Knowledge about infertility risk factors, fertility myths and illusory benefits of healthy habits in young people

Laura Bunting and Jacky Boivin

School of Psychology, Cardiff University, Tower Building, Park Place, Wales CF10 3AT, UK

BACKGROUND: Previous research has highlighted a lack of fertility awareness in the general population especially in relation to the optimal fertile period during the menstrual cycle, incidence of infertility and duration of the reproductive life span. The current study assessed fertility knowledge more broadly in young people and investigated three areas of knowledge, namely risk factors associated with female infertility (e.g. smoking), beliefs in false fertility myths (e.g. benefits of rural living) and beliefs in the illusory benefits of healthy habits (e.g. exercising regularly) on female fertility. METHOD: The sample (n = 149) consisted of 110 female and 39 male postgraduate and undergraduate university students (average age 24.01, SD = 7.81). Knowledge scores were based on a simple task requiring the participants to estimate the effect a factor would have on a group of 100 women trying to get pregnant. Items (n = 21) were grouped according to three categories: risk factors (e.g. smoking; 7 items), myths (e.g. living in countryside; 7 items) and healthy habits (e.g. being normal weight; 7 items). RESULTS: An analysis of variance showed a significant main effect of factor (P < 0.001) and post hoc tests revealed that young people were significantly better at correctly identifying the effects of risks compared with null effects of healthy habits (P < 0.001) or fertility myths (P < 0.001). CONCLUSION: Young people are aware that the negative lifestyle factors reduce fertility but falsely believe in fertility myths and the benefits of healthy habits. We suggest that the public education campaigns should be directed to erroneous beliefs about pseudo protective factors.

Keywords: fertility knowledge; risk factors; infertility; psychology; fertility myths
future fertility problems. Scarcely any studies have examined whether people are aware of the main lifestyle (e.g. smoking, alcohol consumption; Roth and Taylor, 2001) and reproductive (e.g. menstrual cycle irregularities; Koff et al., 1990) risk factors for infertility. Research focusing on age (Lansac, 1995; Lampic et al., 2006; Skoog Svanberg et al., 2006) and sexually transmitted infections (STIs) (e.g. increased risk of tubal damage, Mosher and Aral, 1991) also show a lack of general knowledge. In light of such work, it is imperative to assess understanding of the effects of other factors associated with reduced fertility. Another important source of misinformation that could impact on fertility self-care is erroneous belief, e.g. in fertility myths or fertility gains made by staying healthy. For example, people may falsely believe that they ‘increase’ their fertility by not smoking rather than simply avoid decrements in fertility due to smoking. In the present study, we examined fertility knowledge in relation to not only the risk factors but also fertility myths and misconceptions about healthy habits as both may contribute to poor fertility self-care.

Risk factors, fertility myths and illusory benefits of health habits
Numerous factors have been associated with reduced fertility problems that cover demographic (e.g. age), reproductive history (e.g. menstrual cycle characteristics, history of pelvic surgery) and current lifestyle habits (e.g. alcohol consumption, smoking). The aim of the present study was to establish knowledge regarding risk factors associated with infertility in a young, university sample, who should demonstrate the highest level of fertility knowledge one should expect from young people. Seven risk factors were selected based on their relevance for a young population; age, weight, smoking (tobacco and marijuana), alcohol consumption, stress and STIs (e.g. Chlamydia). There is a plethora of research associating age, weight, smoking and STI to the reduced fertility (see Cates et al., 1990; Hassan and Killick, 2004; Homan et al., 2007 for reviews). There is also emerging, but inconsistent, evidence of associations between alcohol consumption. Homan et al. (2007) concluded in their review of the literature that there is sufficient evidence to recommend that couples attempting to conceive should limit or abstain from consuming alcohol. Similarly, there does appear to be converging evidence that increasing levels of stress are associated with reduced fertility (Boivin and Schmidt, 2005; Homan et al., 2007). It would therefore be important to ascertain whether young people know the potential influence of these factors. Knowledge about these seven risk factors was examined and compared with the knowledge and beliefs about other factors associated with fertility (as below).

As a taboo subject people accumulate many myths about reproductive health and fertility. ‘Old wives tales’ describe unusual events occurring due to a person carrying out a relatively normal behaviour (e.g. feed a cold, starve a fever; cracking your knuckles will cause arthritis; Castellanos and Axelrod, 1990; van den Brink et al., 2002) and there are a number of tales or fertility myths regarding increasing the chances of becoming pregnant. For example, women conceiving naturally immediately after adopting a child (Lamb and Leurgans, 1979). Other myths concern post-coital techniques (e.g. standing on your head, Daniluk, 2001) that would keep the oocyte and sperm in closer contact and facilitate fertilization. Although all are relatively harmless in that they do not involve risky behaviour, there is no empirical research that these factors have an effect on pregnancy. Another source of misconception is falsely believing that not engaging in unhealthy habits actually increases health (Blenner, 1990). For example, that ‘never’ smoking or drinking, or exercising and maintaining a healthy weight is conducive to better fertility. Although such abstinence is a positive way to act the healthy habits typically maintain baseline fertility and do not in and of themselves increase or decrease fertility. In the present study perceptions of fertility associated with seven myths (three regarding post coital behaviours; two regarding living area; one on healthy eating and one about adoption) and seven healthy habits linked to the risk factors (e.g. ‘never’ smoking, ‘never’ drinking alcohol) was examined.

The main aims of the study were to first ascertain knowledge/awareness of the effect of certain risk factors on a woman’s chance of achieving a pregnancy in a sample of 149 young men and women. Assessing risk is not an easy task. A significant proportion of the public have difficulty understanding numerical risk information (Weinstein, 1999) with people often grossly overestimating risks and being influenced by particular ways in which numbers are presented (i.e. anchoring and availability bias; Fischhoff et al., 1993, framing effects; Tversky and Kahneman, 1981). Risk and risk perception are defined in a number of diverse ways and is often interpreted differently by individuals (Sjøberg, 1997). Recommendations have been made to improve the validity of risk assessment and these were used in the present study. Instructions clearly stated the rationale behind the task (Fischhoff et al., 1993) and the method of ascertaining risk perception used graphical representations and numerical information to increase comprehension of risk (Julian-Reyniet et al., 2003). Specifically, participants were asked to rate the impact that the different factors (risks, fertility myths and healthy habits) would have on the chances of 100 women getting pregnant using a graphically presented sliding scale. A second aim was to determine whether participants could distinguish between factors that have an effect on pregnancy rates (risk factors) and those that do not (myths and healthy habits). In line with the research reviewed, it was hypothesized that the participant’s knowledge concerning the factors that affect fertility would be poor.

Materials and Methods
Participants
The final sample consisted of 149 participants, 110 women and 39 men. On average the sample was 24.01 (SD = 7.81) years of age, with 61.7% educated to A-level standard (equivalent to the International Baccalaureate). The data were pooled from two waves of data collection. The first stage of collection (n = 83) were postgraduate (i.e. Master’s and doctoral) university students and junior staff, the second undergraduate (i.e. Bachelor’s) students (n = 66),
all from Cardiff University. The first sample was older (M = 28.76 years, SD = 9.74) (t(147) = 7.86, P < 0.001) and educated to a higher standard (χ² 95.49 df = 3, P < 0.001) compared with the undergraduate sample (M = 20.23 years, SD = 1.53).

Materials

- Background information form: This form was designed for the study to obtain demographic information (e.g. age, highest educational qualification) about the participants.
- The factors affecting fertility scale (FAFS) was designed for this study. For each question, participants marked a number on the response scale that represented their perception of the effect a given factor (e.g. smoking) had on the chance of pregnancy of 100 women trying to get pregnant. The online survey was designed by iPsychExpts (Brand, 2005).

Items

Participants were asked to the rate factors belonging to three categories: risk factors (7 items, e.g. smoking), fertility myths (7 items, e.g. living in the countryside) and healthy habits (7 items, e.g. being normal weight). Each factor was evaluated by a number of questions depending on the level of risk associated with that factor in the literature review, resulting in 30 questions being presented to participants. For example, the risk factor smoking produced four questions, namely the effect of never smoking (‘healthy habit’), smoking 1–9 cigarettes per day (‘considered a low risk factor’), 10–19 cigarettes (‘considered a high risk factor’) or over 20 cigarettes (‘considered a high risk factor’) per day.

Instructions and response scale

The response scale ranged from 0 to 100 women (intervals of 5). Participants were presented with 30 questions about 21 factors and asked to decide whether the given factor had an effect on the number of women in the group of 100 who would get pregnant in 3 months, and if so, the direction of the effect (i.e. an increase, decrease or no effect). The number 50 represented ‘no effect’ as population data predicts that 50 of 100 women would conceive after 3 months of unprotected intercourse (It was calculated that if 100 women were trying to get pregnant, on average after 3 months of unprotected sexual intercourse, it would be expected that half of these 100 women would have achieved a pregnancy (calculation was made from time to pregnancy data; Te Velde et al., 2000)). The online response scale showed a vertical bar with 21 radio buttons (0–100). The number 50 was always highlighted with a written reminder that choosing it meant that the factor was perceived to have no effect. If the mouse was held over a number a pop-up caption appeared providing the participant with additional information. For example, if the participant was to hover the mouse over the number 85, a caption would appear on the computer screen, stating ‘35 extra women will get pregnant, representing a 70% increase in the number of women getting pregnant’. The pop-up box for each number contained the same amount of information.

FAFS scoring

Two scores were derived from the FAFS. A ‘percentage correct score’ was derived for each category (risk, myth and healthy habit) by summing the number of correct responses to the relevant items. For the correct score, correct identification of the effect of the factor (i.e. correct identification that smoking decreases the number of women getting pregnant) was assigned 1. An incorrect response (i.e. incorrectly responding that living in the countryside increases the number of pregnant women) was assigned 0. The maximum score for each category was 7. Participant’s total correct score (per category) was then divided by the maximum score (per category) and multiplied by 100, to give the percentage correct score. A ‘pregnancy gain/loss score’ was calculated to express the degree to which people believed a factor increased (positive score, maximum 50) or decreased (negative score, maximum 50) the number of women who would get pregnant. It was derived for each item by calculating an average deviation score from 50 (no effect).

FAFS instructions, items and response scales can be obtained from the corresponding author.

Procedure

Participants were recruited through the university electronic participant panel that advertises research studies to psychology students and the university-wide electronic notice board system. The study was approved by the Ethics Committee of the School of Psychology, Cardiff University.

Potential participants received a written announcement on the electronic notice board when they signed into their university account inviting them to participate in an online survey about fertility. Those interested followed a link to the FAFS online survey website and were instructed on how to complete the survey. Questions were randomly presented and completion of all the questions took around 5–10 min. Once they completed the final question, they were given a more detailed explanation of the study and the option to submit their answers if they wished.

Data analyses

Preliminary data screening produced one participant that was excluded from the analyses due to incomplete data (>50% of data missing). An analysis of variance (ANOVA) was conducted with category (Risk, Healthy Habit, Myth) as the within-subject factor and percentage correct score as the dependent measure. A probability value P < 0.05 was regarded as statistically significant. A significant category effect was followed-up with paired t-tests (using the Bonferroni correction, P < 0.017 for alpha inflation). Pearson r correlation, t-tests and ANOVA were used to examine the relationships between knowledge and demographic variables. Analyses were performed with the software Statistical Package for the Social Sciences.

Results

Knowledge regarding factors associated with infertility

Fig. 1 shows average percentage correct scores per category. An ANOVA showed an overall significant effect (F(2,296) =

Figure 1: Average percentage correct score per category (n = 149).
482.93, \( P < 0.001 \) of category. Follow-up tests revealed that the participants were significantly better at identifying risks compared with myths (\( P < 0.001 \)) or healthy habits (\( P < 0.001 \)), and significantly better at identifying myths compared with the healthy habits (\( P < 0.001 \)) with an average correct score of 90.70% compared with 41.53 and 26.46%, respectively. Neither age nor gender was associated with knowledge level. A trend was found for education and knowledge (\( F_{(3145)} = 2.59, \ P = 0.055 \)) with follow-up tests showing a trend for degree students having higher knowledge scores compared with A-level students (\( P = 0.088 \)).

Fig. 2 shows the pregnancy gain/loss score for each question in each category. Participants correctly identified all the high risk factors as decreasing the chances of getting pregnant (see Fig. 2) as shown by negative deviations (i.e. loss). Being over 45 years of age was considered to have the greatest impact of all the risk factors on the number of women getting pregnant, whereas being aged 35–39 was the least impact.

Participants believed that myths and healthy habits had an impact on pregnancy rates. With the exception of two factors (living in the city and post-coital urination) participants rated myths as increasing the chance of getting pregnant (see Fig. 2). Eating five portions of fruits and vegetables had the largest gain score (15.50); meaning that just over 15 extra women would achieve pregnancy due to eating the recommended number of fruits and vegetables a day. Participants also believed that living in the city decreased the number of women getting pregnant by 5.40, while living in the countryside actually increased chances by 5.77 women.

Other than doing less than 7 min of exercise per day (average decrease in the number of women pregnant by 7.82), all the healthy behaviours were rated as having a positive influence on the pregnancy rate (see Fig. 2). Being under the age of 24 was associated with a gain score of 19.56, with being able to cope with stressful events having the smallest gain (1.24).

Finally, Fig. 2 also includes the four low risk factors. These follow a similar pattern to the high risk factors, in that

Figure 2: Pregnancy gain/loss scores per item, according to the category in a survey of knowledge about female infertility in young people.
participants are rating the majority of these behaviours as having a negative effect on the number of women getting pregnant. With the exception of drinking under 14 U of alcohol per week that showed an increase (4.29) in pregnancy rates, all the factors suggest that the participants are rating healthy habits as increasing the number of women getting pregnant and the risk factors (high and low) as decreasing the number of women conceiving.

Discussion
Knowledge about fertility issues is a core motivator behind engaging in the medical process for fertility problems (Bunting and Boivin, 2007). The results demonstrated that the participants were knowledgeable about the risk factors for infertility but were not as knowledgeable at recognizing factors that had no effect on fertility (myths and healthy behaviours), and believed that these factors actually increased a woman’s fertility potential. Fertility awareness campaigns need to address false beliefs as these may give individuals a false sense of security about their fertility.

Taking into account only the correct identification of the risk factors one would conclude from the results that in this young, educated sample, knowledge regarding the potential risks associated with infertility was high. All the risk factors were correctly identified as decreasing the number of women who would get pregnant. Although such results may reflect genuine knowledge given the lack of fertility information in the public domain (Fuentes and Devoto, 1994; Adashi et al., 2000; Dyer et al., 2002; Kuang et al., 2006; Lampic et al., 2006) it is more likely that participants were using their knowledge about negative lifestyle factors in other health conditions to make an assumption about their effect on fertility. All the risk factors used (e.g. smoking, obesity) have been associated with serious health conditions that have received extensive media coverage (e.g. lung cancer, heart disease; Newcomb and Carbone, 1992; Hecht, 1999; Edwards, 2004). Many studies have shown that people are aware of the impact of risk factors on health (Sutton, 1998; Siahpush et al., 2006) and research also shows that people apply scientific knowledge acquired from different sources (e.g. friends, acquaintances, and media) to novel domains (Collins and Evans, 2007). Although generalization seems to be a good way to manage a large quantity of incoming health information, it could occasionally lead to over-generalization. For example, in the current study, participants rated drinking small quantities of alcohol as beneficial possibly because of the perceived benefits of red wine to cardiovascular function (Gronbaek et al., 1999; Poikolainen and Vartiainen, 1999; Wollin and Jones, 2001).

Young people perceived certain factors to be riskier than they actually were, and a number of low risk factors were perceived as reducing fertility to the same degree as high risk factors. For example, being overweight is a major risk factor for infertility (Hassan and Killick, 2004; Gesink Law et al., 2007) but was rated as having a lesser effect than alcohol consumption and smoking (both tobacco and marijuana) which have less pronounced effects on fertility. This finding could be an artefact of the FAFS paradigm because gains/losses could only be made in intervals of 5, but even with this consideration gains and losses seemed exaggerated. Therefore, the results would seem to suggest that while young educated people have broad knowledge of risk factors they lack specific knowledge of how much exposure is too much exposure in relation to fertility effects. There is much debate in the health literature about whether one ought to implement zero tolerance policies or educate people to know critical thresholds for negative effects. For example, whether pregnant women should be told not to drink at all or whether they should be told not to drink more than one small glass of wine per day (NICE, 2003). It could be important to relay accurate information to the public to reduce the possibility that without such specificity people would consider themselves outside the risky zone of behaviour. Although our results suggest that people do not know critical threshold levels when it comes to fertility, we need more research to find out whether knowing such thresholds would indeed change negative behaviours.

One limitation of the present study is that young people were not asked whether they engaged in the risk behaviours or how they felt their lifestyle was affecting their own fertility. Although people may be able to identify risk factors they may not apply this risk to themselves. Smokers present an excellent example of this as they often maintain an illusion of immunity concerning their personal tobacco related health risks (Hay et al., 2005). There is evidence of similar beliefs for fertility, especially in relation to age. In the present study, age was associated with the largest pregnancy loss score (29.43%) with correct identification that fertility declines from 35 years of age. These results are consistent with numerous other studies that show people are aware of the relationship between age and declining fertility. Despite this, there is a steady increase in the number of women having children over the age of 35 in Western countries (Botting and Dunnell, 2000). The current research could therefore be extended by investigating differences between general versus personal risk perception as such work may show that people do not apply risk to themselves in decision-making about everyday health habits (e.g. whether to smoke or not, at what age to have a child). In addition, having accurate knowledge may only be the first step in the process of behaviour change. It would be important to establish how people go from personal risk to actual behaviour change (i.e. reducing negative lifestyle habits) and what factors are important to this transition. Previous research has highlighted that the extent to which the person wants, desires or wills to change (Miller and Rollnick, 2002) is imperative to successful behaviour change. The motivation to change could be particularly high in the context of fertility as having a child is a highly valued life goal for the majority of young people (Lampic et al., 2006).

In contrast to good risk knowledge, false beliefs were abundant. Participants erroneously believed that they could increase their fertility by, e.g. moving to the countryside, using specific coital techniques, eating fruit and vegetables or adopting a child. All these myths were obtained from reputable sites on the internet and participants believed these behaviours could increase fertility by an average of 6.2%. In addition to these myths, participants also erroneously believed that one could...
be more fertile by ‘not doing’ something unhealthy (e.g. never drinking alcohol), which is an incorrect assumption to make as healthy lifestyles are only good because they reduce the exposure to risk and its effects rather than because they are in and of themselves health promoting. Together these results would suggest that people could, if faced with a fertility problem, engage in ineffective behaviours that could delay seeking effective interventions. Indeed, people who keep a healthy lifestyle often express astonishment that they should be infertile given that they were the healthiest of their family and friends (Blenner, 1990). Feeling healthy has also been cited as a reason for delay in a number of other illnesses (e.g. heart disease, White and Johnson, 2000; cancer, Smith et al., 2005).

The FAFS proved a useful tool to obtain data on people’s beliefs about the factors presented. Only one participant had to be excluded due to the incomplete data and no negative comments were given at the end of the study by participants regarding the use and information provided by the scale. One problem with most attempts to learn whether people know what causes an illness is that the correct answer is often implied within the questions (Weinstein, 1999). Thus asking a person whether smoking is a risk factor for infertility reminds them of the health effects that are of concern and perhaps suggests that it must have some effect. People might therefore assume that any factor questioned in the FAFS must have some effect, including the myths and health behaviours. To counteract this methodological artefact, the instructions and scale were very specific in reminding participants that the marker could be left at 50 meaning the factor had no effect and the label attached to the number 50 stated that 50 meant ‘no effect’. The variability in responses (min 0 and max 100) showed that individuals were using all response options (the number 50 was chosen on average 22.41% of the time). The FAFS was able to detect subtle but important grades of knowledge, e.g. broad versus specific risk knowledge (e.g. between levels of cigarette smoking or between different ages) and could be used to better inform health campaigns.

The results of this study could be extended in a number of ways. In the current study, the sample was well educated, with the majority achieving at least A-level education. Studies looking at a wide range of health areas (cancer, diabetes, human immunodeficiency virus) have found that education levels have negative relationships between literacy skills and health outcomes (DeWalt et al., 2004) and the initiation and uptake of healthcare campaigns (e.g. quitting smoking; Sander, 1995). Although public health campaigns do not discriminate and target all people exposed to the advertising including people with less education, it would be important to replicate in other samples with varied educational backgrounds, different cultures and so on. Similarly, more in-depth analysis of gender effects could be carried out. Previous research has highlighted that women are more likely to express higher concern about health risks (Boholm, 1998) and that men often have a poor knowledge of matters related to health (Banks, 2001). In this sample, no differences were found and this could be due to people not discriminating against gender, i.e. smoking is bad for anyone not just women. The current study had a low sample size of men (n = 39) and it would be important to increase this in future research to establish any gender differences. In addition, the FAFS only included factors affecting female fertility and therefore it is not known to what extent people would show similar knowledge and false beliefs in regards to male fertility. It would be important to establish people’s knowledge surrounding male fertility and whether gender differences occur in the way people rate the influence of a factor on fertility.

In conclusion, young educated people were aware of the risk factors that impacted negatively on a woman’s fertility, however false beliefs about beneficial effects of benign factors were also abundant. Further research needs to establish the impact incorrect knowledge has on perceived personal risk for fertility problems and on decision-making when couples are faced with difficulties conceiving.

Acknowledgement
The authors thank Laura Brighton for her help with data collection.

Funding
This project was funded by a Biotechnology and Biological Sciences Research Council (BBSRC) Case Studentship with Merck Serono International awarded to Laura Bunting.

References


*Submitted on January 21, 2008; resubmitted on March 17, 2008; accepted on April 8, 2008*