals about fetal and maternal safety, and risks associated with drug, chemical, radiation, and infectious exposures in pregnancy and lactation. We impart this information daily to 150–200 women, mostly by telephone, by trained counsellors or information specialists.

One of the main objectives of Motherisk is to assist women and their health-care professionals to understand risk information in the hope that they will make better and more informed decisions. The consequences of poor decisions can be severe and include fetal malformations (if women are exposed to a teratogenic agent), psychological and physiological maternal harm (eg, if women choose to abruptly discontinue medication),<sup>1</sup> and termination of healthy and otherwise wanted pregnancies.<sup>2</sup> Therefore, presentation of accurate information in an understandable and convincing form is very important.

Slight changes in the way information is presented can have large effects on behaviour. For example, information framing can affect perceptual judgment, and decisions in patients and physicians.<sup>3</sup> In a classic study of attribute framing,<sup>4</sup> ground beef labelled "75% lean" (the positive frame) was seen as better tasting and less greasy than the same meat labelled "25% fat" (the negative frame). Furthermore, people asked to choose between surgery or radiation therapy for lung cancer view surgery as the more attractive option if life expectancy for surgery is framed in terms of the probability of living rather than of dying.<sup>5</sup> Thus, a similar manipulation might affect perceptions and decisions of pregnant women inquiring about teratogenic risk. We aimed to assess these effects by comparison of groups of women who received baseline fetal-risk information in a positive or negative form.

Participants were successive female Motherisk callers (already, or planning to be, pregnant) seeking information

about use of allergy-related drugs during pregnancy. Drugs included oral formulations, nasal sprays, and injections; none had been shown to increase teratogenic risk above baseline. For a complete list of drugs please contact the first author. 125 participants were included: 64 in the positive frame and 61 in the negative frame. However, only 105 participants were successfully contacted in follow-up. All women successfully contacted in follow-up agreed to participate. Table 1 shows their demographic characteristics.

After completing a standard intake form, callers were invited to participate in a study assessing "different ways of presenting information to callers". After giving verbal consent, callers were randomly assigned to baseline teratogenic-risk information in the positive (55 women) or negative (50) frame. Callers who received negatively-framed baseline information (the standard form of counselling at Motherisk) were told: "In every pregnancy, there is a 1–3% chance that a woman will give birth to a child who has a major birth defect. This/these drug(s) [insert applicable drug name] has/have not been shown to change that." Callers receiving positively framed baseline information were told: "In every pregnancy, there is a 97–99% chance that a woman will give birth to a child who does not have a major birth defect. This/these drug(s) [insert applicable drug name] has/have not been shown to change that."

Follow-up calls to participants were made 1–4 days after the first call. During follow-up, women were asked to (1) rate their likelihood of having a child with a birth defect as a result of using allergy-related drugs on a 5-point scale ranging from 1, "very low", to 5, "very high", with 3 being "moderate"; (2) rate their likelihood of having a child with a birth defect as a result of using allergy-related medications on a 100-point scale ranging from zero, "0% or absolutely no chance", to 100, "100% or definite chance"; and (3) indicate whether or not they were going to take the drug(s) in question. Data were compared between the framing groups with the Mann-Whitney U test (question 1), unpaired *t* test (2), and  $\chi^2$  (3).

In terms of risk perception, the two scales gave almost the same information. Binomial tests and one-sample *t* tests against the values of 3, 4, and 5 together (five-point scale) and 50 (100-point scale), respectively, showed that both groups estimated their risk of having a child with a birth defect as a result of allergy-related drug use as being low (all *p* values <0.05). Participants who had received positively-framed information, however, gave lower estimates of risk

	Negative frame group (n=50)	Positive frame group (n=55)
Characteristic		
Age (mean [SD], years)	30.5 (4.4)	31.0 (4.2)
Gravidity (median [range])	1 (0–6)	1 (0–6)
Parity (median [range])	0 (0–3)	0 (0–4)
First time callers	33 (66%)	38 (69%)
Currently pregnant	41 (82%)	49 (89%)
Currently exposed to medication in question	27 (54%)	27 (49%)

Table 1: Demographic characteristics

Measure	Negative frame (n=50)	Positive frame (n=55)	p
Estimate of fetal risk (mean [SD])*	1.86 (0.95)	1.73 (0.85)	0.503
Estimate of fetal risk (mean [SD])†	14.9 (20.3)	8.3 (13.1)	0.048
Number indicating that they would take the medication‡	9 (20%)	17 (34%)	0.126

\*Five-point scale, 1=very low, 5=very high. †100-point scale. ‡n=45 and n=50 for the negative and positive frames, respectively.

Table 2: Results for callers receiving negatively and positively framed information

than those who received negatively-framed information (table 2). This difference, though, was significant only for the 100-point risk estimation scale ( $p=0.0484$ ). Previous research,<sup>2</sup> with a validated in-clinic visual analogue scale, has shown that mean estimates are 25% before Motherisk counselling.

Results showed no significant difference in the proportion of callers who said that they would take the medication in question. (A "no" decision included those who said "no" and those who said "no, probably not". Under positive framing, ten women responded "no" and 23 women responded "no, probably not". Under negative framing, seven women said "no", and 29 said "no, probably not"). However, there was a tendency for callers receiving information in the positive frame to respond with "yes" more so than callers in the negative frame ( $p=0.126$ ). Almost twice as many women responded "yes" under positive, compared with negative, framing, 34% versus 20%, respectively. However, this difference was not significant and even with positive framing more than 65% of women chose not to take their medication. An additional  $\chi^2$  analysis was done with three categories instead of two: "yes", "no", and "no, probably not". The result ( $\chi^2=3.43$ ,  $p=0.180$ ), though non-significant, suggested that the increased proportion of "yes" responses under positive framing (by comparison with negative framing) came from callers switching from "no, probably not" to "yes", rather than from "no" to "yes".

Our results accord with those of previous work showing that framing manipulations can alter risk perceptions as well as decision-making. We showed that presentation of teratogenic risk information to women in terms of the probability of giving birth to a normal child lowers their perception of risk, and increases the likelihood that they will take their medication, more than does presentation of the same information in terms of the probability of giving birth to a malformed child.

Clearly, better information about risk is important in making better health care decisions. However, people are affected by the way in which information is presented. Subtle changes in framing make a substantial difference to people's responses. Should programmes such as Motherisk use positive framing with safe drugs? Should health professionals prejudge their patients' decisions and attempt to manipulate their perceptions? Perhaps health workers should present information neutrally—ie, in a mixed (positive and negative) frame. The choice of appropriate formulation, however, does not involve science per se, but rather the domains of law, ethics, and politics, and, obviously, necessitates a larger, more formal study.

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- Einarson A, Selby P, Koren G. Abrupt discontinuation of psychotropic drugs during pregnancy: fear of teratogenic risk and impact of counseling. *J Psychiatry Neurosci* 2001; 26: 44–48.
- Koren G, Bologna M, Long D, Feldman Y, Shear NH. Perception of teratogenic risk by pregnant women exposed to drugs and chemicals

during the first trimester. *Am J Obstet Gynecol* 1989; 160: 1190–94.

- Levin IP, Schneider SL, Gaeth GJ. All frames are not created equal: a typology and critical analysis of framing effects. *Org Behav Hum Dec Proc* 1998; 76: 149–88.
- Levin IP, Gaeth GJ. Framing of attribute information before and after consuming the product. *J Consum Res* 1988; 15: 374–78.
- McNeil BJ, Pauker SG, Sox HC, Tversky A. On the elicitation of preferences for alternative therapies. *N Engl J Med* 1982; 306: 1259–62.

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## Selection pressure for the factor-V-Leiden mutation and embryo implantation

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The factor-V-Leiden mutation is seen in high frequencies in white people, despite its contribution to second-trimester abortion, preterm birth, and deep-vein thrombosis. The reason for its high frequency is not known. We investigated 102 mother-child pairs who had had successful in-vitro fertilisation by intracytoplasmic sperm injection as a model for human implantation. In 90% (9 of 10) of mother-child pairs who carried factor-V-Leiden mutation, the first embryo transfer was successful, compared with 49% (45 of 92) in factor-V-Leiden negative pairs ( $p=0.018$ , Fisher's exact test). Furthermore, the median number of unsuccessful transfers was lower in pairs who were positive for the mutation (0, range 0–2) than those who were negative (1, 0–8) ( $p=0.02$ , Mann Whitney U test) suggesting that improved implantation rate is an important genetic advantage of the factor-V-Leiden mutation.

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Factor-V-Leiden (FVL) mutation is present in about 6% of white people and is the most common risk factor for venous thrombosis in this population. Haplotype analyses suggest a sole origin for the FVL mutation, which is estimated to have arisen 21 000–34 000 years ago.<sup>1</sup> The only positive effect of the mutation described so far is a moderate reduction of maternal intrapartum blood loss.<sup>2</sup> Since the mutation is associated with a raised risk of fatal disorders such as second trimester abortion and very preterm delivery,<sup>3,4</sup> there have to be some unknown benefits, or the mutation would have been eradicated.

In in-vitro fertilisation by intracytoplasmic sperm injection (IVF/ICSI), spermatozoa and oocytes are selected by a technical assistant, and one spermatozoon is directly injected into the oocyte. Therefore, survival of an embryo after IVF/ICSI is almost wholly due to its ability to implant in the endometrium. Mothers with a mutation that improves the likelihood of implantation would need fewer embryo transfers, and embryos with such a mutation would be more frequently implanted. Most carriers of the FVL mutation are heterozygous. If the maternal FVL mutation alone is associated with improved implantation, its presence would result in a raised implantation rate of both FVL-positive and FVL-negative embryos, but the higher rate of FVL-positive fetuses who are aborted during the second trimester of pregnancy<sup>3,4</sup> would lead to an eradication of the