CHANGES IN WOMEN'S CONSUMPTION PREFERENCES AND BEHAVIORS ACROSS THE MENSTRUAL CYCLE

Eric Pierre Stenstrom

A Thesis

In

The John Molson School of Business

Presented in Partial Fulfillment of the Requirements
for the Degree of Master of Science in Administration at
Concordia University
Montreal, Quebec, Canada

December 2007

Canada

ABSTRACT

Changes in Women's Consumption Preferences and Behaviors
Across the Menstrual Cycle

Eric Pierre Stenstrom

Recently, a multitude of psychology studies have discovered menstrual cycle changes in a variety of preferences and behaviors in women. However, no study to date has investigated whether or not the menstrual cycle influences consumer behavior. Based on evolutionary theory and behavioral physiology findings, it was hypothesized that women would 1) engage in more consumption associated with food, cleaning, home, health, and gift-giving during the luteal phase when progesterone and immunosuppression levels are elevated, and 2) engage in more appearance-related consumption during the follicular phase when estrogen and fertility levels are highest. Thirty-five normally cycling women were asked to track their purchases and complete online surveys every evening for 35 days. Analyses revealed significant differences between consumption levels reported on luteal days and on fertile days. On luteal days, women exhibited increases in various food consumption measures and amount of money spent on food. Results also show that women spend more money on health-related products, and have a greater desire to spend money on home-related products and on gift-giving during the luteal phase. Regarding appearance-related consumption, results suggest a stronger desire to spend money on clothes, shoes and/or accessories on fertile days in partnered women. This paper contributes to the marketing literature in four key ways. First, managerial implications are discussed, including potential product placement and data mining strategies. Second, the results constitute the first evidence of a hormonal driver of shopping behavior. Third, the findings contribute to the growing research stream focused on consumer welfare. Finally, this thesis promotes a novel research stream that unites the fields of biology and consumer behavior.

ACKNOWLEDGEMENTS

TABLE OF CONTENTS

List of Figures

List of Tables

Introduction

Women constitute one of the largest, fasting-growing markets in the world. Their combined earnings have increased by 63% over the past three decades to an estimated $1 trillion each year. Yet, their spending power is estimated at over $2 trillion annually (Johnson & Learned, 2004). They now control approximately 80 percent of all household spending. Consequently, practitioners are searching for new ways of reaching female consumers (Barletta, 2003). Sex is the most popular form of segmentation used by marketers since it satisfies several requirements for effective implementation including measurability, identifiably, accessibility, and profitability (Darley & Smith, 1995). Nevertheless, sex differences in consumer behavior remain under-researched and constitute a long-standing source of perplexity for marketers (Hupfer, 2002). By enhancing their knowledge and understanding of the unique qualities of the female market, practitioners will be in a better position to design more effective marketing campaigns targeting women.

Recently, numerous studies in the psychology literature have linked the menstrual cycle to shifts in a variety of preferences (e.g., Gangestad, Thornhill, & Garver-Apgar, 2005a) and certain consumption-related behaviors in women (e.g., Haselton, Mortezaie, Pillsworth, Bleske-Rechek, & Frederick, 2007). However, no consumer behavior study to date has investigated whether or not menstrual cycle hormones are a significant situational driver of consumption. The current thesis takes a psychophysiological and

1

evolutionary approach to explore how the menstrual cycle and associated hormonal fluctuations might influence a woman's buying preferences.

First, the literature review begins with a brief exploration of the various types of situational variables in order to elucidate their potential to influence consumer behavior. Next, the different types of psychophysiological approaches that have previously been used by consumer researchers will be highlighted. Afterwards, the literature on menstrual cycle effects and their physiological and evolutionary substrates will be explored in detail. This review will set the stage for the hypotheses and methodology sections, followed by the analyses and results. Finally, the managerial and theoretical implications of the paper's findings will be discussed.

Literature Review

Situational Variables of Consumption

There are a number of factors that have been identified in the marketing literature as having an impact on consumption and buying behavior. Belk (1974, 1975) differentiated between non-situational and situational factors. The former includes variables that are lasting characteristics associated with consumers or products such as an individual's sex, race, and personality traits, as well as a product's size, function, and quality. The latter refers to all variables particular to a place and time which have a demonstrable effect on behavior but do not constitute personal or stimulus attributes. Belk identified physical and social surroundings, temporal perspective, task definition and antecedent states as the five groups of features that characterize a situation. This

2

section will outline each of these factors and briefly explore how they might impact consumption.

Physical Surroundings

The physical surroundings within which a choice alternative is situated can have a significant impact on consumer behavior. The location, weather, aromas, sounds and décor are all examples of such factors (Belk 1975). For example, Wakefield and Baker (1998) reported that the environmental factors of a shopping mall such as architectural design, music, layout, and décor are related to excitement levels and the desire to stay in the mall. Donovan, Rossiter, Marcoolyn, and Nesdale (1994) showed that the pleasantness of a store's environment tends to increase unplanned shopping and time spent in a store. Both the presence of music (Milliman 1982, 1986; Yalch & Spangenberg, 1990, 2000) and scents (Spangenberg, Crowley, & Henderson, 1996) have been found to affect consumer behavior in simulated or actual retail environments. Moreover, shopping environments with congruent scents and music tend to be preferred and lead to more unplanned purchases than incongruent stimuli (Mattila & Wirtz, 2001). Daily weather conditions also seem to have a significant impact on consumer behavior. A significant correlation has been discovered between the amount of daily sunshine and the generosity of tips left for restaurant waitresses (Cunningham, 1979). Similarly, a study conducted in New Zealand revealed that daily rainfall and maximum temperature were negatively correlated with pedestrian traffic levels in shopping centers (Parsons, 2001). In addition, there is evidence which suggests that weather influences market trading behaviors; the amount of sunshine in a given day was found to be positively

3

correlated with daily stock returns (Hirshleifer & Shumway, 2003), whereas the degree of cloudiness was found to be negatively correlated with index returns (Saunders, 1993). In short, there is evidence to suggest that physical surroundings can have a significant impact on various consumption behaviors.

Social Surroundings

Social surroundings, namely the presence, characteristics, and interpersonal reactions of others, can influence consumer behavior (Belk 1975). Consumption is influenced by an interactive social presence such as a friend, family member (Bearden & Etzel, 1982; Childers & Rao, 1992), or confederate (Bearden & Rose, 1990), as well as by a non-interactive presence such as other shoppers in a store (Argo, Dahl, & Manchanda, 2005; Zhou & Soman, 2003). An imagined social presence can also have an impact on consumption. Dahl, Manchanda, and Argo (2001) demonstrated that both a real or imagined social presence during the selection of a potentially embarrassing product increases consumer embarrassment levels. Thus, the presence of others has been shown to be a significant factor in buying behavior.

Temporal Perspective

Temporal perspective refers to time in units that can range from a season of the year to a time of the day. This temporal dimension can also be measured in relation to future or past events (e.g., time constraints imposed by prior or future commitments, time since last purchase, or time since payday) (Belk, 1975). Time constraints have been found to affect various consumption behaviors and preferences such as product and price

4

perceptions (Suri & Monroe, 2003), unplanned buying, brand switching, failure to make an intended purchase, amount of purchase volume deliberation (Park, Iyer, & Smith, 1989), preference for mass merchandisers or combination stores (Popkowski Leszczyc & Timmermans, 2001; Mattson, 1982), purchase choice deferral (Dhar & Nowlis, 1999), and stopping thresholds in sequential choice (Saad, 1994). The day of week has also been shown to have a significant impact on shopping activity patterns (MacKay, 1973; Yun & O'Kelly, 1997). For instance, consumers are more likely to go shopping and spend more money on Thursdays, Fridays, and Saturdays than the other four days of the week (Kahn & Schmittlein, 1989; East, Lomax, Willson, & Harris, 1994). Temporal elements can therefore be significant factors in explaining consumption behavior.

Task Definition

Task definition factors are intentions or requirements to shop for or obtain information regarding a choice alternative (Belk, 1975). For instance, a woman who is shopping for clothing for a friend is in a different buying situation than if she were shopping for clothing for herself. Thelen and Woodside (1997) found that primary store choice was influenced by a given task definition. Van Kenhove, De Wulf, and Van Waterschoot (1999) showed that attribute salience and store choice tend to differ across task definitions. Mattson (1982) found that individuals shopping for a gift prefer to shop at department stores rather than at specialty stores or mass merchandisers. Hence, task definition factors can significantly affect shopping decisions.

Antecedent States

Antecedent states refer to transient emotional states or conditions of buying. Examples include fatigue, illness, amount of money available, pleasantness, arousal, sadness, anxiety, and excitation (Belk, 1975). Gardner (1985) proposed that mood might affect a wide range of consumption-related judgments, recall, and behaviors. Studies have since demonstrated that consumers are more likely to purchase self-gifts when experiencing strong positive moods (Mick, DeMoss, & Faber, 1992) or strong negative ones (Mick & DeMoss, 1990; Faber & Christenson, 1996). Knowles, Grove, and Pickett (1999) found that individuals induced into a positive mood tended to recall more information about viewed advertisements than those in a bad mood. In a series of brand choice experiments, Kahn and Isen (1993) demonstrated that positive affect induced by a small gift increases variety seeking tendencies among pleasant and safe alternatives. Hunger has also been shown to affect buying behavior. Nisbett and Kanouse (1969) demonstrated that the amount of money that consumers spent at a grocery store was positively correlated with their hunger. Thus, antecedent states have been shown to play a key role in driving consumer behavior. Yet, one potential antecedent state that has been overlooked by most consumer scholars thus far is a woman's menstrual cycle phase (Saad, 2007). Although the menstrual cycle has been shown to affect a plethora of preferences and behaviors in women (e.g., Gangestad, Thornhill, & Garver-Apgar, 2005b), the current work is the first to explore its potential impact on consumer behavior. Prior to delving into the menstrual cycle literature in section III, the physiology-based

6

studies that have been undertaken within the realm of consumer behavior thus far will be outlined in the ensuing section.

Physiology-based studies in Consumer Behavior

Consumer scholars have used a variety of physiological measures in hopes of better understanding the psychophysiological changes associated with various consumption responses, choices, and behaviors. These include various measures of arousal and emotional response, as well as brain imaging techniques. Links between consumption and physiological markers such as pheromones, testosterone (T) levels, and the menstrual cycle have also been shown. In this section, consumer behavior studies that have utilized physiology-based measures as well as papers that have linked physiological markers to consumption phenomena will be reviewed.

Physiological Measures of Arousal and Emotional Response

Activation research in consumer behavior focuses primarily on measuring arousal responses to marketing stimuli (Kroeber-Riel, 1979). Techniques used by marketing scholars have included various measures such as pupillary dilation response (PDR), electrocardiogram (EKG), and electrodermal response (EDR). Given the evidence suggesting that pupil dilation is reflective of emotional arousal and interest towards a given stimulus, PDR has been used to measure interest to, and momentary information processing effort of, visual stimuli (Hess & Polt, 1960). For instance, Day, Shyi, and Wang (2006) found that the flashing of peripheral banner advertisements was associated with faster decision making and greater pupil dilation than a control group not exposed to

any such ads, suggestive of higher levels of general arousal. Heart rate measured by EKG has been linked to stimulus attention, recognition, and recall (Spence, Lugo, & Youdin, 1972; Watson & Gatchel, 1979). EKG has also been used to differentiate between certain emotional responses to affective visual stimuli such as anger, fear, and sadness (Schwartz, Weinberger, & Singer, 1981). Another measure of physiological response, EDR, has been used to demonstrate greater arousal responses to high-speed animated advertisements than slower ones (Sundar & Kalyanaraman, 2004). Higher arousal levels measured by EDR have also been found to be positively related to greater advertisement recall in an experimental setting (Kroeber-Riel, 1979) as well as to the likelihood of purchase in a field experiment (Groeppel-Klein, 2005).

Although EDR and PDR can capture arousal, these measures tend to be less sensitive to emotional valence. Measures of facial response via observation and manual coding procedures (Ekman & Friesen, 1978) have not yet yielded significant results in advertising response research (Derbaix, 1995; Graham, 1980). However, facial electromyography (EMG) has been successful in measuring more subtle emotional responses that are often characteristic of advertising response but are not detectable by visual observation. This has been achieved via the recording of EMG activity over the muscles involved in facial expression (Cacioppo, Petty, Losch, & Kim, 1986). Facial EMG has been used in consumer research by Hazlett and Hazlett (1999) to show that this particular form of data was a more sensitive measure in discriminating between commercial responses and was more strongly associated with commercial recall than were self-reported paper-and-pencil measures. Consumer researchers have therefore used

8

a variety of physiological measures to assess arousal and emotional response in shopping contexts.

Brain Imaging Techniques

The emerging field of neuromarketing seeks to better understand the neural substrates of consumer behavior using functional brain imaging techniques. This technology enables researchers to map activation patterns in the brain involved in the processing of consumer-related information. Neuroimaging techniques include electroencephalography (EEG) (e.g., Rothschild, Hyun, Reeves, Thorson, & Goldstein, 1988), magnetoencephalography (MEG) (e.g., Ambler, Ioannides & Rose, 2000), positron emission tomography (PET) (e.g., Royet et al. 2000), and functional magnetic resonance imaging (fMRI) (e.g., Yoon, Gutchess, Feinberg, & Polk, 2006). EEG has been used in research on advertising response to identify distinct patterns of brain activity and hemispheric activation that are correlated with television commercial recall (Rothschild & Hyun, 1990; Rossiter & Silberstein, 2001). Recently, the most frequently used brain imaging technique has been fMRI, given its high spatial and temporal resolution (Kenning, Plassmann, & Ahlert, 2007). One fMRI study conducted by Yoon et al. (2006) showed distinct activation patterns associated with the processing of semantic judgments about brands and people. This evidence challenges the view that brands and people are processed similarly by consumers (Aaker, 1997). FMRI technology has also been used to identify particular functional areas of the brain that are activated when the attractiveness of various types of cars are being evaluated (Erk, Spitzer, Wunderlich, Galley, & Walter, 2002) as well as when a favored brand is chosen

(Deppe, Schwindt, Kugel, Plassmann, & Kenning, 2005). Thus, researchers have recently used fMRI technology to uncover new findings relating to how the consumer's brain processes information and makes decisions.

Pheromones

Beyond measures of arousal, emotional response, and brain activation, there are other physiological markers that have been linked to consumer behavior. Pheromones, chemicals that trigger behavioral responses in others members of the same species, have been linked to product preferences in humans. Previous research has demonstrated that various insects and mammals communicate via pheromones (Dulac, 2000; Liberles & Buck, 2006). There is also evidence to suggest that humans are receptive to pheromones (McClintock, 1971; Monti-Bloch, Jenngings-White, Dolberg, & Berliner, 1994; Stern & McClintock, 1998; Thornhill & Gangestad, 1999; see Kohl, Atzmueller, Fink, & Grammer, 2001 for a review). In the realm of consumer behavior, Ebster and Kirk-Smith (2005) showed that exposure to pheromones can influence product appraisals. They found that men exposed to the male pheromone androstenol rated the male magazine *Men's Health* more favorably and as more masculine than did men who were not exposed to it. In a similar vein, Milinski and Wedekind (2001) found that one's choice of perfume tends to be consistent with one's immunogenetic profile via pheromones. By examining perfume choices and one's major histocompatibility complex (MHC), a set of genes that plays a role in immune function, researchers discovered that a correlation exists between these variables. Earlier studies have demonstrated that individuals prefer the body scent of potential mates who have a different MHC genotype than their own (Wedekind,

10

Seebeck, Bettens, & Paepke, 1995; Wedekind & Furi, 1997). It has been suggested that this mating preference may contribute to a penchant towards potential partners who are genetically dissimilar, which would lead to more heterogeneous and consequently healthier offspring (Brown, 1997). Milinski and Wedekind's (2001) study revealed that the perfumes that individuals chose were correlated with their MHC complex. Given that one's MHC can be smelled by potential mates and influence partner preferences, the researchers argued that individuals chose perfumes for themselves that highlighted their chemical profile as a mating signal. By recognizing the potential impact of pheromones on the human psyche, consumer scholars have discovered that pheromones can have a significant impact on consumer preferences.

Testosterone

Testosterone (T) is another physiological marker that has been associated with consumption. It has been linked to various male-specific behaviors, particularly those relating to male intra-sexual competition, status, and aggressiveness (Mazur & Booth, 1998). T levels have been found to be positively correlated with victorious outcomes in competitive sports (Elias, 1981) and chess (Mazur, Booth, & Dabbs, 1992). Moreover, T levels of spectators have been shown to increase or decrease according to whether their favored sports team was winning or losing (Bernhardt, Dabbs, Fielden, & Lutter, 1998). Thus, there is evidence to suggest that consumption of sports is directly associated with shifts in T levels via direct and vicarious competition. T levels have also been associated with social status (Mazur & Lamb, 1980). Within the realm of consumer behavior, Saad (2006) proposed that testosterone levels should be linked to male-specific conspicuous

11

consumption. In a recent field study, Saad and Vongas (2007) investigated whether displays of conspicuous consumption elicited changes in testosterone levels in men. Males showed an increase in salivary T levels when driving a luxury sports car through a busy downtown core and an isolated highway. In contrast, a decrease in T levels was measured when males drove through the downtown core in an old sedan. Hence, T levels have been shown to be directly associated with competition, status, and conspicuous consumption behaviors in men. To recapitulate, numerous studies have successfully highlighted existing links between consumer behavior and various antecedent states such as arousal, emotions, brain activation patterns, pheromones, and T levels via a physiological approach. In the next section, it will be argued that the menstrual cycle is a key physiological and situational driver of consumption.

The Menstrual Cycle

The field of psychology has recently experienced a surge in menstrual cycle studies that have consequently uncovered new insights into the female psyche. Although no study has directly investigated how a woman's buying preferences and behavior might shift across a cycle, there has been conceptual work published on the matter. Saad and Gill (2000) first proposed that a woman's menstrual cycle might be related to her consumption choices. They hypothesized that purchasing clothing such as a provocative dress or lingerie and engaging in activities like going to a bar may be related to a woman's cycle. To further elaborate on this point, Saad (2006, 2007) later proposed that specific consumption choices associated with beautification (e.g., wearing high heels, haircuts) and outings to social settings (e.g., going out to a café, studying at a library

rather than at home) might be correlated with a woman's cycle. Given that no empirical

menstrual cycle work has been conducted within the realm of the marketing discipline,

the following section will draw from the existing psychology literature to explore how

key aspects of a woman's psyche change across her cycle and how her buying

preferences and behavior might shift accordingly. This review will be preceded by a

general overview of the physiology of the menstrual cycle as well as by a discussion on

the adaptive significance of its design.

General Overview of Menstrual Cycle Physiology

The ovulatory cycle most commonly lasts 28 days, but can vary between 26 and

39 days of length. The cycle consists of three distinct phases (see Figure 1); the

menstrual phase (typically days 1 to 4 of a standardized 28-day cycle), the follicular

phase (days 5 to 14), and the luteal phase (days 15 to 28). The menstrual phase is

characterized by the onset of menstrual bleeding which occurs when the lining of the

uteral walls are shed, and is accompanied by very low estrogen and progesterone levels.

The follicular phase begins once the menstrual bleeding ceases, at which point estrogen

levels slowly begin to rise. During the late follicular stage, fertility, estrogen, and

testosterone levels are high and eventually peak around the time of ovulation. Although

it can be difficult to correctly estimate the days on which a woman is most likely to

conceive, the most fertile phase of a cycle typically consists of days 9 to 15 in a 28-day

cycle. Researchers tend to use the terms late follicular phase, periovulatory phase, mid-

cycle, near ovulation, and around ovulation interchangeably in reference to the most

fertile days of a menstrual cycle. After ovulation, the luteal phase begins, marked by

13

(A) Gonadotropins
(from anterior pituitary)

Luteinizing
hormone (LH)

Follicle-stimulating hormone (FSH)

(B) Events in ovary

Ovulation

Developing follicle

Egg

Corpus luteum

(C) Ovarian hormones

Progesterone

Estrogen

(D) Uterine lining

Menses   Follicular phase   Luteal phase

0   5   10   15   20   25

Day of menstrual cycle
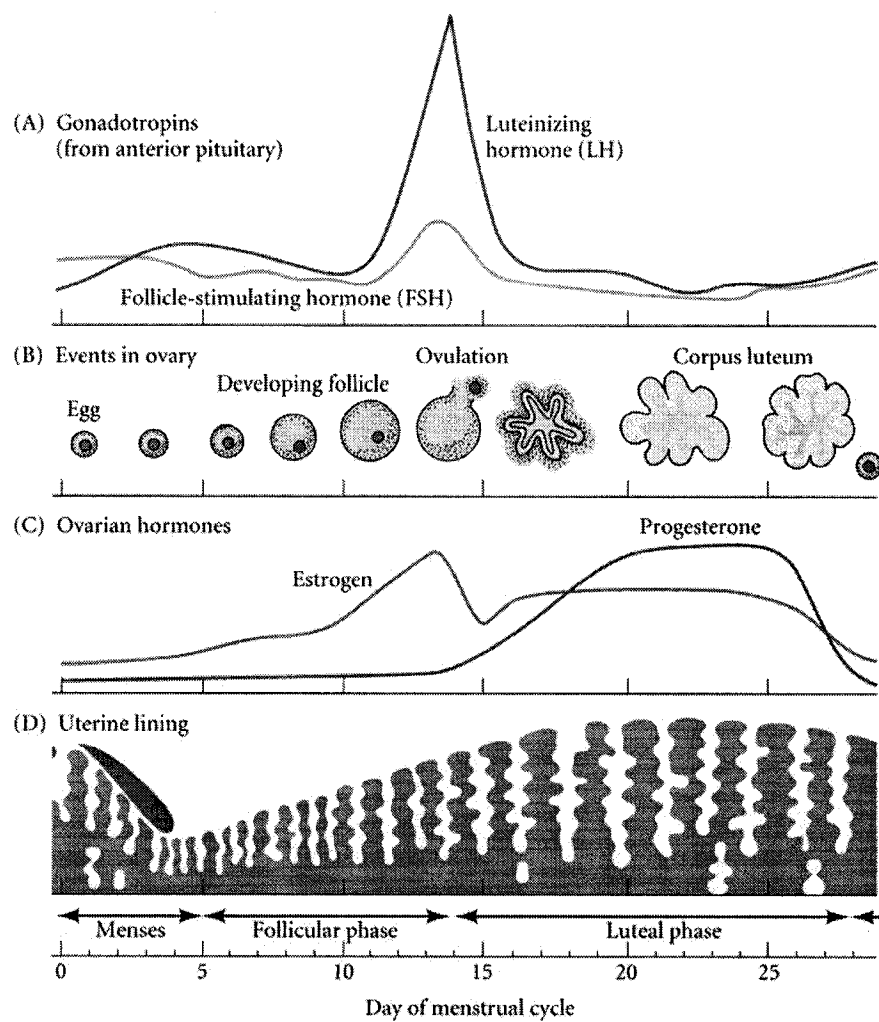
Figure 1. The human menstrual cycle. From S.F. Gilbert (2006) *Developmental Biology*

(8th ed.). Sunderland, MA: Sinauer Associates.

14

falling estrogen and testosterone and rising progesterone levels. The luteal phase is a time when the body prepares for a possible conception and implantation. The late luteal phase is characterized by soaring progesterone levels. Estrogen levels also rise once again at this phase, but to a lesser degree than progesterone. The luteal phase ends with a steep drop in both progesterone and estrogen levels, which triggers menstruation and the beginning of the next cycle (Carlson, 2001; Nelson, 2005). In sum, each of the three menstrual cycle phases is distinct in terms of hormone levels and biological function. In the ensuing section, the evolutionary underpinnings of the psychological, physiological, emotional, and behavioral mechanisms associated with the menstrual cycle will be discussed.

Proximate and Ultimate Explanations of Menstrual Cycle Effects

Over the last century, the Standard Social Science Model (SSSM) seems to have permeated mainstream thinking in the social sciences (Tooby & Cosmides, 1992; Pinker, 2003) and consumer research (Saad 2006, 2007). This epistemology focuses on proximate explanations of psychological phenomena while supporting the notion that the human mind is a domain-general processor. In contrast, evolutionary psychology (EP) views the mind as consisting of domain-specific cognitive mechanisms that have evolved as functional adaptations to frequently encountered reproductive and survival problems that our ancestors faced throughout our evolutionary history. Ultimate explanations are used to identify how specific psychological mechanisms were adaptive in the *environment of evolutionary adaptedness* (EEA; i.e., the environment in which the human mind was forged by the forces of natural and sexual selection). This environment refers

15

mainly to Africa during the Pleistocene era (approximately 1.8 million to 12,000 years before present) when our ancestors lived as nomadic hunters and gatherers. Given that the last 12,000 years is not enough time for any significant changes to occur to the human brain via selection processes, our brains are wired to succeed in a Pleistocene Savannah, not in the relatively recent agricultural and industrial civilizations (Buss, 1999; Pinker, 1997). An advantage of this Darwinian approach is its potential for the generation of novel, testable, and otherwise unfathomable hypotheses (Saad & Gill, 2000; Saad, 2006). For instance, Gangestad and Thornhill (1998) based themselves on evolutionary theory to propose that women might exhibit heightened preferences for males that exude cues of genetic fitness during the late follicular phase of their menstrual cycle when conception is most likely. They found that women report an enhanced preference for the scent of symmetrical men during the fertile phase of their menstrual cycle. While most menstrual cycle findings have been discovered using a proximate approach (e.g., Dillon & Brooks, 1992), the recent surge in menstrual cycle findings in mating-related preferences has been fueled by evolutionary psychologists utilizing both proximate and ultimate approaches (Gangestad et al., 2005a). Thus, in order to best examine how the menstrual cycle might influence consumer behavior, both proximate explanations (i.e., how has the menstrual cycle and the associated hormone level fluctuations been shown to impact the female psyche?) and ultimate ones (i.e., how might these effects have been adaptive in ancestral times?) will be explored in this paper.

Fessler (2003) put forth an ultimate explanation regarding the proximately puzzling decrease in caloric intake during the fertile phase of the menstrual cycle when

energy requirements are greatest. He argued that women have inherited psychological mechanisms that would have favored spending more time in mating-related activities and less time in foraging and other non-mating activities during the periovulatory phase of the menstrual cycle. He reviewed the literature on food consumption and physical activity across the menstrual cycle in humans and other mammals and showed that ranging activities (i.e., mating-related mobility) tend to increase while feeding behaviors (i.e., foraging) tend to decrease around the time of ovulation, despite greater caloric needs at that time. The current work is based in part on Fessler's notion of competing psychological mechanisms in women that shift in motivational salience across the menstrual cycle in a manner that would have been optimal for reproduction and survival in ancestral times. Specifically, it is proposed herewith that evolved psychological mechanisms that would have led ancestral women to spend more time on mating-related activities during the fertile phase of their menstrual cycle now leads modern women to engage in more mating-related consumer behavior at this time in their cycle. Likewise, the psychological mechanisms that would have favored non-mating activities relating to survival such as foraging for food, avoiding disease, and finding adequate shelter in ancestral women during their luteal phase now favor shopping preferences and behaviors of a similar nature at this time in their cycle. Prior to positing specific hypotheses pertaining to mating- and survival-related consumption, the literature on menstrual cycle effects will be thoroughly reviewed.

Menstrual Cycle Studies

Menstrual cycle effects on mating preferences have been well documented in the psychology literature. The breakdown of this section will be based on Saad's (2007) four elemental Darwinian modules: reproductive, survival, kin selection, and reciprocation. First, the menstrual cycle findings associated with mating such as mood, appearance self-esteem, and appearance-related behaviors and consumption will be discussed in the reproductive module section. Next, the menstrual cycle studies relating to the survival module such as food consumption, house cleaning, and health concerns will be reviewed. In the third and final menstrual cycle section, the studies examining cycle effects on the need to affiliate with family members (i.e., kin selection) and non-kin (i.e., reciprocation) will be reviewed.

Reproductive Module

Behavioral scientists have amassed a long list of findings relating to menstrual cycle effects associated with the reproductive module including shifts in mating mobility, general sexual behaviors and desires, mate choice, physical attractiveness, appearance self-esteem, mood, and sexual signaling. Each of the latter will be addressed in this section.

Mating Mobility

Studies that have documented shifts in mobility across the menstrual cycle have reported a peak in physical activity and/or locomotion at the late follicular phase (Altmann, Knowles, & Bull, 1941; Eck et al., 1997; Johnson, Corrigan, Lemmon,

Bergeron, & Crusco, 1994; Morris & Udry, 1970; Stenn & Klinge, 1972) as well as at the late luteal phase (Altmann et al., 1941; Morris & Udry, 1970). Yet, the nature of the physical activity associated with the late follicular phase seems to be distinct from the activity during the late luteal phase. The types of physical activity characteristic of the late luteal phase are house cleaning and putting things in order (Altmann et al., 1941), indicative of an evolved survival-related menstrual cycle mechanism. In contrast, the mid-cycle peak in physical activity does not pertain to cleaning or organizing but seems to be associated with mating-related activities. For instance, women seem to be most interested in going out and meeting men near ovulation. Doty and Silverthorne (1975) found that women who were in the fertile phase of their cycle were more likely to volunteer for an experiment than those in their non-fertile phase. This finding suggests that women might be more interested in new experiences or meeting new people when highly fertile (Fessler, 2003). More recently, Haselton and Gangestad (2006) examined the daily attitudes of women over a 35-day period. Women reported a stronger desire to go out to places where they might meet men, such as at parties or dance clubs, on fertile days than on luteal days. In addition, women have been found to display distinct navigational patterns during periovulation. Numerous studies have shown that men tend to utilize a Euclidean (i.e., orientation) navigational style relying on an "internal compass" whereas women tend to employ a "landmark" (i.e., topographical) navigation style. It has been suggested that males evolved this navigational advantage because our male ancestors travelled long distances in relatively unpredictable directions to hunt animals whereas women stayed closer to home to gather fixed items and care for children

19

(Silverman & Eals, 1992; Ecuyer-Dab & Robert, 2004). However, Harrison (2000) found that women tend to utilize more of a male-based Euclidean navigational style at mid-cycle than during a non-fertile phase. Fessler (2003) points out that women may have evolved the tendency towards a male-like navigational style when most fertile, in order to facilitate chasing men across long distances and then returning home safely (akin to how men chase animals while hunting). Thus, it appears as though women show an increase in mating-related mobility and male-based navigational patterns during the most fertile phase of their cycle. The following section will review further evidence that the periovulatory increase in mobility is sexual in nature and indicative of an evolved psychological mating mechanism, which increases in salience during the fertile phase of the menstrual cycle.

Sexual Desires and Behaviors

The literature relating to menstrual cycle shifts in sexual activity and desires is examined next. The reviewed research topics include general sexual activity and response to sexual stimuli, the "good genes" hypothesis, extra-pair mating, desires and flirtation, and rape avoidance.

General Sexual Activity and Response to Sexual Stimuli

Several studies have examined whether general sexual behavior is contingent upon a woman's menstrual cycle phase. Although women engage in sexual activity across the menstrual cycle, researchers have reported an increase in women's sexual interest (Dennerstein et al., 1994; Silber, 1994) and desire (Stanislaw & Rice, 1988)

20

during the late follicular phase when estrogen and testosterone levels, as well as fertility, are at their highest. In addition, women are more likely to have sex (Bancroft, Sanders, Davidson, & Warner, 1983; Harvey, 1987; Morris, Udry, Khan-Dawood, & Dawood, 1987; Persky, Lief, Strauss, Miller, & O'Brien, 1978; Udry & Morris, 1968; Wilcox, Weinberg, & Baird, 1995; Wilcox et al., 2004), initiate sex with their partner (Adams, Gold, & Burt, 1978; Gangestad et al., 2002; Silber, 1994) and masturbate around ovulation (Adams et al., 1978). Given that a woman is more likely to be interested in, engage in, and initiate sexual relations during the most fertile phase of the menstrual cycle, the female reproductive mechanism seems to increase in motivational salience at a time when she is most likely to conceive. In addition, Clayton, Clavet, McGarvey, Warnock, and Weiss (1999) found that women reported having more frequent and satisfying orgasms mid-cycle versus during the late luteal phase. This increase in orgasmic activity may be indicative of an adaptive mechanism given that female orgasms occurring near the time of ovulation increase sperm retention thereby increasing the chances of conception (Baker & Bellis, 1993; Thornhill, Gangestad, & Comer, 1995).

Highly fertile women also seem to be more attentive and favorable towards stimuli of a sexual nature during this time. Krug, Plihal, Fehm, and Born (2000) showed that women display an increase in attention to and processing of stimuli of reproductive significance around ovulation. Women have also been shown to prefer male odours when fertile. The odour of the male sex steroid androstenone was perceived by women as more pleasant near ovulation than at other times in their cycle (Hummel, Gollisch, Wildt, & Kobal, 1991; Grammer, 1993). In addition, women in their fertile phase of their

21

cycle have been found to be more interested in erotic movies than women in their luteal

phase (Zillmann, Schweitzer, & Mundorf, 1994). Similarly, women in their follicular

phase were more sexually aroused by erotic video clips and reported having greater

desire and sexual fantasies during the 24 hours following the study than during their

luteal phase (Slob, Ernste, & van der Werfften Bosch, 1991; Slob, Bax, Hop, & Rowland,

1996). Women in their late follicular phase appear to be more sexually stimulated by

pictures of attractive male models than women in their late luteal phase (Luschen &

Pierce, 1972). The accumulated evidence suggests that reproductive mechanisms led

women to engage in greater sexual activities and to be more responsive towards sexually

relevant stimuli when they are in the most fertile phase of their menstrual cycle. Beyond

cyclical increases in sexuality, there is evidence to suggest that the mating context (i.e.,

short versus long-term) moderates numerous menstrual cycle effects. In the ensuing

section, the "good genes" hypothesis of extra-pair mating will be introduced.

The "Good Genes" Hypothesis

In a short-term mating context, women tend to place a greater emphasis on male

attributes that are hypothesized to signal "good genes" such as physical attractiveness,

muscularity, bilateral symmetry, and masculine facial features. Within this context, they

tend to place less weight on indicators of parental care and investment that are associated

with long-term mating such as being a good father, financially successful, family

oriented, trustworthy, warm, and faithful (Buss 1989; Gangestad, Garver-Apgar,

Simpson, & Cousins, 2007; Li & Kenrick, 2006; Penton-Voak et al., 1999; Regan, 1998;

Thornhill et al., 1995; Thornhill & Gangestad, 1996). Researchers have proposed that

22

women may have evolved an inclination towards conditional "mixed" mating strategies - to pursue short-term and long-term mateships in appropriate circumstances - in order to improve reproductive fitness (Buss & Schmitt, 1993; Gangestad & Simpson, 2000). Given that women are only fertile for approximately six days out of a cycle (Wilcox et al., 1995), they are more likely to engage in "gene shopping" (i.e., short-term mating) within this fertile window. The underlying premise is that cues of heritable fitness are valued more by women when they can gain genetic benefits from short-term mating (Gangestad & Thornhill, 1998; Penton-Voak & Perrett, 2000; Penton-Voak et al., 1999; Regan, 1996). While the risks of losing one's primary partner extend throughout the cycle, partnered women can only gain genetic benefits from extra-pair mating during this short fertile window. Thus, according to the good genes hypothesis, women have evolved an inclination towards short-term and extra-pair mating conditional on their menstrual cycle phase and associated fertility status.

Extra-Pair Mating, Desires, and Flirtation

There are a number of findings that support the good genes hypothesis of extra-pair mating. A few studies have documented a greater sexual attraction to and fantasy about men other than their primary partner at the follicular phase compared to the luteal phase (Gangestad et al., 2002, 2005c; Haselton & Gangestad, 2006; Pillsworth & Haselton, 2006). Partnered women (but not single women) are also more likely to report having flirted with other men around the time of ovulation (Haselton & Gangestad, 2006). Moreover, Bellis and Baker (1990) found that women were more likely to have extra-pair sexual relations around ovulation than during the rest of their cycle and they

23

were less likely to use contraceptives during these affairs than they were with their primary partner. A review of the literature on sexual infidelity suggests a proportion of women do in fact engage in extra-pair mating during a phase of their cycle when conception was possible. Geary, Vigil, and Byrd-Craven (2004) found that 10% of men have been cuckolded (i.e., deceived into raising the child of another man as a result of extra-pair mating). Sheldon, Cooper, Geary, Hoard, and DeSoto (2006) found evidence suggesting that women tend to have different motives driving sexual activity depending on where they are in their menstrual cycle. Women at a fertile phase of their cycle were less likely to report intimacy as a motive for having engaged in sexual relations than women in non-fertile phases. The authors contend that a decline in the need for sexual intimacy around ovulation, when fertility is high, may be indicative of an evolved mechanism that promotes mate choosiness and extra-pair mating. In sum, partnered women tend to exhibit greater extra-pair desires and at times copulations around ovulation when they are most likely to conceive.

Women's heightened desires for men other than their primary partner do not stem merely from a general increase in sexual desire. Three studies have distinguished between partnered women's general sexual desires and extra-pair desires. Gangestad and colleagues (2002), Haselton and Gangestad (2006), and Pillsworth and Haselton (2006) found that women exhibited greater sexual desires for men other than their primary partner on fertile days than on luteal days, while no significant differences in general sexual desire were observed between phases. Interestingly, extra-pair desires at the late follicular phase tend to be greatest in women whose partners are relatively physically

24

unattractive (Haselton & Gangestad, 2006; Pillsworth & Haselton, 2006) or bilaterally

asymmetrical (Gangestad et al., 2005b). Given that physical attractiveness and symmetry

are traits associated with genetic fitness, women whose partners lack these indicators of

good genes are those who would theoretically gain the most from seeking outside

partners when fertile.

Rape Avoidance

In addition to women exhibiting increased extra-pair desires when highly fertile,

evidence suggests that women may also be more alert to potential sexual threats during

this time. Given the high costs of pregnancy resulting from rape (particularly for

ancestral women who did not have access to birth control or abortion), women may have

evolved certain defenses against unwanted sexual relations during the fertile phase of

their menstrual cycle. Research has revealed that women are less likely to report having

engaged in sex-related risk-taking behaviors on highly fertile days than on non-fertile

days of the cycle (Chavanne & Gallup, 1998). Moreover, Petralia and Gallup (2002)

later showed that women who read a scenario about a sexual assault and who were in

their ovulatory phase displayed greater grip strength than at any other time of the

menstrual cycle. This finding may be indicative of a woman's increased ability to defend

herself against sexual assault when maximally fertile. Another study measured women's

disgust sensitivity to food aversions, filth, and maladaptive sex (e.g., incest) across the

menstrual cycle. Fessler and Navarette (2003) found that only disgust to maladaptive sex

was positively correlated with fertility. In sum, evidence suggests that women have a

greater ability to detect and protect against unwanted sexual relations when in the fertile

25

phase of their cycle. The agglomerated findings indicate an increase in sexual attention, desires, responses, activity, and protection, as well as extra-pair desires and activities during the most fertile phase of a woman's menstrual cycle. The next section will explore how a woman's particular preferences in potential mates are driven by the menstrual cycle.

Mate Choice

According to the good genes hypothesis, women should favor males who display hypothesized indicators of good genes more so on fertile days than on non-fertile days of their cycle. Testosterone-dependent traits seem to be indicators of genetic fitness given that they are honest signals of immunocompetence (Folstad & Karter, 1992; Zahavi & Zahavi, 1997) and long-term health in males (Rhodes et al., 2003; Thornhill & Gangestad, 2006). Research has demonstrated that women exhibit a heightened preference for masculine bodies (Little, Jones, & Burriss, 2007), for height (Pawlowski & Jasienska, 2005), and for facial cues of masculinity such as a large jaw and a prominent brow ridge (Johnston, Hagel, Franklin, Fink, & Grammer, 2001; Penton-Voak et al., 1999; Penton-Voak & Perrett, 2000) around the time of ovulation. Similarly, women exhibit a heightened preference for masculine voices (i.e., low pitch) when highly fertile (Feinberg et al., 2006; Puts, 2005). In addition, fertile women prefer the scent of T-shirts worn by symmetrical males more so than women who where not in a fertile phase of their cycle (Gangestad & Thornhill, 1998; Thornhill & Gangestad, 1999; Thornhill et al., 2003). Given that symmetry is a cue of developmental stability, this evidence suggests

that women near ovulation are more attracted by the scent of a heritable trait as displayed by a fit male.

Another hypothesized indicator of good genes is creative intelligence. In a mate choice scenario, female preferences for creatively intelligent men versus wealthy men were positively correlated with estimated phases of fertility (Haselton & Miller, 2006). This finding suggests that women favor indicators of heritable talent in a potential mate (in this case, creative intelligence) rather than traits associated with a good long-term mate (wealth) when fertile. However, the notions that creative intelligence is solely a cue of good genes and that wealth is a strictly an indicator of a good long-term mate is debatable. Intelligence might be correlated to wealth, and might be a cue of an excellent long-term mate. In a similar vein, behavioral displays such as intrasexual competitiveness and social dominance have been associated with signals of good genes such as symmetry and facial masculinity (Simpson, Gangestad, Christensen, & Leck, 1999; Johnston et al. 2001). Gangestad, Simpson, Cousins, Garver-Apgar, and Christensen (2004) found that behavioral displays of masculinity such as direct intrasexual competitiveness and social presence were preferred more by women on fertile days than on non-fertile days. In addition, Havlicek, Roberts and Flegr (2005) had males wear cotton pads in their armpits for 24 hours and assessed their psychological dominance via questionnaires. Partnered women in their fertile cycle phase rated the cotton pads worn by psychologically dominant males as sexier than did women in a non-fertile phase. Recently, Gangestad et al. (2007) demonstrated that fertile women who are evaluating males within a short-term mating context are particularly attracted to a variety

of hypothesized cues of genetic benefits such as physical attractiveness, muscularity, being influential, arrogant, confrontational, and socially respected. In line with the good genes hypothesis, no changes in preferences associated with long-term mating such as being a good father, faithful, financially successful, and warm were found across the cycle.

Another adaptive mate preference relates to self-resemblance, which has been shown to be a cue of kinship (Debruine, 2005). Women show a greater preference for self-resembling faces during the non-fertile phase of the cycle than during the fertile phase. This shift in preference for self-resembling faces is believed to function to reduce the chances of engaging in sexual relations with closely related men when fertility is high, thereby diminishing the likelihood of inbreeding (Debruine, Jones, & Perret, 2005). To recapitulate, when evaluating potential mates within a short-term context, women around ovulation exhibit an increased preference for males that exhibit cues of heritable physical traits such as masculine voices, masculine and muscular bodies, and masculine and symmetrical faces, as well as personality traits such as creative intelligence, being influential, socially respected, arrogant, confrontational, and competitive. These cyclical mate preference changes are in line with the good genes hypothesis of extra-pair mating, and lend support to the notion that fertile women are psychologically primed towards mating-related activities in a manner which would have led to enhanced reproductive success in ancestral times. In the ensuing section, the manner in which physical attractiveness and appearance self-esteem change across the menstrual cycle will be explored.

28

Physical Attractiveness and Appearance Self-Esteem

Another set of menstrual cycle effects that would have increased reproductive success in the EEA relates to female physical appearance. Evidence suggests that women are perceived as more attractive during the late follicular phase than during the rest of the menstrual cycle. Roberts et al. (2004) had pictures of women's faces taken during the follicular and luteal phases. Male and females judges rated the pictures taken during the follicular phase as more attractive significantly more often than would be expected by chance. Similarly, women's waist-to-hip ratio (Kirchengast & Gartner, 2002) and bilateral asymmetry of soft tissue characteristics such as breasts and ears (Manning, Scutt, Whitehouse, Leinster, & Walton, 1996) have been found to be lowest near ovulation than at other time in their cycle. Given that males have been found to favor low as opposed to high wait-to-hip ratios (Singh, 1993), and bilaterally symmetrical breasts (Singh, 1995) and facial features in mate preference experiments (Grammer & Thornhill, 1994), a woman's physique is likely to be perceived as being most attractive during the fertile phase of her cycle. Researchers have also found that odors emitted by women are more attractive on fertile days than on non-fertile days. T-shirts worn by women during the follicular phase were judged by males as more pleasant and sexy than those worn during their luteal phase (Kuukasjarvi et al., 2004; Singh & Bronstad, 2001; Thornhill et al., 2003). Likewise, Havlicek, Dvorakova, Bartos, and Flegr (2006) used a within-subjects design wherein women wore cotton pads in their arms pits at the follicular, luteal, and menstrual phases. Men rated the cotton pads worn by women during the fertile phase as most attractive. Further evidence of a periovulatory increase in

29

attractiveness around the time of ovulation comes from a recent field study involving nightclub dancers (Miller, Tybur, & Jordan, 2007). Dancers reported making significantly greater tip earnings during the late follicular phase than during any other phase. This finding suggests that males may have been more receptive to and favorable towards the physical cues of fertility exuded by dancers around the time of ovulation. Alternately, it could also suggest that highly fertile women were more sexual in their movements and more flirtatious. In sum, women tend to look and smell more attractive on fertile days than on non-fertile days. From an evolutionary standpoint, it is likely that an enhanced attractiveness around ovulation would have improved a woman's ability to attract a desirable mate when her likelihood of conception was greatest, thereby enhancing reproductive success.

Women not only appear to be more attractive when fertile, but also they may tend to feel as though they are more desirable at that time. Haselton and Gangestad (2006) found that women reported feeling both more physically attractive and sexually desirable on highly fertile days than on luteal phase days. The researchers speculate that highly fertile women may exhibit greater appearance-related self-confidence because they are receptive to improvements to their own physical appearance. They also point out that this mid-cycle self-esteem effect may serve an adaptive motivational function that leads to enhanced mate choosiness when a woman is most fertile thereby optimizing reproductive success. As will be discussed in the next section, a similar increase in positive mood around the time of ovulation might have also increased reproductive success in the EEA.

Mood

Researchers have found evidence suggesting that the menstrual cycle has an effect on mood. Some researchers have found that women's positive moods peak at the late follicular phase while negative moods peak at the late luteal phase (Altmann et al., 1941; Backstrom et al., 1983; Krug et al., 2000; Little & Zahn, 1974; Sanders, Warner, Backstrom, & Bancroft, 1983). However, other studies have found no clear menstrual cycle effects on mood (Abplanalp, Rose, Donnelly, & Livingston-Vaughan, 1979; Van Goozen, Wiegant, Endert, Helmond, & Van de Poll, 1997). Furthermore, one study found *higher* negative moods scores in the late follicular phase than in the late luteal phase (Parlee, 1982). Hence, the results regarding mood and the menstrual cycle seem somewhat mixed. Nonetheless, an increase in positive mood around ovulation might serve an adaptive purpose by making fertile women more approachable in a mating context. In line with this reasoning, Gladstone and Parker (2002) found that pictures of women who were smiling sincerely were judged as being more approachable than women who did not smile or did not do so sincerely. Women showing signs of positive mood such as smiling may therefore be seen as more approachable by prospective mates. Thus, in ancestral times, a periovulatory increase in mood would have likely enhanced a woman's mating success when she was most fertile. It is therefore argued that women have evolved a mating-related adaptive psychological mechanism that augments mood during the fertile phase of the menstrual cycle.

31

Sexual Signaling

Perhaps the most direct evidence suggesting that evolved psychological mechanisms that led women to spend more time in mating-related activities in ancestral times now lead to increases in mating-related consumption in modern women, comes from studies that explore shifts in sexual signaling. Grammer, Renninger and Fischer (2004) had estrogen levels measured and pictures taken of women at an Austrian night club to investigate if provocative attire was linked to the menstrual cycle. They found evidence that estrogen levels were positively correlated with clothing tightness and amount of skin revealed in partnered women who were unaccompanied by their partner. However, estrogen levels are also relatively high for most of the luteal phase (e.g., Scepkowski, Georgescu, & Pfaus, 2006; see figure 1) and they vary more between women than within (Gann, Giovanazzi, Van Horn, Branning, & Chatterton, 2001). Therefore, although estrogen levels peak at the late luteal phase when fertility is highest, they cannot effectively be used to estimate cycle phase in between-subject studies such as the one conducted by Grammer and colleagues (2004). These findings may therefore be indicative of trait estrogen differences rather than menstrual cycle effects. Haselton et al. (2007) used a within-subject design with accurate phase estimation methods to examine the link between fertility and attire. Participants had their full bodies photographed once during the late follicular phase and once during the luteal phase. Judges, who were asked to evaluate the clothing and ornamentation worn by the participants, were significantly more likely to pick the picture taken near ovulation as "trying to look more attractive" than the one taken at the non-fertile phase. Thus, women appear to be advertizing their

fertility via the wearing of more attractive clothing and/or ornamentation and/or self-grooming.

Overall, the evidence suggests that the reproductive module increases in motivational salience in various respects during the fertile window. In the ensuing section, the manner in which the survival module and associated consumption preferences and behaviors might vary across the menstrual cycle will be explored.

Survival Module

The increase in motivational salience towards mating-related activities during the late follicular phase described in the previous section is coupled with a decrease in motivation towards food consumption at this fertile time in the menstrual cycle (Fessler, 2003). In turn, the luteal phase is characterized by low fertility, a decrease in mating-related behaviors compared to periovulation, and an increase in caloric intake. This section will describe how the luteal phase is unique in terms of its hormonal profile, adaptive significance, and its potential effect on consumption. As opposed to the follicular phase, the hormonal profile of a woman in her luteal phase is remarkably characteristic of actual pregnancy, namely high progesterone levels and moderately elevated estrogen levels (see Figure 1). In addition, the luteal phase is unique to other phases of the cycle in that the female body prepares for a possible pregnancy at this time with the development of the uteral lining in anticipation of a possible implantation of a fertilized egg (Carlson, 2001; Nelson, 2005). Consequently, women may be more vulnerable to pathogens during the luteal phase given that it is characterized by immunosuppression (Angstwurm, Gaertner, & Ziegler-Heitbrock, 1997; Check,

33

Szekeres-Bartho, & O'Shaughnessy, 1996; Fessler, 2001; Schwarz, Schafer, Bode & Bode, 2000). Given that the luteal phase is a period of infertility, pregnancy preparation, and immunosuppression, it is likely that women will be inclined towards particular consumption preferences and behaviors. It is therefore posited that women have evolved psychological mechanisms that led ancestral women to engage in a greater number of activities related to survival such as feeding, avoiding potential sources of disease and physical threats, and finding adequate shelter during the luteal phase than during the follicular phase. Specifically, these evolved mechanisms are posited to increase consumption relating to food, cleaning, home, and health during the luteal phase of the menstrual cycle in modern women. The following section will review the literature relating to menstrual cycle shifts in the consumption desires and behaviors associated with food, house cleaning and organizing, and concern for health.

Food Consumption

A strong link exists between reproductive function and caloric intake. For instance, the mating mechanism "shuts down" when caloric intake or caloric reserves are deficient. Secondary amenorrhea (i.e., the ceasing of menstruation cycles) can occur when women subject themselves to highly restrictive diets (Pirke, Schweiger, Lemmei, Krieg, & Berger, 1985; Schweiger et al., 1987) or extreme exercise programs (Dalvit-McPhillips, 1983). Several studies have examined how food consumption fluctuates across the menstrual phases. An abundance of findings indicate a marked increase in caloric intake at the luteal phase as well as a decrease in intake around the time of ovulation (Abraham, Beaumont, Argall, & Haywood, 1981; Dalvit, 1981; Dalvit-

McPhillips, 1983; Fong & Kretch, 1993; Gong, Garrel, Calloway, 1993; Johnson, Corrigan, Lemmon, Bergeron, & Crusco, 1994; Lyons, Truswell, Mira, Vizzard, & Abraham, 1989; Manocha, Choudhuri, & Tandon, 1986; Schweiger et al., 1992; Tarasuk & Beaton, 1991). The peak in caloric consumption during the luteal phase is positively correlated with progesterone levels (Buffenstein, Poppitt, McDevitt, & Prentice, 1995). The same pattern in caloric intake has been documented in well controlled animal studies conducted on rats (Blaustein & Wade, 1976; Kanerek & Beck 1980; Tarttelin & Gorski, 1973) and primates (Czaja & Goy, 1975; Czaja, 1978; Kemnitz et al., 1984; Rosenblatt, Durenfurth, Ferin, & Vande-Wiele, 1980). Specifically, a clear reduction in food intake is exhibited near ovulation when estrogen levels are elevated, followed by a marked post-ovulation peak in intake when progesterone levels are high. The periovulatory decrease in caloric intake in women cannot be explained by energetic demands given that women have greater energy needs at that (Lissner, Stevens, Levistky, Rasmussen, & Strupp, 1988; Paolisso et al. 1999). Hence, it is likely that this decrease in eating is part of a trade-off in a woman's limited time in favor of mating-related activities (Fessler, 2003). In sum, the literature suggests a distinct pattern in caloric intake across the menstrual cycle. Researchers have documented a decrease in caloric intake during the late follicular phase as well as a marked increase during the luteal phase that is paralleled by progesterone levels. The menstrual shifts in home-related behaviors will be addressed next.

Home-Related Behaviors

A few studies have examined a possible link between the menstrual cycle and behaviors associated with one's home such as organizing and cleaning. Altmann et al. (1941) discovered that the higher incidence of activity reported during the luteal phase was associated with cleaning, organizing, and placing things in order around the home. In a related study, Dillon and Brooks (1992) asked female participants to log episodes of excessive cleaning or unusual cleaning behaviors. Women were significantly more likely to engage in excessive or unusual cleaning during the luteal phase than during any other phase of the menstrual cycle. Thus, there is some evidence of an increase in cleaning and taking care of one's home at the luteal phase of the menstrual cycle when progesterone levels are elevated. In a similar vein, animal studies have looked at a possible link between progesterone levels and the building of nests. Saito (1987) found that naturally occurring increases in progesterone levels subsequent to mating in female mice is paralleled by an increase in the amount of nesting materials brought into a cage (as cited in Dillon & Brooks, 1992). In addition, female mice injected with progesterone display a significant increase in nesting behaviors than baseline and control groups (Schneider, Lynch, & Gundaker, 1983). Thus, progesterone seems to increase nest building in mice and appears to promote the cleaning and caring of one's home in women. These findings may be indicative of an evolved survival mechanism that leads women to spend more time searching for adequate, clean, and safe shelter during the luteal phase of the menstrual cycle. In the ensuing section, the link between health concerns and progesterone levels will be addressed.

Health-Related Preferences and Behaviors

Women seem to have a greater aversion to possible sources of disease or physical danger at the luteal phase than at the follicular phase of the menstrual cycle. A recent experiment regarding facial preferences has found that women show a greater sensitivity to emotional displays of disgust and fear at the luteal phase of the menstrual cycle. Conway and colleagues (2007) found evidence that women are more sensitive to facial expressions signaling nearby contagion (i.e., disgust) and those signaling nearby physical threat (i.e., fear) during the luteal phase when progesterone levels are highest. The researchers suggested that elevated progesterone levels enhance a woman's ability to protect herself and her potentially fertilized egg. Similarly, Jones and colleagues (2005a, 2005b) conducted studies examining a woman's menstrual cycle shifts in preferences for faces that display high or low apparent health. Women reported a greater aversion to faces perceived as unhealthy during the luteal phase than during the late follicular phase. In addition, pregnant women demonstrated a greater preference for healthier faces than non-pregnant women. The authors argue that women's facial preferences are affected by adaptations that help reduce the risk of contracting diseases when progesterone levels are elevated. Additional evidence suggests that women may be more concerned with the health of others during the luteal phase. One study looked specifically at how the level of concern that mothers exhibit with regards to their children's health shifts across the menstrual cycle. Tuch (1975) found that women who were in their late luteal or menses phases (i.e., paramenstrual) were more likely to bring their children to a hospital prematurely than women in their follicular or early luteal phase (i.e., intermenstrual).

37

Although Tuch's study did not specifically compare days of the late luteal phase to their late follicular phase counterparts, his phase comparison is valid given that the late luteal days are included within the paramenstrual days and the fertile days are included within the intermenstrual days. He demonstrated that children brought in by paramenstrual mothers were considered to be less sick and had been sick for a shorter period of time than children brought in by intermenstrual mothers. This finding is indicative of a greater concern for the health of loved ones during the late luteal phase than during the fertile phase of the menstrual cycle. In brief, women are more concerned about health during the luteal phase of the menstrual cycle.

Overall, evidence suggests that women are most concerned with survival-related matters such as feeding, house cleaning and organization, and health during the luteal phase when progesterone levels are elevated. From an evolutionary standpoint, the aforementioned luteal effects are adaptive for women in terms of increasing caloric reserves, finding adequate shelter, and avoiding physical threats and potential sources of contagion when the likelihood of conception is low and when they are most vulnerable to disease.

Kin Selection and Reciprocation Modules

Forging and maintaining strong relationships both with family and non-kin was undoubtedly vital to our ancestors' success in the EEA (Pinker, 1997). However, it is possible that this need to affiliate was strongest during the luteal phase of the menstrual cycle when women were less preoccupied with mating and were concerned with preparing for a potential pregnancy. Recently, findings have emerged which suggest that

a woman's desire to affiliate might increase during the luteal phase (e.g., Debruine et al., 2005). It is proposed herewith that the evolved reciprocation and kin selection modules which led to an enhanced focus on building and maintaining familial and social ties during the luteal phase now lead modern women to engage in more gift-related consumption during this time. Evidently, the mechanisms for affiliating with kin and non-kin are distinct and consequently do not always function concurrently. However, both mechanisms are posited herewith to influence gift-giving behaviors across the menstrual cycle in a similar manner. The following section will review the findings relating to menstrual cycle shifts in the desire to affiliate with family and friends.

Research findings demonstrate a link between progesterone levels and a need to affiliate with others. In two recent experiments, a desire for positive social contact was induced in subjects by exposing them to affiliation-related (versus neutral) movie clips. Both studies revealed that the need for positive social contact was positively correlated with measured progesterone levels (Schultheiss, Wirth, & Stanton, 2004; Wirth & Schultheiss, 2006). In a similar vein, women at the luteal phase of the menstrual cycle show stronger preferences for facial cues of kinship. Debruine and colleagues (2005) found that women report stronger preferences for self-resembling male and female faces when estimated progesterone levels were elevated. The researchers maintain that shifts in preferences for self-resembling male and female faces during the luteal phase promote spending time with family members when elevated progesterone levels prepare the body for a possible pregnancy. Support for this notion comes from two studies suggesting that facial resemblance is a visual cue of kinship. Specifically, Debruine (2002, 2005)

39

demonstrated that images of faces that are digitally altered to resemble that of the participant are judged as more trustworthy than non-resembling faces.

In a related study, Jones and colleagues (2005b) assessed women's preferences for femininity in male and female faces at different points in the menstrual cycle. They reported an increased preference for feminine facial features in both men and women during the luteal phase. In addition, estimated progesterone levels were positively related to the preference for feminine faces. Jones and colleagues' (2005b) reasoning is similar to that of Debruine and colleagues (2005) in that they argue that an enhanced preference for feminine individuals associated with progesterone levels during the luteal phase has a clear adaptive function. Specifically, they hypothesize that this shift in preferences leads to greater social support when high progesterone levels prepare a woman for pregnancy. Indeed, individuals who possesses such a feminine face whilst not being the woman's mate are likely better providers of social support. In fact, males and females with feminine facial features are perceived as better parents, and as more honest, warm, and trustworthy (Perrett et al., 1998). In sum, women prefer feminine traits and cues of kinship in men and women during the luteal phase of the menstrual cycle. Furthermore, this preference might be adaptive in terms of receiving social support from family and friends, which was essential for survival in ancestral times. Given that gift giving is done in part to promote ties and bonding among individuals (Beatty, Kahle, and Homer, 1991; Caplow, 1982), it is argued that women will engage in more gift-related consumption at this time in their menstrual cycle.

Overall, the menstrual cycle literature relating to the four modules suggests that women are more preoccupied with activities related to mating during the late follicular phase and are more engaged in activities related to survival and affiliation during the luteal phase. It was therefore proposed that women will engage in more mating-related behaviors on fertile days and will engage in more consumption associated with survival and affiliation on luteal days. In the next section, a list of specific hypotheses relating to consumption preferences and behaviors will be posited according to Darwinian module.

Hypotheses

Based on the aforementioned literature, 25 specific hypotheses relating to menstrual cycle changes in various consumption-related preferences and behaviors will be put forth.

Reproductive Module

Mood

In the literature review, it was argued that women have evolved psychological mechanisms that elevate mood during the fertile phase for adaptive mating purposes. Thus, the following hypothesis is put forth:

H1: Women will report being in a better mood on fertile days than on luteal days.

41

Appearance Self-esteem

The literature suggests that women may feel more attractive during the late follicular phase. The following hypothesis is therefore posited:

H2: Women will report feeling more physically attractive on fertile days than on luteal days.

Appearance-Related Behaviors and Consumption

Based on the literature suggesting that a woman are more inclined towards mating-related activities during the fertile phase, it is proposed that women engage in greater appearance-related activities and consumption at this time:

H3a: Women will report engaging in greater beautifying behaviors on fertile days than on luteal days.

H3b: Women will report engaging in greater sexual signaling behaviors on fertile days than on luteal days.

$H3c_i$: Women will report spending more money on clothes on fertile days than on luteal days.

$H3c_{ii}$: Women will report spending more money on shoes on fertile days than on luteal days.

$H3c_{iii}$: Women will report spending more money on jewelry or other accessories on fertile days than on luteal days.

$H3c_{iv}$: Women will report spending more money on cosmetics and other beauty products on fertile days than on luteal days.

H3d$_i$: In a hypothetical shopping scenario, women will allocate more of their money towards buying clothes, shoes and/or accessories on fertile days than on luteal days.

H3d$_{ii}$: In a hypothetical shopping scenario, women will allocate more of their money towards buying cosmetics and/or other beauty products on fertile days than on luteal days.

Survival Module

Food Consumption

The literature suggests a decrease in caloric intake during the fertile phase and subsequent increase in caloric intake during the luteal phase. It is therefore posited that women will report an increase in hunger, cravings for highly caloric foods, consumption of calories, consumption of highly caloric foods, and money spent on food during the luteal phase of the menstrual cycle:

H4a$_i$: Women will report feeling hungrier on luteal days than on fertile days.

H4a$_{ii}$: Women will report craving highly caloric foods more on luteal days than on fertile days.

H4b$_i$: Women will report consuming a greater amount of calories on luteal days than on fertile days.

H4b$_{ii}$: Women will report consuming more highly caloric foods on luteal days than on fertile days.

H4c: Women will report spending more money on food on luteal days than on fertile days.

Home-Related Desires and Behaviors, and Associated Consumption

Based on the findings suggesting that women may have a greater concern for their home during the luteal phase, it is posited that women will have a greater desire to clean and organize one's home, and engage in more home-related behaviors and consumption on luteal days than on fertile days:

H5a$_i$: Women will report a greater desire to clean their main living spaces on luteal days than on fertile days.

H5a$_{ii}$: Women will report a greater desire to organize their main living spaces on luteal days than on fertile days.

H5b$_i$: Women will report spending more time cleaning their main living spaces on luteal days than on fertile days.

H5b$_{ii}$: Women will report spending more time organizing their main living spaces on luteal days than on fertile days.

H5c: Women will report spending more money on cleaning-related products on luteal days than on fertile days.

H5d: Women will report spending more money on home-related products on luteal days than on fertile days.

H5e: In a hypothetical shopping scenario, women will allocate more of their money towards buying home-related products on luteal days than on fertile days.

44

Health Concerns and Associated Consumption

Previous studies have reported an enhanced sensitivity to potential cues of disease. Thus, it is proposed that women will experience greater concerns for health and spend more money on health-related products during the luteal phase:

H6a: Women will report a greater concern for their health or the health of a loved one on luteal days than on fertile days.

H6b: Women will report spending more money on health-related products on luteal days than on fertile days.

Kin Selection and Reciprocal Altruism Modules

Given that the amount of the gift towards an individual will be indicative of the degree to which there a need to build and secure social ties with that person, it is posited that women will want to spend more money towards buying gifts for loved ones during the luteal phase:

H7: In a hypothetical shopping scenario, women will allocate more of their money towards buying a gift for a loved one on luteal days than on fertile days.

In order to test these 25 hypotheses, a within-subject experiment was devised. In the ensuing section, the study's methodology will be described.

Methodology

Participants

Participants were 35 heterosexual women aged 19 to 36 years old (mean = 22.8 years old). All participants reported meeting the following requirements: 1) having regular menstrual cycles of 26 to 39 days in length within the last 12 months, 2) not being pregnant nor lactating, 3) not taking hormonal contraceptives, anti-depressants, or other medications that may affect mood in the three months prior to the start of the study. Those taking hormonal contraceptives were excluded from the study given that the pill prevents ovulation and can nullify or alter ovulatory effects (cf. Adams, Gold, & Burt, 1978; Kuukasjaarvi et al., 2004). Women who had cycle lengths falling outside the normal 26 to 39 day range were excluded given that the timing of the fertile window is extremely unpredictable in women with irregular and/or long cycles (Wilcox, Dunson & Baird, 2000).

Participants were recruited from Concordia University via announcements made to undergraduate and continuing education classes. A cover story was used in order to keep potential participants blind to the study's true goals (i.e., menstrual cycle effects on consumption patterns). The purpose of the research was described as follows: To examine how various consumption preferences and behaviors in women vary daily over a 35-day period due to a variety of factors such as weather conditions, desires, and moods. Interested students were asked to write their name and email addresses on sign-up sheets being circulated throughout the classroom. The 470 women who filled out the sign-up

sheet were subsequently e-mailed an initial screening questionnaire (appendix A) in Microsoft Word format, as well as a detailed description of the study's participation requirements. The initial survey included screening questions relating to age, daily access to the Internet, menstrual cycle, and use of hormonal contraceptives. Participants were notified that survey questions regarding sexuality and medical history (i.e., the menstrual cycle) were necessary in order to examine a wide variety of factors which might affect mood and/or consumption patterns. A total of 139 women completed the initial questionnaire and emailed it back to the experimenter. The completed screening questionnaires were subsequently reviewed by the experimenter to determine whether the potential participant met the study's inclusion criteria. Eighty women met the criteria and were invited to a one-on-one orientation session on campus (57.55% inclusion rate). Sixty-six women replied to the invitation and scheduled a session, 63 of whom presented themselves at the meeting and completed the orientation process.

Procedure

At the orientation meetings, women were provided with details regarding what participation in the study would entail. Participants were asked to track all of their purchases and complete an online daily survey (appendix B) at approximately the same time every evening for a period of 35 days. On three specific days within the 35-day period, participants were asked to fill out a longer version of the questionnaire that included the same daily survey as well as a number of additional items (appendix C). Filler questions regarding weather conditions were also included in the questionnaires in order to support the cover story. Participants were given a shopping diary to assist them

47

in tracking their purchases and were asked to complete an orientation questionnaire in paper format which included a number of demographic questions (appendix D). They were instructed to not go back and answer missed surveys on subsequent days given that memory biases might occur. Participants were informed that they would receive an honorarium of $30.00 for completing the study, with a $1.00 penalty per missed daily survey and a $3.50 penalty per missed longer survey. Participants were also notified that those who dropped out of the study before completing the 35-day period would be penalized an extra $5.00. This payment system was put into place to promote high survey completion rates. Immediately following the orientation meeting, participants were emailed the link to the online surveys, as well as a word document version of the survey. They were asked to complete and email the word version of the survey back to the experimenter should the online survey system not function properly.

The daily survey is comprised of a total of 101 items, whereas the longer survey includes 344 items. The analyses reported in this thesis stem from data collected via 29 items included in the daily survey. The data reported in this thesis are part of a larger study exploring the effects of menstrual cycle on a wide range of phenomena. The remaining data collected fall beyond the scope of this paper and will be analyzed in later work.

Fifty-nine women began the 35-day study period by completing at least one daily online questionnaire. All participants were regularly emailed reminders throughout the 35 days in order to encourage continued participation, to provide individualized participation rate updates and to inform participants on which days they were to complete

the longer version of the survey. All participants were sent a reminder email the day before a longer survey was to be completed. In addition, the response rates of all participants were verified daily and whom ever had missed two surveys in a row was also emailed a reminder. After the 35-day period was complete, participants were asked to complete and email back a closing questionnaire in Word format (appendix E). The survey included questions regarding the use of hormonal contraceptives during the study, as well as the date of the start of the participant's most recent menstrual cycle period. Participants were also asked to guess the study's goals or hypotheses. Although some participants thought that the study was related to the menstrual cycle or the menses phase, none indicated that the study's hypotheses might relate to ovulatory or luteal effects.

Of the 59 women who began the study, 11 dropped out at some point during the 35-day period and had to be excluded from the analyses for not having completed questionnaires on both fertile and luteal days. Based on the information regarding the dates of menstrual onset collected during and after the study, 12 women who had completed the 35-day study did not have regular menstrual cycles (of 27 to 39 days in length) and consequently were excluded from the analyses as per the study's inclusion criteria. One student was excluded from the analyses after indicating in her closing questionnaire that she had taken a "morning after" hormonal contraceptive pill on day five of her study. Thus, of the 59 women who began the 35-day study, 35 women were eligible for inclusion in the final analyses (59.3%). This sample size is comparable a number of menstrual cycle studies with similar methodologies that have yielded statistically significant findings (e.g., Haselton & Gangestad, 2006; Haselton et al., 2007;

49

Miller, et al., 2007). On average, the 35 participants completed 33.4 daily questionnaires (95.43% of the requested 35 days). Participants completed an average of 8.00 fertile days and 8.43 luteal days.

Menstrual Cycle Phase Estimation

The reverse-cycle-day (RCD) method was used to estimate each participant's fertile days and luteal days (e.g., DeBruine et al., 2005; Gangestad and Thornhill, 1998; Haselton and Gangestad, 2006; Haselton and Miller, 2006; Jones et al., 2005b; Lenton, Landgren, and Sexton 1984; Pillsworth, Haselton, and Buss 2004). The most fertile days of a woman's cycle are the day of ovulation and the five days preceding it. However, given that the day of ovulation varies from one cycle to another, it can be difficult to predict on which days the chances of conception are greatest. The RCD method provides the most accurate estimations of the timing of the fertile window. The method considers the date of the beginning of the most recent menstrual period and the average cycle length of the individual in order to estimate the day of ovulation. It is based on the notion that the menstrual period is most likely to begin 15 days after ovulation occurs regardless of the length of the menstrual cycle. The variation in cycle lengths can therefore be attributed to the varying length of the follicular phase. In order to estimate the days on which a participant is most likely to be in her fertile window, days are counted 14 to 21 back from the day of the start of the next menstrual period. Fertile days were therefore identified as RCD 14 to 21, which would consist of days 8 to 15 in a 28-day cycle (i.e., the last eight days of the follicular phase). Although the RCD method is the most reliable non-intrusive method of predicting the fertile days of a woman's cycle (as compared to

salivary, blood, or urine-based tests used for predicting ovulation), evidence suggests that the day of ovulation can range between RCD 7 and 19. Thus, in order to ensure that the days identified in this study as luteal have the lowest probability of conception, the luteal days were identified as RCD 8 to 1 (i.e., the last eight days of the luteal phase). The aforementioned two sets of eight days differ most in conception risk, and estimated estrogen and progesterone levels (Wilcox, Dunson and Baird, 2000).

Information regarding average cycle length and the start of the most recent menses was acquired from each potential participant during the initial screening process. However, in order to increase the accuracy of the fertility estimates, the actual day of the start of the next menstrual cycle was acquired via one of the following methods: 1) daily reports of menstrual bleeding included in the daily surveys over the 35-day period, 2) the closing questionnaire completed at some point during the month following the end of the 35-day period, or 3) when necessary, subjects were contacted via email after the closing questionnaire was completed.

Dependent Variables

Mood was assessed via the four-item Mood Short Form (MSF; Peterson and Sauber 1983). Participants were asked to select a number from one ("strongly disagree") to five ("strongly agree") for each of the following items: "currently, I am in a good mood," "as I answer these questions I feel cheerful," "for some reason I am not very comfortable right now" (reverse coded), and "at this moment I feel edgy or irritable" (reverse coded) ($\alpha = 0.91$ on fertile days; $\alpha = 0.90$ on luteal days).

51

For the various appearance-related and survival-related desire and behavior items, participants were asked to provide daily ratings by indicating "Over the last 24 hours, compared to most days in the last 12 months, I ..." Participants were asked to select a number from a nine-point Likert-type scale anchored by -4 ("far less than usual"), 0 ("about average"), and +4 ("far more than average"). The first appearance-related item was appearance self-esteem, which was assessed via the item "felt as though I looked attractive." Secondly, beautifying behaviors were assessed by the item "spent time making myself beautiful (includes fixing hair, applying make-up, putting jewelry on, thinking of what to wear, etc.)." The third item assessed sexual signaling behaviors: "wore clothing that showed off my figure." Nine items related to survival were devised. Specifically, four items assessed desires or consumption behaviors pertaining to food: "felt hungry today," "craved highly caloric foods," "consumed calories," and "ate highly caloric foods." Four items assessed desires or behaviors relating to cleaning and organizing one's home: "felt like cleaning my main living spaces," "felt like organizing or re-arranging my main living spaces," "spent time cleaning my main living spaces," and "spent time organizing or re-arranging my main living spaces." The final item related to survival assessed the level of concern for health: "felt like there may be something wrong with my health or the health of a loved one."

In order to measure the amount of money spent on various types of products, participants were given shopping diaries and asked to record every penny spent over the 35-day period. In the online daily questionnaires, participants were asked to indicate "how much money did you spend on the following product categories?" The four

appearance-related product categories were "clothes," "shoes," "jewelry or other accessories," and "cosmetics and other beauty products." Survival-related product categories included "money spent on food to be consumed outside the home," "money spent on food to be consumed inside the home," "money spent on cleaning products," "money spent on home decorative items for your main living spaces," and "money spent on health-related products." The two food items were added together to measure the total amount of money spent of food.

A shopping scenario was developed in order to assess the desire to spend money on products falling within four major categories. Participants were asked the following: "Imagine that you were to go shopping for yourself now, but that you were limited to spending your money on certain kinds of products. How much of your money would you spend on the 4 following product categories, in %:" The first two categories assessed the desire to spend money on appearance-related products: "clothes, shoes, or accessories," and "cosmetics or other beauty products." Cosmetics and other beauty products were deemed to be sufficiently different from clothes, shoes, and accessories to require their own appearance-related category. The third product category refers to the survival-related consumption. Specifically, the third item measured the desire to spend money on home-related products: "home decorative items for your main living spaces." Finally, the filler category "entertainment services" was added. It was deemed to be a desirable alternative option that does not map onto any particular Darwinian module.

A second shopping scenario was devised in order to assess the desire to spend money on gifts for loved ones versus the desire to spend money on self-gifts. Participants

were instructed as follows: "Imagine that you were to go shopping now, but that you had to choose between spending money on yourself and spending money on buying a gift for a loved one. How much of your money would you spend on yourself versus on a loved one, in %:"

Analyses and Results

The choice of analysis for a given hypothesis was contingent upon the normality of the data's distribution. A paired-samples t test will be reported in instances when the distribution of the data of a given item is normal (i.e., all skewness and kurtosis statistics are within the +-2 range). When the data does not follow a normal distribution, the non-parametric Wilcoxon ranked sign test will be reported. However, percentage data derived from the shopping scenarios that did not follow a normal distribution were normalized via arcsine transformations (de Vaus, 2002; Kerr, Hall, & Kozub, 2002). A summary of the hypotheses, analyses and results is presented in Table 1.

Reproductive module

Mood (H1)

As hypothesized, women reported feeling in a significantly better mood on fertile days (N = 35, mean [M] = 3.45, standard deviation [SD] = 0.70) than on luteal days (N = 35, M = 3.18, SD = 0.73; t [34] = 2.786, p = 0.009).

Appearance Self-Esteem (H2)

Regarding H2, women did not report feeling significantly more attractive on fertile days (median [MD] = 0.29, inter-quartile range [IQR] = 1.25) than on luteal days (MD = 0.00, IQR = 1.65; z [34] = 1.089, p = 0.276), though, directionally speaking, there was support for the posited hypothesis.

Appearance-Related Behaviors and Consumption (H3)

Women did not report engaging in significantly more beautifying behaviors on fertile days (M = 0.00, SD = 1.44) than on luteal days (M = -0.07, SD = 1.45; t [34] = 0.452, p = 0.654) (H3a). With regards to H3b, women did not engage in significantly greater sexual signaling behaviors on fertile days (M = -0.03, SD = 1.75) than on luteal days (M = -0.19, SD = 1.45; t [34] = 0.864, p = 0.394). Nonetheless, the differences in means lend directional support for H3a and H3b. There were no significant differences between amounts of money spent on clothing fertile days (MD = $0.00, IQR = 8.48) and amounts spent on luteal days (MD = $0.00, IQR = 3.20; z = [34] = 0.817, p = 0.414) (H3c_i). However, directionally speaking, the means supported the posited hypothesis. Specifically, on average, women reported spending more money on clothing on fertile days (M = $7.17/day) than on luteal days (M = $4.58/day). Regarding H3$c_{ii}$, no significant differences were found between the reported amounts of money spent on shoes on fertile days (MD = $0.00, M = $1.13, IQR = 0.00) and the amounts spent on luteal days (MD = $0.00, M = $1.59, IQR = 1.36; z [34] = -0.517, p = 0.605). Likewise, women did not report spending significantly more money on jewelry or other accessories

Table 1. Summary of hypotheses, analyses, means, and significance levels.

Hypothesis	Test	T/Z Value	M/MD fertile	M/MD luteal	P
H1: Women will report being in a better mood on fertile days than on luteal days.	T	T = 2.786	M = 3.45	M = 3.18	0.009
H2: Women will report feeling more physically attractive on fertile days than on luteal days.	Wil.	Z = 1.089	MD = 0.29	MD = 0.00	0.276
H3a: Women will report engaging in greater beautifying behaviors on fertile days than on luteal days.	T	T = 0.452	M = 0.00	M = -0.07	0.654
H3b: Women will report engaging in greater sexual signaling behaviors on fertile days than on luteal days.	T	T = 0.864	M = -0.03	M = -0.19	0.394
H3c$_i$: Women will report spending more money on clothes on fertile days than on luteal days.	Wil.	Z = 0.817	MD = $0.00 (M = $7.17/day)	MD = $0.00 (M = $4.58/day)	0.414
H3c$_{ii}$: Women will report spending more money on shoes on fertile days than on luteal days.	Wil.	Z = -0.517	MD = $0.00 (M = $1.13/day)	MD = $0.00 (M = $1.59/day)	0.605
H3c$_{iii}$: Women will report spending more money on jewelry or other accessories on fertile days than on luteal days.	Wil.	Z = -2.271	MD = $0.00 (M = $0.13/day)	MD = $0.00 (M = $1.10/day)	0.023
H3c$_{iv}$: Women will report spending more money on cosmetics and other beauty products on fertile days than on luteal days.	Wil.	Z = -1.529	MD = $0.00 (M = $0.48/day)	MD = $0.17 (M = $1.48/day)	0.126
H3d$_i$: In a shopping scenario, women will allocate a greater percentage of money towards buying clothes, shoes and/or accessories on fertile days than on luteal days.	T T	T = 1.265 T = 2.594	M = 56.76% M = 59.14%	M = 53.19% M = 49.53%	0.215 0.020
H3d$_{ii}$: In a shopping scenario, women will allocate a greater percentage of money towards buying cosmetics and/or other beauty products on fertile days than on luteal days.	T	T = 0.406	M = 17.51%	M = 16.57%	0.687
H4a$_i$: Women will report feeling hungrier on luteal days than on fertile days.	T	T = -2.353	M = -0.59	M = -0.21	0.025
H4a$_{ii}$: Women will report craving highly caloric foods more on luteal days than on fertile days.	T	T = -2.072	M = -0.68	M = -0.11	0.046
H4b$_i$: Women will report consuming a greater amount of calories on luteal days than on fertile days.	Wil.	Z = -1.975	MD = 0.13	MD = 0.44	0.048

H4b$_{ii}$: Women will report consuming more highly caloric foods on luteal days than on fertile days.	Wil.	Z = -2.283	**MD = 0.00**	**MD = 0.38**	**0.028**
H4c: Women will report spending more money on food on luteal days than on fertile days.	Wil.	Z = -2.080	**MD = $0.00 (M = $1.57/day)**	**MD = $0.00 (M = $2.48/day)**	**0.038**
H5a$_i$: Women will report a greater desire to clean their main living spaces on luteal days than on fertile days.	T	T = -2.178	**M = -1.20**	**M = -0.76**	**0.036**
H5a$_{ii}$: Women will report a greater desire to organize their main living spaces on luteal days than on fertile days.	T	T = -1.632	**M = -1.33**	**M = -0.94**	0.112
H5b$_i$: Women will report spending more time cleaning their main living spaces on luteal days than on fertile days.	T	T = -0.308	**M = -1.04**	**M = -0.97**	0.760
H5b$_{ii}$: Women will report spending more time organizing their main living spaces on luteal days than on fertile days.	T	T = -0.841	**M = -1.36**	**M = -1.17**	0.406
H5c: Women will report spending more money on cleaning-related products on luteal days than on fertile days.	Wil.	Z = -0.105	MD = $0.00 (M = $0.11/day)	MD = $0.00 (M = $0.11/day)	0.917
H5d: Women will report spending more money on home-related products on luteal days than on fertile days.	Wil.	Z = -0.874	MD = $0.00 (M = $1.59/day)	MD = $0.00 (M = $0.98/day)	0.382
H5e: In a shopping scenario, women will allocate a greater percentage of money towards buying home-related products on luteal days than on fertile days.	T	T = -2.070	**M = 9.39%**	**M = 13.30%**	**0.040**
H6a: Women will report a greater concern for their health or the health of a loved one on luteal days than on fertile days.	T	T = -1.574	**M = -1.25**	**M = -0.91**	0.125
H6b: Women will report spending more money on health-related products on luteal days than on fertile days.	Wil.	Z = -2.271	**MD = $0.00 (M = $0.41/day)**	**MD = $0.00 (M = $0.86/day)**	**0.023**
H7: In a shopping scenario, women will allocate a greater percentage of money towards buying a gift for a loved one on luteal days than on fertile days.	T	T = -2.198	**M = 58.65%**	**M = 63.28%**	**0.035**

T refers to a paired-samples t test, while Wil. refers to a Wilcoxon ranked sign test. Bolded means indicate directional support of the posited hypothesis (20 out of 25 hypotheses listed). P levels < 0.05 in the hypothesized direction are also bolded (10 out of 25). The additional analysis conducted on partnered women is italiced and is not included within the 25 hypotheses.

57

on fertile days (MD = \$0.00, M = \$0.13, IQR = \$0.00) than on luteal days (MD = \$0.00,

M = \$1.10, IQR = 0.45; z [34] = -2.271, p = 0.023) (H3c$_{iii}$). Similarly, regarding H3c$_{iv}$,

women did not report spending significantly more on cosmetics and other beauty

products on fertile days (MD = \$0.00, M = \$0.48, IQR = 0.20) than on luteal days (MD =

\$0.17, M = \$1.48, IQR = 1.67; z [34] = -1.529, p = 0.126).

Regarding the product-category scenarios, no significant differences were found

between the percentage of money allocated to clothes, shoes and/or accessories on fertile

days (M = 56.76%, SD = 18.17) and the percentage allocated on luteal days (M =

53.19%, SD = 20.14; t [34] = 1.265, p = 0.215) (H3d$_i$). As for H3d$_{ii}$, no significant

differences were found in the percentage of money allocated to cosmetics and/or other

beauty products on fertile days (M = 17.51%, SD = 13.45) and the percentage allocated

on luteal days (M = 16.57%, SD = 11.20; t [34] = 0.406; p = 0.687). Nevertheless,

directionally speaking, there was support for H3d$_i$ and H3d$_{ii}$.

Some menstrual cycle studies examining mate preferences have discovered

stronger effects in partnered women than in single women. Researchers argue that these

mating-related cycle effects are driven by extra-pair desires (e.g., Havlicek, Roberts &

Flerg, 2005; Little, Jones, Bert, & Perret, 2007). As a result, some recent studies have

limited their sample to partnered women (e.g., Haselton et al., 2007). An additional

analysis was conducted to test H3d$_i$ on partnered women (N = 16) to investigate if

relationship status might play a role in appearance-related consumption. Partnered

women did in fact allocate a significantly greater percentage of their money towards

clothes, shoes and/or accessories on fertile days (M = 59.14%, SD = 21.05) than on luteal

days (M = 49.53%, SD = 24.04; t [34] = -2.594, p = 0.020).

Survival Module

Food-Related Desires and Consumption (H4)

As hypothesized (H4a$_i$), the paired-samples t test revealed that women reported

feeling significantly hungrier on luteal days (M = -0.21, SD = 1.47) than on fertile days

(M = -0.59, SD = 1.63; t [34] = -2.353, p = 0.025). Regarding (H4a$_{ii}$), women reported

craving highly caloric foods more on luteal days (M = -0.11, SD = 1.59) than on fertile

days (M = -0.68, SD = 1.67; t [34] = -2.072, p = 0.046), as predicted. In support of H4b$_i$,

women reported consuming a significantly greater amount of calories on luteal days (MD

= 0.44, IQR = 0.97) than on fertile days (MD = 0.13, IQR = 1.00; z [34] = -1.975, p =

0.048). Likewise, as hypothesized (H4b$_{ii}$), women reported consuming significantly

more highly caloric foods on luteal days (MD = 0.38, IQR = 1.27) than on fertile days

(MD = 0.00, IQR = 1.25; z [34] = -2.283, p = 0.028). In support of H4c, women reported

spending significantly more money on food on luteal days (MD = $2.48, M = $8.77, IQR

= 7.58) than on fertile days (MD = $1.57, M = $7.10, IQR = 7.69; z [34] = -2.080, p =

0.038).

Home-Related Desires and Behaviors (H5)

As predicted (H5a$_i$), women reported a greater desire to clean their main living space on luteal days (M = -0.76, SD = 1.52) than on fertile days (M = -1.20, SD = 1.70; t [34] = -2.178, p = 0.036). Women did not report a significantly greater desire to organize their main living spaces on luteal days (M = -0.94, SD = 1.49) than on fertile days (M = -1.33, SD = 1.71; t [34] = -1.632, p = 0.112) (H5a$_{ii}$). There were no significant differences between the reported time spent cleaning on luteal days (M = -0.97, SD = 1.51) and on fertile days (M = -1.04, SD = 1.68; t [34] = -0.308, p = 0.760) (H5b$_i$). Regarding H5b$_{ii}$, women did not report spending significantly more time organizing their main living spaces on luteal days (M = -1.17, SD = 1.58) than on fertile days (M = -1.36, SD = 1.62; t [34] = -0.814, p = 0.406). Nonetheless, directionally speaking, the mean differences were in support of H5a$_{ii}$, H5b$_i$, and H5b$_{ii}$. With regards to H5c, no significant differences were found between the reported amounts of money spent on cleaning products on luteal days (MD = $0.00, M = $0.11, IQR = 0.00) and the amounts spent on fertile days (MD = $0.00, M = $0.11, IQR = 0.00; z [34] = -0.105, p = 0.917). Likewise, women did not spend significantly more money on home-decorative items on luteal days (MD = $0.00, M = $0.98, IQR = 0.38) than on fertile days (MD = $0.00, M = $1.59, IQR = 0.00; z [34] = -0.874, p = 0.382) (H5d). However, in support of H5e, women allocated a significantly greater percentage of their money towards home-decoration products on luteal days (M = 13.30%, SD = 0.15) than on fertile days (M = 9.39%, SD = 0.17; t [34] = -2.070, p = 0.040).

Health Concerns and Associated Consumption (H6)

Women did not report a greater concern for one's health or the health of a loved one on luteal days (M = -0.91, SD = 1.65) than on fertile days (M = -1.25, SD = 1.85; t [34] = -1.574, p = 0.125), though directionally speaking there was support for H6a. As predicted, women reported spending significantly more money on health-related products on luteal days (MD = $0.00, M = $0.86, IQR = 0.83) than on fertile days (MD = $0.00, M = $0.41, IQR = 0.00; z [34] = -2.271, p = 0.023) (H6b).

Kin Selection and Reciprocal Altruism Modules

Regarding the gift-giving scenario (H7), women allocated a significantly greater percentage of their money towards buying gifts for loved ones on luteal days (M = 63.28%, SD = 18.33) than on fertile days (M = 58.65%, SD = 16.90; t [34] = -2.198, p = 0.035), as hypothesized.

Discussion

Women are endowed with psychological mechanisms that decrease their motivational drive to forage for food during the most fertile phase of their menstrual cycle in favor of mating-related activities (Fessler, 2003). This notion was expanded upon to include other non-mating activities related to survival and affiliation that are posited to decrease in importance during the fertile phase and subsequently increase during the luteal phase. Moreover, it was proposed that women would display changes in consumption desires and behaviors across the menstrual cycle. Taken together, the

results of this study suggest that the menstrual cycle can, in fact, influence a woman's consumption desires and behaviors.

Overall, 10 of the 25 hypotheses put forth in this paper were supported. Directionally speaking, 20 hypotheses were supported. The number of non-significant findings may be partly due to methodological or measure-related issues. For instance, the shopping pattern items were less likely to yield significant results than other items in the study (two out of eight hypotheses relating to shopping patterns were supported as compared to eight out of the remaining 17 hypotheses which were supported). It is possible that the length of the study might have had an impact on the results relating to buying behavior. In fact, the average amounts of money spent on a number of product categories over the 35-day period are so small that floor effects are likely to have occurred. Thus, increasing the length of the study period would likely augment the variance in money values, and therefore lead to a greater probability of generating significant findings. In addition, the hypotheses pertaining to appearance-related behaviors did not receive very much support. One plausible explanation for the lack of significant mating-related results is that the self-reported survey measures may not have been sufficiently sensitive to capture a significant effect for certain types of behaviors. Participants were asked to answer a large number of questions regarding a vast array of desires and behaviors every evening for 35 days. Many of these questions required a good deal of self-reflection and memory, which may have been too demanding on participants over the course of the study. Hence, it is possible that women were not receptive to or did not remember their own behaviors relating to appearance, while

accurately recalling other types of more memorable behaviors relating to survival. For instance, women may not have realized that they were dressing more revealingly and spending more time beautifying themselves on fertile days. Conversely, they might easily recognize and remember the piece of chocolate cheese cake they had for dessert. In fact, significant menstrual cycle effects in beautifying and dressing behaviors have yet to be documented via the use of self-reported measures. The only documented dressing and/or beautifying effect was captured by taking pictures of participants at two different points in their cycle (Haselton et al., 2007). In future studies, the use of other methodologies such as in-lab experiments might be warranted. With regards to buying patterns, appearance-related shopping may be too far removed from actual mating to increase during the fertile phase. Hence, women may be too invested in mating-relating activities to spend significantly more time shopping for clothes, shoes, jewelry or cosmetics on fertile days. Nevertheless, the findings resulting from the additional analysis performed on only partnered women do suggest that women in a committed romantic relationship show a greater desire for clothes, shoes and/or accessories on fertile days than on luteal days.

Regarding the first hypothesis, women reported being in a significantly more positive mood during their fertile phase than during their luteal phase. However, given the general nature of the mood construct which spans across a vast array of non-mating drivers, it is difficult to demonstrate that this effect is driven specifically by a mating-related mechanism or directly serves a mating purpose. Nevertheless, it is feasible that the enhanced mood around the time of ovulation versus during the luteal phase is driven

63

by a mating-related adaptive design. A more positive mood near ovulation likely yields a mating advantage over a negative mood. Specifically, a woman in a positive mood is judged as more approachable to prospective mates than a woman who is in a negative mood.

With regards to the survival module, it was proposed that women would report an increase in consumption preferences and behaviors related to food, cleaning, home, and health. The results unequivocally support the notion that women engage more in the consumption of and shopping for food during the luteal phase than during the periovulatory phase. Specifically, women reported being hungrier, craving more calories, eating more calories, eating more highly caloric foods, and spending more money on food during the luteal phase than during the follicular phase. These findings are in line with previous findings related to a luteal increase and periovulatory decrease in caloric intake (Buffenstein et al., 1995). However, this finding is a unique contribution to the literature in that is the first to date to report a menstrual cycle effect on the amount of money a woman spends on food.

Another set of findings of particular importance relates to home- and health-related consumption. The results of the product-category scenario suggest that women have a greater desire to spend money on home-decorative items on luteal days than on fertile days. This finding constitutes the first evidence of a menstrual cycle effect on home-related buying desires. However, there was no evidence of a menstrual effect on cleaning- and home-related spending patterns. For cleaning products, it is probable that a floor effect occurred for both conditions given that the amount of money spent both

64

during luteal and fertile phases was minimal (M = $0.11/day). The results also suggest that women spend significantly more money on health-related products during the luteal phase than during the fertile phase. This constitutes the first evidence of a menstrual cycle effect on health-related buying behavior. Coupled with the luteal increase in food shopping, these findings contribute significantly to the marketing literature in that they constitute the first economic evidence of the existence of a luteal phase effect on female behavior.

The results of the gift-giving scenario constitute the first evidence of a menstrual cycle effect on gift-giving desires. Within the context of recent findings relating progesterone to preferences for cues of kinship and femininity, the stronger desire to buy gifts for loved ones on luteal days likely stems from a greater desire to affiliate with family and friends. However, the shopping scenario did not differentiate between potential recipients of the gifts. As such, it is unclear whether the kin, reciprocation, or even mating modules are driving this luteal effect. Nevertheless, this finding contributes significantly to the literature as it constitutes the first evidence suggesting a hormonal influence on gift-giving.

Caveats and Future Research

The results reported herewith must be construed in light of certain caveats. First, the sample was comprised of women who were not taking hormonal contraceptives due to the fact that they prevent ovulation via the intake of considerable levels of estrogens and progesterone. Although the pill has been found to nullify or alter fertility effects (cf. Adams, Gold, & Burt, 1978; Kuukasjaarvi et al., 2004), the manner in which the added

65

hormone levels affect buying preferences and behavior constitutes an interesting potential research avenue.

Another limitation relates to fertility estimates. The timing of the fertile window can be difficult to estimate given that the occurrence of ovulation can be unpredictable even in regular cycles (Wilcox, Dunson & Baird, 2000). A more rigorous design would have incorporated a test of fertility to verify the day of ovulation (e.g., *ClearBlue*). However, by confirming the date of the start of the next menstrual period, the current methodology employed a more accurate estimate than many other studies in the field who estimated the start of the next cycle using menstrual history data (e.g., DeBruine et al., 2005; Haselton & Gangestad, 2006; Haselton & Miller, 2006; Jones et al., 2005b; Pillsworth, Haselton, & Buss, 2004). Moreover, any inaccuracies of ovulation estimations in this study would have merely underrepresented existing menstrual cycle effects.

The t tests and Wilcoxon ranked sign tests reported are limited in terms of examining potential moderating effects. The results of the additional analysis conducted only on partnered women suggest that certain appearance-related menstrual cycle effects may be more pronounced in partnered women. Given that 19 participants included in the analyses were single (versus 16 partnered participants), it is possible that certain effects reported by partnered women were nullified by the single women's responses. Therefore, more complex analyses (e.g., repeated measures general linear model analysis) should be conducted on the current data to investigate how single and partnered women might exhibit distinct menstrual cycle shifts in other consumption preferences and behaviors. In

addition, some recent studies have found that extra-pair desires are stronger in women with asymmetric and physically unattractive partners (Gangestad, Thornhill, & Garver-Apgar, 2005c; Haselton & Gangestad, 2006). If mating-related consumption is driven in part by extra-pair desires, it is possible that the physical attractiveness of a woman's partner might have an impact on mating-related consumption effects. Thus, future analyses should also include the partner's physical attractiveness as a potential moderating variable in mating-related analyses. Furthermore, the current sample consisted of young adults (31 out of the 35 participants were aged between 19 and 25 years old) who did not have any children. It is possible that the age and life stage of a woman might influence her consumer preferences and behavior. For instance, working mothers in their late thirties might favor different product categories than those preferred by childless students in their early twenties. In this case, if working mothers were to spend more money on home- or cleaning-related products, the greater variance in money values would lead to an increased probability of yielding significant results. Furthermore, it is possible that women experience different menstrual cycle changes according to their age and life stage. The hormonal profile and mating strategies of a 40-year-old woman are likely to be different from those of an 18-year-old woman. As a result, women in different age categories might demonstrate distinct shifts in consumption preferences and behaviors. Thus, investigating the potential moderating effects of age and life-stage might generate interesting results.

In addition, the analyses in the current paper compared mean values reported on the last eight days of the follicular phase to the mean values of the last eight days of the

luteal phase. However, every day of the menstrual cycle is unique in terms of conception risk and hormonal profile. It might be interesting to compare these two phases to other phases such as menses or the early follicular phases using more complex analyses. Additional analyses examining daily levels of each consumption variable would likely yield interesting findings. Another possible analysis would be to estimate daily levels of estrogen and progesterone and examine their relationship with the daily dependent variables.

Another caveat to consider is that the current analyses were mainly conducted on single-item survey instruments in order to test predictions across a wide range of consumption areas. Future analyses will include multi-item measures of consumption, which were collected in the daily and longer survey but were not analyzed in this thesis. For instance, the longer survey included 53 items measuring various aspects of mating-relating consumption. Moreover, it would have been interesting to break down various spending amounts and shopping scenario categories into more specific options. For example, one possible analysis to explore would be to break the money spent on clothing category into sexy versus non-sexy clothing to see if money spent on non-sexy clothing might have confounded a sexual signaling effect. Another example consists of the gift-giving scenario, where women allocated more of their money to buying gifts for loved ones during the luteal phase. It remains unclear who exactly the gifts were intended for. Further research should investigate if the recipient of the gift would be more likely to be a family member, a friend, or a mate.

Conclusions

This paper contributes to the growing stream in consumer behavior research that focuses on consumer and societal welfare. These findings can improve female consumers' understanding of when they may be more vulnerable to succumb to temptations for certain types of products as a function of their menstrual cycle. For instance, women in their luteal phase may wish to make a pronounced effort to restrain from buying highly caloric food on these days, knowing that their cravings will likely lessen upon the start of the next follicular phase. Although informing consumers about possible dangers of consumption habits does not necessarily lead to improvements in behavior, it may help women become more proactive in resisting certain unwanted consumption behaviors.

From a managerial perspective, marketers would likely benefit from acknowledging that certain consumption desires and behaviors follow menstrual cycle patterns. For instance, practitioners may want to consider these patterns when making product placement decisions. Given that the current study's findings suggest an increased desire for a number of survival-related products during the luteal phase, a woman who desires one such product is more likely to desire a second such product. Hence, the purchasing of certain types of luteally driven products might be indicative of the fact that a consumer is currently in her luteal phase. Thus, by placing survival-related products close to one another, a woman in her luteal phase who is shopping for one of these products will consequently be presented with another. For instance, it would be advantageous to place highly caloric foods next to health-related products or home-

related products. Likewise, pharmacies might consider adding a few home-decoration products to their stores and placing them next to health products or highly caloric foods. Moreover, stores selling food, health, or home-related products may wish to advertise their highly caloric foods in order to attract women who are in their luteal phase and are therefore more likely to be purchase their other products.

Another managerial implication relates to direct marketing. The amount of information that marketers can acquire regarding their consumers' buying habits and demographics are ever increasing. Consequently, it has become easier for companies to utilize direct marketing strategies. Many Internet advertisements are specifically targeted to demographic profiles, and television commercials may soon be utilizing similar direct marketing technologies. If marketers seek out information regarding the menstrual cycles and the use of hormonal contraceptives of their customers, it is fathomable that some women may be willing to devolve this information to certain well-trusted companies. Futhermore, women who live together tend to cycle together, a phenomenon known as the McClintock effect (McClintock 1971; Stern & McClintock, 1998). Thus, if information regarding the menstrual cycle of a potential customer is acquired, it is likely that other women living in that household are following the same cycle and cycle-related consumption patterns. Hence, marketers could potentially be in a position to customize their direct marketing tools according to the menstrual cycle phases of select consumers as well as their female housemates. Moreover, information relating to a consumer's menstrual cycle might be deducible via data mining. Firms that have access to purchasing data can identify particular purchases that follow 26- to 39-day patterns which

may be driven by the menstrual cycle. This, in turn, might enable marketers to estimate a woman's cycle phase and employ direct marketing strategies accordingly to better suit her needs as her preferences shift.

Generally speaking, the obtained findings add to a growing Psychology literature suggesting that the menstrual cycle has an impact on a woman's preferences and behaviors. Moreover, these findings constitute the first evidence of a hormonal driver of consumer behavior. Overall, the findings reported in this thesis highlight the importance of understanding the physiological and evolutionary underpinnings of consumption. It would have been impossible to put forth this study's hypotheses without considering the biology and evolutionary bases of consumption. Thus, this study promotes novel research streams for consumer scholars that combine the fields of marketing and biology to further explore how the vestiges of our Darwinian heritage drive consumer behavior. Furthermore, these findings add to our understanding of the situational drivers of consumption that are unique to the female market, particularly in the food, home, and health industries. By better understanding how women's consumption desires and behaviors change across the menstrual cycle, marketers will be in a better position to satisfy the shopping needs of one of the largest, fastest-growing, and easily segmented markets on the globe.

References

Aaker, J. L. (1997). Dimensions of brand personality. *Journal of Marketing Research, 34*(3), 347-356.

Abplanalp, J. M., Rose, R. M., Donnelly, A. F., & Livingston-Vaughan, L. (1979). Psychoendocrinology of the Menstrual Cycle, II . The relationship between enjoyment of activities, moods, and reproductive hormones. *Psychosomatic Medicine, 41*(8), 605-615.

Abraham, S. F., Beaumont, P. J. V., Argall, W. J., & Haywood, P. (1981). Nutrient intake and the menstrual cycle. *Australian and New Zealand Journal of Medicine, 11,* 210-211.

Adams, D. B., Gold, A. R., & Burt, A. D. (1978). Rise in female-initiated sexual activity at ovulation and its suppression by oral contraceptives. *The New England Journal of Medicine, 299,* 1145-1150.

Altmann, M., Knowles, E., & Bull, H. D. (1941). A psychosomatic study of the sex cycle in women. *Psychosomatic Medicine, 3,* 199-225.

Angstwurm, M. W. A., Gaertner, R., & Ziegler-Heitbrock, H. W. L. (1997). Cyclic plasma IL-6 levels during normal menstrual cycle. *Cytokine, 9,* 370-374.

Ambler, T., Ioannides, A., & Rose, S. (2000). Brands on the brain: Neuro-images of the brain. *Business Strategy Review, 11*(3), 17-30.

Argo, J. J., Dahl, D. W., & Manchanda, R. V. (2005). The influence of a mere social presence in a retail context. *Journal of Consumer Research, 32*(2), 207-212.

Backstrom, T., Sanders, D., Leask, R., Davidson, D., Warner, P., & Bancroft, J. (1983). Mood, sexuality, hormones, and the menstrual cycle. II. Hormone levels and their relationship to the premenstrual syndrome. Psychosomatic Medicine, 45(6), 503-507.

Baker, R. R., & Bellis, M. A. (1993). Human sperm competition: Ejaculate manipulation by females and a function for the female orgasm. *Animal Behaviour, 46*(5), 887-909.

Bancroft, J., Sanders, D., Davidson, D., & Warner, P. (1983). Mood, sexuality, hormones, and the menstrual cycle. III. Sexuality and the role of androgens. *Psychosomatic Medicine, 45,* 509-16.

Barletta, M. (2003). *Marketing to women: How to understand, reach, and increase your share of the world's largest market segment.* Chicago, IL: Dearborn Trade Publishing.

Bearden, W. O., & Etzel, M. J. (1982). Reference group influence on product and brand purchase decisions. *Journal of Consumer Research, 9,* 183-194.

Bearden, W. O., & Rose, R. L. (1990). Attention to social comparison information: An individual difference factor affecting consumer conformity. *Journal of Consumer Research, 18,* 461-741.

Beatty, S. E., Kahle, L. R. & Homer, P. (1991). Personal values and gift-giving behaviors: A study across cultures. *Journal of Business Research, 22*(2), 149-157.

Belk, R. W. (1974). An exploratory assessment of situational effects in buyer behavior. *Journal of Marketing Research, 11,* 156-163.

Belk, R. W. (1975). Situational Variables and Consumer Behavior. *Journal of Consumer Research, 2,* 157-164.

Bellis, M. A., & Baker, R. R. (1990). Do females promote sperm competition? Data for humans. *Animal Behaviour, 40,* 997-999.

Blaustein, J. D.,& Wade, G. N. (1976). Ovarian influences on the meal pattern of female rats. *Physiology and Behavior, 17,* 201-208.

Bernhardt, P. C., Dabbs, J. M. Jr, Fielden, J. A., & Lutter, C. D. (1998). Testosterone changes during vicarious experiences of winning and losing among fans at sporting events. *Physiology and Behavior, 65*(1), 59-62.

Brown, J. L. (1997). A theory of mate choice based on heterozygosity. *Behavioral Ecology, 8,* 60-65.

Buffenstein, R., Poppitt, S. D., McDevitt, R. M., & Prentice, A. M. (1995). Food intake and the menstrual cycle: A retrospective analysis, with implications for appetite research. *Physiology and Behavior, 58*(6), 1067-1077.

Buss, D.M. (1989). Sex differences in human mate preferences: Evolutionary hypotheses tested in 37 cultures. *The Behavioral and Brain Sciences, 12,* 1-49.

Buss, D. M. (1999). *Evolutionary psychology: The new science of mind.* Needham Heights, MA: Allyn & Bacon.

Buss, D. M., & Schmitt, D. P. (1993). Sexual strategies theory: An evolutionary perspective on human mating. *Psychological Review, 100*(2), 204-232.

Cacioppo, J. T., Petty, R. E., Losch, M. E., & Kim, H. S. (1986). Electromyographic activity over facial muscle regions can differentiate the valence and intensity of affective reactions. *Journal of Personality and Social Psychology, 50*(2), 260-268.

Caplow, T. (1982). Christmas gifts and kin network. *American Sociological Review, 47,* 383-392.

Carlson, N. R. (2001). *Physiology of behavior* (7th ed.). Boston: Allyn and Bacon.

Chavanne, T. J., & Gallup, G. G. (1998).Variation in risk taking behavior among female college students as a function of the menstrual cycle. *Evolution and Human Behavior, 19,* 27-32.

Check, J. H., Szekeres-Bartho, J., & O'Shaughnessy, A. (1996). Progesterone induced blocking factor seen in pregnancy lymphocytes soon after implantation. *American Journal of Reproductive Immunology, 35,* 277-280.

Childers, T. L., & Rao, A. R. (1992). The influence of families and peer-based reference groups on consumer decisions. *Journal of Consumer Research, 19,* 198-211.

Clayton, A. H., Clavet, G. J., McGarvey, E. L., Warnock, J. K., & Weiss, K. (1999). Assessment of sexual functioning during the menstrual cycle. *Journal of Sex and Marital Therapy, 25,* 281-291.

Conway, C. A., Jones, B. C, DeBruine, L. M., Welling, L. L. M., Law Smith, M. J., Perrett, D. I., Sharp, M. A., Al-Dujaili, E. A. S. (2007). Salience of emotional displays of danger and contagion in faces is enhanced when progesterone levels are raised, *Hormones and Behavior, 51,* 202-206.

Cunningham, M. R. (1979). Weather, mood, and helping behavior: Quasi experiments with the sunshine samaritan. *Journal of Personality and Social Psychology, 37,* 1947-1956.

Czaja, J. A. (1978). Ovarian influences on primate food intake: Assessment of progesterone actions. *Physiology and Behavior, 21,* 923-928.

Czaja, J. A., & Goy, R. W. (1975). Ovarian hormones and food intake in female guinea pigs and rhesus monkeys. *Hormones and Behavior, 6,* 329-349.

Dahl, D. W., Manchanda, R. V., & Argo, J. J. (2001). Embarrassment in consumer purchase: The roles of social presence and purchase familiarity. *Journal of Consumer Research, 28,* 473-481.

Dalvit, S. P. (1981). The effect of the menstrual cycle on patterns of food intake. *American Journal Clinical Nutrition, 34,* 1811-1815.

Dalvit-McPhillips, S. P. (1983). The effect of the human menstrual cycle on nutrient intake. *Physiology and Behavior, 31,* 209-212.

Darley, W. K., & Smith, R. E. (1995). Gender differences in information processing strategies: An empirical test of the selectivity model in advertising response. *Journal of Advertising, 24*(1), 41-56.

Day, R.-F., Shyi, G. C.-W., & Wang, J.-C. (2006). The effect of flash banners on multiattribute decision making: Distractor or source of arousal? *Psychology & Marketing, 23*(5), 369–382.

DeBruine, L. M. (2002). Facial resemblance enhances trust. *Proceedings of the Royal Society of London, B, 269*(1498), 1307-1312.

DeBruine, L. M. (2005). Trustworthy but not lust-worthy: Context-specific effects of facial resemblance. *Proceedings of the Royal Society of London, B, 272*(1566), 919-922.

DeBruine, L. M., Jones, B. C., & Perrett, D. I. (2005). Women's attractiveness judgments of self-resembling faces change across the menstrual cycle. *Hormones and Behavior, 47,* 379-383.

Dennerstein, L., Gotts, G., Brown, J. B., Morse, C. A., Farley, T. M., & Pinol, A. (1994). The relationship between the menstrual cycle and female sexual interest in women with PMS complaints and volunteers. *Psychoneuroendocrinology, 19*(3), 293-304.

75

Deppe, M., Schwindt, W., Kugel, H., Plassmann, H., & Kenning, P. (2005). Nonlinear responses within the medial prefrontal cortex reveal when specific implicit information influences economic decision making. *Journal of Neuroimaging, 15*(2), 171-182.

Derbaix, C. M. (1995). The impact of affective reactions on attitudes toward the advertisement and the brand: A step toward ecological validity. *Journal of Marketing Research, 32*(4), 470-480.

DeVaus, D. (2002). *Analyzing social science data.* Thousand Oaks, CA: SAGE publication Ltd.

Dhar, R., & Nowlis, S. M. (1999). The effect of time pressure on consumer choice deferral. *Journal of Consumer Research, 25*(4), 369-384.

Dillon, K. M., & Brooks, D. (1992). Unusual cleaning behavior in the luteal phase. *Psychological Report, 70*(1), 35-39.

Donovan, R. J., Rossiter, J. R., Marcoolyn, G., & Nesdale, A. (1994). Store atmosphere and purchasing behavior. *Journal of Retailing, 70*(3), 283-294.

Doty, R. L., & Silverthorne, C. (1975). Influence of menstrual cycle on volunteering behaviour. *Nature, 254*(5496), 139-140.

Dulac, C. (2000). Sensory coding of pheromone signals in mammals. *Current Opinion in Neurobiology, 10,* 511-518.

East, R., Lomax, W., Willson, G., & Harris, P. (1994). Decision making and habit in shopping times. *European Journal of Marketing, 28*(4), 56-71.

Ebster, C., & Kirk-Smith, M. (2005). The effect of the human pheromone androstenol on product evaluation. *Psychology & Marketing, 22*(9), 739-750.

Eck, L. H., Bennett, A. G., Egan, B. M., Ray, J. W., Mitchell, C. O., Smith, M. A., Klesges, R. C. (1997). Differences in macronutrient selections in users and nonusers of an oral contraceptive. *American Journal of Clinical Nutrition, 65,* 419-424.

Ecuyer-Dab, I., & Robert, M. (2004). Have sex differences in spatial ability evolved from male competition for mating and female concern for survival? *Cognition, 91*(3), 221-257.

Ekman, P., & Friesen, W. V. (1978). *Facial action coding system: A technique for the measurement of facial movement.* Palo Alto, CA: Consulting Psychologists Press.

Elias, M. (1981). Serum cortisol, testosterone, and testosterone-binding globulin responses to competitive fighting in human males. *Aggressive Behavior, 7,* 215–224.

Erk, S., Spitzer, M., Wunderlich, A. P., Galley, L., & Walter, H. C. A. (2002). Cultural objects modulate reward circuitry. *Neuroreport, 13*(18), 2499-2503.

Faber, R. J., & Christenson, G. A. (1996). In the mood to buy: Differences in the mood states experienced by compulsive buyers and other consumers. *Psychology and Marketing, 13*(8), 803-819.

Feinberg, D. R., Jones, B. C., Law-Smith, M. J., Moore, F. R., DeBruine, L. M., Cornwell, R. E., Hillier, S. G., & Perrett, D. I. (2006). Menstrual cycle, trait estrogen level, and masculinity preferences in the human voice. *Hormones and Behavior, 49*(2), 215-222.

Fessler, D. M. T. (2001). Luteal phase immunosuppression and meat eating. *Rivista di Biologia/ Biology Forum, 94,* 407-430.

Fessler, D. M. (2003). No time to eat: An adaptationist account of periovulatory behavioral changes. *The Quarterly Review of Biology, 78,* 3-21.

Fessler, D. M. T., & Navarrete, C. D. (2003). Domain-specific variation in disgust sensitivity across the menstrual cycle. *Evolution and Human Behavior, 24,* 406-417.

Folstad, I., & Karter, A. J. (1992). Parasites, bright males, and the immunocompetence handicap. *The American Naturalist, 139,* 603-622.

Fong, A. K. H., & Kretch, M. J. (1993). Changes in dietary intake, urinary nitrogen and urinary volume across the menstrual cycle. *American Journal Clinical Nutrition, 57,* 43-46.

Gangestad, S. W., Garver-Apgar, C. E., Simpson, J. A., & Cousins, A. J. (2007). Changes in women's mate preferences across the ovulatory cycle. *Journal of Personality and Social Psychology, 92* (1), 151-163.

Gangestad, S. W., & Simpson, J. A. (2000). The evolution of human mating: Trade-offs and strategic pluralism. *Behavioral and Brain Sciences, 23,* 675-687

Gangestad, S. W., Simpson, J. A., Cousins, A. J., Garver-Apgar, C. E., & Christensen, P. N. (2004). Women's preferences for male behavioral displays shift across the menstrual cycle. *Psychological Science, 15,* 203-207.

Gangestad, S. W., & Thornhill, R. (1998). Menstrual cycle variation in women's preferences for the scent of symmetrical men. *Proceedings of the Royal Society of London, B, 265*(1399), 927-933.

Gangestad, S. W., Thornhill, R., & Garver-Apgar, C. E. (2002). Changes in women's sexual interests and their partners' mate retention tactics across the menstrual cycle: Evidence for shifting conflicts of interest. *Proceedings of the Royal Society of London, B, 269*(1494), 975-982.

Gangestad, S. W., Thornhill, R., & Garver-Apgar, C. E. (2005a). Adaptations to ovulation. In D. Buss (Ed.), *The handbook of evolutionary psychology* (pp. 344-371). New York: Wiley.

Gangestad, S. W., Thornhill, R., & Garver-Apgar, C. E. (2005b). Adaptations to ovulation: implications for sexual and social behavior. *Current Directions in Psychological Science, 12*(4), 312-316.

Gangestad, S. W., Thornhill, R., & Garver-Apgar, C. E. (2005c). Women's sexual interests across the ovulatory cycle depend on primary partner developmental instability. *Proceedings of the Royal Society of London, B, 272,* 2023–2027.

Gann, P. H., Giovanazzi, S., Van Horn, L., Branning, A., & Chatterton, R. T. Jr. (2001). Saliva as a medium for investigating intra- and interindividual differences in sex hormone levels in premenopausal women. *Cancer Epidemiology, Biomarkers, & Prevention, 10,* 59-64.

Gardner, M. P. (1985). Mood states and consumer behavior: A critical review. *Journal of Consumer Research, 12*(3), 281-301.

Geary, D. C., Vigil, J., & Byrd-Craven, J. (2004). Evolution of human mate choice. *Journal of Sex Research, 41, 27-42.*

Gladstone, G. L., & Parker, G. B. (2002). When you're smiling does the whole world smile for you? *Australasian Psychiatry, 10,* 144-146.

Gong, E. J., Garrel, D., & Calloway, D. H. (1989). Menstrual cycle and voluntary food intake. *American Journal Clinical Nutrition, 49,* 252-258.

Graham, J. L. (1980). A new system for measuring nonverbal responses to marketing appeals. *AMA Educator's Conference Proceedings, 46,* 340-343.

Grammer, K. (1993). 5-alpha-androst-16en-3alpha-on: a male pheromone? A brief report. *Ethology and Sociobiology,* 14, 201-208.

Grammer, K., Renninger, L., & Fisher, B. (2004). Disco clothing, female sexual motivation, and relationship status: Is she dressed to impress? *Journal of Sex Research, 41*(1), 66-74.

Grammer, K., & Thornhill, R. (1994). Human *(Homo sapiens)* facial attractiveness and sexual selection: The role of symmetry and averageness. *Journal of Comparative Psychology, 108*(3), 233-242.

Groeppel-Klein, A. (2005). Arousal and consumer in-store behavior. *Brain Research Bulletin, 67,* 428-437.

Harrison, C. R. (2000). Gender and menstrual cycle effects in human spatial cognition. *PhD dissertation.* Champaign, IL: University of Illinois at Urbana-Champaign.

Harvey, S. M. (1987). Female sexual behavior: Fluctuations during the menstrual cycle. *Journal of Psychosomatic Research, 31,* 101-110.

Haselton, M., & Gangestad, S. W. (2006). Conditional expression of women's desires and men's mate guarding across the ovulatory cycle. *Hormones and Behavior, 49,* 509-518.

Haselton, M. G., & Miller, G. F. (2006). Women's fertility across the cycle increases the short-term attractiveness of creative intelligence. *Human Nature, 17*(1), 50-73.

Haselton, M. G., Mortezaie, M., Pillsworth, E. G., Bleske-Rechek, A., & Frederick, D. A. (2007). Ovulatory shifts in human female ornamentation: Near ovulation, women dress to impress. *Hormones and Behavior, 51,* 41-45.

Havlicek, J., Roberts, S. C., & Flegr, J. (2005). Women's preference for dominant male odour: Effects of menstrual cycle and relationship status. *Biology Letters, 1*(3), 256-259.

Havlicek, J., Dvorakova, R., Bartos, L., & Flegr, J. (2006). Non-advertized does not mean concealed: Body odour changes across the human menstrual cycle. *Ethology, 112*, 81-90.

Hazlett, R. L., & Hazlett, S. Y. (1999). Emotional response to television commercials: Facial EMG vs. self-report. *Journal of Advertising Research, 39*(2), 7-23.

Hess, E. H., & Polt, J. M. (1960). Pupil size as related to interest value of visual stimuli. *Science, 132*(3423), 349-350.

Hirshleifer, D., & Shumway, T. (2003). Good day sunshine: Stock returns and the weather. *The Journal of Finance, 58*(3), 1009-1032.

Hummel, T., Gollisch, R., Wildt, G., & Kobal, G. (1991). Changes in olfactory perception during the menstrual cycle. *Experientia, 47*, 712-15.

Hupfer, M. (2002). Communicating with the agentic woman and the communal man: Are stereotypic advertising appeals still relevant? Academy of Marketing Science Review, 2002, 1-17.

Johnson, L., & Learned, A. (2004). *Don't Think Pink: what really makes women buy–and how to increase your share of this crucial market*. New York, NY: Amacom.

Johnson, W. G., Corrigan, S. A., Lemmon, C. R., Bergeron, K. B., & Crusco, A. H. (1994). Energy regulation over the menstrual cycle. *Physiology and Behavior, 56*, 523-527.

Johnston, V. S., Hagel, R., Franklin, M., Fink, B., & Grammer, K. (2001). Male facial attractiveness: Evidence for a hormone-mediated adaptive design. *Evolution and Human Behavior, 22*, 251-267.

Jones, B. C., Little, A. C., Boothroyd, L., DeBruine, L. M., Feinberg, D. R., Law Smith, M. J., Cornwell, R. E., Moore, F. R., & Perrett, D. I. (2005a). Commitment to relationships and preferences for femininity and apparent health in faces are strongest on days of the menstrual cycle when progesterone level is high. *Hormones and Behavior, 48*, 283-290.

Jones, B. C., Perrett, D. I., Little, A. C., Boothroyd, L., Cornwell, R. E., Feinberg, D. R., Tiddeman, B. P., Whiten, S., Pitman, R. M., Hillier, S. G., Burt, D. M., Stirrat, M. R., Law Smith, M. J., & Moore, F. R. (2005b). Menstrual cycle, pregnancy and

oral contraceptive use alter attraction to apparent health in faces. *Proceedings of the Royal Society of London, B 272*(1561), 347-354.

Kahn, B. E., & Isen, A. M. (1993). The influence of positive affect on variety seeking among safe, enjoyable products. *Journal of Consumer Research, 20*(2), 257-270.

Kahn, B. E., & Schmittlein, D. C. (1989). Shopping trip behavior: An empirical investigation. *Marketing Letters, 1*(1), 55-69.

Kanerek, R. B., & Beck, J. M. (1980). Role of gonadal hormones in diet selection and food utilization in female rats. *Physiology and Behavior, 24,* 779-782.

Kemnitz, J. W., Eisle, S. G., Lindsay, K. A., Engle, M. J., Perelman, R. H., & Farrell, P. M. (1984). Changes in food intake during menstrual cycles and pregnancy of normal and diabetic rhesus monkeys. *Diabetologia, 26,* 60-64.

Kenning, P., Plassmann, H., & Ahlert, D. (2007). Applications of functional magnetic resonance imaging for market research. *Qualitative Market Research: An International Journal, 10*(2), 135-152.

Kerr, A. W., Hall, H. K., & Kozub, S. A. (2002). *Doing statistics with SPSS.* Thousand Oaks, CA: SAGE Publications Ltd.

Kirchengast, S., & Gartner, M. (2002). Changes in fat distribution (WHR) and body weight across the menstrual cycle. *Collegium Antropologicum, 26,* 47-57.

Knowles, P. A., Grove, S. J., & Pickett, G. M. (1999). Mood versus service quality effects on customers' responses to service organizations and service encounters. *Journal of Service Research, 2*(2), 187-199.

Kohl, J. V., Atzmueller, M., Fink, B., & Grammer, K. (2001). Human pheromones: Integrating neuroendocrinology and ethology. *Neuroendocrinology Letters, 22,* 309–321.

Kroeber-Riel, W. (1979). Activation research: psychobiological approaches in consumer research. *Journal of Consumer Research, 5*(4), 240-251.

Krug, R., Plihal, W., Fehm, H.L., & Born, J. (2000). Selective influence of the menstrual cycle on perception of stimuli with reproductive significance: An event-related potential study. *Psychophysiology, 37,* 111-122.

Kuukasjärvi, S., Eriksson, C. J. P., Koskela, E., Mappes, T., Nissinen, K. & Rantala, M. J. (2004). Attractiveness of women's body odors over the menstrual cycle: The role of oral contraceptives and receiver sex. Behavioral Ecology, 15(4), 579-584.

Lenton, E. A., Landgren, B. M., & Sexton, L. (1984). Normal variation in the length of the luteal phase of the menstrual cycle: identification of the short luteal phase. British Journal of Obstetrics and Gynaecology, 91(7), 685-689.

Li, N. P., & Kenrick, D. T. (2006). Sex similarities and differences in preferences for short-term mates: What, whether, and why. Journal of Personality and Social Psychology, 90(3), 468-489.

Liberles, S. D., & Buck, L. B. (2006). A second class of chemosensory receptors in the olfactory epithelium. Nature, 442(10), 645-650.

Lissner, L., Stevens, J., Levistky, D. A., Rasmussen, K., & Strupp, B. J. (1988). Variation on energy intake during the menstrual cycle: Implications for food intake research. American Journal of Clinical Nutrition, 48, 956-962.

Little, A. C., Jones, B. C., Bert, D. M., & Perret, D. I. (2007). Preferences for symmetry in faces change across the menstrual cycle. Biological Psychology, 76, 209-216.

Little, A. C., Jones, B. C., & Burriss, R. P. (2007). Preferences for masculinity in male bodies change across the menstrual cycle. Hormones and Behavior, 51, 633-639.

Little, B. C., & Zahn, T. P. (1974). Changes in mood and autonomic functioning during the menstrual cycle. Psychophysiology, 11(5), 579-590.

Luschen, M. E., & Pierce, D. M. (1972). Effect of the menstrual cycle on mood and sexual arousability. The Journal of Sex Research, 8(1), 41-47.

Lyons, P. M., Truswell, A. S., Mira, M., Vizzard, J., & Abraham, S. F. (1989). Reduction of food intake in the ovulatory phase of the menstrual cycle. American Journal of Clinical Nutrition, 49, 1164-1168.

MacKay, D. B. (1973). A spectral analysis of the frequency of supermarket visits. Journal of Marketing Research, 10, 84-90.

Manning, J. T., Scutt, D., Whitehouse, G. H., Leinster, S.J., & Walton., J.M. (1996). Asymmetry and the menstrual cycle in women. Ethology and Sociobiology, 17, 129-143.

Manocha, S., Choudhuri, G., & Tandon, B. N. (1986). A study of dietary intake in pre and post-menstrual period. *Human Nutrition. Applied Nutrition, 40*(3), 213-216.

Mattila, A. S., & Wirtz, J. (2001). Congruency of scent and music as a driver of in-store evaluations and behavior. *Journal of Retailing, 77,* 289-293.

Mattson, B. E. (1982). Situational influences on store choice. *Journal of Retailing, 58*(3), 46-58.

Mazur, A., & Booth, A. (1998). Testosterone and dominance in men. *Behavioural and Brain Sciences, 21,* 353-397.

Mazur, A., Booth, A., & Dabbs, J. Jr. (1992). Testosterone and chess competition. *Social Psychology Quarterly, 55,* 70–77.

Mazur, A., & Lamb, T.A. (1980). Testosterone, status, and mood in human males. *Hormones and Behavior, 14*(3), 236-246.

McClintock, M. K. (1971). Menstrual synchrony and suppression. *Nature, 229*(5282), 244-245.

Mick, D. G., & DeMoss, M. (1990). Self-gifts: Phenomenological insights from four contexts. *Journal of Consumer Research, 17*(3), 322-332.

Mick, D. G., DeMoss, M., & Faber, R. J. (1992). A projective study of motivations and meanings of self-gifts: Implications for retail management. *Journal of Retailing, 68*(2), 122-144.

Milinski, M., & Wedekind, C. (2001). Evidence for MHC-correlated perfume preferences in humans. *Behavioural Ecology, 12,* 140-149.

Miller, G., Tybur, J. M., Jordan, B. D. (2007). Ovulatory cycle effects on tip earnings by lap dancers: Economic evidence for human estrus? *Evolution and Human Behavior 28,* 375-381.

Milliman, R. E. (1982). Using background music to affect the behavior of supermarket shoppers. *Journal of Marketing, 46,* 86-91.

Milliman, R. E. (1986). The influence of background music on the behavior of restaurant patrons. *Journal of Consumer Research, 13,* 286-289.

83

Monti-Bloch, L., Jenngings-White, C., Dolberg, D. S., & Berliner, D. L. (1994) The human vomeronasal system. *Psychoneuroendocrinology, 19*(5-7), 673-686.

Morris, N. M., & Udry, J. R. (1970). Variations in pedometer activity during the menstrual cycle. *Obstetrics and Gynecology, 35,* 199-201.

Morris, N. M., Udry, R., Khan-Dawood, F., & Dawood, M. Y. (1987). Marital sex frequency and midcycle female testosterone. *Archives of Sexual Behavior, 16*(1), 27-37.

Nelson, R. J. (2005). *An introduction to behavioral endocrinology* (3rd ed.).Sunderland, MA: Sinauer.

Nisbett, R. E., & Kanouse, D. E. (1969). Obesity, food deprivation, and supermarket shopping behavior. *Journal of Personality and Social Psychology, 12*(4), 289-294.

Paolisso, G., Rizzo, M. R., Mazziotti, G., Rotondi, M., Tagliamonte, M. R., Varricchio, G., Carella, C., & Varricchio, M. (1999). Lack of association between changes in plasma leptin concentration and in food intake during the menstrual cycle. *European Journal of Clinical Investigation, 29,* 490-495.

Park, C. W., Iyer, E. S., & Smith, D. C. (1989). The effects of situational factors on in-store grocery shop. *Journal of Consumer Research, 15,* 422-433.

Parlee, M. B. (1982). Changes in moods and activation levels during the menstrual cycle in experimentally naive subjects. *Psychology of Women Quarterly, 7*(2), 119-131.

Parsons, A. G. (2001). The association between daily weather and daily shopping patterns. *Australasian Marketing Journal, 9* (2), 78-84.

Pawlowski, B., & Jasienska, G. (2005). Women's preferences for sexual dimorphism in height depend on menstrual cycle phase and expected duration of relationship. *Biological Psychology, 70*(1), 38-43.

Pearson, R., & Lewis, M. B. (2005). Fear recognition across the menstrual cycle. *Hormones and Behavior, 47,* 267-271.

Penton-Voak, I. S., Perrett, D. J., Castles, D. L., Kobayashi, T., Burt, D. M., Murray, L. K., & Minamisawa, R. (1999). Menstrual cycle alters face preference. *Nature, 399*, 741-742.

Penton-Voak, I. S., & Perrett, D. I. (2000). Female preferences for male faces changes cyclically: Further evidence. *Evolution and Human Behavior, 21*(1), 39-48.

Perret, D. I., Lee, K. J., Penton-Voak, I., Rowland, D., Yoshikawa, S., Burt, D. M., Henzik, S. P., Castles, D. L., & Akamatsu, S. (1998). Effects of sexual dimorphism on facial attractiveness, *Nature, 394*, 884-887.

Persky, H., Lief, H. I., Strauss, D., Miller, W. R., & O'Brien, C. P. (1978). Plasma testosterone level and behavior of couples. *Archives of Sexual Behavior, 7*, 157-173.

Petralia, S. M., & Gallup, G. G. (2002). Effects of a sexual assault scenario on handgrip strength across the menstrual cycle. *Evolution and Human Behavior, 23*, 3-10.

Peterson, R. A., & Sauber, M. (1983). A mood scale for survey research. In W. Bearden, Netermeyer, R., & Mobley, M. (Eds.) *Handbook of marketing scales*, pp. 187-188, Newbury Park, CA: Sage.

Pillsworth E. G., & Haselton, M. G. (2006). Male sexual attractiveness predicts differential ovulatory shifts in female extra-pair attraction and male mate retention. *Evolution and Human Behavior, 27*, 247-258.

Pillsworth, E. G., Haselton, M. G., & Buss, D. M. (2004). Ovulatory shifts in female sexual desire. *The Journal of Sex Research, 41*(1), 55-65.

Pinker, S. (1997). *How the Mind Works*. New York, NY: Norton.

Pinker (2003). *The Blank Slate: The Modern Denial of Human Nature*. New York, NY: Penguin.

Pirke, K. M., Schweiger, U., Lemmei, W., Krieg, J. C., & Berger, M. (1985). The influence of dieting on the menstrual cycle of healthy young women. *Journal of Clinical Endocrinology and Metabolism, 60*, 1174-1179.

Popkowski Leszczyc, P. T., & Timmermans, H. (2001). Experimental choice analysis of shopping strategies. *Journal of Retailing, 77*, 493-509.

Puts, D. A. (2005). Mating context and menstrual phase affect women's preferences for male voice pitch. *Evolution and Human Behavior, 26*, 388-397.

Regan, P. C. (1996). Rhythms of desire: The association between menstrual cycle phases and female sexual desire. *The Canadian Journal of Human Sexuality, 5*, 145-156.

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*(12), 1294-1303.

Rhodes, G., Chan, J., Zebrowitz, L. A., Sanfey, A. G., Rilling, J. K., Aronson, J. A., Nystrom, L. E., & Cohen, J. D. (2003). The neural basis of economic decision-making in the ultimatum game. *Science, 300*(5626), 1755-1758.

Roberts, S. C., Havlicek, J., Flegr, J., Hruskova, M., Little, A. C., Jones, B. C., Perrett, D. I., & Petrie, M. (2004). Female facial attractiveness increases during the fertile phase of the menstrual cycle. *Proceedings of the Royal Society of London, B, 271*(S5), S270-S272.

Rosenblatt, H., Durenfurth, I., Ferin, M., Vande-Wiele, R. L. (1980). Food intake and the menstrual cycle in rhesus monkeys. *Physiology and Behavior, 24*, 447-449.

Rossiter, J. R. & Silberstein, R. B. (2001). Brain-imaging detection of visual scene encoding in long-term memory for TV commercials. *Journal of Advertising Research, 41*(2), 13-21.

Rothschild, M. L. & Hyun, Y. J. (1990). Predicting memory for components of TV commercials from EEG. *Journal of Consumer Research, 16*(4), 472-478.

Rothschild, M. L., Hyun, Y. J., Reeves, B., Thorson, E., & Goldstein, R. (1988) Hemispherically lateralized EEG as a response to television. *Journal of Consumer Research, 15*(2), 185-198.

Royet, J.-P., Zald, D., Versace, R., Costes, N., Lavennem F., Koenig, O., & Gervais, R. (2000). Emotional responses to pleasant and unpleasant olfactory, visual, and auditory stimuli: A positron emission tomography study. *The Journal of Neuroscience, 20*(20), 7752-7759.

Saad, G. (1994). The adaptive use of stopping policies in sequential consumer choice. *Ph.D. Dissertation, Cornell University*, 1-107.

Saad, G. (2006). Applying evolutionary psychology in understanding the Darwinian roots of consumption phenomena. *Managerial and Decision Economics, 27*(2-3), 189-201.

Saad, G. (2007). *The Evolutionary Bases of Consumption.* Mahwah, NJ: Lawrence Erlbaum.

Saad, G., & Gill, T. (2000). Applications of evolutionary psychology in marketing. *Psychology & Marketing, 17*,1005-1034.

Saad, G. & Vongas, J. (2007). The effects of conspicuous consumption on testosterone. *Human Behavior and Evolution Society Annual Conference.* Presented by J. Vongas, Williamsburg, VA.

Sanders, D., Warner, P., Backstrom, T., & Bancroft, J. (1983). Mood, sexuality, hormones and the menstrual cycle. I. Changes in mood and physical state: Description of subjects and method. *Psychosomatic Medicine, 45*(6), 487-501.

Saunders, E. M. (1993). Stock prices and wall street weather. *American Economic Review, 83*, 1337-1345.

Scepkowski, L. A., Georgescu, M., & Pfaus, J. G. (2006). Neuroendocrine factors in sexual desire and motivation. In Goldstein I, Meston C, Davis K, Traish A (Eds.) *Women's Sexual Function and Dysfunction* (pp. 159-167). London: Taylor and Francis.

Schneider, J. E., Lynch, C. B., & Gundaker, C. L. (1983). The influence of exogenous progesterone on selected lines of mice divergent for maternal nesting. *Behavior Genetics, 13*(3), 247-256.

Schultheiss, O. C., Wirth, M. M., & Stanton, S. J. (2004). Effects of affiliation and power motivation arousal on salivary progesterone and testosterone. *Hormones and Behavior, 46*(5), 592-599.

Schwartz, G. E., Weinberger, D. A., & Singer, J. A. (1981). Cardiovascular differentiation of happiness, sadness, anger, and fear following imagery and exercise. Psychosomatic Medicine, 43(4), 343-364.

Schwarz, E., Schaefer, C., Bode, J. C., & Bode, C. (2000). Influence of the menstrual cycle on the LPS-induced cytokine response of monocytes. *Cytokine, 12,* 413-416.

Schweiger, U., Laessle, R. G., Pfister, H., Hoehl, C., Schwingenschloegel, M., Schweiger, M., & Pirke, K. M. (1987). Diet-induced menstrual irregularities: Effects of age and weight loss. *Fertility and Sterility, 48,* 746-751.

Schweiger, U., Tuschl, R. J., Platte, P., Broocks, A., Laessle, R. G., & Pirke, K. M. (1992). Everyday eating behavior and menstrual function in young women. *Fertility and Sterility, 57,* 771-775.

Sheldon, M. S., Cooper, M. L., Geary, D. C., Hoard, M., & DeSoto, M. C. (2006). Fertility cycle patterns in motives for sexual behavior. *Personality and Social Psychology Bulletin, 32*(12), 1659-1673.

Silber, M. (1994). Menstrual cycle and work schedule: Effects on women's sexuality. *Archives of Sexual Behavior, 23,* 397-404.

Silverman, I., & Eals, M. (1992). Sex differences in spatial abilities: evolutionary theory and data. In J. H. Barkow, L. Cosmides, & J. Tooby (Eds.) *The Adapted Mind: Evolutionary Psychology and the Generation of Culture* (pp. 533- 549). Oxford and New York: Oxford University Press.

Simpson, J. A., Gangestad, S. W., Christensen, P. N., & Leck, K. (1999). Fluctuating asymmetry, sociosexuality, and intrasexual competitive tactics. *Journal of Personality and Social Psychology, 76,* 159-172.

Singh, D. (1993). Adaptive significance of female physical attractiveness: Role of waist-to-hip ratio. *Journal of Personality and Social Psychology, 65*(2), 293-307.

Singh, D. (1995). Female health, attractiveness and desirability for relationships: Role of breast asymmetry and waist-to-hip ratio. *Ethology and Sociobiology, 16,* 465-481.

Singh, D., & Bronstad, P. M. (2001). Female body odour is a potential cue to ovulation. *Proceedings of the Royal Society of London, B, 268*(1469), 797-801.

Slob, A. K., Ernste, M., & van der Werff ten Bosch, J. J. (1991). Menstrual cycle phase and sexual arousability in women. *Archives of Sexual Behavior, 20,* 567-577.

Slob, A. K., Bax, C. M., Hop, W. C. J., & Rowland, D. L. (1996). Sexual arousability and the menstrual cycle. *Psychoneuroendocrinology, 21,* 545-558.

Spangenberg, E. R., Crowley, A. E., & Henderson, P. W. (1996). Improving the store environment: Do olfactory cues affect evaluations and behaviors? *Journal of Marketing, 60,* 67-80.

Spence, D. P., Lugo, M., & Youdin, R. (1972). Cardiac change as a function of attention to and awareness of continuous verbal text. *Science, 176*(4041), 1344-1346.

Stanislaw, H., & Rice, F. J. (1988). Correlation between sexual desire and menstrual cycle characteristics. *Archives of Sexual Behavior, 17,* 499-508.

Stenn, P. G., & Klinge, V. (1972). Relationship between the menstrual cycle and bodily activity in humans. *Hormones and Behaviour, 3*(1972), 297-305.

Stern, K., & McClintock, M. K. (1998). Regulation of ovulation by human pheromones. *Nature, 392*(6672), 177-179.

Sundar, S. S., & Kalyanaraman, S. (2004). Arousal, memory, and impression-formation effects of animation speed in web advertising. *Journal of Advertising, 33*(1), 7-18.

Suri, R. & Monroe, K. B. (2003). The effects of time constraints on consumers' judgments of prices and products. *Journal of Consumer Research, 30,* 92-104.

Tarasuk, V., & Beaton, G. H. (1991). Menstrual-cycle patterns in energy and macronutrient intake. *American Journal of Clinical Nutrition, 53,* 442-447.

Tarttelin, M. F., & Gorski, R. A. (1973). The effects of ovarian steroids on food and water intake and body weight in the female rat. *Acta Endocrinology, 73,* 551-568.

Thelen, E. M.. & Woodside, A. G. (1997). What evokes the brand or store? Consumer research on accessibility theory applied to modeling primary choice. *International Journal of Research in Marketing, 14,* 125-145.

Thornhill, R., & Gangestad, S. W. (1996). Human female copulatory orgasm: A human adaptation or phylogenetic holdover. *Animal Behavior, 52,* 853-855.

Thornhill, R., & Gangestad, S. W. (1999). The scent of symmetry: A human sex pheromone that signals fitness? *Evolution and Human Behavior, 20,* 175-201.

Thornhill, R., & Gangestad, S. W. (2006). Facial sexual dimorphism, developmental stability, and susceptibility to disease in men and women. *Evolution and Human Behavior, 27,* 131-144

Thornhill, R., Gangestad, S. W., & Comer, R. (1995). Human female orgasm and mate fluctuating asymmetry. *Animal Behaviour, 50,* 1601-1615.

Thornhill, R., Gangestad, S. W., Miller, R., Scheyd, G. McCollough, J. K., & Franklin, M. (2003). Major histocompatibility complex genes, symmetry, and body scent attractiveness in men and women. *Behavioral Ecology, 14*(5), 668-678.

Tooby, J., & Cosmides, L. (1992). Psychological foundations of culture. In J.H. Barkow, L. Cosmides, & J. Tooby (Eds.), *The adapted mind: Evolutionary psychology and the generation of culture* (pp. 19-136). New York: Oxford University Press.

Tuch, R. H. (1975). The Relationship between a mother's menstrual status and her response to illness in her child. *Psychosomatic Medicine, 37*(5), 388-394.

Udry, J. R., & Morris, N. M. (1968). Distribution of coitus in the menstrual cycle. *Nature, 220,* 593-596.

Van Goozen, S. H. M., Wiegant, V. M., Endert, E., Helmond, F. A., & Van de Poll, N. E. (1997). Psychoendocrinological assessment of the menstrual cycle: The relationship between hormones, sexuality, and mood. *Archives of Sexual Behavior, 26*(4), 359-382.

Van Kenhove, P., De Wulf, K., & Van Waterschoot, W. (1999). The impact of task definition on store-attribute. *Journal of Retailing, 75*(1), 125-137.

Wakefield, K., & Baker, J. (1998). Excitement at the mall: Determinants and effects on shopping response. *Journal of Retailing, 74,* 515-539.

Watson, P. J., & Gatchel, R. J. (1979). Autonomic measures of advertising. *Journal of Advertising Research, 19*(3), 15-26.

Wedekind, C., & Furi, S. (1997). Body odour preferences in men and women: Do they aim for specific MHC combinations or simply heterozygosity? *Proceedings of the Royal Society of London, B, 264*(1387), 1471-1479.

Wedekind, C., Seebeck, T., Bettens, F., & Paepke, A. J. (1995). MHC-dependent mate preferences in humans. *Proceedings: Biological Sciences, 260* (1359), 245-249.

Wilcox, A. J., Dunson, D., & Baird, D. D. (2000). The timing of the "fertile window" in the menstrual cycle: Day specific estimates from a prospective study. *British Medical Journal, 321,* 1259-1262.

Wilcox, A. J., Weinberg, C. R., & Baird, D. D. (1995). Timing of sexual intercourse in relation to ovulation: Effects on the probability of conception, survival of the pregnancy, and sex of the baby. *New England Journal of Medicine, 333*, 1517-1521.

Wilcox, A. J., Baird, D. D., Dunson, D. B., McConnaughey, D. R., Kesner, J. S., & Weinberg, C. R. (2004). On the frequency of intercourse around ovulation: Evidence for biological influences. *Human Reproduction, 19*(7), 1539-1543.

Wirth, M. W., & Schultheiss, O. C. (2006). Effects of affiliation arousal (hope of closeness) and affiliation stress (fear of rejection) on progesterone and cortisol. *Hormones and Behavior, 50*, 786-795.

Yalch, R. F., & Spangenberg, E. R. (1990). Effects of store music on shopping behavior. *Journal of Consumer Marketing, 7*, 55-63.

Yalch, R. F., & Spangenberg, E. R. (2000). The effects of music in a retail setting on real and perceived shopping times. *Journal of Business Research, 49*, 139-147.

Yoon, C., Gutchess, A. H., Feinberg, F., Polk, T. A. (2006). A functional magnetic resonance imaging study of neural dissociations between brand and person judgments. *Journal of Consumer Research, 33*(1), 31-40.

Yun, D.-S., & O'Kelly, M. E. (1997). Modeling the day-of-the-week shopping. *Socio-Econonomic Planning Sciences, 31*(4), 307-319.

Zahavi, A., & Zahavi, A. (1997) *The handicap principle.* Oxford: Oxford University Press.

Zhou, R. & Soman, D. (2003). Looking back: Exploring the psychology of queuing and the effect of the number of people behind. *Journal of Consumer Research, 29*, 517-530.

Zillmann, D., Schweitzer, K. J., Mundorf, N. (1994). Menstrual cycle variation of women's interest in erotica. *Archives of Sexual Behavior, 23*, 579-97.

Appendices

Appendix A. Initial questionnaire.

Instructions:

1. In the empty column to the right of each question, please type in your answer. Please answer all questions. It is very important that you answer all questions honestly and as accurately as possible. Please use a calendar when necessary.

2. Once you have completed the survey, please save this file on your computer and then email it as an attachment to shoppingstudy@gmail.com.

3. We will contact you shortly with the results. Thank you for your interest in participating in our Shopping Study.

Question	Answer
1. Are you male or female?	
2. How old are you?	
3. Do you have daily access to the Internet? (Please continue only if you do have daily access to the Internet, as participants will be asked to answer an online questionnaire every evening.)	
4. What is your background? 1 - Canadian 2 - American 3 - French (France) 4 - Greek 5 - Portuguese 6 - Italian 7 - Chinese 8 - Japanese 9 - Indian	

10 - Middle Eastern 11 - Other (please specify) *Please select the number that best indicates your background. If you are of mixed ethnicity, please select more than one number. If you would like to add any further explanations regarding your ethnicity, please feel free to do so.*	
5. In what country were you born?	
6. What was the first language you learned (your mother tongue)? *Examples include French, English, Chinese, Japanese, Arabic, Greek, Spanish, Portuguese, etc.*	
7. How many years have you lived in Canada?	
8a. Are you currently taking any kind of <u>hormonal</u> contraceptives? *Kinds of hormonal contraceptives include the contraceptive pill ("birth control pill"), injections, implants, patches, and the emergency contraceptive pill ("morning after pill").*	
8b. If so, what kind are you currently using?	
If you answered YES to question 8a, please skip to question 9. If you answered NO to question 8a, please answer the following questions (8c, 8d, and 8e): **8c.** Have you ever used any <u>hormonal</u> contraceptives in the past?	
8d. If so, what kind did you last use?	
8e. If so, <u>how long ago</u> (in years and months) did you use it last?	
9. Are you currently taking any anti-depressants or other mood enhancing medications? *Examples of anti-depressants include Celexa, Prozac, Luvox, Paxil and Zoloft.*	
10. In the past year, by how many days has your own menstrual <u>cycle</u> length tended to vary from one month to the next? *If your menstrual cycle tended to be the same length every month, please indicate "0 days", if your menstrual cycle tended to vary in length on average by about 1 day, please indicate "1 day", etc.*	
11. As far as you know, are you currently pregnant?	

12a. Have you ever given birth?	
12b. If so, how long ago (in years and months) did you last give birth?	
13. Are you currently breast feeding a baby?	
14. On a scale from 1 to 7 (1 = very weak; 7 = very strong), how strong are your English reading and writing skills compared to the average Canadian university student?	

Appendix B. Daily survey.

Welcome to the Shopping Study. The following questions refer to your shopping activities, feelings and preferences OVER THE LAST 24 HOURS. Please answer this survey at approximately the same time every evening after 7:30 p.m. Please be sure to answer all of the items.

Section 1 – Various Questions

Your study ID number:
What is today's date?
Day of study (out of 35):

Please select a number from 1 to 5 for each of the following items, with 1 = "strongly disagree" and 5 = "strongly agree."

- Currently, I am in a good mood.
- As I answer these questions I feel cheerful.
- For some reason I am not very comfortable right now.
- At this moment I feel edgy or irritable.

Please select a number from 1 to 9 for each of the following items, with 1 = "strongly disagree," 5 = "neutral," and 9 = "strongly agree."

- It was sunny today.
- It was rainy today.
- Relative to the last 30 days, the temperature today was comfortable outside.
- I felt tired today.
- I slept well last night.
- I felt hungry today.
- I was in a good mood today.
- I felt emotionally upset today.
- I felt much sadness today.
- I felt much happiness today.
- I felt anxious today.
- I felt stressed today.
- I felt nauseous today.
- I had a headache today.

Did you take any pain relievers today (includes Tylenol, Advil, etc.)? (Yes/No)
Did you menstruate today? (Yes/No)
Did you have sex within the last 24 hours? (Yes/No)
Are you in a committed romantic relationship? (Yes/No)

95

Section 2 – Various Desires and Activities

Please select a number from -4 to +4 for each of the following items, with -4 = "far less than usual," 0 = "about average," and +4 = "far more than usual."
OVER THE LAST 24 HOURS, compared to most days in the last 12 months, I ...

- felt as though I looked physically attractive.
- felt a desire to look attractive.
- spent time making myself beautiful (includes fixing hair, applying make-up, putting jewelry on, thinking of what to wear, etc.).
- wore fashionable clothing.
- wore clothing that showed off my figure.
- felt like going out to a nightclub or bar (also includes pubs, lounges, etc.).
- spent time at a nightclub or bar.
- spent time out in a public setting (includes cafes, libraries, restaurants, etc.).
- spent time browsing through stores.
- craved highly caloric foods (includes very sweet foods that are high in sugar and very fatty foods such as French fries, pizza, cake, pie, chips, candy, chocolate, etc.).
- consumed calories.
- ate highly caloric foods.
- ate red meat (includes hamburger, steak, etc.).
- felt like cleaning my main living spaces (can refer to your bedroom, your living room, your entire apartment, your bathroom, your kitchen, etc.).
- felt like organizing or re-arranging my main living spaces.
- spent time cleaning my main living spaces.
- spent time organizing or re-arranging my main living spaces.
- felt like there may be something wrong with my health or the health of a loved one.
- felt a desire to care for children.
- made efforts to maintain friendships.
- felt like socializing with my female friends.
- felt like spending time with members of my immediate family.
- felt like having quick sex.
- felt like having rough sex.
- felt like having affectionate sex.
- felt like taking the time to engage in foreplay before sex.

(QUESTIONS FOR PARTNERED WOMEN ONLY)

- felt committed to my partner.
- felt a need for my partner to be committed to me.

Section 3 - Shopping Desires

Please select a number from -4 to +4 for each of the following items, with -4 = "far less than usual," 0 = "about average," and +4 = "far more than usual."
OVER THE LAST 24 HOURS, compared to most days in the last 12 months, I ...

- felt like buying new clothes.
- felt like buying new shoes.
- felt like buying new jewelry or other accessories (includes necklaces, earrings, bracelets, watches, hair bands, belts, rings, etc.).
- felt like buying new cosmetics and other beauty products (includes grooming products, perfumes, anti-aging creams, shampoos, conditioners, razors, wax, etc.).
- felt like buying new cleaning products (includes cleaning cloths, cleaning gels, Windex, dusting clothes, stain removers, detergents, mops, scrubbers, cleaning gloves, etc.).
- felt like buying new health-related products (includes non-prescription medications like pain relievers, herbal medications and supplements like Echinacea and Ginseng, vitamins, etc.).
- felt like buying new home decorative items and furniture for my main living spaces (includes art, candles, blankets, pillows, picture and painting frames, decorative pieces, chairs, beds, shelves, cabinets, sofas, dressers, etc.).
- felt like buying a new pet (includes bunnies, cats, dogs, hamsters, etc.).
- felt like buying entertainment services (includes movie rentals, movies at a theater, upgrading cable or satellite televisions services, music concerts, admission to museums and other activities, live sports events, live performing arts, etc.).

(QUESTION FOR UNPARTNERED WOMEN ONLY)

- felt like buying a gift for a loved one.
- felt like receiving a gift from a loved one.

(QUESTIONS FOR PARTNERED WOMEN ONLY)

- felt like buying a gift for my partner.
- felt like buying a gift for a loved one other than my partner.
- felt like receiving a gift from my partner.
- felt like receiving a gift for a loved one other than my partner.

Section 4 - Money Spent

When answering the following questions, please be as accurate as possible. You can use your shopping diary entries as well as any documentation that could be helpful in providing the most accurate response possible (receipts, online banking statements, etc.). Include all types of purchases you made both in-store and online (except rent and bills) and all forms of payment (including cash, credit card, debit, check, etc.). Be sure to include all of your purchases regardless of the source of

money used (for example, you would include clothes that you shopped for with your parents but that they paid for). The questions refer to amounts spent over the last 24 hours, in Canadian dollars.

How much money did you spend today in total?

How much money did you spend on the following product categories?

- Clothes:
- Shoes:
- Jewelry or other accessories:
- Cosmetics and other beauty products:
- Cleaning products:
- Home decorative items for your main living spaces:
- Health-related products:
- Food to be consumed in the home:
- Food to be consumed outside the home:
- Alcoholic beverages:
- Admission at a nightclub or bar:
- Entertainment services:

(QUESTIONS FOR UNPARTNERED WOMEN ONLY)

- How much money did men that are not your family members spend on you, if any?

(QUESTION FOR PARTNERED WOMEN ONLY)

- How much money did your partner spend on you, if any (includes gifts of any sort, drinks or food at a nightclub, bar or restaurant, flowers, etc.)?
- How much money did you spend on your partner, if any?
- How much money did men that are neither your partner nor your family members spend on you, if any? .

Section 5 – Shopping Scenarios

Imagine that you were to go shopping now, but that you had to choose between spending money on yourself and spending money on buying a gift for a loved one. How much of your money would you spend on yourself versus on a loved one, in %:

- Buy something for yourself: _____ %
- Buy something for a loved one: _____ %

Total: 100%

Imagine that you were to go shopping for yourself now, but that you were limited to spending your money on certain kinds of products. How much of your money would you spend on the 4 following product categories, in %:

- Clothes, shoes, or accessories: _____ %
- Cosmetics or other beauty products: _____ %
- Home decorative items for your main living spaces: _____ %
- Entertainment services: _____ %

Total: 100%

Section 6 – Shopping Activities

The following questions relate to your shopping activities over the last 24 hours, irrespective of whether or not you actually bought anything. They refer to both in-store (such as buying, casual browsing through stores, just looking through store windows, looking at products, trying on clothing, etc.) and online shopping (looking at and/or buying products on commercial websites, online auction websites like EBay, and online classifieds like Craig's List).

Please select a number from 1 to 9 for each of the following items, with 1 = "strongly disagree," 5 = "neutral," and 9 = "strongly agree."

OVER THE LAST 24 HOURS, compared to most days in the last 12 months, I ...
- shopped for clothes.
- shopped for shoes.
- shopped for jewelry or other accessories.
- shopped for cosmetics or other beauty products.
- shopped for cleaning products.
- shopped for home decorative items and furniture for your main living spaces.
- shopped for health-related products.
- shopped for highly caloric foods.
- shopped for entertainment services.

(QUESTION FOR UNPARTNERED WOMEN ONLY)
- shopped for gifts for loved ones.

(QUESTIONS FOR PARTNERED WOMEN ONLY)
- shopped for gifts for my partner.
- shopped for gifts for loved ones other than my partner.

Appendix C. Longer survey.

Welcome to our Shopping Study. The following questions refer to your shopping activities, feelings and preferences OVER THE LAST 24 HOURS. Please answer this survey at approximately the same time every evening after 7:30 p.m. Please be sure to answer all of the items.

Section 1 – Various Questions

Your study ID number:
What is today's date?
Day of study (out of 35):

Please select a number from 1 to 5 for each of the following items, with 1 = "strongly disagree" and 5 = "strongly agree."

- Currently, I am in a good mood.
- As I answer these questions I feel cheerful.
- For some reason I am not very comfortable right now.
- At this moment I feel edgy or irritable.

Please select a number from 1 to 9 for each of the following items, with 1 = "strongly disagree," 5 = "neutral," and 9 = "strongly agree."

- It was sunny today.
- It was rainy today.
- Relative to the last 30 days, the temperature today was comfortable outside.
- I felt tired today.
- I slept well last night.
- I felt hungry today.
- I slept enough hours last night to feel well rested.
- I drank cups of coffee or caffeinated tea.
- I felt socially isolated today.
- I felt lonely today.
- I felt like putting money aside into a savings account.
- I felt that buying something online may be unsafe.
- I felt as though I made good shopping choices today.
- I felt as though I made good overall choices.
- I was in a good mood today.
- I felt emotionally upset today.
- I felt much sadness today.
- I felt much happiness today.
- I felt anxious today.
- I felt stressed today.

100

- I felt nauseous today.
- I had a headache today.

Did you take any pain relievers today (includes Tylenol, Advil, etc.)? (Yes/No)
Did you menstruate today? (Yes/No)
Did you have sex within the last 24 hours? (Yes/No)
Are you in a committed romantic relationship? (Yes/No)

Section 2 – Various Desires

Please select a number from -4 to +4 for each of the following items, with -4 = "far less than usual," 0 = "about average," and +4 = "far more than usual."
OVER THE LAST 24 HOURS, compared to most days in the last 12 months, I ...

- felt a desire to look attractive.
- felt a desire to look sexy.
- felt like dressing fashionably.
- felt like wearing clothes that show off my figure.
- felt like wearing a short skirt.
- felt like wearing high heels.
- felt like sun tanning.
- felt like going to the hairdresser (for services such as a haircut, hair coloring, highlights, etc.).
- felt like removing facial or body hair (waxing, shaving, plucking eyebrows, etc.).
- was interested in cosmetic surgery to enhance my body appearance (e.g., breast implants, liposuction, etc.).
- was interested in cosmetic surgery to enhance my facial appearance (e.g., to rectify imperfections of my nose, eyes, check bones, etc.).
- felt like going out to a nightclub or bar (also includes pubs, lounges, etc.).
- felt like dancing at a nightclub.
- felt like meeting new men.
- felt like talking to attractive men.
- felt like going out with my female friends to someplace where I might meet men.
- felt like inviting my female friends over to hang out at home (with no men present).
- felt like having a one-night stand if I were to meet the right man while out with friends.
- felt like visiting an online dating website.
- felt like looking at the profiles and pictures of males that are neither my partner nor my family members on an online community network (examples include Facebook, MySpace, etc.).
- felt like attending a male sporting event.
- felt like I had a lot of energy today.
- felt like being physically active.
- felt a desire to exercise.
- felt like browsing through stores.
- would have felt like staying home for most of the day if I had had a day off today.

- craved highly caloric foods (includes very sweet foods that are high in sugar and very fatty foods such as French fries, pizza, cake, pie, chips, candy, chocolate, etc.).
- was easily tempted by highly caloric foods.
- felt regret about eating too many calories.
- was proud of how healthy I ate.
- felt like eating red meat (examples include hamburger, steak, etc.).
- felt like eating chicken.
- felt like eating fish today (includes salmon, tuna, sushi, etc.).
- was turned off by the thought of eating red meat.
- felt repulsed by the thought of eating red meat.
- felt like drinking alcoholic beverages.
- felt like cleaning my main living spaces (can refer to your bedroom, your living room, your entire apartment, your bathroom, your kitchen, etc.).
- felt like organizing or re-arranging my main living spaces.
- felt like there may be something wrong with my health or the health of a loved one.
- felt like going to a health clinic to consult a physician or nurse.
- felt like there may be something wrong with my health.
- worried about the health of a loved one.
- felt like re-arranging the layout of my main living spaces.
- worried about my health.
- felt like taking non-prescription medications (e.g., cold and allergy medications, pain relievers, antacids, etc.).etc.)
- felt like taking herbal medications and supplements (e.g., Echinacea, Ginseng, etc.)
- felt like socializing with my female friends.
- felt like spending time with members of my immediate family
- could have used some support from a member of my immediate family.
- felt like re-kindling old friendships.
- felt like buying a gift for a close female friend.
- felt like receiving a gift from a close female friend.
- considered putting money into a life insurance plan to leave money behind for my loved ones.
- felt a desire to care for children.
- felt maternal.
- felt a desire to play with a baby or child.
- felt a desire to care for a pet (includes bunnies, cats, dogs, hamsters, etc.).
- felt like having quick sex.
- felt like having rough sex.
- felt like having "animalistic" sex.
- felt like having tender sex.
- felt like having affectionate sex.
- felt like taking the time to engage in foreplay before sex.
- felt that taking the time to create a romantic mood prior to and during sex would be important.
- felt like having long-lasting sex.

(QUESTIONS FOR PARTNERED WOMEN ONLY)
- felt committed to my partner.
- felt a need for my partner to be committed to me.
- would want my partner to increase the level of commitment in our relationship.
- felt worried about the health of my partner.
- felt sexually satisfied with my partner.
- felt insecure about my relationship with my partner.
- felt frustrated towards my partner.
- found my partner to be irritating.

Section 3 – Various Activities

Please select a number from -4 to +4 for each of the following items, with -4 = "far less than usual," 0 = "about average," and +4 = "far more than usual."
OVER THE LAST 24 HOURS, compared to most days in the last 12 months, I ...

- spent time making myself beautiful (includes fixing hair, applying make-up, putting jewelry on, thinking of what to wear, etc.).
- wore fashionable clothing.
- wore clothing that showed off my figure.
- wore nice clothes.
- wore sexy clothes.
- wore clothes with bright colors.
- wore clothes that attract attention.
- wore brightly colored clothing.
- wore clothes that showed lots of skin.
- wore a skirt.
- wore high heels.
- wore jewelry (necklaces, earrings, etc.).
- wore a cap or hat (baseball cap, etc.).
- wore perfume.
- spent time making myself beautiful (includes fixing hair, applying make-up, putting jewelry on, thinking of what to wear, etc.).
- wore my hair in a pony tail (rather than wearing it down), if possible.
- wore make-up (lipstick, blush, eye shadow, etc.).
- removed body or facial hair (waxing, shaving legs, plucking eyebrows, etc.).
- went sun tanning.
- spent time at a nightclub or bar.
- spent time out in a public setting (includes cafes, libraries, restaurants, etc.).
- spent time browsing through stores.
- spent time dancing at a nightclub.
- spent time with men that are neither my partner nor my family members.
- spent time talking on the phone with men that are neither my partner nor my family members.

- spent time visiting an online dating website.
- spent time looking at the profiles and pictures of males that are neither my partner nor my family members on an online community network.
- spent most of the day outside my home.
- exercised at a gym or fitness club.
- was physically active.
- traveled long distances by foot.
- consumed calories.
- ate highly caloric foods.
- ate red meat (includes hamburger, steak, etc.).
- ate fatty foods.
- ate sweet foods.
- ate chicken today.
- ate fish today.
- ate healthy foods.
- drank alcoholic beverages.
- spent time cleaning my main living spaces.
- spent time organizing or re-arranging my main living spaces.
- spent time creating order in my main living spaces.
- washed my hands.
- used home cleaning products.
- went to a health clinic to consult a physician or nurse.
- searched online for medical information.
- took non-prescription medications (e.g., cold and allergy medications, pain relievers, antacids, etc.).
- took herbal medications and supplements (e.g., Echinacea, Ginseng, etc.).
- made efforts to maintain friendships.
- spent time talking on the phone with female friends or members of my immediate family.
- enjoyed spending time with female friends.
- spent time socializing with female friends (in person).
- spent time with members of my immediate family (in person).
- spent time talking to female friends on the phone.
- spent time talking to members of my immediate family on the phone.
- made many phone calls and/or phone text messages to my female friends.
- spent time writing emails to female friends and family members.
- spent time communicating with female friends on an online community network.
- spent time browsing through profiles of female friends on an online community network.
- spent time re-kindling old friendships.

(QUESTIONS FOR PARTNERED WOMEN ONLY)
- shopped for my partner.
- bought gifts for my partner.

- received gifts from my partner.
- identified a product that I thought would be great to receive as a gift from my partner.
- spent time talking to my partner on the phone.
- made many phone calls and/or phone text messages to my partner.
- spent time in person with my partner.

(QUESTIONS FOR PARTICIPANTS WHO HAVE HAD SEX WITHIN THE LAST 24 HOURS)
Please select a number from 1 to 9 indicating how descriptive the following adjectives and statements are of the sexual activity that you have had over the last 24 hours, with 1 = "not at all descriptive," 5 = "somewhat descriptive," and 9 = "extremely descriptive."

- rough.
- "animalistic."
- quick.
- affectionate.
- tender.
- took the time to engage in foreplay.
- took the time to create a romantic mood.
- long-lasting.

Section 4 – Shopping Desires

Please select a number from -4 to +4 for each of the following items, with -4 = "far less than usual," 0 = "about average," and +4 = "far more than usual."

Please read the examples of each product category carefully as they will not be repeated in the next pages.

OVER THE LAST 24 HOURS, compared to most days in the last 12 months, I ...

- felt like buying new clothes.
- felt like buying new shoes.
- felt like buying new jewelry or other accessories (includes necklaces, earrings, bracelets, watches, hair bands, belts, rings, etc.).
- felt like buying new cosmetics and other beauty products (includes grooming products, perfumes, anti-aging creams, shampoos, conditioners, razors, wax, etc.).
- felt like buying new cleaning products (includes cleaning cloths, cleaning gels, Windex, dusting clothes, stain removers, detergents, mops, scrubbers, cleaning gloves, etc.).
- felt like buying new health-related products (includes non-prescription medications like pain relievers, herbal medications and supplements like Echinacea and Ginseng, vitamins, etc.).
- felt like buying new home decorative items and furniture for my main living spaces (includes art, candles, blankets, pillows, picture and painting frames, decorative pieces, chairs, beds, shelves, cabinets, sofas, dressers, etc.).

- felt like buying a new pet (includes bunnies, cats, dogs, hamsters, etc.).
- felt like buying entertainment services (includes movie rentals, movies at a theater, upgrading cable or satellite televisions services, music concerts, admission to museums and other activities, live sports events, live performing arts, etc.).

(QUESTION FOR UNPARTNERED WOMEN ONLY)
- felt like buying a gift for a loved one.
- felt like receiving a gift from a loved one.

(QUESTIONS FOR PARTNERED WOMEN ONLY)
- felt like buying a gift for my partner.
- felt like buying a gift for a loved one other than my partner.
- felt like receiving a gift from my partner.
- felt like receiving a gift from a loved one other than my partner.

Section 5 – Money Spent

When answering the following questions, please be as accurate as possible. You can use your shopping diary entries as well as any documentation that could be helpful in providing the most accurate response possible (today's receipts, online banking statements, etc.). Include all types of purchases you made both in-store and online (except rent and bills) and all forms of payment (including cash, credit card, debit, check, etc.). Be sure to include all of your purchases regardless of the source of money used (for example, you would include clothes that you shopped for with your parents but that they paid for). The questions refer to amounts spent over the last 24 hours, in Canadian dollars.

How much money did you spend today in total?

How much money did you spend on the following product categories?
- Clothes:
- Shoes:
- Jewelry or other accessories:
- Cosmetics and other beauty products:
- Cleaning products:
- Home decorative items for your main living spaces:
- Health-related products:
- Food to be consumed in the home:
- Food to be consumed outside the home:
- Alcoholic beverages:
- Admission at a nightclub or bar:
- Entertainment services:

(QUESTIONS FOR UNPARTNERED WOMEN ONLY)
- How much money did men that are not your family members spend on you, if any?

(QUESTION FOR PARTNERED WOMEN ONLY)
- How much money did your partner spend on you, if any (includes gifts of any sort, drinks or food at a nightclub, bar or restaurant, flowers, etc.)?
- How much money did you spend on your partner, if any?
- How much money did men that are neither your partner nor your family members spend on you, if any?

Section 6 – Shopping Scenarios

Imagine that you were to go shopping now, but that you had to choose between spending money on yourself and spending money on buying a gift for a loved one. How much of your money would you spend on yourself versus on a loved one, in %:

- Buy something for yourself: _____ %
- Buy something for a loved one: _____ %

Total: 100%

Imagine that you were to go shopping for yourself now, but that you were limited to spending your money on certain kinds of products only. How much of your money would you spend on the 4 following product categories, in %:

- Clothes, shoes, or accessories: _____ %
- Cosmetics or other beauty products: _____ %
- Home decorative items for your main living spaces: _____ %
- Entertainment services: _____ %

Total: 100%

Imagine that you had $400 to spend for yourself today, but that you were limited to spending this money in select stores only. Please allocate a total of $400 amongst the following 8 stores:

- IKEA (furniture store) ($):
- Aldo Shoes ($):
- Office Depot (office supplies) ($):
- Future Shop (home electronics) ($):
- Simons (clothing store) ($):
- M.A.C. Cosmetics ($):
- Aldo Accessories ($):
- Birks (high-end jewelry store) ($):

Section 7 – Shopping Activities

The following questions relate to your shopping activities over the last 24 hours, irrespective of whether or not you actually bought anything. They refer to both in-store (such as buying, casual browsing through stores, just looking through store windows, looking at products, trying on clothing, etc.) and online shopping (looking at and/or buying products on commercial websites, online auction websites like EBay, and online classifieds like Craig's List).

Please select a number from 1 to 9 for each of the following items, with 1 = "strongly disagree," 5 = "neutral," and 9 = "strongly agree."

OVER THE LAST 24 HOURS, compared to most days in the last 12 months, I ...

- shopped for clothes.
- shopped for shoes.
- shopped for jewelry or other accessories.
- shopped for cosmetics or other beauty products.
- shopped for cleaning products.
- shopped for home decorative items and furniture for your main living spaces.
- shopped for health-related products.
- shopped for highly caloric foods.
- shopped for entertainment services.

(QUESTION FOR UNPARTNERED WOMEN ONLY)
- shopped for gifts for loved ones.

(QUESTIONS FOR PARTNERED WOMEN ONLY)
- shopped for gifts for my partner.
- shopped for gifts for loved ones other than my partner.

The following questions relate to your shopping activities over the last 24 hours, irrespective of whether or not you actually bought anything. They refer to both in-store (such as buying, casual browsing through stores, just looking through store windows, looking at products, trying on clothing, etc.) and online shopping (looking at and/or buying products on commercial websites, online auction websites like EBay, and online classifieds like Craig's List).

Please select a number from 1 to 9 for each of the following items, with 1 = "strongly disagree," 5 = "neutral," and 9 = "strongly agree."

OVER THE LAST 24 HOURS, compared to most days in the last 12 months, I ...

- spent time shopping in stores.
- browsed through many stores.

- traveled long distances while shopping.
- looked at many products in stores.
- spoke to male sales clerks.
- spoke to female sales clerks.

The next 2 statements relate to online shopping only (excludes in-store shopping; includes all types of online shopping and looking at products on commercial websites, online auction websites like EBay, and online classifieds like Craig's List).

Please select a number from 1 to 9 for each of the following items, with 1 = "strongly disagree," 5 = "neutral," and 9 = "strongly agree."

OVER THE LAST 24 HOURS, compared to most days in the last 12 months, I ...

- spent time shopping online.
- looked at products on a variety of different websites.

Section 8 - Various Questions

The following statements refer to how you feel TODAY.

Please select a number from 1 to 7 for each of the following items, with 1 = "strongly disagree" and 7 = "strongly agree."

- The way I look is extremely important to me.
- I am very concerned about my appearance.
- I would feel embarrassed if I was around people and did not look my best.
 -Looking my best is worth the effort.
- It is important that I always look good.
- People notice how attractive I am.
- My looks are very appealing to others.
- People are envious of my good looks.
- I am a very good-looking individual.
- My body is sexually appealing.
- I have the type of body that people want to look at.
- Professional achievements are an obsession with me.
- I want others to look up to me because of my accomplishments.
- I am more concerned with professional success than most people I know.
- Achieving greater success than my peers is important to me.
- I want my achievements to be recognized by others.
- In a professional sense, I am a very successful person.
- My achievements are highly regarded by others.
- I am an accomplished person.
- I am a good example of professional success.

109

- Others wish they were as successful as me.

Please select a number from 1 to 9 for each of the following items, with 1 = "extremely unattractive," "5 = about average," and 9 = "extremely attractive."

Compared with women you know who are roughly the same age as you, how attractive is your body to men?
Compared with women you know who are roughly the same age as you, how attractive is your face to men?

The following questions relate to what you are thinking at this moment.

Please select a number from 1 to 5 for the following items, with 1 = "not at all," 2 = "a little," 3 = "somewhat," 4 = "very much," and 5 = "extremely."

- I feel confident about my abilities.
- I am worried about whether I am regarded as a success or failure.
- I feel satisfied with the way my body looks right now.
- I feel frustrated or rattled about my performance.
- I feel that I am having trouble understanding things that I read.
- I feel that others respect and admire me.
- I am dissatisfied with my weight.
- I feel self-conscious.
- I feel as smart as others.
- I feel displeased with myself.
- I feel good about myself.
- I am pleased with my appearance right now.
- I am worried about what other people think of me.
- I feel confident that I understand things.
- I feel inferior to others at this moment.
- I feel unattractive.
- I feel concerned about the impression I am making.
- I feel that I have less scholastic ability right now than others.
- I feel like I'm not doing well.
- I am worried about looking foolish.

The following statements refer to how you feel TODAY.

Please select a number from 1 to 5 for each of the following items, with 1 = "strongly disagree" and 5 = "strongly agree."

- impulsive
- careless
- self-controlled

- extravagant
- farsighted
- responsible
- restrained
- easily tempered
- rational
- methodical
- enjoy spending
- a planner

Read each of the following adjectives and phrases carefully and indicate how well each describes you TODAY.

Please select a number from 1 to 7 for the following adjectives and phrases, with 1 ="not at all," 4 = "somewhat," and 7 = "very well."

- I often buy things spontaneously.
- "Just do it" describes the way I buy things.
- I often buy things without thinking.
- "I see it, I buy it" describes me.
- "Buy now, think about it later" describes me.
- Sometimes I feel like buying things on the spur of the moment.
- I buy things according to how I feel at the moment.
- I carefully plan most of my purchases.
- Sometimes I am a bit reckless about what I buy.

The following statements refer to how you feel TODAY.

Please select a number from 1 to 5 for each of the following items, with 1 = "strongly disagree" and 5 = "strongly agree."

- I would like to explore strange places.
- I would like to take off on a trip with no pre-planned routes or timetables.
- I get restless when I spend too much time at home.
- I prefer friends who are excitingly unpredictable.
- I like to do frightening things.
- I would like to try bungee jumping.
- I like wild parties.
- I would love to have new and exciting experiences, even if they are illegal.

Please select a number from -4 to +4 for each of the following items, with -4 = "far less than usual," 0 = "about average," and +4 = "far more than usual."

OVER THE LAST 24 HOURS, compared to most days in the last 12 months, I ...

111

- felt that I looked physically attractive (facial attractiveness).
- felt that I looked physically attractive (body attractiveness).
- felt that I looked physically attractive (overall attractiveness).
- felt sexually desirable.
- felt sexually attractive.
- looked hot.
- felt unattractive.
- flirted with men I do not know.
- flirted with male acquaintances.
- flirted with friends or co-workers.
- was attracted to a man I did not know.
- was attracted to a male acquaintance.
- was attracted to a male friend or coworker.
- noticed attractive men around campus or around town.

(THE FOLLOWING QUESTION IS FOR PARTNERED WOMEN ONLY & WAS INCLUDED IN THE LAST LONG QUESTIONNAIRE ONLY)

Please select a number from 1 to 9 for the following items, with "1 = extremely low/not sexy at all/not intelligent at all/etc., 5 = average, 9 = extremely high/extremely sexy/extremely intelligent/etc."

- Compared with most men, how attractive is your partner's body to women?
- Compared with most men, how attractive is your partner's face to women?
- Compared with most men, how sexy would women say your partner is?
- Compared with most men, what is your partner's present financial status?
- Compared with most men, what is your partner's estimated future financial status?
- Compared with most men, how high is your partner in social status at the present time?
- Compared with most men, what is your partner's estimated future social status?
- How intelligent would women say your partner is, compared to most men?

Appendix D. Orientation questionnaire.

1. Please indicate a number from 1 to 14 that best corresponds to your current annual personal income level bracket (including salary, bursaries, loans, parental assistance and spousal assistance; in Canadian dollars): _____

1 - $5,000 or less	8 - $35,001 - $40,000
2 - $5,001 - $10,000	9 - $40,001 - $45,000
3 - $10,001 - $15,000	10 - $45,001 - $50,000
4 - $15,001 - $20,000	11 - $50,001 - $55,000
5 - $20,001 - $25,000	12 - $55,001 - $60,000
6 - $25,001 - $30,000	13 - $60,001 - $65,000
7 - $30,001 - $35,000	14 - Over $65,000

2. Are you currently in a committed romantic relationship? _____

If you are in a committed romantic relationship, please answer question 3. If not, please skip to question 4.

3. a) how long have you been with your partner? _____
b) is your partner male or female? _____
c) are you married? _____. If not, are you engaged to be married? _____

For questions 4 to 7, please use the calendar provided by the experimenter.

4. Over the last 12 months, what is the typical duration of your menstrual cycle, from the start of one menstrual period to the start of the next (in days)? _____

5. What is today's date? _____

6. What was the date of the beginning of your most recent menstrual period? _____

7. How many days ago did your most recent menstrual period begin? _____

8. What was the date of the beginning of your second most recent menstrual period?

_____

9. Please indicate the choice that best describes your sexual orientation (1 to 5): _____

1 - Strictly heterosexual (partners are always male).
2 - Generally heterosexual (partners are generally male).
3 - Bisexual (partners tend to be of either sex).
4 - Generally homosexual (partners are generally female).
5 - Strictly homosexual (partners are always female).

10. Do you have any children? _____

If so, please indicate the age and sex of each child:

Appendix E. Closing session questionnaire.

1. What do you think the main topic of the study was?

2. What do you think we expected to find in terms of results (i.e., main hypothesis)?

3a. Over the course of the study, did you take any kind of hormonal contraceptives?

Kinds of hormonal contraceptives include the contraceptive pill ("birth control pill"), injections, implants, patches, and the emergency contraceptive pill ("morning after pill").

3b. If so, what kind did you use?

4a. One of the most difficult variables to measure in our study is the menstrual cycle. What was the date of the first day of your most recent menstrual period?

4b. In order to measure menstrual cycle as accurately as possible, we may want to know the first day of your next menstrual period. If so, would it be ok with you if we contacted you in a few weeks to ask?

We will email you the results of the study as soon as we've completed our analyses. Thanks again for all your hard work over the course of this study. We greatly appreciate your participation!