UC/FPCE_2015

Universidade de Coimbra
Faculdade de Psicologia e de Ciências da Educação

The impact of online fertility education: evaluating knowledge, childbearing motivations and the intentions to change negative lifestyle factors among reproductive age people

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Dissertação de Mestrado em Psicologia Clínica e da Saúde, Subárea de Especialização em Intervenções Cognitivo-Comportamentais nas Perturbações Psicológicas e na Saúde, sob a orientação da Professora Doutora Maria Cristina Canavarro e da Doutora Mariana Moura Ramos

O impacto de um programa educacional *online* sobre fertilidade: avaliação do conhecimento, motivações para a parentalidade e intenções de alterar factores de estilo de vida negativos em pessoas em idade reprodutiva

Introdução: A investigação tem mostrado que existem lacunas significativas de conhecimento sobre fertilidade e saúde reprodutiva entre homens e mulheres. Tal pode impedir as pessoas de se comportarem de forma otimizada e assim ameaçarem a sua paternidade futura. Método: A amostra incluiu 230 pessoas sem filhos, com idades compreendidas entre os 18 e os 40 anos, que foram distribuídas aleatoriamente por três grupos, sendo um destes o grupo de controlo. Os participantes completaram um questionário *online* que avaliou o seu conhecimento sobre fertilidade e saúde reprodutiva, a presença de fatores de estilo de vida negativos, motivações para a parentalidade e intenções de alterar o estilo de vida. Resultados: Os participantes que receberam informação sobre fertilidade e saúde reprodutiva aumentaram significativamente o seu conhecimento quando comparados com o grupo de controlo, que não recebeu qualquer informação. Um mês após receber informação, a maioria dos participantes tinha intenções de mudar pelo menos um dos fatores de estilo de vida negativos e quase metade já iniciado pelo menos uma mudança no seu estilo de vida. Os resultados mostraram ainda que possuir conhecimento afeta as intenções de mudança quando as motivações negativas para a parentalidade são baixas ou médias, mas não quando são elevadas. Conclusões: O estudo evidenciou que a educação elaborada com base em ferramentas *online* contribui para o aumento do conhecimento e afeta as intenções para proceder a mudanças no estilo de vida, o que pode contribuir para prevenir problemas de fertilidade futuros.

Palavras chave: programa educacional *online*, fertilidade, fatores de estilo de vida negativos, mudança no estilo de vida.

The impact of online fertility education: evaluating knowledge, childbearing motivations and the intentions to change negative lifestyle factors among reproductive age people

Background: Research has identified significant gaps in men's and women's knowledge of fertility and reproductive health, which can prevent them from behaving optimally and threaten future parenthood. Methods: Sample was composed by 230 childless people with ages ranged from 18 to 40 years, randomly assign in three groups, one of them the control group. Participants completed an online questionnaire aimed at assessing knowledge of fertility and reproductive health, negative lifestyle factors, childbearing motivations and intentions to do lifestyle changes. Results: Participants who received online fertility information significantly increased their knowledge about fertility and reproductive health when compared with the control group that did not receive any information. The majority of the participants had intentions to change at least one negative lifestyle factor and almost half had already initiated lifestyle changes one month after receiving online fertility education. Being informed affect intentions to change in situations where negative childbearing motivations were low or moderate, not high. Conclusions: The study provided evidence that online fertility education contributes to increase knowledge and affect intentions to do lifestyle changes, which contributes to prevent fertility problems.

Key Words: online fertility education, negative lifestyle factors, childbearing motivations, lifestyle changes.

Agradecimentos

Finalizada esta longa etapa, que se afigurou repleta de desafios paulatinamente transformados em novas aprendizagens, não posso deixar de agradecer aos profissionais e entes queridos que me acompanharam e auxiliaram neste percurso.

Por conseguinte, em primeiro lugar gostaria de agradecer à Professora Doutora Maria Cristina Canavarro, pelos ensinamentos e conselhos que contribuíram para construir aprendizagens mais sólidas.

À Doutora Mariana Moura Ramos, agradeço-lhe o seu enorme rigor, que tanto me fez crescer, mas acima de tudo a sua dedicação, toda a disponibilidade demonstrada e os momentos de partilha de conhecimento, sem os quais teria sido possível chegar até aqui. Foi um enorme privilégio poder trabalhar consigo.

A todos aqueles que colaboraram neste estudo longitudinal, o meu obrigado pelo tempo despendido. O contributo de cada um foi extremamente precioso!

Gostaria também de deixar uma palavra de agradecimento ao Doutor Marco Pereira, à Doutora Helena Moreira, à Doutora Ana Fonseca, à Doutora Susana Santos e à Doutora Cláudia Melo, pelos seminários para os quais se disponibilizaram (e que nos foram tão úteis) e pelas prementes manifestações de disponibilidade para esclarecimento de dúvidas.

À minha companheira de todas as horas, a Rita, pelo seu apoio e boa disposição. Juntas conseguimos cair de pé!

Depois, não posso deixar de agradecer a todos aqueles que, à sua maneira, decoraram este caminho árduo com os mais belos apontamentos de afeto, incentivo, otimismo e tranquilidade. Refiro-me em especial à Andreia, ao Cândido, à Eva, à Filipa, ao Francisco, à Sofia, à Verónica, à Mariana e, claro, ao Pedro.

Por último, agradecer à minha família. Aos meus avós maternos, que sempre me apoiaram neste e noutros percursos, e em particular à minha mãe, pelo exemplo de coragem, força e infindável dedicação.

Índice

I – Conceptual framework

The trend towards delaying childbearing increased dramatically in recent decades all over the world (Lampic, Svanberg, Karlström, & Tydén, 2006; Williamson, Lawson, Downe, & Pierson, 2014). A meta-analysis reported that several personal, social and economic factors form a complex process around the decision to delay parenthood (Cooke, Mills, & Lavender, 2010), namely the financial costs of raising a child, the presence and the quality of childcare, the importance of career, the influence of cultural norms, the personal beliefs regarding the context within which children should be educated, the importance of parenthood, the relationship status and the perceived control for getting pregnant, among other factors.

More and more men and women choose to have children above 35 years, especially among people with higher education qualifications (Cooke et al., 2010; Lampic et al., 2006; Williamson et al., 2014). In women, fertility begins to decline before 30, when the reduction of the quality and the quantity of oocytes occurs. The numbers of oocytes decline exponentially with age (Homan, Davies, & Norman, 2007). A woman above 35 years takes twice as long to get pregnant compared to a woman aged less than 25 years (Hassan & Killick, 2004). The capacity to maintain a pregnancy is also affected (Sharma, Biedenham, Fedor, & Agarwal, 2013).

Most women are aware of the decline of fertility with age, but a significant number overestimate the chance of pregnancy at any age and are unaware of the marked fertility decrease (Bretherick, Fairbrother, Avila, Harbord, & Robinson, 2010; Lampic et al., 2006). Bretherick et al. (2010) found that less than half of the women correctly identified women age as the most important factor for infertility. However, men are significantly more optimist in relation to age-related female fecundity than women (Lampic et al., 2006).

Contrary, a study based in a random sample of Canadian's women, between 20 and 45 years, found that approximately 75% of women knew that the possibility of conceiving change with age, with 41% underestimated the frequency of infertility (Tough, Benzies, Fraser-Lee, & Newburn-Cook, 2007). In addition, approximately half of the respondents in a telephone survey across Europe, United States and Australia underestimated the percentage of couples that seek medical assistance to treat infertility (Adashi et al., 2000). However, another studies found a trend to overestimate the prevalence of infertility. These discrepancies between studies may derive from population's surveyed (Bretherick et al., 2010).

Thus, the postponement of parenthood increases the prevalence of involuntary childlessness or secondary infertility (Lampic et al., 2006). An estimated 9% of people worldwide are infertile and this percentage tends to be higher in developed countries (Boivin, Bunting, Collins, & Nygren, 2007). In Portugal, the number of infertile couples is approximately 300,000 (Silva-Carvalho & Santos, 2009).

Despite fertility problems are a medical condition, some of the causes of infertility may be preventable through the adoption of a healthy lifestyle and changing negative factors that may compromise future fertility.

However, it remains unclear whether providing information of modifiable risk factors to men and women in reproductive age increases knowledge on fertility and reproductive health and whether this knowledge may have an effective impact in lifestyle changes.

The effect of Negative Lifestyle Factors in fertility

Several environmental, occupational, health and social factors may affect human fertility. While some cannot be modifiable, others, such as negative lifestyle factors, may be changed (Sharma et al., 2013), contributing to reducing the risk of fertility problems in the future. In the cases where risk factors cannot be modifiable (e.g. related to reproductive history) it is important to inform people about those risk factors, for people can seek help in a timely manner. These risks include menstrual cycle irregularities, menstrual pain and history of pelvic surgery among others (Koff, Rierdan, & Stubbs, 1990). For men, for instance, having had parotiditis during adulthood is an important risk factor that may contribute to an early diagnosis of fertility problems (Andersen et al., 2000).

Negative lifestyle factors include unprotected sexual intercourse, abnormal weight and smoking (Bunting & Boivin, 2010; Kelly-Weeder & Cox, 2006; Homan et al., 2007). There is also emerging evidence that the alcohol consumption affects fertility, but results are inconsistent (Bunting & Boivin, 2008; Homan et al., 2007). For men, the exposure to radiation is another negative lifestyle factor (Kumar, Kumari, & Murarka, 2009).

Smoking has been linked to ovarian follicular damage, oocyte depletion, ectopic pregnancies, uterine tube, alter hormone levels and time to get pregnant was significantly longer if woman or partner smoked more than 15 cigarettes per day (Hassan & Killick, 2004; Homan et al., 2007; Kelly-Weeder & Cox, 2006; Sharma et al., 2013). According to Bunting and Boivin (2008), fertility is affected if people just smoke more than 10 cigarettes per day. For men, studies suggested a quality reduction of semen with alterations in sperm production and morphology (Daniluk & Koert, 2013; Kumar et al., 2009). Smoking was significantly more common among male. Comparing the number of cigarettes pack smoked per day, men smoke significantly more cigarettes than women, too (Gungor, Rathfisch, Beji, Yarar & Karamanoglu, 2013).

Alcohol consumption seems to decrease fertility, but is unclear which quantity is a risk factor for fertility. Alcohol consumption may just damage fertility when consumption exceeds 20 units of alcohol per week (Hassan & Killick, 2004), but Bunting & Boivin (2008) considered in risk people who drink more than 14 units of alcohol per week. When consumption is low there is no conclusive evidence of damage. A large data reported that sperm quality were negatively associated with increasing alcohol consumption (Kumar et al., 2009; Jensen et al., 2014). A study reported that this association was observed in men reporting at least 5 units of alcohol (Jensen et al., 2014). For women, drinking was associated with longer time to get pregnant/achieve pregnancy (Hassan & Killick, 2004).

Overweight affects more androgens, which are converted into

estrogens in fat cells, inhibiting secretion of FSH in women and testosterone in men (Hassan & Killick, 2004). For women, over and underweight produces hormone imbalances and ovulatory dysfunction. Obesity also negatively affects the efficacy of infertility treatments (Homan et al., 2007) and has an increase in rate of early pregnancy loss (Homan et al., 2007; Kelly-Weeder & Cox, 2006). For men, overweight induces a significant reduction in sperm concentration and in motility (Kumar et al., 2009). Studies also found a relation between obesity and erectile dysfunction (Sharma et al., 2013). Underweight also produces negative effects on fertility (Hassan & Killick, 2004), but overweight has more impact in decreased fertility (Bunting & Boivin, 20008). In a student sample, which ages ranged between 16 and 37 years, Gungor et al. (2013) found that women tended to be underweight while men tended to be overweight.

People who currently have unprotected intercourse with multiple partners increase the chances of contracting a sexually transmitted infection (STI; Bunting & Boivin, 2010). Many STIs are linked to infertility, pelvic inflammatory disease, miscarriage, tubal pregnancy and other complications of pregnancy (Mosher & Aral, 1991). Data suggests that 15% of infertility cases in the United States are caused by STIs, but just 30% of women's consider STIs one of the factors that may decrease women's fertility (Tydén, Svenberg, Karlström, Lihoff, & Lampic, 2006). In a study developed with students, 43% were unaware that STIs can cause infertility, but 89% failed to give an example of STI. The most mentioned was chlamydia, but less than 6% of that subgroup identified this. Moreover, 55.3% agreed with the sentence "I would be willing to undergo screening once a year for STIs if it will help my chances in reducing infections that can cause infertility" (Quach & Librach, 2008, p.2103).

Specifically for men, exposure to radiation issued, for example, by cell phones and computers, decreases semen quality by decreasing the sperm number, motility and normal morphology. Reproductive system is affected according to dose and duration of exposure (Kumar et al., 2009).

The impact of lifestyle may differ depending on individual circumstances but there is high evidence of the adverse association between negative lifestyle factors and the risk of compromised fertility (Homan et al., 2007). Previous researches showed an increase exposure in number of negative lifestyle factors by people in reproductive age (Bunting & Boivin, 2010) and the combined effect of many negative lifestyle factors that reduces fertility progressively (Hassan & Killick, 2004). It is important that young people who want to have children in the future are aware of the consequences of negative lifestyle factors in their fertility in order to adopt behaviours that protecting their reproductive health.

Knowledge on fertility and reproductive health among people in reproductive age

Poor knowledge about fertility can help explain the tendency to postpone parenthood (Adashi et al., 2000; Bunting et al., 2012; Cooke et al., 2010; Lundsberg et al., 2014) and prevents people from behaving optimally

regarding their reproductive health, contributing unintentionally to future fertility problems (Bunting & Boivin, 2008; Daniluk & Koert, 2013; Sabarre, Khan, Whitten, Remes, & Phillips, 2013). In order to help individuals protecting their fertility, the first and most important key factor is equip them with necessary knowledge to protect and maintain their own health (Daniluk & Koert, 2013; Gungor et al., 2013).

In United States, younger women (18–24 years) demonstrated less knowledge about fertility and older women (25-40 years) tended to believe more in myths and misconceptions. In general, there is a lack of fertility knowledge among reproductive age people (Gungor et al., 2013; Bunting, Tsibulsky, & Boivin, 2013) which were more evident in the younger age group (Lundsberg et al., 2014). Previous studies in Canada, Australia and United States also found that many individuals, regardless of gender, are not aware of the lifestyle implications, such as weight, smoking and radiation exposure (Bretherick et al., 2010; Gungor et al., 2013; Lundsberg et al., 2014). However, women tend to have more knowledge than men (Daniluk & Koert, 2013; Quach & Librach, 2008). In addition, younger men have less knowledge than older men (Daniluk & Koert, 2015).

Other data show that in an educated sample young people correctly identified negative lifestyle factors as decreasing the chances of getting pregnant but falsely believe in fertility myths (Bunting & Boivin, 2008). The discrepancy between results may reflect genuine knowledge about the impact of negative lifestyle factors in other health conditions (e.g. impact of smoking in cancer). Given the lack of fertility information in the public domain, results of educated samples can result from general health knowledge about the impact of negative lifestyle factors by making an assumption about their effect on fertility (Adashi et al., 2000; Lampic et al., 2006).

Kalebic (2011) also found significant differences in fertility knowledge according to country, which may be derived from different health education policies and prevention strategies across countries, thus supporting the importance of fertility education. Therefore, previous results founded different levels of fertility knowledge among respondents, according to gender, age, level of education and country.

The importance of Fertility Education: Can it make a difference?

To date, little research has focused on the prevention of infertility. In a study developed in Canada among high school students, 70% felt that protecting their fertility was important to them, with significantly more women's than men's demonstrated a desire to learn about protecting fertility (Quach & Librach, 2008).

Williamson et al. (2014) provided fertility education to an intervention group, though slide-presentation to childless female undergraduate students, excluding men from the study. Young women that received fertility education show an increase in fertility knowledge and less intention to delay parenthood compared with young women that had not receive fertility education (Williamson et al., 2014). According with this

findings, fertility knowledge plays an important role in the decision making process of couples about when to have their first child (Bretherick et al., 2010; Daniluk & Koert, 2013; Williamson et al., 2014).

Lundsberg et al. (2014) found that online fertility education was the second preferred source of receiving information, after primary care physician. A study developed with undergraduate students (M_{age}=19.05; *SD*=3.17) found that online fertility education promoted significantly increases on fertility knowledge and decrease the postponement of parenthood in the intervention group, when compared to the control group (Wojcieszek & Thompson, 2013).

Daniluk & Koert (2015) develop a pre-post intervention study with childless people in reproductive age (18 to 35 years), but just evaluated the variation in fertility knowledge and did not use a control group. These authors found a significant increase in knowledge immediately after people received online fertility education, although this increase was not sustained after 6 months. The authors hypothesized that participants remembered the information, but no learning had occurred. Results did not identify differences among relationship status and age, but gender differences were found. After intervention men had a sharper increase in knowledge than women, but after 6 months women reported higher knowledge than men. In addition, was identified a decrease in delayed parenthood for both genders after intervention. In spite of this, after 6 months this tendency disappears. Thus, the extent to which online fertility education is effective in increasing fertility knowledge and changing behaviours needs more investigation.

According to findings of one meta-analysis, the impact of information presented in video on knowledge was significantly greater than the impact of other educational approaches (Healton & Messeri, 1992). Until now fertility studies showed that providing information presented in text form is effective (e.g. Williamson et al., 2014; Wojcieszek & Thompson, 2013), but it remains unknown weather using other forms, such a video, would have a different and more effective impact.

Does information on risk factors promotes Lifestyle Changes?

Having knowledge about fertility risk factors is associated with an increased likelihood to behave optimally in relation to reproductive health (Kalebic, 2011). Fulford, Bunting, Tsibulsky and Boivin (2013) found that participants who had not tried any fertility-optimizing behaviours were more likely to engage in lifestyle changes than to seek medical or non-medical help.

Fulford et al. (2013) found that women who smoke 10 or more cigarettes per day and had high fertility knowledge had high intentions to do lifestyle changes. Contrariwise, for women who smoked less than 10 cigarettes per day, level of fertility knowledge was not related to intentions to do lifestyle changes. In the same sample, overweight women with high fertility knowledge had higher intentions to change weight. However, older women did not make any effort to preserve their fertility. According to the authors, these may occur because participants may consider that there are

limited options available for age-related infertility (Fulford et al., 2013). It has been recognized the difficulty in changing behaviours when the results have a medium to long-term impact and are not relevant to the person in the present, too (Bunting & Boivin, 2010; Bretherick et al., 2010). According to this, Kalebic (2011) found that providing fertility education for people in early reproductive ages may not be effective as parenthood plans are still too far in the future.

In fact, knowledge about negative lifestyle factors appears to be associated with the intention to change these behaviours when these are part of the conduct in order to preserve reproductive health (Kalebic, 2011; Sabarre et al., 2013). In spite of this, fertility education about negative lifestyle factors does not always promote lifestyle changes (Kalebic, 2011; Williamson et al., 2014). The relation between knowledge and change lifestyle is not direct, but intentions and motivations are strongly associated with behaviour (Ajzen, 1991). Ajzen (1996) recommended at least one month interval in-between intervention and follow-up, to assure a reliable measure of behaviour.

The importance of Childbearing Motivations in changing negative lifestyle factors

Previous studies reported that the majority of people in reproductive age (thereabout 90%) wants children and reported parenthood as a life priority (Bretherick et al., 2010; Lampic et al., 2006). Bretherick et al. (2010) found that 88.9% of women's show a desire to have children, but 32.1% desire to bear their first child between 30 and 35 years old. Additionally, the majority of people preferred to have two or three children (Tydén et al., 2006). This is worrying because the majority of people perceived parenthood as a life goal (Lampic et al., 2006).

The fertility intentions are an important predictor of change negative lifestyle factors (McQuillan, Greil, Shreffler, & Bedrous, 2015), that helps to protect fertility. Some studies have highlighted that the intentions to change are particularly high when having a child is a life goal (Bunting & Boivin, 2008). Moreover, childbearing motivations are important determinants of reproductive intentions and behaviours (Miller & Pasta, 1995).

Childbearing motivations are latent dispositions to react favorably or unfavorably to childbearing. They have two dimensions – positive and negative childbearing motivations (Miller & Pasta, 1994). They include, for example, points related to pregnancy and birth, childcare and new interactions with partner, family and friends as a parent.

The childbearing motivations are the major source of childbearing desires (Miller & Pasta, 1994). Thus, it is crucial to analyze the childbearing motivations because a comprehensive assessment of them could be helpful to understand how they can affect the intentions to change negative lifestyle factors to prevent fertility problems and involuntary childlessness.

II - Study aims

The objectives of the present study were: 1) to examine the efficacy of online fertility education in increasing fertility knowledge, considering two different approaches of fertility education (online video and text written information); 2) to understand the effect of online fertility education in (intentions to do) lifestyle changes; 3) to assess which factors moderated the relationship between having knowledge on infertility and the intentions to do lifestyle changes, namely age, gender and childbearing motivations.

To our knowledge, this is the first study examining the effect of providing fertility education on intentions to change negative lifestyle factors while considering the role of individual's childbearing motivations.

III – Materials and Methods

Participants

Participants were men and women aged between 18 and 40 years old and childless. Being pregnant or trying to get pregnant for more than two months (for men in relation to partner) was established as exclusion criteria.

Procedure

The research was approved by the Commission of Ethics and Deontology Research of the Scientific Council of the Faculty of Psychology and Educational Sciences of the University of Coimbra.

The sample was recruited by convenience procedures: participants were invited to participate by email and were asked to disseminate the questionnaire throughout friends and acquaintances. A consent form was given to all participants, providing a brief description of the study and assuring the confidentiality of the data, the voluntary nature of the participation and the possibility to withdraw from the study at any time. Participants who gave their consent to participate were directed to the study questionnaire, developed on Lime Survey platform. Data was collected from February to May 2015.

The study design was prospective and quasi-experimental, with three assessment times. After filling out the questionnaire at baseline (T1), participants were asked to choose a letter (A, B or C), which distributed them randomly by the three groups. Group A and Group B were two different intervention groups to whom fertility education was provided. Group A received the information throughout a video and Group B received the information through a written document. In both situations, fertility education included information about negative lifestyle factors, comprise smoking tobacco, abnormal weight, unprotected intercourse, alcohol consumption and specifically for men the exposure to radiation (mobile phone and computer), but also contained generically information (e.g. percentage of infertile couples in Portugal) and information about risk factors related to reproductive history, like woman's age, menstrual pain and

irregular cycles, and past history of parotiditis in adult men. Group C was the control group and did not receive any information.

At T1, survey included demographic information, questions about the desire to have children, a questionnaire on Knowledge on Fertility and Reproductive Health and evaluated lifestyle behaviours. Email address was supply by the participants at the end of the survey to proceed with the participation in the study. One week after the T1 questionnaire was submitted, an email was sent to each participant, inviting to participate in the second assessment time (T2).

At T2, the assessment protocol included the questionnaire on Knowledge on Fertility and Reproductive Health. Multiple choice questions and items that assessed questions that were not covered by the education material were excluded from the questionnaire.

At T3, which occurred one month after T1, the assessment protocol includes the questionnaire on Knowledge on Fertility and Reproductive Health, Childbearing Motivations Scale and questionnaire on behavioural change intentions. A reminder email was send three days after. Time to complete T1 was about 15 minutes, 2 minutes for T2 and about 8 minutes for T3.

Participants who responded to the questionnaires were given the possibility of entering a draw of a €75 shopping voucher. The raffle was conducted by Random.org software, based on the emails provided by the participants.

Table 1. Description of study milestones

Times	T1	T2	T3
Measures	Demographic information Questions about the desire to have children Questionnaire on Knowledge on fertility and reproductive health Presence of negative lifestyle factors ***[+ Educational intervention - Groups A & B]***	Questionnaire on Knowledge on fertility and reproductive health	Questionnaire on Knowledge on Fertility and Reproductive Health Questionnaire on behavioural change intentions Childbearing Motivations Scale (Guedes et al., 2013)
Time to complete	15 min	2 min	8 min

Instruments

Demographic information: Demographic variables included in the survey were age, gender, education level, socioeconomic level, religion and identify if they are in a relationship. Future plans of having children (e.g. regarding having children in the future: "I am absolutely sure that I do want to have children; I have not decided yet, but I most probably will want to have children") if they have sure that want or did not want children and how many children's they like to have.

Knowledge on Fertility and Reproductive Health: Knowledge about infertility and reproductive health was accessed by different types of questions. In the three times, participants answer to 14 items (*true/false*) about risk factors related to reproductive history (e.g. woman's age, menstrual pain and irregular cycles) and negative lifestyle factors (smoking, weight, alcohol consumption, unprotected intercourse and exposure to radiation). On the present sample the Cronbach's alpha of this questionnaire was 0.80. In T1 participants answered to four multiple choice questions about at what age a women is most fertile, what is the probability to get pregnant that have a young woman in ovulation without fertility problems, what is the percentage of infertile couples in Portugal and what is the probability of achieving a pregnancy after an fertilization in vitro cycle.

Negative Lifestyle Factors: The presence of negative lifestyle factors – weight, smoking, alcohol, unprotected intercourse and exposure to radiation (e.g. use cell phone in pants front pocket or computer in the lap) – was evaluated by dichotomous items (0=*No*; 1=*Yes*) concerning each behaviour. In the cases where participants reported that they smoke or drink alcohol, they were prompted to indicate how many cigarettes they use to smoke per day and how many drinks the usually consume per week (spirit drinks were coded as two units of alcohol). In addition, participants classified their weight as below (Body mass index (BMI) <19), within (BMI $\geq$ 20 and $\leq$25) or overweight (BMI > 26). Regarding unprotected sexual intercourse, participants were asked to classify whether they used condoms using three categories: never, sometimes or always.

Childbearing Motivations: The childbearing motivations were measured by Childbearing Motivations Scale (CMS – Guedes, Pereira, Pires, Carvalho & Canavarro, 2013), that include positive and negative childbearing motivations. The subscale of positive childbearing motivations is composed by 26 items, distributed into four dimensions: socioeconomic aspects; personal fulfillment; continuity; and couple relationship. Participants had to classify in which way they value the favorable reasons to become mother/father, through a 5-point Likert scale, ranging from 1 (*none*) to 5 (*completely*). The final score in this subscale consists in the sum of all items. Subscale scores ranged between 26 and 130 points. Higher scores reflect higher levels of positive motivation to parenthood. In the present sample the Cronbach's alpha subscale was 0.95. The subscale of negative childbearing motivations is composed by 21 items that are organized in five dimensions: childrearing burden and immaturity; social and ecological worry; marital stress; economic constraints; physical suffering; and body-image concerns. Participants had to classify in which ways they value the unfavorable reasons to become mother/father, through a 5-point Likert scale, ranging from 1 (*none*) to 5 (*completely*). The final score in this subscale consists in the sum of all items. Subscale score ranged between 21 and 105 points. Higher scores reflect higher levels of negative motivations to parenthood. In the present sample the Cronbach's alpha subscale was 0.94.

Intentions to do Lifestyle Changes: The intentions to change negative lifestyle factors were classified by a multiple choice question for

each negative lifestyle factor. For each one, participants answered whether they a) reduced the negative lifestyle factor; b) had the intention to reduce or eliminate it; c) did not want to change it; or d) it did not apply (they did not have such negative lifestyle factor). Actual change or intention to change was coded as 1 and total score considering all behaviours was calculated. In order to calculate the variable of intentions to change behaviour regarding negative lifestyle factors, each participant score was computed by dividing the sum of changes and the intentions to change by the sum of negative lifestyle factors.

Data Analyses

Responses to survey questions were analyzed using software Statistical Package for the Social Sciences (SPSS), version 20.

A priori power analysis using GPower software (Faul, Erdfelder, Lang, & Buchner, 2007) showed that, for the Repeated Measures ANOVA examining differences between groups over the three time points, considering a power of .80 and a significance level of 0.05, the number of participants in each group required to detect small effects (f = .10) should be 30 or above.

To analyses equivalence of groups regarding knowledge on infertility and reproductive health on baseline, an Analysis of Variance (ANOVA) was performed. To test whether there were differences from baseline to T2 and T3 across the 3 groups, a GLM for repeated measures with time (T1, T2 and T3 as a within subject factor) and group (A, B and C) as a between subject factor was performed. Bonferroni post hoc teste were used to identify group differences. To understand if level of knowledge about negative lifestyle factors was associated with lifestyle changes, it was used Pearson's correlation test. Gender differences were tested using ANOVA.

To examine whether the direct and indirect effects of online fertility education (independent variable—IV; 0=control; 1=intervention) on lifestyle changes (dependent variable—DV) through knowledge (mediator—M) were moderated by age, gender and childbearing motivations, the PROCESS computation tool (Hayes, 2013) was used. A bootstrapping procedure was used to assess unconditional indirect effects (using 5000 resamples).

For all analyses, a *P* value of 0.05 or less was considered significant.

IV – Results

1) Participants

The final sample (Figure 1) was formed by 230 participants (male=50; female=180). The mean age of the sample was 27.14 years (*SD*=4.94), ranged between 18 and 40 years. Regarding educational level, participants studied for a mean of 15.48 years (*SD*=1.89). The majority of sample belonged to the medium socioeconomic level (*n*=189, 82.2%) and were catholic (*n*=164, 71.3%).

Concerning the relationship status, 164 participants (71.3%) were in a relationship. Just 1.3% of the sample was sure that do not want to have children, contrasting with 70.0% of the sample that was sure to want to have children. Most of participants want to have 2 children (*n*=120, 52.2%).

The intervention group that received online fertility education by video (Group A) was formed by 99 participants and the group that received online fertility education through a written document (Group B) was composed by 84 subjects. The control group (Group C) had 47 participants.

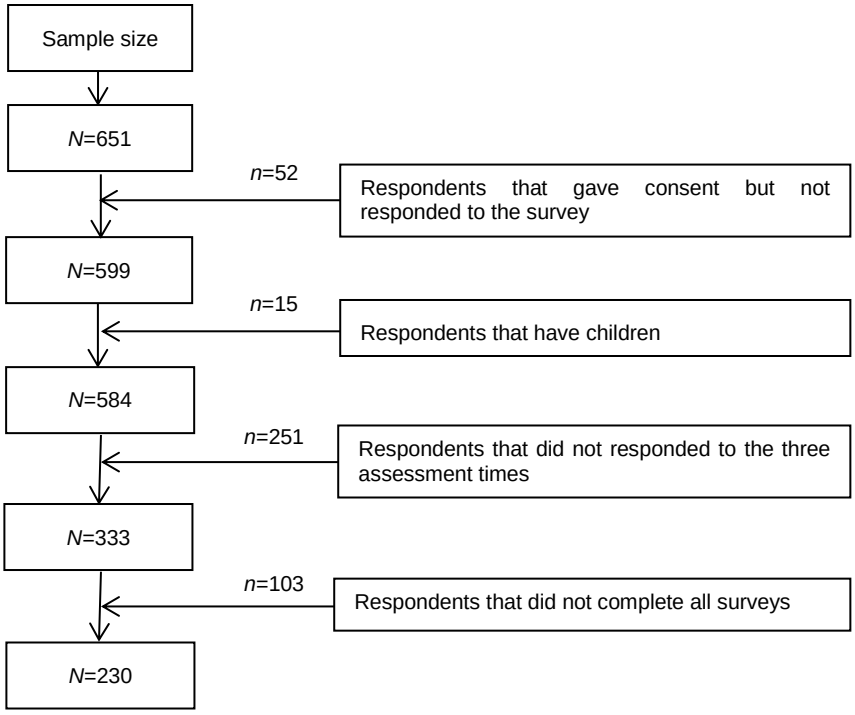

Figure 1 – Flowchart of study participants

2) <u>The efficacy of online fertility education in change fertility knowledge</u>

The knowledge on fertility and reproductive health was measured by calculating the mean number of correct answers. ANOVA results showed no significant differences between the 3 groups at baseline [$F(2,227)=1.050$, $p=.351$], before receiving the online fertility education. In the 3 times, knowledge increased in the intervention groups. The means of each group in each Time are present at the Table 2.

Table 2. Mean and standard deviations of correct responses on the fertility knowledge questionnaire between the participants from the three groups at the three assessment times

	A (n=99)		B (n=84)		C (n=47)		
	M	*SD*	*M*	*SD*	*M*	*SD*	*P*
T1	.61	0.13	.59	0.12	.62	0.12	.35
T2	.74	0.17	.72	0.15	.59	0.17	<.001
T3	.86	0.18	.83	0.17	.70	0.19	<.001

A significant interaction effect Time x Group was found significant [$F(2,227)=17.20$, $p<.001$]. From baseline to T2 and T3, knowledge on T2 and T3 increased for both A and B groups (intervention groups), but not for group C (control group).

The results of post-hoc test (Bonferroni) showed that knowledge of groups A and B was significantly higher than Group C ($p<.001$ for both comparisons). The comparison between Group A and B revealed no significant differences ($p=.634$). The variation of fertility knowledge along the three times between groups is represented in Figure 2.

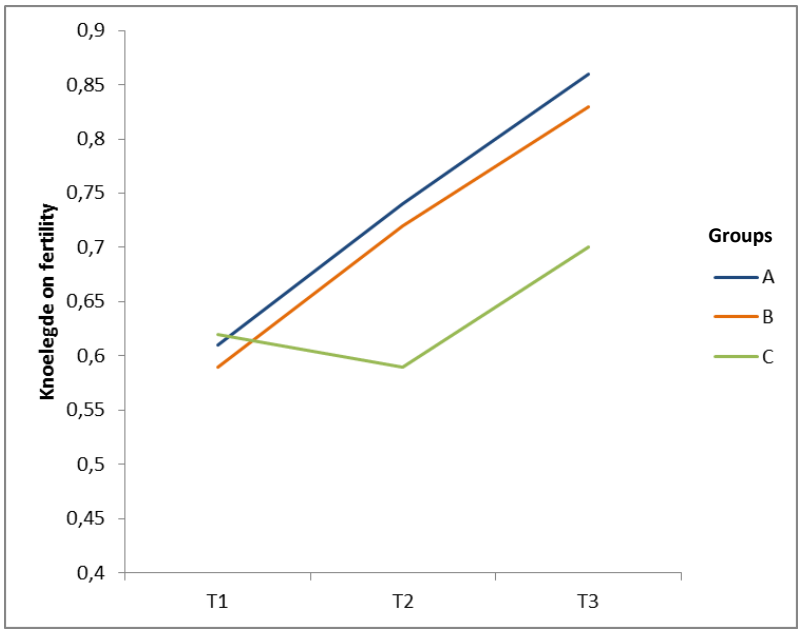

Figure 2 – Means of correct responses along the three times between the three study groups.

3) <u>The effect of knowledge on fertility and reproductive health in lifestyle changes</u>

In the sample composed by 230 participants, 3 participants reported that they did not have any of the negative lifestyle factors evaluated, so they were excluded from the analysis presented below. Participants ($n=227$) with negative lifestyle factors (table 3) reported to have intentions to change at least one risk factor ($n=186$, 81.94%) and already begun to do at least one lifestyle change ($n=111$, 48.90%) one month after received online fertility education.

Table 3. Negative lifestyle factors of women and men

	Women *n* (%)	Men *n* (%)
Smoking tobacco	30 (16.7)	14 (28.0)
Alcohol Consumption	79 (43.9)	34 (68.0)
Abnormal Weight	39 (21.7)	9 (18.0)
Unprotected intercourse	123 (68.3)	32 (64.0)
Computer on the lap		19 (38.0)
Mobile phone in the pants front pocket		41 (82.0)

Knowledge about negative lifestyle factors at post intervention was weakly significantly correlated with at post intervention intentions to change negative lifestyle factors (*r*=.16, *p*=.017).

To examine whether change in fertility knowledge due the intervention explained the association between online fertility education and intentions to do lifestyle changes a meditational model was tested (Process macro, model 4).

Results indicated that the indirect effect was significant (point estimate = .07, 95% BCa CI [0.03, .13]), that is, change in fertility knowledge mediated the association between receiving information and intentions to change negative lifestyle factors (Figure 3). Online fertility education explained 12.93% of the variance of change in fertility knowledge [*F*(1,225)=33.42, *p*<.001]. Receiving online fertility education and change in fertility knowledge explained 4.86% of the variance of the intentions do to lifestyle changes [*F*(2,224)=5.73, *p*=.004].

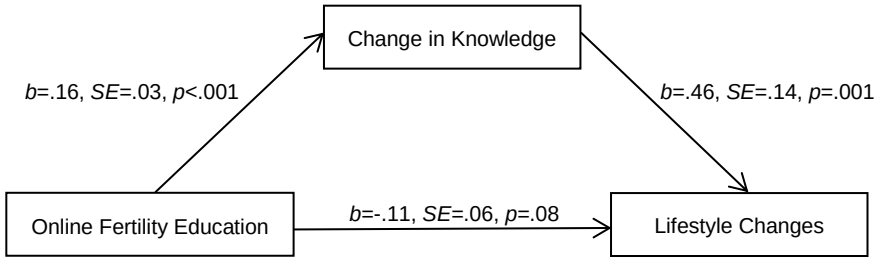

Figure 3 – Mediation model.

4) Who have intentions to make lifestyle changes? Exploring the moderator

In order to understand which factors may prevent or facilitate lifestyle changes after receiving information on negative lifestyle factors, and considering the literature on the topic, moderated mediation analysis were conducted considering age, gender, and positive and negative childbearing motivations. Analysis were conducted using Hayes (2013) PROCESS macro (model 14). In each model, online fertility education (control=0; intervention=1) was the predictor, fertility knowledge was the mediator and lifestyle changes was the outcome variable.

Results showed that neither age (*b*=.01, *SE*=.02, *p*=.435) nor gender (*b*=-.16, *SE*=.34, *p*=.649) moderated the indirect effect between the level of knowledge about negative lifestyle factors and intentions to change negative lifestyle.

Regarding childbearing motivations, preliminary analysis revealed that no significant differences were found between men and women regarding negative [Women: 55.91±16.24, Men: 53.52±15.53; *F*(1,228)=.86, *p*=.35] nor positive [Women: 75.30±19,73; Men: 78.18±17.76; *F*(1,228)=.87, *p*=.35]. No differences were found according to age in negative [*F*(1,228)=.072, *p*=.79] nor positive [*F*(1,228)=2.73, *p*=.10]

childbearing motivations.

To examine if childbearing motivations moderated the relation between having knowledge about negative lifestyle factors and intentions to do lifestyle changes, two moderated mediation models were estimated. In the first model, the positive childbearing motivations were entered as the moderator. In second model, negative childbearing motivations were entered as the moderator. In first model, the interaction effect was not significant (*b*=-.002, *SE*=.01, *p*=.727), which means that positive childbearing motivations did not moderate the indirect effect between the level of knowledge about negative lifestyle factors and intentions to make lifestyle changes.

In the second model (Figure 4), the interaction effect was significant (*b*=-.02, *SE*=.01, *p*=.013), confirming that the negative childbearing motivations moderated the indirect effect between knowledge about negative lifestyle factors and intentions to make lifestyle changes.

Online fertility education explained 12.93% of the variance of knowledge [*F*(1,225)=33.42, *p*<.001]. Online fertility education and change in knowledge explained 7.51% of the variance of the intentions do to lifestyle changes [*F*(4,222)=4.51, *p*=.002], an additional 2,7% when compared with the mediation model reported in the previous section.

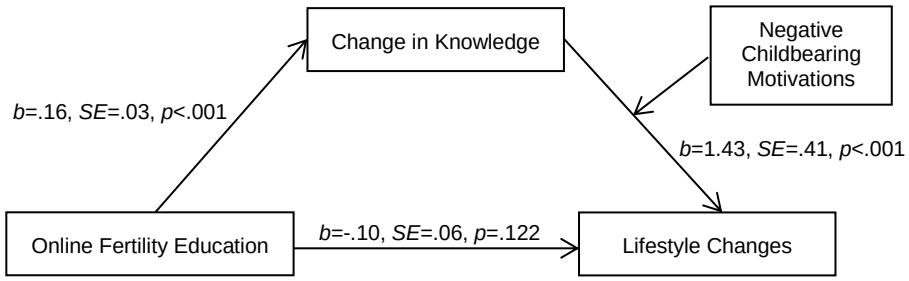

Figure 4 - Conceptual diagram of the moderated mediating model

When negative childbearing motivations are high, having more knowledge on infertility and reproductive health does not affect intentions to change negative lifestyle factors (point estimate = .02, 95% BCa CI [-.05, .08]). Conversely, participants who report low (point estimate = .11, 95% BCa CI [.06, .18]) to moderate (point estimate = .06, 95% BCa CI [.01, .11]) negative childbearing motivations, having more knowledge on infertility and reproductive health positively affects intentions to change negative lifestyle factors. The interaction effect is presented in Figure 5.

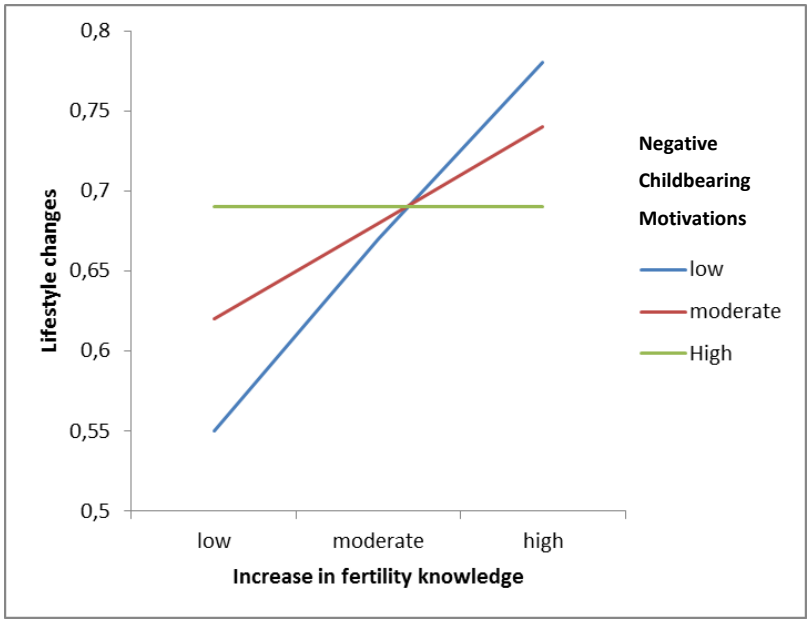

Figure 5 – Intentions do to lifestyle changes according to knowledge and negative childbearing motivations.

V – Discussion

The present study aimed studying the effect of providing information on fertility risk factors on young people intentions and actual changes of negative lifestyle factors and the intervening processes that may facilitate or inhibit those changes.

Results from the present study showed significant increases in knowledge one week and one month after provided online fertility education in the intervention groups. This results are consistent with previous reports (Daniluk & Koert, 2015; Williamson et al., 2014), suggesting that this type of intervention could be useful in educating about fertility and reproductive health.

Results also revealed that the fertility knowledge of the control group also increased but to a much lesser extent than knowledge of participants from the intervention group, although participants in the control group did not receive any information on the topic. This was a surprising result and it may due to the interest raised by the participation in the study, as Quach and Librach (2008) found that protection of fertility is important for the majority of young people. Participants from the control group may have searched information in the internet after participating in the study because it was an important topic for them.

Our results also showed that there were no significant differences when comparing the two different approaches for delivering information. This result is in line with the study of Breimer, Cotler and Yoder (2012), who found that presenting information by video or by text form produces similar results, but contradict the study of Healton and Messeri (1992) that indicated that the information presented in a video had significantly greater

impact on knowledge than the impact of other educational approaches. Therefore, future studies on this topic should clarify this issue.

Regarding the evaluation of negative lifestyle factors, a great majority of the sample reported having at least one risk factor. This was not the case of other studies (Fulford et al., 2013; Gungor et al., 2013) that found a prevalence of negative lifestyle factors ranging from 14.6 to 51.8%. One month after receiving online fertility information, almost half of the subsample did at least one lifestyle change and the majority had intentions to do at least one lifestyle change. These results are in line with other findings, which showed that high fertility knowledge was linked to higher intentions to do lifestyle changes (Fulford et al., 2013).

Bearing in mind that research has shown that providing information does not always make people change (Ajzen, 1991), the present study aimed at assessing the influence of several factors that may facilitate or hamper that association, which was an important feature of the study. Results showed that the relationship between change in fertility knowledge and the intentions to make lifestyle changes occur regardless of age and gender. This result was surprising because for one hand, for older women (35 years or above) previous research showed that there was not a significant relationship between fertility knowledge and lifestyle changes (Fulford et al., 2013) and on the other hand, Lampic et al. (2006) has shown that having children is significantly more important to women than to men. Conversely, negative childbearing motivations showed to affect the path linking fertility knowledge and lifestyle changes. That is, when negative childbearing motivations are low or moderate, and increase in knowledge resulted in more lifestyle changes. When negative childbearing motivations are high this association did not occur. Previous research has highlighted that the extent to which people want, desire or will to change (Miller & Rollnick, 2013) is imperative to successfully change lifestyle.

Strengths and limitations

A major contribution of the present study was the assessment of the childbearing motivations as an important factor in explaining the link between having fertility knowledge and intentions to change lifestyle.

Another contribution was the use of online tools in providing information, confirming that online approaches, which have the benefit of being easily and conveniently accessed by people worldwide, may be an effective way for fertility education and therefore optimizing the chances to conceive.

It is also important to note that the present study included both women and men. The majority of studies just included women in their samples (e.g. Bretherick et al., 2010; Lundsberg et al., 2014; McQuillan et al., 2015), which limited data about male gender. Because infertility is common among men (Macaluso et al., 2010), evaluating fertility knowledge, childbearing motivations and intentions to change negative lifestyle factors of men is important. In addition, this study sample was composed by a wide age of group participants. This is of foremost importance as a large number

of previous studies on this topic just included university students in their sample (e.g. Bunting & Boivin, 2008; Gungor et al., 2013; Lampic et al., 2006; Quach & Librach, 2008). Considering that the parenthood decisions may arise after concluding university studies, the inclusion of participants at other stages is essential.

Finally, it is also important to add that participants from the control group, who did not received online fertility education during the study, will receive all the relevant information on fertility and reproductive health.

Despite the aforementioned strengths, some limitations are worth to note. First, the findings of our study may be limited by the online nature of the recruitment methods, because online samples are linked to higher educational levels (Haagen et al., 2003) and to higher socioeconomic levels (Weissman, Gotlieb, Ward, Greenblatt, & Casper, 2000), with a better access to information in general and health information in particular.

Second, despite of the random distribution in three groups prior to the intervention, the final sample composed by the participants that responded and completed the three assessment times is not equally distributed by the three groups. In addition, the low rate responses among men (n=50) can limit the generalization of conclusions that were drawn to men, although it has been shown that in general men are much less prone to participate in research as participants (Gosling, Vazire, Srivastava, & John, 2004).

Third, in spite of in this study online fertility education increase fertility knowledge, Daniluk and Koert (2015) found that knowledge returned to the baseline level six months after provided online fertility education, particularly for men. Thus, long-term follow-up is necessary to better evaluate the extension of the efficacy of this type of intervention.

Finally, due to the lack of relevant standardized instruments of for the focus of the present study, main measures were developed specifically for this study, which can compromise the comparison of the study results with other studies in the same topic.

Implications for research and health policies

Future research should consider evaluating childbearing motivations as an important predictor of fertility protection and lifestyle changes related to reproductive health, because they can affect the results about the efficacy of fertility education programs.

Even there may not be conclusive evidence about the risk of entire negative lifestyle factors discussed, its useful adopt healthy lifestyle to prevent secondary infertility and childlessness. And more than have some awareness of negative lifestyle factors, healthcare providers must offer specific information about the effects that each negative lifestyle factor has on fertility (Bunting & Boivin, 2008; Daniluk & Koert, 2013; Kalebic, 2011; Sabarre et al., 2013). For healthcare providers, it is equally important to identify unrealistic negative childbearing motivations that can prevent people from protecting fertility. It is also imperative to promote interventions for facilitate planned pregnancy, which is linked to a reduced

number of negative lifestyle factors (Bunting & Boivin, 2010).

Results from the present research showed that most of people do not behave optimally in order to protect their fertility although the majority of the population wants to have children. Thus, there is a need for public education on fertility and reproductive health and healthcare providers should develop psychoeducative interventions for people in reproductive age for promote satisfactory and thoughtful decision-making on future parenthood.

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