



SPANISH JOURNAL OF MARKETING - ESIC

www.elsevier.es/sjme



ARTICLE

Decision making and erotic stimuli: An evolutionary perspective[☆]



M.C. Gracia*, R. Huertas-Garcia

Departament d'Economia i Organització d'Empreses, Facultat d'Economia i Empresa, Universitat de Barcelona, Barcelona, Spain

Received 5 March 2015; accepted 8 August 2015
Available online 16 September 2015

KEYWORDS

Discount rate;
Gender differences;
Evolutionary
psychology;
Consumer behaviour

PALABRAS CLAVE

Tasa de descuento;
Diferencias
de género;
Psicología evolutiva;
Comportamiento
del consumidor

Abstract Exposing individuals to erotic stimuli modifies perceived time horizons, causing subjects to assign greater value to the present than the future. This can be explained by different models, including the theory of visceral factors and evolutionary psychology. Specifically, evolutionary theory analyses the latest reasons as explanatory variables of this behaviour.

An evolutionary perspective was used to perform two experiments where individuals were exposed to pictures containing erotic stimuli. The first experiment, in which both men and women took part, shows that the influence of such stimuli on risk perception is different in the two sexes. The second experiment, in which only women took part, shows that female risk perception varies according to the subject's aims in a relationship.

© 2015 ESIC & AEMARK. Published by Elsevier España, S.L.U. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

Toma de decisiones y estímulos eróticos: una perspectiva evolucionista

Resumen La exposición de sujetos a estímulos eróticos provoca un cambio en su perspectiva temporal, otorgando un mayor valor al momento presente que al futuro. Diferentes modelos intentan explicar este fenómeno, como bien pueden ser la teoría de los factores viscerales o la psicología evolutiva. La teoría evolutiva, concretamente, propone el análisis de las razones últimas como variables explicativas de la conducta.

[☆] Please cite this article as: Gracia, M. C., & Huertas-Garcia, R. (2016). Decision making and erotic stimuli: An evolutionary perspective. *Revista Espanola de Investigacion en Marketing ESIC*, <http://dx.doi.org/10.1016/j.reimke.2015.08.001>

* Corresponding author at: Departament d'Economia i Organització d'Empreses, Universitat de Barcelona, Torre 2 – 3a planta (Despacho 2304), Diagonal, 690, 08034 Barcelona, Spain.

E-mail address: gracia@ub.edu (M.C. Gracia).

Desde la perspectiva de la teoría evolutiva, se proponen 2 experimentos en los cuales se demuestra cómo la exposición a imágenes de estímulos eróticos, en primer lugar, ejerce una influencia en la percepción del riesgo de manera diferente en hombres y mujeres. En el segundo se amplía el enfoque, centrando el análisis solo en las mujeres, y los resultados ponen en evidencia el modo en que dicha percepción varía según el objetivo perseguido a la hora de establecer una relación sentimental.

© 2015 ESIC & AEMARK. Publicado por Elsevier España, S.L.U. Este es un artículo Open Access bajo la licencia CC BY-NC-ND (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

Introduction

Initially, one might suppose that modern consumers' decision-making processes are more heavily influenced by contemporary culture than by our own human nature. However, in recent decades, many authors have observed that these processes are closely tied to the same motivations that drove the everyday decision-making processes of our ancestors (Saad, 2013).

These findings come from the discipline of evolutionary psychology, which has also analyzed its subjects' decision-making behaviour as consumers (Griskevicius & Kenrick, 2013), meaning their financial decisions and their choices about consumption, working on the principle that the human mind is the product of thousands of years of natural and sexual selection, and that explains how we behave (Buss, 2014).

The study of consumer behaviour and the decision-making process is an ideal means of exploring underlying human motivations. Analysing how people allocate their limited financial resources under one set of environmental circumstances or another helps researchers understand which needs we prioritize as consumers and when. It can explain why some people squander the money they took such effort to earn on luxury goods that have no survival benefit or why others make apparently irrational consumer decisions. Or it can be used to consider why people go to great efforts to avoid certain losses and give these more importance than equivalent gains (Griskevicius & Kenrick, 2013). To understand many of these apparently irrational patterns of behaviour, we need a robust theoretical framework to study people's decision-making behaviour as consumers, whether this means what they choose to consume or what they are prepared to pay. The evolutionary approach can provide just such a framework (Kenrick, Sadalla, Groth, & Trost, 2010).

Wilson and Daly (2004) demonstrate that looking at sexual stimuli can modify a consumer's financial decisions. Specifically, for male subjects, viewing pictures of potential mates (young and attractive women) is enough to generate impatience in financial decision making, particularly in estimating the discount rate (Van den Bergh & Dewitte, 2006; Van den Bergh, Dewitte, & Warlop, 2008). Wilson and Daly (2004) also demonstrate that sexual stimuli influence male and female decision making differently. While discounting increased in men who looked at pictures of attractive women but not in men who saw pictures of unattractive women, women who saw pictures of attractive men did not respond differently to women who viewed unattractive men.

Originally performed in Canada, these experiments were replicated in Belgium with similar results (Van den Bergh & Dewitte, 2006; Van den Bergh et al., 2008).

This paper seeks to demonstrate two ideas. First, it will show that erotic or sexual cues can activate evolutionary and inherited patterns of behaviour and cause our cognitive faculties in decision making to become driven by evolutionary motivators. This is important because it allows marketing to modify consumers' preferences by using communication strategies that inhibit our rational behaviour. Second, the paper will show that erotic or sexual cues – such as pictures of potential suitors – have a different impact on risk perception in female consumers than it does in males and vary according to whether the consumer is seeking to establish a short- or long-term relationship with the potential suitor. The paper continues the work of two experiments conducted in Canada and Belgium. These showed that in women, the evolutionary motivation triggered by an erotic stimulus will depend on the subject's objective in her consumer–suitor relationship.

The paper is divided into four parts. It begins by reviewing the theoretical background that supports our hypothesis and then describes our research methodology, empirical work and results. We end the paper with some conclusions.

Theoretical background

The cognitive revolution paved the way for extensive research on consumer behaviour and decision making, which took the information process mechanisms that underlie human thought as the basis for human behaviour (Kassarjian & Goodstein, 2010). However, cognitive psychology fell short of explaining the seeming irrationality of certain types of human behaviour, which were more effectively addressed in other quarters. Two important contributions came with Loewenstein's work on *visceral factors* (Loewenstein, 1996) and cross-cultural studies on the evolutionary psychological mechanisms that underlie human behaviour (Saad, 2011). These studies challenged the cognitive paradigm by proposing that human beings were not selected because of their ability to process, store or learn information, or even because of their ability simply to think. Instead, they argued, these abilities should be understood as instruments that have evolved over time to satisfy two main human objectives: survival and reproduction (Buss, 2014).

The fundamental principles of evolutionary psychology are rooted in Charles Darwin's two books, *On the Origin of Species* (1859) and *The Descent of Man* (1871), which

describe the basic processes of evolution: natural selection, by which living beings adapt to their environment (e.g., the use by animals of natural camouflage to deter predators); and sexual selection, which allows animals to reproduce certain traits that facilitate courtship and mating (e.g., the antlers in deer or the tail feathers in peacocks). In the course of history, however, scientists know that evolutionary processes have played just as important a role in determining animal and human behaviour as they have in shaping our physiological traits. The sciences that study this are known as evolutionary behavioural sciences (Saad, 2013).

One of the most important of these sciences, the branch of biology and experimental psychology known as ethology, studies animal behaviour in both controlled and natural environments and examines how animals adapt to environmental change to improve their chances of survival. Human ethology studies adaptive behaviour in humans and accepts that many types of behaviour are not learned after birth but evolve as instinctive manifestations. These include the newborn infant's ability to find its mother's breast during breastfeeding or our universal ability to recognize other people's emotions by their facial expressions (Eibl-Eibesfeldt, 1989).

Evolutionary psychology has used the findings of ethology to create a body of theory with which to analyze human behaviour. One of its basic tenets is that the human brain works as an operating system which has learnt to resolve recurrent challenges by evolving, just as our lungs, pancreas or liver have. In fact, evolutionary psychologists argue that all living organisms have evolved to behave in a way that gives them an evolutionary advantage (Confer et al., 2010).

Some of the recurring challenges that propel the human brain towards evolution are the need to forage, select a mate, invest in childcare and education, avoid predators and form protective groups. From an evolutionary perspective, therefore, the human brain is understood not so much as a general processor that applies the same algorithm to any task – and so in our discipline, to an exercise in cost-benefit analysis, for example – but as an organ that has evolved to provide specific algorithmic instructions for a multitude of tasks. Evolutionary psychology also rejects the standard premise of social sciences that the brain begins as a blank slate and is then filled during the socialization process (Pinker, 2006). Instead, it affirms, human beings are endowed with a universal human nature grounded in biology, modified by evolution and inherited by sexual selection (Norenzayan & Heine, 2005).

Like ethologists, evolutionary psychologists make an important epistemological distinction between the *proximate* and *ultimate* reasons for how we behave (Tinbergen, 1963). Studies on proximate reasons address our immediate emotions and the mechanistic relationship between the facts that explain a phenomenon, while the research on ultimate reasons examines the triggers of certain kinds of non-immediate behaviour based on an evolutionary function. Such studies use Darwinian logic to ascertain the cause of certain kinds of behaviour and determine how humans have evolved to act in particular ways (Griskevicius & Kenrick, 2013; Saad, 2013). In short, proximate reasons explain the *how* and *why* of a phenomenon, while ultimate reasons focus solely on the *why*.

Sometimes the two types of reasons are not easy to distinguish and one of the main findings in many consumer behaviour studies is the difficulty people have recognizing ultimate reasons for their actions (Kenrick et al., 2010). Note, however, that proximate and ultimate reasons are also complementary and may co-exist, so that researchers can examine examples of both types in any given study on consumer behaviour.

Finally, the distinction between proximate and ultimate also provides a fundamental epistemological tool in research on evolutionary behaviour (Saad, 2013). By way of example, most cross-cultural research on consumer behaviour considers proximate reasons, exploring behavioural differences between groups but rarely addressing the ultimate causes of such differences. Hofstede's cultural criteria (individualism vs collectivism) have been used in numerous studies as explanatory variables in cultural differences in consumer behaviour. An important but much neglected question is whether biological or evolutionary reasons can explain the differences in cultural criteria scores between different countries. Are they responsible for why China qualifies as a collectivistic society while the United States is rated as individualistic? Fincher, Thornhill, Murray, and Schaller (2008) propose an alternative explanation where they show that the overall distribution of individualism and collectivism scores worldwide correlate with the prevalence of pathogens in different countries. According to these authors, the degree of collectivism is greater in those countries where there are more factors causing disease and where collectivism encourages greater cohesion between group members but greater distance between groups. Therefore, in studies on ultimate reasons, the behavioural differences between individualistic and collectivistic societies are considered as the result of an environmental challenge; the cultural and biological reasons for these differences are not directly addressed, even though they can offer additional information about the way people behave. In short, in their behaviour as consumers, people combine their biological past (ultimate reasons) with their cultural heritage (proximate reasons).

This study focuses on ultimate reasons for certain kinds of consumer behaviour. Specifically, it examines how external stimuli with adaptive objectives (e.g., mate selection, investment in family care and security) can play a more decisive role than our cognitive capabilities in modifying our decision-making processes. In what is now a well-known analogy, evolutionary psychologists once argued that the human brain functions "more like a Swiss army knife than an all-purpose blade" (Cosmides & Tooby, 1994), meaning that just as the army knife has different tools for different problems (bottle opener, penknife, toothpick, etc.) so the human brain uses a variety of *psychological systems* to meet different developmental challenges (Barrett & Kurzban, 2006). These systems, which are designed to meet an evolutionary challenge, are activated in our response to different stimuli and any (internal or external) cue in the form of an opportunity or threat can trigger them. Sexual or erotic cues can activate a subject's desire to relate to a potential suitor, which in turn has a knock-on effect on that subject's attention, on their activation of memory and on their knowledge and preferences (Kenrick et al., 2010), which all work together to provide an adequate response. In consumer studies, for instance, we know that if someone wants to find a

mate they will be attracted to consumer products that help them do this. Importantly, this also means that our preferences may change when there is a change in the stimulus and in the psychological system that responds to that stimulus. If the stimulus is a message of danger, for example, the brain automatically activates a self-protection system and our need for protection prompts us to search for other people and be part of a group. On the other hand, if the stimulus activates our sexual desire, we will want to stand out from the crowd to gain intimacy with another individual (Griskevicius, Goldstein, Mortensen, Cialdini, & Kenrick, 2006).

Observing how our psychological systems respond to stimuli in the field of advertising, Griskevicius et al. (2009) observe that television programmes can generate feelings in viewers that make the advertising of certain product types more or less effective. For example, a group of consumers watching a crime programme will respond by activating their self-protection system, which will increase their attraction to group-oriented products; on the other hand, if the same group watches a romantic or erotic programme, each individual will respond by activating a mate acquisition system, which will increase the attraction to products that allow an individual to stand out from the crowd.

Just as it conditions our preferences, the activation of our psychological systems can also influence our decision-making processes in seemingly irrational ways. Traditionally, economists and cognitive psychologists regard this irrational behaviour as an indication that there are flaws in the design of the brain, while evolutionary psychologists argue that by behaving in these ways we are actually making an adaptive response to achieve a fundamental objective, so that this behaviour actually reflects the specificity of that design (Griskevicius & Kenrick, 2013).

All these theoretical principles are now being used to study consumer behaviour and design marketing strategies, as evidenced in Aspara and Van Den Bergh (2014), Griskevicius et al. (2009) and Saad and Gill (2000), amongst many others. This study aims to extend the research in this theoretical line and describes two experiments that show that sexual or erotic cues can modify the discount rate estimation made by consumers.

Hypothesis

Initially developed by Keynes in 1936, the concept of liquidity preference is a basic axiom of rational choice theory. Economists propose three reasons why people prefer liquidity: the transactions motive, the precautionary motive and the speculative motive. All three support the notion that it is preferable to hold money in the immediate present than to enjoy it in the future and that delaying a reward reduces its value.

Liquidity preference affects the interest rate because it represents the price to be paid to liquidity suppliers to keep their wealth under circumstances that do not provide liquidity (Keynes, 1936). That is to say, it is the opportunity cost that tries to compensate for the decision to move the availability of money in the present to the future.

The discount rate is the degree to which a subject reduces the current value of a future reward. Usually, the

research measures this rate with choice models by inviting subjects to choose real or hypothetical amounts of money in different time periods (Frederick, Loewenstein, & O'Donoghue, 2002).

In the relationship between the discount and interest rate, the higher the discount rate, the lower the interest rate in any operation. This also means a lower opportunity cost or fewer requirements by individuals to project a certain sum of money into the future.

Over the last 50 years or more, research into decision making has uncovered a number of reasons why people violate rational choice axioms (Kahneman, 2011). Some of the most influential reasons are explained by prospect theory (Kahneman & Tversky, 1979), which in contrast to classical economic theory postulates that our willingness to take risks varies according to our outcome expectations. That is to say, our willingness depends on whether we expect to incur gains or losses. Since prospect theory was first proposed, numerous experiments inspired by cognitive psychology have taken types of people as their only explanatory variable and have neglected to consider how external circumstances modify our perceptions and behaviour. On the other hand, people's degree of impatience has also been considered a relatively stable personal attribute (Laibson, 2001).

Evolutionary theorists have furthered this research by examining how different environments and physiological experiences transmit evolutionary signals that modify people's willingness to take risks and influence not only their decisions but the discount rate they assign to future values (Griskevicius & Kenrick, 2013; Wilson & Daly, 2004). For male subjects, for example, looking at pictures of potential mates (young and attractive women) provides sufficient stimulus to generate impatience in financial decision making, particularly in estimating the discount rate (Van den Bergh & Dewitte, 2006; Van den Bergh et al., 2008).

Wilson and Daly (2004) also demonstrate that sexual stimuli influence male and female decision making differently. While discounting increased in men who looked at pictures of attractive women but not in men who were shown unattractive women, women who saw pictures of attractive men did not respond differently to women who were shown unattractive men. Originally performed in Canada, these experiments were replicated in Belgium with similar results (Van den Bergh & Dewitte, 2006; Van den Bergh et al., 2008). However, the theoretical basis underlying each experiment was different. In Van den Bergh et al. (2008), the explanation was determined by the existence of the consumer's visceral factors (As observed above, the theory of visceral factors proposed by Lowenstein holds that people are fully aware of what they do when they engage in most types of irrational behaviours). On the other hand, Wilson and Daly (2004) based their argument on evolutionary psychology, meaning on the ultimate reasons that the subjects themselves are often unable to recognize (Durante, Griskevicius, Hill, Perilloux, & Li, 2011).

As observed above in *Theoretical background*, our paper uses finalistic logic. Trivers (1972) holds that men and women look for different characteristics in potential mates because they invest different types of resources in their offspring. While women invest direct physiological resources through gestation and lactation, men's more indirect investment is based on material resources such as preparing

shelter and protection. In this sense, women have evolved to look for qualities in their partners related to the possession of resources (e.g., monetary wealth, social status, ambition), while men have evolved to value qualities that reflect fertility and health (e.g., youth, physical attractiveness) (Buss, 2014).

Returning to the idea that the brain responds to cues by activating different psychological system, a sexual or erotic stimulus will activate the system that "perceives an opportunity to maintain a relationship" and this will be transformed, depending on the person's gender, to a more or less pronounced preference for liquid funds and, therefore, in a higher or lower discount rate on future values. In men, this kind of cue stimulates the desire for liquid money to impress the suitor (the way the male peacock spreads his tail to impress the female), while women do not experience this desire. As a proposal of evolutionary psychology, this corresponds to the results obtained by neurological research, which suggest that the stimuli that activate the limbic system (like a product one desires or the picture of a sexually attractive person) can influence impulsive behaviour in various domains and that an erotic stimulus can affect a business decision because it is processed by the same psychological system (McClure, Laibson, Loewenstein, & Cohen, 2004). Based on these premises, we make the following hypothesis:

Hypothesis 1. A sexual or erotic cue can stimulate a higher rate of discounting in men than in women.

While evolutionary research originally focused on people's general preferences in mate selection and was concerned with the differences between men and women (Buss, 1995; Gangestad & Simpson, 2000), later studies began to examine other issues, such as the length of a relationship. Researchers also began to compare the reasons why individuals preferred short-term relationships (dating, one-night stands) to long-term ones (cohabitation, marriage) (Buss & Schmitt, 1993).

Evolutionary psychologists now consider that women may establish short- or long-term relationships for a variety of reasons which depend on environmental circumstances (Durante et al., 2011). Women in developed societies prefer long-term partners who transmit a sense of professional, material and social success, as evidenced in studies that positively correlate suitor's preferences and income level, and their degree of job security (Landolt, Lalumière, & Quinsey, 1995). Other studies also corroborate women's preference for ambitious suitors focused on their career and ability to earn a high income (Eagly & Wood, 1999). However, women also positively evaluate other signs that men will make good partners and have long-term cooperative attitudes, such as their willingness to invest time in children (Scheib, 2001). Although physical attractiveness is considered to be an important asset, in stable relationships women assign less importance to this than men do (Buss, 1995; Regan, 1998). One of evolutionary psychology's main subjects is partner preference in attractive couples, and physical attractiveness and sex appeal are considered to be "honest signals" to opposite-sex members of a mate's phenotypic quality (Kirkpatrick, 1996).

However, while the desire for a physically attractive partner may be an instinctive preference, Jensen-Campbell,

Graziano, and West (1995) observe that for women a suitor's physical attractiveness must be complemented by pro-social behaviour: in short, a good candidate for a long-term relationship must have favourable financial prospects (Gustavsson, Johnsson, & Uller, 2008) and solid social status (Buss & Schmitt, 1993); the candidate must also be a little older (Buss et al., 1990), ambitious and hardworking (Lund, Tamnes, Moestue, Buss, & Vollrath, 2007); and, finally he must also be strong and attractive (Gangestad & Thornhill, 1997).

On the other hand, the literature observes five basic reasons why women pursue short-term relationships: to obtain material and protective resources; to gain some kind of genetic benefit; to begin the process by which a current partner is eventually replaced; to begin a relationship that may become long-term; and to manipulate a current partner (as a strategy for revenge or deterrence) (Buss, 2014). These reasons also apply in the animal world, where trading sex for resources occurs among primates (Symons, 1980) and in humans in pre-industrial hunter-gatherer societies (Benschhof & Thornhill, 1979). (Note that female primates and women in pre-industrial societies use short-term relationships to attain immediate resources and reduce the time required to forage for their own survival and their offsprings.)

In line with the findings of Scheib (2001), however, in the developed world and modern society, women establish short-term or even extramarital relationships mainly to obtain genetic benefits. Women show similar preferences about their suitors' personal attributes in short- and long-term relationships (Buss, 1994) but consider physical attractiveness to be more important in the short term (Regan, 1998), where casual partners do not usually offer long-term investments and where the woman's main concern is genetic quality. Note that an important physical marker of a suitor's health is his degree of face and body symmetry (Gangestad & Thornhill, 1997; Greiling & Buss, 2000; Rikowski & Grammer, 1999) and that another sign of health and genetic quality is facial appearance, where suitors with larger and more pronounced lower jaws, stronger brow ridges and more pronounced cheekbones transmit a greater sense of masculinity (Waynforth, Delwadia, & Camm, 2005).

Women who want to pursue a monogamous relationship are often prepared to forego genetic quality for some other attribute which favours a long-term relationship (e.g., status, ambition, generosity) and indicates an ability and disposition to devote long-term resources to the woman and to children (Kenrick, Sadalla, Groth, & Trost, 1990). Therefore, physical appearance and markedly masculine traits appear to be discriminating attributes for women seeking a short-term relationship because most women will trade genetic quality for long-term economic stability (Buss & Schmitt, 1993; Greiling & Buss, 2000). In women, then, a prospective partner's sense of masculinity and physical attractiveness will activate their psychological system for mate selection and their objective – whether to attain genetic quality or economic stability – will mediate over sexual signal effects in the monetary discount rate (Stark et al., 2005).

In their mate selection study, Li, Bailey, Kenrick, and Linenmeier use a purchasing process to observe how woman's choice of mate may depend on her "mating budget",

meaning whether she is shopping for a “necessity” or a “luxury” (Li, Bailey, Kenrick, & Linssenmeier, 2002). Depending on the attribute and the weight assigned to it, men available for long-term relationships become necessities, while men available for short-term relationships are luxuries. In this context, and though it might initially seem to be hedonic, the attribute social status becomes particularly interesting in a later work by Li where female respondent completing a compensatory exercise considered that suitors’ social status was a necessity rather than a luxury (Li, 2007). We therefore propose the hypothesis that the type of external stimulus (in our case, the picture of a suitor for a short- or long-term relationship) will mediate in activating the individual’s psychological system for mate selection generating a change in preferences which leads to varying degrees of impatience and discount rates. Viewing attractive individuals as potential short-term suitors (or viewing desired objects) is associated with a hedonic stimulus that activates the limbic system, which in turn is related to impulsive behaviour (McClure et al., 2004). On the other hand, the vision of potential long-term suitors will activate an individual’s psychological system for mate acquisition, which is utilitarian in nature and, much more cognitive and rational than the hedonic system. This analysis leads us to the following hypothesis:

Hypothesis 2. In women a sexual or erotic cue of a hedonic nature (i.e., a short-term suitor) can stimulate impulsive behaviour that leads to a higher rate of discounting than when the sexual or erotic cue is utilitarian (i.e., a long-term suitor).

Methodology

To verify the hypotheses, two laboratory experiments were performed using undergraduate students as experimental subjects. Voluntary participants were separated by gender and family name in different computer rooms, where the researchers gave them general instructions on what they had to do without specifying the overall aims of the experiments. The participants then opened a file containing a presentation, instructions and sequences of images and questions. Not all of these were related to the experiment and some were used to monitor the participants’ degree of attention and detect random responses.

In addition, each participant was provided with a booklet containing the questions that they had to answer about what they saw in a computer display. One of the control exercises was a short reading comprehension supported by four multiple choice questions which appeared in a later section of the booklet. Only those who answered at least three of the four questions correctly could continue and the rest were disqualified, as their answers to the experimental test questions were considered unreliable. In the first experiment, 7.96% ($n=29$) of the participants were disqualified and in the second experiment 4.7% ($n=8$) were disqualified.

Experiment 1

This replicated the experiments conducted by Wilson and Daly (2004) in Canada and by Van den Bergh et al. (2008)

in Belgium, performed this time with Spanish students. The objectives were (a) to confirm that a subject’s exposure to sexual signals leads to an increased desire for money in the present, regardless of whether the subject’s cultural identity is central-European, American or Mediterranean, and (b) to demonstrate that this desire differs in men and women insofar as in men it generates greater impatience, meaning a greater monetary discount rate over time.

Participants

The participants were 364 undergraduates from one of the largest universities in Spain aged between 19 and 34 years (*mean (M)* 20.92; *standard deviation (SD)* 8.33), and 53% were men. The students participated in order to receive a partial course credit.

Method

The participants completed the experiment in a university computer room under the supervision of teachers and researchers in examination conditions, meaning that they were not allowed to have contact with each other. After a brief explanation about the rules for each exercise, the participants were given a series of pictures to look at, which varied according to their gender and sexual orientation.

In the first scenario, the participants looked at pictures of opposite-sex potential suitors published by a dating agency that required them to choose a date. These pictures were grouped in 11 blocks (slides) of six pictures each, and in the manner of a discrete choice model the participants had to choose the most attractive suitor in each block. The block followed a Plackett–Burman saturated factorial design (1946), which is both balanced and orthogonal (i.e., all profiles appear the same number of times).

At the same time, a randomly chosen group of students and a small number of participants who did not want to disclose their sexual profile formed the control group and were given an alternative of the first scenario (Segunpat & Dahl, 2008; LaTour, 1990), in which an advertising agency invited them to select a landscape picture to accompany an advertisement, indicating that the picture had to transmit a feeling of freshness. The pictures portrayed rainy and snowy mountain scenes. Again, the 11 landscapes were arranged in 11 blocks of six landscapes each and the participants had to choose one picture from each block.

Both picture series (attractive men and women, landscapes) were selected after exploratory research with three teams of five undergraduates. Each team used an Internet application to select 25 pictures of men, women and landscapes, which after a pilot test, were reduced to 11. The test was performed in three small surveys using samples of 24, 27 and 32 participants respectively. The participants evaluated the attractiveness of each picture on a seven-point scale ranging from -3 (not attractive at all) to $+3$ (very attractive) (Van den Bergh et al., 2008).

After selecting a suitor, the respondents performed a discount rate exercise. In this exercise, they had to name the sum of money they would require in a month’s time in order to be indifferent to receiving 200 euros in that immediate moment and they then had to name the sum of money they

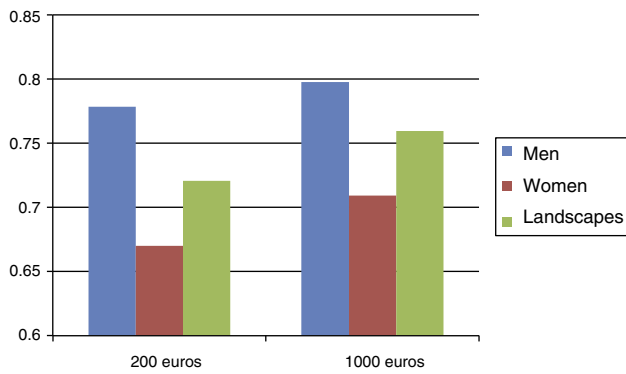


Figure 1 Discount rate for the sums of 200 euros and 1000 euros, findings from Experiment 1.

would require in the same time period in order to be indifferent to immediately receiving 1000 euros. This exercise was adapted from Thaler (1981) and allowed us to calculate a discount rate for each participant using the model proposed by Samuelson (1937):

$$\alpha(t) = \frac{1}{(1+r)^t} \quad (1)$$

where $\alpha(t)$ is the discount rate; r is profitability; and t is the time horizon. Note, however, that in this experiment we used the hypothetical discount rate where a real case would have been preferable. To date, there has been no clear evidence that the rewards from hypothetical exercises and the discount rates estimated from these differ to those that are estimated from real reward exercises (Lagorio & Madden, 2005; Van den Bergh et al., 2008).

Results

After performing a descriptive statistical analysis of the data, we removed some outliers from the dependent variable, which in our case was the discount rate. Outliers had to have value outside the range of $\pm 3\sigma$ (the standard deviation) of the sample distribution, a customary approach in statistical quality control (Montgomery, 2007). This criterion was used in both experiments.

The ANOVA analysis revealed that the picture content had a significant effect on the discount rate applied by participants in the 200 euros exercise ($F(2, 332) = 10.216, p < 0.01$). That is, after looking at pictures of attractive potential suitors, men showed a greater degree of impatience to have the resources ($M = 0.778, SD = 0.154$) and discounted money more markedly than women did ($M = 0.67, SD = 0.191$). And the women choosing a date showed a slightly less marked response than the women choosing a landscape ($M = 0.72, SD = 0.198$). These results are shown in Fig. 1. The two-way ANOVA detailed significant differences in all comparisons [men vs women $F(1, 218) = 20.43, p < 0.01$; men vs neutral $F(1, 208) = 5.07, p < 0.05$; neutral vs women vs $F(1, 208) = 3.42, p < 0.10$, though to a less significant degree].

The results show that the highest discount rate is given in the "pretty women" scenario and the lowest is given in the "sexy men" scenario. The results were similar in the replica of the experiment, which involved a larger

amount of money (1000 euros): the ANOVA showed significant differences ($F(2, 332) = 7.954, p < 0.01$) and again, men showed greater impatience after looking at attractive women ($M = 0.797, SD = 0.142$) than women did after looking at attractive men ($M = 0.709, SD = 0.179$). Women choosing a date had a lower discount rate than women choosing a landscape ($M = 0.759, SD = 0.182$). In this case, there were also significant differences in the pairwise comparisons [men vs women $F(1, 218) = 15.06, p < 0.01$; men vs neutral $F(1, 208) = 2.65, p < 0.10$, although to a less significant degree; and women vs neutral $F(1, 208) = 4.30, p < 0.05$].

Discussion

As we might expect after the findings obtained in the experiments in Canada and Belgium (and even though there were only male participants in Belgium), in the Spanish experiment the exposure to sexual signals stimulated the participants' impatience and prompted them to express a preference for immediate over eventual monetary rewards. Furthermore, this preference was more markedly expressed in the male participants than in the women, which is consistent with Trivers' parental investment theory (1972), which is a finalist conception. In short, we therefore propose that sexual signals stimulate a greater desire to have monetary liquidity, meaning that sexual attraction can influence impulse buying.

Experiment 2

This experiment was performed to extend the results of Experiment 1 from two perspectives. First, research shows that women use less sensitive reward systems than men and are therefore less likely to be influenced by sexual signals (Van den Bergh & Dewitte, 2006; Van den Bergh et al., 2008; Wilson & Daly, 2004). However, extensive research on consumer behaviour and evolutionary psychology finds that women respond differently to a signal according to whether they want a short- or long-term relationship (Buss & Schmitt, 1993) and that their objective conditions their response to erotic stimuli accelerating the desire to attain a financial reward and increasing the subject's monetary discount rate.

The change in monetary liquidity preference will occur when a woman's objective is to maintain a short-term relationship and she feels sensitive enough to be triggered by her exposure to sexual signals. More specifically, we aimed to verify the hypothesis that, after exposure to sexual stimuli, women who pursue short-term relationships will generate behaviour that favours steeper discount rates than women who pursue long-term relationships.

Participants

The participants were 161 undergraduate women from the same university whose age ranged from 19 to 34 years (*mean* (M) 19.89; *standard deviation* (SD) 5.64). Again, the students participated in order to receive a partial course credit.

Method

The experiment used the same procedure as Experiment 1 with volunteer students being invited to complete a questionnaire in a computer room under the supervision of teachers and researchers in examination conditions. However, in this case, all the volunteers were women. After receiving a brief explanation about the rules of the exercise, they were invited to look at a file containing a series of pictures of men, which were distributed randomly according to the participant's family name.

The scenario described was that the participants had signed up on a dating agency programme that helped couples meet, that the agency had sent the participants a series of pictures of potential suitors for short- and long-term relationships and that the participants had to choose a suitor for each type of relationship.

For the short-term relationship, there was a series of 11 casually dressed, young and physically attractive men in 11 blocks of six pictures each (the "sexy men" scenario). In the manner of a discrete choice model, the participants had to choose the most attractive suitor in each block. For the long-term relationship, there was a series of 11 potential suitors whose profile differed from the short-term suitors in that they were dressed in suits and were slightly older. Similarly, these men appeared in 11 blocks of six pictures each and participants had to choose the most attractive man in each block. As in Experiment 1, the blocks followed a Plackett–Burman saturated factorial design (1946).

Both the long- and short-term suitor profiles were selected after exploratory research carried out by the three student teams described above in Experiment 1. This time, the facial structure of the candidates was also included in the profiles, as women prefer typically masculine faces in short-term potential suitors (angular profile, deep frown, square jaw) but less markedly masculine features in long-term suitors (rounder and softer profile) (Penton-Voak & Perrett, 2000).

At a later moment, the participants completed a discount rate exercise adapted from Thaler (1981) like the participants in Experiment 1, in which they had to name the sum of money they would require in a month's time in order to be indifferent to receiving 200 euros in that immediate moment, and then name the sum of money they would require in the same time period to be indifferent to immediately receiving 1000 euros.

Results

Again, a descriptive statistical analysis was performed and some outliers were removed. An ANOVA analysis revealed that the picture content had a significant effect on the discount rate in women ($F(1, 159) = 6.702, p < 0.01$). After seeing potential suitors, women who wanted a short-term relationship ($M = 0.681, SD = 0.16$) discounted the money more markedly than women who pursued a long-term relationship ($M = 0.609, SD = 0.165$).

These results are shown in Fig. 2, where the highest discount rate is given to "attractive and hedonic men" and the lowest is recorded in "utilitarian men".

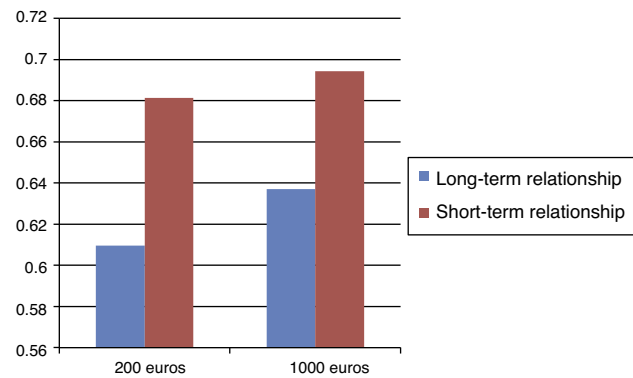


Figure 2 Discount rate for the sums of 200 euros and 1000 euros, findings from Experiment 2.

The results were similar in the replication, where the sum of money considered was 1000 euros; ANOVA analysis reflects significant values ($F(1, 332) = 4.921, p < 0.05$), and women who pursued a short-term relationship ($M = 0.694, SD = 0.161$) discounted the money more markedly than women pursuing a long-term relationship ($M = 0.637, SD = 0.172$).

Discussion

This second experiment indicated that the object women pursue in the relationship mediates the effect of the sexual signal on the discount rate; women who pursued a short-term relationship wanted greater monetary rewards; and after looking at pictures of potential opposite-sex partners for long-term relationships, women were less sensitive to immediate rewards. Note, finally, that cognitive variables cannot explain these behavioural differences in women while evolutionary theories can.

Conclusions

A premise of evolutionary thought is that each challenge a person faces can be of a different nature and therefore the motivations it stimulates and the actions taken to meet that challenge are also different. For example, the motivations a man feels when he sees the pictures of a potential opposite-sex suitor and the actions he then takes to negotiate these are quite unlike the motivations and actions that come into play in situations characterized by danger, where an individual must escape from a predator (Griskevicius & Kenrick, 2013).

This paper proposes that sexual or erotic stimuli can modify people's temporal perspective so that they value the present over the future. In our study, specifically, the sexual cue stimulated the subject's desire to establish a relationship with the opposite sex because this was an opportunity to engage in courtship. Also importantly, this did not involve the subject's cognitive capabilities.

However, our study also showed that people are not able to avoid altering their preference system because the possible outcome of courtship leads them to prefer and seek products that facilitate the mate acquisition process (Durante et al., 2011); and it therefore also leads them to

display greater interest in monetary gain or a greater preference for liquidity. As described in most models of consumer behaviour, an increase in consumer preference for one particular item increases the probability of certain kinds of behaviour, such as the purchase of that item (Blythe, 2013).

Our findings that sexual appetite induces a greater desire for liquidity are in line with the results reported by Wilson and Daly (2004) and by Van den Bergh et al. (2008), and they are also consistent with some neurological research (McClure et al., 2004). However, we found significant gender differences where men who looked at pictures of attractive women reacted much more impulsively than women who saw pictures of attractive men, and where the degree of discount rate over a future income could be used to measure impulsiveness. This showed that after exposure to pleasant stimuli, risk aversion in men and women decreases in varying degrees.

Furthermore, although women behave far less impulsively than men, closer inspection reveals that women's system of preferences for men varies according to the type of relationship they wish to pursue. The literature generally considers that women believe relationships can be short- or long-term (Buss, 2014). Furthermore, Li (2007) and Li et al. (2002) have associated these two types of relationships with the purchase of hedonic and utilitarian products, revealing that women increase their discount rate estimation when the focus is hedonic and reduce their discount rate when the focus is utilitarian. To our knowledge, this is the first time such a hypothesis has been put forward and it therefore represents our main contribution to the literature.

The findings obtained in this research have theoretical and practical implications for marketing and the sale of financial products carrying a component of risk. For example, advertising often presents consumers with rational arguments, emphasizing the value of an interest rate or a return on the investment. But our results suggest that when an advertisement is primarily addressed to a male audience, it can also benefit by containing sexual or erotic stimuli (i.e., pictures of attractive women) which reinforce the rational arguments in the advertisement by attending to the consumer's less discernible but equally important instinctive motivation. On the other hand, we propose, the process is more complex and subtle when the target audience is mostly women. Then, and in line with Li (2007) and Li et al. (2002), while hedonic product advertising should use pictures of sexually attractive younger men (i.e., the short-term relationship profile) to increase the consumer's attention and preferences for the product, utilitarian product advertising should use pictures of older men who transmit a sense of social success (i.e., the long-term relationship profile). However, further research should also examine the implications of our results with the results of other studies.

Our findings also have implications for advertisement design, indicating the importance of using designs to stimulate specific motivations. This is effectively what our study did; in order to evaluate a series of opposite-sex suitors, the participants were required to activate their mate selection process and, in the subsequent decision-making exercise, the result was determined by the type of motivation they had responded to. Similarly, in a television advertisement the first fifteen seconds might activate the viewer's

instinctive motivations and the rest of the advertisement could then use these to make its argument more persuasive.

Finally, our work has implications for the selection of sales personnel. Still today, companies profile their sales team members' personal appearance to reflect the seriousness and professionalism the company wants to inspire. However, our findings suggest that companies might also consider incorporating instinctive arguments into sales representative profiling and that good looks and appeal might also contribute to improving the sales of financial products depending on the degree of risk to be borne by the consumer.

Although it is not discussed in detail in this paper, note that the sum of money considered increases the discount rate. That is, discount rates are lower for a smaller sum than for a larger sum.

Through an evolutionary process, the human brain has designed specific motivational mechanisms to ensure that certain kinds of behaviour match the needs of certain circumstances. For example, the desire to have sex occurs when the circumstances favour reproduction and the desire to eat occurs when the brain detects the body's nutritional deficiency. The research indicates that the perception of signs commonly associated with the opportunity to have sex leads to increased sexual motivation and desire (Wilson & Daly, 2004).

This does not mean that the choice processes between different periods of time are governed by a single assessment mechanism. Research using magnetic resonance imaging suggests that temporary choice is a combination of two processes: a hot, visceral, instinctive-affective process, and a cooler, cognitive process (McClure et al., 2004). In the final event, how the scale tips between these two processes may depend on a number of reasons. For example, in long-term decisions, patience is mediated by more cognitive neural activity but the person may also be affected by exposure to "hot stimuli".

In its experiment with female participants, this paper provides evidence that both kinds of behaviour can be important, in that the subjects were required to be more rational when choosing long-term suitor and more effective and emotional when considering short-term suitors. And the perspective provided in this paper is that the ultimate reason underlies the apparent biases in the subject's psychological behaviour.

Finally, note that this study was also subject to certain limitations. First, our results come from samples composed exclusively of university students and therefore cannot be used to make observations about the general population. Second, further replicas will be required to test the consistency of Hypothesis 2 and validate the results.

Conflict of interests

The authors declare no conflict of interest.

References

- Aspara, J., & Van Den Bergh, B. (2014). Naturally designed for masculinity vs. femininity? Prenatal testosterone predicts male consumers' choices of gender-imaged products. *International Journal of Research in Marketing*, 31, 117–121.

- Barrett, H. C., & Kurzban, R. (2006). Modularity in cognition: Framing the debate. *Psychological Review*, *113*, 628–647.
- Benshoof, L., & Thornhill, R. (1979). The evolution of monogamy and concealed ovulation in humans. *Journal of Social and Biological Structures*, *2*, 95–106.
- Blythe, J. (2013). *Consumer behaviour*. London: Sage Publications.
- Buss, D. M. (1994). The strategies of human mating. *American Scientist*, *82*, 238–249.
- Buss, D. M. (1995). Psychological sex differences: Origins through sexual selection. *American Psychologist*, *50*, 164–168.
- Buss, D. M. (2014). *Evolutionary psychology: The new science of the mind* (4th ed.). Harlow, UK: Pearson Education.
- Buss, D. M., Abbott, M., Angleitner, A., Asherian, A., Biaggio, A., Blanco-Villasenor, A., & Yang, K. S. (1990). International preferences in selecting mates a study of 37 cultures. *Journal of Cross-Cultural Psychology*, *21*, 5–47.
- Buss, D. M., & Schmitt, D. P. (1993). Sexual strategies theory: An evolutionary perspective on human mating. *Psychological Review*, *100*, 204–232.
- Confer, J. C., Easton, J. A., Fleischman, D. S., Goetz, C. D., Lewis, D. M., Perilloux, C., & Buss, D. M. (2010). Evolutionary psychology: Controversies, questions, prospects, and limitations. *American Psychologist*, *65*, 110–126.
- Cosmides, L., & Tooby, J. (1994). Beyond intuition and instinct blindness: Toward an evolutionarily rigorous cognitive science. *Cognition*, *50*, 41–77.
- Durante, K. M., Griskevicius, V., Hill, S. E., Perilloux, C., & Li, N. P. (2011). Ovulation, female competition, and product choice: Hormonal influences on consumer behavior. *Journal of Consumer Research*, *37*, 921–934.
- Eagly, A. H., & Wood, W. (1999). The origins of sex differences in human behavior: Evolved dispositions versus social roles. *American Psychologist*, *54*, 408–423.
- Eibl-Eibesfeldt, I. (1989). *Human ethology*. Hawthorne, NY: Aldine de Gruyter.
- Fincher, C. L., Thornhill, R., Murray, D. R., & Schaller, M. (2008). Pathogen prevalence predicts human cross-cultural variability in individualism/collectivism. *Proceedings of the Royal Society B: Biological Sciences*, *275*, 1279–1285.
- Frederick, S., Loewenstein, G., & O'Donoghue, T. (2002). Time discounting and time preference: A critical review. *Journal of Economic Literature*, *40*, 351–401.
- Gangestad, S. W., & Simpson, J. A. (2000). The evolution of human mating: Trade-offs and strategic pluralism. *Behavioral and Brain Sciences*, *23*(04), 573–587.
- Gangestad, S. W., & Thornhill, R. (1997). The evolutionary psychology of extrapair sex: The role of fluctuating asymmetry. *Evolution and Human Behavior*, *18*, 69–88.
- Greiling, H., & Buss, D. M. (2000). Women's sexual strategies: The hidden dimension of extra-pair mating. *Personality and Individual Differences*, *28*, 929–963.
- Griskevicius, V., Goldstein, N. J., Mortensen, C. R., Cialdini, R. B., & Kenrick, D. T. (2006). Going along versus going alone: When fundamental motives facilitate strategic (non) conformity. *Journal of Personality and Social Psychology*, *91*, 281–294.
- Griskevicius, V., Goldstein, N. J., Mortensen, C. R., Sundie, J. M., Cialdini, R. B., & Kenrick, D. T. (2009). Fear and loving in Las Vegas: Evolution, emotion, and persuasion. *Journal of Marketing Research*, *46*, 384–395.
- Griskevicius, V., & Kenrick, D. T. (2013). Fundamental motives for why we buy: How evolutionary needs influence consumer behavior. *Journal of Consumer Psychology*, *23*, 372–386.
- Gustavsson, L., Johnsson, J. I., & Uller, T. (2008). Mixed support for sexual selection theories of mate preferences in the Swedish population. *Evolutionary Psychology*, *6*(4), 575–585.
- Jensen-Campbell, L. A., Graziano, W. G., & West, S. G. (1995). Dominance, prosocial orientation, and female preferences: Do nice guys really finish last? *Journal of Personality and Social Psychology*, *68*, 427–440.
- Kahneman, D. (2011). *Thinking fast and slow*. New York: Farrar, Strauss and Giroux.
- Kahneman, D., & Tversky, A. (1979). Prospect theory: An analysis of decision under risk. *Econometrica*, *47*, 263–292.
- Kassarjian, H. H., & Goodstein, R. C. (2010). The emergence of consumer research. In P. Maclaran, P. Maclaran, et al. (Eds.), *The SAGE handbook of marketing theory* (pp. 59–73). London: SAGE Publications.
- Kenrick, D. T., Griskevicius, V., Neuberg, S. L., & Schaller, M. (2010). Renovating the pyramid of needs contemporary extensions built upon ancient foundations. *Perspectives on Psychological Science*, *5*, 292–314.
- Kenrick, D. T., Sadalla, E. K., Groth, G., & Trost, M. R. (1990). Evolution, traits, and the stages of human courtship: Qualifying the parental investment model. *Journal of Personality*, *58*, 97–116.
- Kirkpatrick, M. (1996). Good genes and direct selection in the evolution of mating preferences. *Evolution*, *50*, 2125–2140.
- Keynes, J. M. (1936/2007). *The general theory of employment, interest and money*. United Kingdom: Palgrave Macmillan.
- Lagorio, C. H., & Madden, G. J. (2005). Delay discounting of real and hypothetical rewards III: Steady-state assessments, forced-choice trials, and all real rewards. *Behavioral Processes*, *69*, 173–187.
- Laibson, D. (2001). A cue-theory of consumption. *Quarterly Journal of Economics*, *116*, 81–119.
- Landolt, M. A., Lalumière, M. L., & Quinsey, V. L. (1995). Sex differences in intra-sex variations in human mating tactics: An evolutionary approach. *Ethology and Sociobiology*, *16*, 3–23.
- LaTour, M. S. (1990). Female nudity in print advertising: An analysis of gender differences in arousal and ad response. *Psychology and Marketing*, *7*, 65–81.
- Li, N. P. (2007). Mate preference necessities in long-and short-term mating: People prioritize in themselves what their mates prioritize in them. *Acta Psychologica Sinica*, *39*, 528–535.
- Li, N. P., Bailey, J. M., Kenrick, D. T., & Linsenmeier, J. A. (2002). The necessities and luxuries of mate preferences: Testing the tradeoffs. *Journal of Personality and Social Psychology*, *82*, 947–955.
- Loewenstein, G. (1996). Out of control: Visceral influences on behavior. *Organizational Behavior and Human Decision Processes*, *65*, 272–292.
- Lund, O. C. H., Tammes, C. K., Moestue, C., Buss, D. M., & Vollrath, M. (2007). Tactics of hierarchy negotiation. *Journal of Research in Personality*, *41*, 25–44.
- McClure, S. M., Laibson, D. I., Loewenstein, G., & Cohen, J. D. (2004). Separate neural systems value immediate and delayed monetary rewards. *Science*, *306*, 503–507.
- Montgomery, D. C. (2007). *Introduction to statistical quality control*. Hoboken, New Jersey: John Wiley & Sons.
- Norenzayan, A., & Heine, S. J. (2005). Psychological universals: What are they and how can we know? *Psychological Bulletin*, *131*, 763–784.
- Penton-Voak, I. S., & Perrett, D. I. (2000). Female preference for male faces changes cyclically: Further evidence. *Evolution and Human Behavior*, *21*, 39–48.
- Pinker, S. (2006). *The blank slate: The modern denial of human nature*. New York: Penguin.
- Plackett, R. L., & Burman, J. P. (1946). The design of optimum multifactorial experiments. *Biometrika*, *33*, 305–325.
- Regan, P. C. (1998). What if you can't get what you want? Willingness to compromise ideal mate selection standards as a function of sex, mate value, and relationship context. *Personality and Social Psychology Bulletin*, *24*, 1294–1303.
- Rikowski, A., & Grammer, K. (1999). Human body odour, symmetry and attractiveness. *Proceedings of the Royal Society B: Biological Sciences*, *266*, 869–874.

- Saad, G. (2011). The missing link: The biological roots of the business sciences. In G. Saad (Ed.), *Evolutionary psychology in the business sciences* (pp. 1–16). Berlin: Springer.
- Saad, G. (2013). Evolutionary consumption. *Journal of Consumer Psychology, 23*, 351–371.
- Saad, G., & Gill, T. (2000). Applications of evolutionary psychology in marketing. *Psychology and Marketing, 17*, 1005–1034.
- Samuelson, P. A. (1937). A note on measurement of utility. *The Review of Economic Studies, 4*, 155–161.
- Scheib, J. E. (2001). Context-specific mate choice criteria: Women's trade-offs in the contexts of long-term and extra-pair mateships. *Personal Relationships, 8*, 371–389.
- Sengapat, J., & Dahl, D. W. (2008). Gender-related reactions to gratuitous sex appeals in advertising. *Journal of Consumer Psychology, 18*, 62–78.
- Stark, R., Schienle, A., Girod, C., Walter, B., Kirsch, P., Blecker, C., & Vaitl, D. (2005). Erotic and disgust-inducing pictures—Differences in the hemodynamic responses of the brain. *Biological Psychology, 70*, 19–29.
- Symons, D. (1980). The evolution of human sexuality revisited. *Behavioral and Brain Sciences, 3*, 203–214.
- Thaler, R. (1981). Some empirical evidence on dynamic inconsistency. *Economics Letters, 8*, 201–207.
- Tinbergen, N. (1963). On aims and methods of ethology. *Zeitschrift für Tierpsychologie, 20*, 410–433.
- Trivers, R. (1972). *Parental investment and sexual selection*. Chicago, Illinois: Aldine Publishing Company.
- Van den Bergh, B., & Dewitte, S. (2006). Digit ratio (2D:4D) moderates the impact of sexual cues on men's decisions in ultimatum games. *Proceedings of the Royal Society B: Biological Sciences, 273*, 2091–2095.
- Van den Bergh, B., Dewitte, S., & Warlop, L. (2008). Bikinis instigate generalized impatience in intertemporal choice. *Journal of Consumer Research, 35*, 85–97.
- Waynforth, D., Delwadia, S., & Camm, M. (2005). The influence of women's mating strategies on preference for masculine facial architecture. *Evolution and Human Behavior, 26*, 409–416.
- Wilson, M., & Daly, M. (2004). Do pretty women inspire men to discount the future? *Proceedings of the Royal Society B: Biological Sciences, 271*, 177–179.