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DIPLOMARBEIT

Titel der Diplomarbeit

Knowledge Organization throughout the Menstrual Cycle

verfasst von

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angestrebter akademischer Grad

Magistra der Naturwissenschaften (Mag.rer.nat.)

Wien, 2013

Studienkennzahl lt. Studienblatt: A 442

Studienrichtung lt. Studienblatt: Anthropologie

Betreut von: Dipl. -Biol. Dr. Karl Grammer

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I. Introduction

Theories from evolutionary psychology (EP) would predict that men differ from women in personality, cognitive abilities and social behavior. Understanding the underlying causes of such differences are of great scientific interest. From an evolutionary perspective, these result from selection pressures on biological, psychological and socio-ecological adaptations to environmental conditions (Darwin, 1871; Eagly & Wood, 1999). Men of hunter-gatherer societies faced different adaptive challenges than women, which caused a differential development of survival and reproductive strategies (Tooby & Cosmides, 1992). To fully comprehend reproductive strategies, the uptake of information on the environment must be analyzed. Factors influencing the organization of such information are amongst others sex differences in brain organization, sex-typed cognition and hormonal influences on cognitive abilities, as well as personality and mood (as these might influence the demand for such information uptake). The current study investigates women's organizational patterns of reproductively relevant information categories, and how semantic associations between these are influenced by the possibility to conceive. Organizational patterns were analyzed through linguistic associations. Predictions regarding hormonal influences on information processing are based on EP theories regarding female reproductive behavior.

1. Asymmetrical Investment

Darwin's theory of Sexual Selection (1871) and Triver's theory of Asymmetrical Investment (1972) form the basis in understanding behavioral sex differences. Women dedicate greater effort to parental investment (gestation, pregnancy, lactation and early nursing). Therefore they are seen as the limited reproductive resource to men. Sex-typed behaviors evolved through female choice of mates, and the resulting competition between males for sexual access to the female. Women would choose to invest in long-term relationships with men who could commit to and support a potential family and not indulge in short-term mating. The skewed ratio of receptive females to males and the degree of investment that each sex devotes to their offspring, leads to a greater competition for mates. This in turn, determines the

strength of sexual selection. (Darwin, 1871) Triver's theory of Asymmetrical Investment (1972) suggests the evolution of distinct reproductive strategies. Since women pay the bigger price if an untimely or unwanted pregnancy results from sex with an unfitting partner, they tend to act with greater caution than men. To avoid this involvement with unfitting sexual candidates, women communicate in more subtle ways in order to protect themselves from being exploited by men. In other words, they avoid high risk situations, as the consequences of making a possible mistake could be severe. Assumptions about intentions of members of the opposite sex are a particularly interesting domain of human decision-making and judgment regarding systematic errors.

2. Error Management Theory (EMT)

Cognitive biases such as *confirmatory bias* (preferring information that affirms ones beliefs), *base rate fallacy* (basing judgments on specifics, rather than general information) and *illusory correlation* (falsely recognizing a connection between unrelated events) are examples of systematic errors which differ between the sexes (Nisbett & Ross, 1980). Green and Swets (1966) outline that two types of errors can be made in making judgments - the false positive (Type I) error, and the false negative (Type II) error. Type I errors are considered more costly than Type II errors, which is why researchers for instance tend to bias their judgment toward making Type II errors. This minimizes the total cost of errors, but might also increase total error rates. Selection will favor decisions which result in less costly, or even beneficial outcomes, even if those decisions result in more errors than the alternative decision. (as cited in Haselton & Buss, 2000)

2.1. Sex Differences in EMT

Early studies in this field suggest that men tend to perceive greater sexual intent in women, than do women in men (Abbey, 1987). If biased judgment rules are selected for, and men's capacity for gaining sexual access to fertile women determines their reproductive success (Symons, 1979), then men should maintain intention-reading

skills aimed to minimize the consequence of missing the chance for sexual access by over-estimating women's sexual intent (Haselton & Buss, 2000). The cost of missing a sexual opportunity by assuming the prospective mate lacked sexual intent (Type II error), is more severe than wasting courtship effort due to over-inferring sexual interest (Type II error). Following EMT logic, women should follow the reverse bias to men's judgment rules. Women have shown to possess intention-reading skills aimed to minimize the consequence of assumed commitment by underestimating men's commitment intent (Haselton & Buss, 2000). This commitment-skepticism bias describes how committing a Type II error (assuming there is no commitment intent, when in reality there is one) is less costly for women. (Haselton & Buss, 2000) If women falsely infer men's commitment and the interaction results in a pregnancy, women might end up without an investing mate. This could damage their reputation and possibly reduce mate value. Assuming that asymmetrical investment and EMT have shaped female reproductive behavior, implies the conscious or subconscious awareness of female receptivity.

3. Female Reproductive Behavior

Complex interplays of hormones control the monthly menstrual cycle, which varies around the approximate duration of 28 days. The common division is that of the follicular, ovulatory and luteal phase. Estrogen gradually increases during the follicular phase, which causes menstrual bleeding to stop and the uterus lining to thicken. Progesterone prepares the uterine lining for potential implantation of a fertilized ovum. The ovulatory phase is characterized by peak levels of follicle stimulating hormone (FSH), luteinizing hormone (LH) and estrogen, as well as very low levels of progesterone. The luteal phase (where conception is improbable) is characterized by high levels of progesterone and a slight increase in estrogen during the mid-luteal phase. (Campbell & Reece, 2006) The fertile window is timed at 6 days - the day of ovulation and 5 days leading up to ovulation (Wilcox et al., 2001). The past decades of research on human sexuality have lead scholars to believe that humans differ from most primates in the absence of visual fertility cues and have

therefore evolutionarily lost oestrus¹ and instead have evolved to communicate continuous sexuality. It was thought, that loss of oestrus served to conceal the timing of the fertile window. Recent studies, however, indicate otherwise. Suggested by Karl Grammer (1993) and later postulated by Gangestad and Thornhill (1998), the 'Ovulatory Shift Hypothesis' describes how female sexuality near ovulation differs from sexuality in other phases of the menstrual cycle (as cited in Thornhill & Gangestad, 2008). According to Gangestad and Thornhill (2008), women possess a phase of extended sexuality in non-fertile phases and a phase of oestrus near ovulation. Women's sexuality should therefore be regarded as dual.

3.1. Extended Sexuality

Extended sexuality describes the interest in sex which is not necessarily conceptive. According to Hrdy (1981), female Old World primates and chimpanzees copulate with several males of the troop in order to confuse paternity. A possible reason for this example of extended sexuality is to protect their young from harm or infanticide by adult males. Chimpanzees have also been observed to be choosier and to copulate less during times of peak fertility. They show fewer sexual initiations, and are less receptive to male advances. This tactic assumes that males cannot detect the female's fertile phase. (Stumpf & Boesch, 2005) Women are also known to be sexually active when pregnant, lactating, across anovulatory cycles and during early adolescence or menopause. Recent studies revealed no systematic differences or changes in sexual intercourse throughout the menstrual cycle of women in committed relationships, besides a slight decline during menses (Brewis & Meyer, 2005; Wilcox et al. 2004).

3.2. Fertile Sexuality

Whereby male behavior in particular shows no fluctuation over time, women's behavior changes during phases of the menstrual cycle (Gangestad & Thornhill, 1998; Grammer, 1993 as cited in Thornhill & Gangestad, 2008). Studies on female

¹ American Stedman's Medical Dictionary (2002) defines oestrus as "a periodic state of excitement in the female of most mammals, excluding humans, that immediately precedes ovulation and during which the female is most receptive to mating; heat;" (as cited in Gangestad & Thornhill, 2008, p. 1)

reproductive behavior have shown changes in female sexual motivation and subjective arousal, partner choice criteria and self-grooming. Moreover, Fisher (2004) found that women showed more intra-sexual competition when fertile in their cycles. Wilcox and colleagues (2004) observed a 24% increase in sexual activity during the six fertile days of the menstrual cycle, in comparison to other non-bleeding days. An increase in copulations mid-cycle have been observed by Hedricks (1994), and Matteo and Rissman (1984). Manson (1986) and Dobbins (1980) have however observed this peak to occur post-menstrually. (as cited in Gangestad & Cousins, 2001, p. 156) In accordance with Brewis and Meyer (2005), early studies conducted by Adams, Gould and Burt (1978), Matteo and Rissman (1984), as well as Urdy and Morris, have shown a decrease in sexual activity during menses (as cited in Brewis & Meyer, 2005, p. 465). In agreement with Hedricks (1994), it can be said that evidence on shifts in sexual activity are inconsistent and controversial (as cited in Bancroft & Graham, 2011, p. 722). Regardless of actual sexual activity, researchers have observed a rise in female sexual interest in partners other than primary partners during times of high conception probabilities. Coincidentally, Baker and Bellis (1995) found men to offer greater attention towards their female partners, around the time of ovulation (as cited in Grammer, Renninger & Fisher, 2004). This 'double-mating' behavior in humans implies a response to another female reproductive strategy - more commonly known as 'sperm-shopping'. Sperm from more than one male causes competition for the fertilization of the egg cell and offers an increase in potential genetic quality of the offspring. (Gangestad, Thornhill & Garver, 2002; Grammer et al., 2004)

3.2.1. Sexual Motivation

The common usage of 'oestrus' is accompanied by a certain degree of misconception, for oestrus may include a rise in sexual motivation, but is not solely characterized by this attribute. Findings on shifts in sexual motivation during phases of high fertility are inconsistent and seem to be influenced by a variety of outside factors. Men have shown to be attracted to certain features of women fertile in their cycles, such as body odor and increased facial symmetry (Roberts et al., 2004). Women have reported feeling greater subjective arousal and sexual desire when fertile in their

cycles. Pillsworth, Haselton and Buss (2004) even found a peak in sexual desire during fertile phases of women in committed relationships, relative to other phases of the menstrual cycle. Desire for women's primary partners was however influenced by the duration of their respective relationships. The longer the relationship lasted, the higher they reported 'extra-pair' desires to be, when fertile in their cycles (Pillsworth et al., 2004). Whether sexual desire however solely accounts for general sexual motivation or even sexual activity, is unclear.

3.2.2. Preference-Shifts and Partner Choice

If dual sexuality exists in women and sexual selection acts on mate choice, then women should prefer men displaying markers of genetic benefits during their fertile phase. Simultaneously women should be choosier, avoiding unfavorable mating candidates (who might not invest in offspring) during times of high fertility. These premises present women with trade-offs between genetic and material benefits. (Gangestad, Thornhill & Garver-Apgar, 2005a) Preferences for good long-term partners are constant throughout the menstrual cycle. Only the attraction to men as short-term partners seems to shift. Studies show increased attraction to male features that are likely measures of genetic quality, during the fertile phase. (Gangestad & Thornhill, 2008; Haselton, Mortezaie, Pillsworth, Bleske-Rechek & Frederick, 2007; Penton-Voak & Perrett, 2000) Amongst common fitness indicators preferred near ovulation, are facial and bodily masculinity including tall height, the scent of symmetry and social dominance, masculine behaviors, vocal quality and so forth (Gangestad & Thornhill, 2008). Research has shown that women prefer male and female faces resembling their own during the luteal phase when fertility is low, suggesting attraction to qualities associated with trust and perhaps even investment (DeBruine, Jones & Perrett, 2005). In studying couples, Jones and colleagues (2005) observed women to show higher commitment to primary partners when conception probabilities were low. Others observed greater sexual interest in primary partners during fertile phases, but only in couples where male partners showed high degrees of facial symmetry (suggesting developmental stability). In couples where male primary partners were asymmetrical, women showed greater interest in extra-pair copulations during their fertile phase. (Gangestad, Thornhill & Garver-Apgar, 2005b;

Pillsworth & Haselton, 2006) It is however important to mention that preference shifts are not general to all women, nor to all traits preferred. Certain traits such as financial success, intelligence, good health and friendly character, are preferred regardless of fertility phase (Gangestad et al., 2005b). Not only have partner-preference criteria shown to shift throughout the cycle, but so have preferences regarding one-self, as several studies suggest a shift in self-representation across the menstrual cycle.

3.2.3. Self-Representation

Women have shown to invest more time and effort in self-grooming and dressing 'sexier' when fertile in their cycles (Haselton et al., 2007). Women dress more provocatively during phases of high fertility (Grammer et al., 2004) and wear red articles of clothing more frequently (Beall & Tracy, in press). Women's choice of 'sexy' clothing has also proven to coincide with their sexual motivations, suggesting wardrobe choice to partly function as courtship behavior (Grammer et al., 2004). Doty and Silversthorpe (1975) observed that female faces are rated as more attractive and their scent is considered as more pleasant at that time (as cited in Gangestad & Thornhill, 2008; Miller, Tybur & Jordan, 2007; Roberts et al., 2004; Singh & Bronstad, 2001; Thornhill, 2003). Signaling fertility is however of no apparent benefit to women. The increase in physiological attractiveness may therefore be a byproduct of hormonal ratios during ovulation (Gangestad & Thornhill, 2008). Women might be sensitive to their own increase in physical attractiveness when fertile in their cycles, and actively communicate this rise through increased grooming and ornamentation (Haselton & Gangestad, 2006). Perhaps positive mood can cause an increase in self-esteem and positive self-assessment, which could be causing the desire to appear 'sexy'.

4. Mood Fluctuations Across the Menstrual Cycle

Women have reported a greater sense of overall wellbeing, positive mood, sexual arousal, volunteering motivation and general social openness during ovulation,

relative to other phases of the menstrual cycle (Doty & Silverthorne, 1975; Fessler, 2003; Haselton & Gangestad, 2006; Macrae, Alnwick, Milne & Schloerscheidt, 2002; Sanders, Warner, Bäckström & Bancroft, 1983). More specifically, Graham, Janssen and Sanders (2000) observed that women felt happier, more interested in their surroundings, more confident and even 'sexier' around ovulation. Moreover, Macrae and colleagues (2002) found women to be more receptive to social cues and more interested in social interactions when fertile in their cycles. This is suggested to enhance mating changes when conception probabilities are high. In accordance with these findings, heightened progesterone levels are suggested to coincide with an increase in symptoms associated with the premenstrual syndrome (see Kurshan & Epperson, 2006 for review) and a decrease in sensitivity towards social cues and interactions (Derntl, Kryspin-Exner, Fernbach, Moser & Habel, 2008). The increase in self-reported wellbeing and pro-social behavior could suggest the importance of gathering information on our surroundings, in order to effectively assess and thus avoid possible risk during the vulnerable time of high fertility. It is not an unreasonable presumption that hormones may influence social actions and categorizations too (Tooby & Cosmides, 1992; Erlanger, Kutner & Jacobs, 1999). If a change in physiology causes a change in cognitive patterns that profit behavioral changes for women (in the context of reproductive strategies) and vice versa, then this change in physiology must be detected on either a conscious or unconscious level. In some sense, a change in self-perception must take place when a change in perceiving the environment is recognized. Attention and perception outline the first steps in cognitive processing.

5. Sexual Dimorphism of the Human Brain

Natural Selection has determined the organization of the human brain over many generations. Sex-typed differences in human brains do not only concern size, but also lateralization and organization of individual brain areas. The left brain hemisphere controls functions involving reasoning and logic, whereby the right hemisphere controls functions associated with emotion and creativity. However both halves contribute to both functional domains and show strong bilateral symmetry in function and structure for both sexes. The two areas associated with speech and

comprehending language (Broca's area and Wernicke's area) are however situated in the left hemisphere only, with most people. The higher the degree of lateralization (typically male attribute), the greater the potential of focusing distinct areas of the brain on specific functions. If the brain is less lateralized (typically female attribute), the ability to implement several parts of the brain simultaneously is greater. (Halpern, 2000) Humans have distinctly developed temporal lobes, which are involved with processing sensory input and visual memory, emotion, deriving meaning and comprehending language. Certain structures of the limbic system, such as the amygdala (involved with the creation and storage of memories affiliated with emotional experiences) and the hippocampus (involved with formation of memory and spatial navigation) are situated there too. A greater lateralization has shown to profit greater abilities to solve visio-spatial orientation tasks (tasks favoring men), whereas lower degrees of lateralization profits speech eloquence and the solving of mathematical tasks (favoring women). (Kimura, 1992) The left and right amygdalae are involved with fear and appetite conditioning. Patients with Urbach-Wiethe disease for instance, a genetic condition resulting in focal bilateral lesions in the amygdala, fail to exhibit behaviors classified as fear reactions (Feinstein, Adolphs, Damasio & Tranel, 2011). Structures of the amygdala have found to be different in men than in women. The right side of the amygdala is associated with taking physical action, whereas the left side is connected with the recall of details, which allows for more thought rather than physical action. In remembering a horror movie, men showed higher activation in the right side of the amygdala and women in the left side of the amygdala, suggesting that men are wired to take physical action rather than assess the threatening situation on a higher level of thought processing. (Cahill et al. 2001; Lanteaume et al. 2006) The frontal lobe also entails the inferior frontal gyrus (IFG), which is associated with risk-aversion reactions as well as language processing. In accordance with Frost and colleagues (1999), Roskies and colleagues (2001) argue that verb generation, semantic encoding, category judgments and language translation all cause above baseline activity in the left IFG, however have not found regions of semantic task specificity to differ between the sexes. Although language system organization on a large scale shows no sexual dimorphism, Frost and colleagues (1999) propose the possibility of sexual differences on a microscopic level.

5.1. Hormonal Influences on Neural Functioning

Perinatal steroid hormone exposure contributes to the development of sex differences in the brain. Estradiol is at its highest level in the prenatal brain and during the first few days after birth, and then successively decreases to adult levels (McCarthy, 2008). Retracing the effects of such differences in the brain on sex-typed behavior however proves as difficult (DeVries & Södersten, 2009). Beach (1971) suggests that sex hormones should be seen as chemical sensitizers that influence mechanisms of the central nervous systems, rather than as organizing agents (as cited in DeVries & Södersten, 2009). As brain organization occurs prenatally, Erlanger and colleagues (1999) argue that the environment acts on already sex-typically wired brains. Neurobiological studies on the human forebrain have shown structures of the limbic system, such as the amygdala, the hypothalamus, and the hippocampus, to contain estrogen receptors, which when acted on cause a modification in these brain structures (Österlund & Hurd, 2001). Evidence from animal studies indicate an influence of estrogen on improved memory throughout the menstrual cycle of rats, as it aids the formation of synapses and dendritic spines in the hippocampal area. Ovariectomized rats showed less hippocampal density, where administering estradiol reversed this process (Woolley & McEwan, 1994). Lawrence and colleagues' studies (2003) on patients with Turner's syndrome or Autism have shown that defects in the production of oestrogen is associated with lack of social skills, primarily focusing on the ability to empathize. And patients receiving early oestrogen treatment were less likely to develop these deficits. (as cited in Pearson & Lewis, 2005)

6. The Evolution of Human Cognition

Cognitive processes begin with the capacity for perceiving environmental changes and comprehending sensory stimuli. Humans are highly political, scientific and artistic animals, specialized in thinking and knowing. The framework of 'Evolutionary Psychology' has dominated research on human cognition for the past years, and describes the mind to be composed of distinct thinking modules. Natural selection has specified these to solve particular types of problems throughout evolution. (Cosmides & Tooby, 1987) Amongst the cognitive abilities characteristic of humans is

the ability to associate ample representations with any given symbol. Thinking discourse, ranging from reason and private thought to communication, is governed by the capacity for accessing and even manipulating these representations with help of such symbols (Roskies et al., 2001). Characteristic of human cognition is among others the communication in written or spoken languages (Heyes, 2012) and the ability to empathize with others through introspection. This describes the unique capacity for appointing mental states to one-self and to others, while knowing that others might carry different intentions than one-self. This attribute is known as 'Theory Of Mind'.

6.1. The Evolution of Language

Given that the acquisition of language is unique to humans, it is considered that some portions of language is unique to humans as well. The principle term of 'language' needs to be fragmented, distinguishing between the sensory-motor system (phonetics - manners of articulation), the conceptual-intentional system (semantics - meaning) and the computational components of language (syntax), so that a proper description can be made. On one hand, 'language' is regarded in a broad sense, describing all possible mechanisms supporting language and speech, independent of other cognitive domains. On the other hand, the subsidiaries to the mechanisms of language in the broad sense must be considered. Fitch, Hauser and Chomsky (2005) term these descriptions the 'faculty of language in the broad sense' (FLB) and the 'faculty of language in the narrow sense' (FLN). There are two forms of language, the 'internal language' determined by the individual mind, and the 'external language' determined by entire populations. The external language is culturally shared (glossogeny) and has the potential to evolve faster than the internal language, as the genetic predisposition for the acquisition of language (phylogeny) remains comparatively unchanged. (Fitch, 2010) The biological basis of internal language and the instinct to learn language, however remains greatly controversial. In agreement with Fodor (1983) and Liberman (1996), Fitch argues that the capacity for language acquisition is partly determined by encapsulated cognitive mechanisms and on the other hand holds the ability to make use of a variety of cognitive aspects, suggesting semantic components of language to be 'executive' and partly non-encapsulated.

There are however aspects of language which are shared by all languages, of which the understanding develops during early childhood (c. age 4) and takes very few years to learn. Chomsky (1965) describes this aspect as 'Universal Grammar'. Hence an innate predisposition for language acquisition is undisputable. (as cited in Fitch, 2010) Linguists however argue about the innateness of specific components determining this ability. The evolution of vocal imitation (one aspect of FLB), has most probably been driven by sexual selection, whereby Fitch argues that the evolution of abilities to communicate complex information on our surroundings, was most probably driven by non-sexual selection, such as kin selection (Fitch et al., 2005). Jablonka, Ginsburg and Dor (2012) suggest the coevolution of language and emotions, where cultural learning and innovation play a central role. The authors elaborate on emotional control and social sensibility as precursors to the motivation to share information on the environment.

6.2. The Evolutionary Development of Sex-Typed Cognitive Abilities

Our ancestors of hunter and gatherer societies had distinct sex-typed labor-division, where men specialized in fighting predators and in hunting for food, whereby women were assigned to gather food near home base and to care for offspring. This possible division of labor has shaped sex-typed cognitive abilities in the sense that men essentially required long-distance navigational abilities and targeting skills, whereas women were shaped to predominantly specialize in short-distance navigation involving recognition and memory of landmarks, as well as perceptual discrimination attentive to minor environmental fluctuations (such as changes in a child's behavior) and decoding nonverbal communication. (Eals & Silverman, 1994; Kimura, 1996) Halpern discusses a broad catalogue of sex-typed cognitive abilities and summarizes observations on perceptual differences made by Baker (1987), Doty and colleagues (1984) and Reinisch and Sanders (1992), where women were found to outperform men in hearing pure tones, identifying and remembering odors, corporal touch sensitivity and taste (as cited in Halpern, 2000). Men and women also show differences in certain cognitive problem-solving tasks. Women are generally quicker in perceiving their surroundings. They outperform men in tests of verbal fluency, have better memory for landmarks of a specific route and outperform men in

localizing objects or finding matching objects in a given picture. (Kimura, 1992) Moreover, women outperform men in manual precision tasks and mathematical calculations. Men are generally better in mathematical reasoning, have more accurate target-directed skills, route navigation and outperform women on disembedding tests. Men tend to do better on general spatial tasks, such as rotating and object in their minds. Generally speaking, a negative correlation between verbal abilities and spatial abilities can be assumed. Verbal ability is however the most prominent sex-typed cognitive ability which is considered to appear developmentally, where girls precede boys. (Halpern, 2000; Kimura 1992) Geer and Bellard (1996) observed considerable sex differences in respect to language, more specifically in memorizing sexual sentences and in the time used in making unprimed lexical decisions on sexual, romantic and neutral words. Women showed a greater capacity for memorizing romantic sentences than men and a delay in lexical decision-making when sexual stimuli were involved. This describes a sex difference on a fundamental level of information processing, which could be a result of distinct reproductive strategies.

6.3. Hormonal Influences on Human Female Cognition

Sex-typed cognitive functioning has shown to be influenced by levels of both testosterone and estradiol (Hausmann, Slabbekoorn, Van Goozen & Cohen-Kettenis, 2000; Kimura, 1992 & 1996; Mordecai, Rubin & Maki, 2008). High levels of female hormones have been observed to enhance performance on cognitive attributes typical to women, but were negatively associated with greater performance of tasks favoring men. Women should therefore excel in cognitive tasks favoring women when fertile in their cycles and excel in tasks favoring men when menstruating (Kimura & Hampson, 1994). Nyborg (1990) proposed a theory on optimal levels for estradiol favoring specific cognitive abilities. Men with above optimal levels of estrogen and women with below optimal levels of estrogen have better spatial skills. (as cited in Halpern, 2000) The same assumption was found to apply to testosterone levels (Kimura, 1996). As steroid levels fluctuate greatly throughout the menstrual cycle, it is not unreasonable to presume a coinciding impact on fluctuations in cognitive abilities typical to women.

6.3.1. Social Competence, Person-Perception and Verbal Skills

The ability to mentalize about other's thoughts and intentions is characteristic of human cognition. Social competence is a skill generally favoring women, especially when considering the ability to empathize with others (Pearson & Lewis, 2005), and is emphasized when conception probability is high (Macrae et al., 2002). Several findings suggest fluctuations in cycle-dependent person-perception processes, where women show an enhanced sensitivity towards and greater ability to categorize men and access stereotypic material from semantic memory when fertile in their cycles (Krug, Plihal, Fehm & Bjorn, 2000; Macrae & Bodenhauser, 2000; Macrae et al., 2002). It was observed that one component of empathic behavior - facial affect recognition - improved during the fertile follicular phase when estrogen levels were high (Derntl et al., 2008; Derntl, Hack, Kryspin-Exner & Habel, 2013). Generally speaking, emotion recognition accuracy was higher during the early follicular phase of the menstrual cycle and negatively correlated with progesterone levels during the midluteal phase. Similarly, Hampson and Kimura (1988) observed that verbal skills increased mid-cycle and decreased during menses. Later findings by Hampson (1990) reported women's verbal articulation speed to positively correlate with high estrogen levels. (as cited in Hausman et al., 2000) Erlanger and colleagues (1999) furthermore report Gordon and colleagues (1986) observations, that both LH and FSH were positively associated with an increase in verbal fluency. These fluctuations in person-perception and fertility associated social skills could possibly improve mating chances (Macrae et al., 2002).

7. Women Avoid Risk When Fertile in their Cycles

Women are described to be better at encoding basic emotions and mental states, especially in recognizing and remembering fearful faces, than are men (Campbell et al., 2002). Perhaps fear recognition has determined sexual dimorphism in recognizing emotions. Observed sensitivity towards elements of risk would propose an increased demand in avoiding potential risk situations during the vulnerable time of high fertility.

7.1. Fear Recognition

The involvement of the amygdala in the comprehension of emotions is indubitable, and shows particularly increased activation to fearful faces. Relative to men, women show increased activation in the left amygdala and hippocampus when presented with faces bearing expressions of fear (Calder, Lawrence & Young, 2001; Campbell et al., 2002; Morris et al., 1996). These neurological differences seem to be influenced by circulating hormones, as Pearson and Lewis (2005) documented a positive correlation between high levels of estrogen during the fertile pre-ovulatory phase and accuracy in recognizing fearful faces. Furthermore, Derntl and colleagues (2008) observed a negative correlation between progesterone and the recognition accuracy in anger and disgust evaluations. Not only fear recognition shows fluctuations throughout the menstrual cycle, as was found by Guapo and colleagues (2009), who observed a positive correlation between high estrogen levels and a recognition accuracy for anger and sadness, particularly in male mimicry.

7.2. Avoiding Incest and Rape

From an evolutionary perspective, women should have a higher awareness for potentially costly sexual behaviors (such as sexual assault or inbreeding) and show greater sensitivity towards sexual disgust, especially during phases of high fertility (Bröder & Hohmann, 2003). In disgust domains such as 'food, animals, body products, sex, death, hygiene etc.', Fessler and Navarrete (2003) observed that only the sensitivity towards sexual disgust was positively correlated with conception probability. In accordance with previous studies on antierotic attitudes, genetic relatives avoid each other as sexual partners. Women specifically avoid interacting with male relatives when fertile, relative to other phases of the menstrual cycle. (Lieberman, Pillsworth & Haselton, 2011) In investigating women's cell phone calls throughout the menstrual cycle, Lieberman and colleagues (2011) observed that women avoid interactions with their fathers when fertile in their cycles. In questioning college students on how they spent their past 24 hours, Chavanne and Gallup (1998) observed that women avoid general risk-taking behaviors during the ovulatory phase of their menstrual cycles. On a not entirely unrelated note, Goolkasian (1980) found a change in pain sensitivity, where women showed a higher

sensitivity towards painful stimuli during their fertile phase. Perhaps this enhanced sensitivity towards pain is in some way related to higher acuity in recognizing risk, as this would suggest adaptive design.

8. Knowledge Organization and Language

In order to fully comprehend cognitive fluctuations, the manner in which information is processed must be investigated. Knowledge is stored through organizing information into patterns reflecting relationships between certain concepts and the details which accompany them. This mechanism results in different knowledge structures. The process of learning is most commonly investigated by researching the amount of knowledge stored in memory, whereas additional insights on how knowledge is organized prove to be vital in fully comprehending how information is processed. (Johnson-Laird, 1994; Kraiger, Ford & Salas, 1993) Rowe and colleagues (1996) outlined the core methods in assessing knowledge structures. These include *interview studies*, 'thinking aloud' protocols (*process tracing*), *time* and *accuracy measures* and *conceptual assessments* (as cited in Day, Arthur & Gettman, 2001). Structural assessments are commonly used in understanding knowledge structures, as they entail similarity judgments of given concepts (Schvaneveldt, Durso & Dearholt, 1989). Our socially complex environments have shaped the necessity of possessing two major cognitive abilities - steady internal representations of the environment (stable mental models), and an adaptive mind capable of overriding rigid mental models with new information, if required by the environment (Cosmides & Tooby, 1987). Repeated exposure to specific stimuli will gradually form belief systems (that is, norms and stereotypes) and thus contribute to the creation of mental models or semantic memory. The neocortical 'slow-learning' system is involved in this process. The hippocampal 'fast-learning' system contributes to the formation of temporary representations of momentary stimuli, 'episodic memory'. (McClelland, McNaughton, O'Reilly, 1995) Thinking in categories spares us the effort of complex thinking. The mind will not waste costly resources on paying attention to familiar items which can be encoded efficiently through processing driven by categorical thought. Investigating the variability in concept constructions contributes to understanding how information is processed (Macrae & Bodenhausen, 2000).

8.1. Semantic Processing of Reproductively Relevant Information

Representation and thus processing of meaning play a central role in understanding how knowledge is organized, language playing a foundational role in human cognition. Investigating the role semantics plays in the processing of language can aid this understanding (Roskies et al., 2001). The manner in which reproductively relevant information is processed, is particularly interesting in this domain. Geer and colleagues have focused a series of investigations on the processing of sexual information. In 1993, they for instance found, that sexual stimuli is processed differently from non-sexual material and that this processing differs between the sexes (as cited in Geer & Bellard, 1996). The authors commonly used unprimed lexical decision tasks (LDT) to investigate this phenomenon. Participants were presented with a target letter string and asked to judge if the stimuli was a word or not. The time spent deciding whether the target was a word, was measured. The use of such fairly uncomplex procedures, the LDT being one of the simplest paradigms, allows the analysis of rudimentary processes free from intervening variables. In 1997, Geer and Melton used a slightly more complex method to investigate the processing of sexual information through a lexical ambiguity task, and found sexual content induced delays (SCID) with a group of target words which themselves were not explicitly sexual, but considered associated with 'double-entendre' words. This SCID was stronger with female participants. In studying memory for sexual sentences, Geer and Bellard (1996) found that men have an enhanced memory for explicit sexual material. In agreement with existing gender stereotypes, women showed an enhanced memory for relationship oriented and romantic material. In a more recent study conducted by Bush and Geer (2001), the memory for negative-emotional, neutral and sexual words was investigated using Jacoby's dissociation framework (1991). The framework allows the evaluation of influences on automatic 'implicit' and conscious 'explicit' memory. Participants were asked to remember a list of words assigned to them and later fill out word stems with, on the one hand, words they were given and on the other hand with words they were not given (inclusion and exclusion test). The second part of the dissociation procedure entailed mathematical transformations which approximate automatic influences (implicit memory) and conscious recollection, compared to baseline probabilities of using certain words regardless of an experiment setting. Jacoby then divided participant's attention to

specific stimuli and found that only explicit recollection was affected. Bush and Geer (2001) argue that semantic saliency of stimuli enhance the likelihood of being detected and thus remembered, compared to less noticeable stimuli and therefore largely affect explicit memory. They observed that this applied to sexual stimuli for both men and women and did not apply for neutral or emotional words. Moreover, the authors found women to use romantic words in stem completion exercises more frequently than did men. These findings suggest that reproductively significant information in form of language is processed differently than other information, and that the definition of reproductively relevant stimuli could differ between the sexes.

8.2. Knowledge Organization Across the Menstrual Cycle

Natural and sexual selection have constructed specific frameworks acting on humans, sculpting optimal thought programs designed to deal with environmental changes. As hormonal fluctuations have shown to influence specific motivational systems, even on rudimentary levels of information processing, it is not unreasonable to presume fluctuations in associative thought throughout the menstrual cycle. To effectively understand how these fluctuations come about, the current study investigates how associations between sexual words, romantic words, neutral words and words signifying risk vary across the menstrual cycle. Beatrix Haslinger (2000) conducted a similar experiment, analyzing associations between the three word categories used by Geer and Bellard (1996) - neutral, romance, sex. The current study investigates associative fluctuations between fewer words per category and considers words signifying risk as reproductively significant stimuli. Haslinger's measurements of estrogen and testosterone levels were partly inconclusive and were not repeated in the current investigation.

9. Hypotheses

1. When conception probability is high, the association of sexual words with words signifying risk, will be greater than in other phases of the menstrual cycle.
2. The association between sexual and romantic words is greater when conception probability is high, than in other phases of the menstrual cycle.
3. Women in committed relationships associate less between sexual words and words signifying risk, as the romantic component is satisfied.
4. The association between sexual words and words signifying risk, and between sexual and romantic words will be weaker when conception probability is low.

II. Method

1. Materials and Participants

Four Apple Computers (two 'Mac Mini 2.4', one 'Mac Mini 2.0' and one 'Mac Mini 2.26') were used for the purpose of this experiment. Data from the word association test was collected through a Python interface, programmed by Karl Grammer. The same display resolution (1280 x 1024) was chosen for all four computer screens. The collected data was analyzed with the Pathfinder Software 6.3 and SPSS 19. All participants were female students and their mother tongue was German. They participated at their free will and received no pay.

2. Study Design

To investigate the changes in associative thinking of female students throughout the menstrual cycle, participants were asked to complete a test on word associations. Using the pathfinder model, Haslinger (2000) investigated the changes in word associations across the menstrual cycle, using 45 words from Geer and Bellard's study (1996) of three word categories - romantic, sexual and neutral. However, Haslinger's sample sizes for specific phases of the menstrual cycle were small and unevenly distributed. As the word list from 1996 was in English and possibly outdated, German speaking female students were asked to brainstorm on the word categories necessary for the word association test. The 16 words selected for the current study were four words of the word category 'neutral', four words of the category 'romantic', four words of the 'sexual' word category and four words signifying 'risk.'

3. Word Selection

The word selection was conducted at the main university campus of Vienna / Austria, and consisted of a two-step questionnaire. 36 female students aged 19-36 ($\bar{X} = 24$, $SD = 3.8$) were asked to brainstorm on all four word categories by writing down at least 10 word examples per category (see Appendix A for German original). 10 words

which were mentioned more than 5 times were selected as examples for each word category (Table 1). The word selection was also discussed with Human Ethology students of the department of Anthropology in Vienna. 39 female students aged 18 to 36 ($\bar{X} = 24$, $SD = 4.2$) were asked to rate the resulting 40 words on affiliation with their subsequent word categories, following a scale of one to four (see Appendix B). The four words that scored the strongest affiliation with their categories were chosen for the word association test (Table 2; see Appendix C for German original).

Table 1.

40 Words Chosen for the Affiliation Rating

<i>romance</i>	<i>sex</i>	<i>risk</i>	<i>neutral</i>
togetherness	oral	venture	pH-value
candlelight	fuck	uncertainty	table
sunset	humping	threat	viewless
dinner	anal	adventure	white
tenderness	lust	parachuting	water
love	blow	courage	clean
kissing	porno	sports	Switzerland
wedding	orgasm	car-race	computer
rose	penis	fear	book
flower	sex	motorcycle	house

Table 2.

16 Words Chosen for the Main Experiment

<i>romance</i>	<i>N</i>	<i>sex</i>	<i>N</i>	<i>risk</i>	<i>N</i>	<i>neutral</i>	<i>N</i>
love	34	orgasm	35	threat	35	table	28
tenderness	34	fuck	33	venture	31	house	25
kissing	32	humping	35	parachuting	31	white	29
candlelight	29	sex	36	car-race	29	Switzerland	30

Number of students (out of 39) evaluating highest affiliation to word categories

4. Test on word association

4.1. Procedure

The main experiment was conducted at the Biocenter, Vienna and encompassed approximately 45 minutes. Female participants were asked to partake in a test on word associations in form of a lexical-semantic task, and were later asked to fill out a questionnaire. Participants were asked to rate 240 word pairs on their perceived similarity, with help of a slider ranging from 0 to 100 (0 meaning 'no similarity', 100 meaning 'absolute similarity'). The word pairs were presented in random order. As soon as the rating was submitted, the next word pair appeared automatically. Each participant rated all 240 combinations. The data was collected through the python program 'words' designed by Prof. Dr. Grammer (Figure 2) and saved as individual text files. Once the association test was completed, the participants were asked to fill out the questionnaire (see Appendix D), assured that their data is treated confidentially and only used for academic purposes. Cardboard dividers were used to create a private atmosphere (Figure 1).



Figure 1.

Experimental Setup, Department of Anthropology, Vienna University, Austria

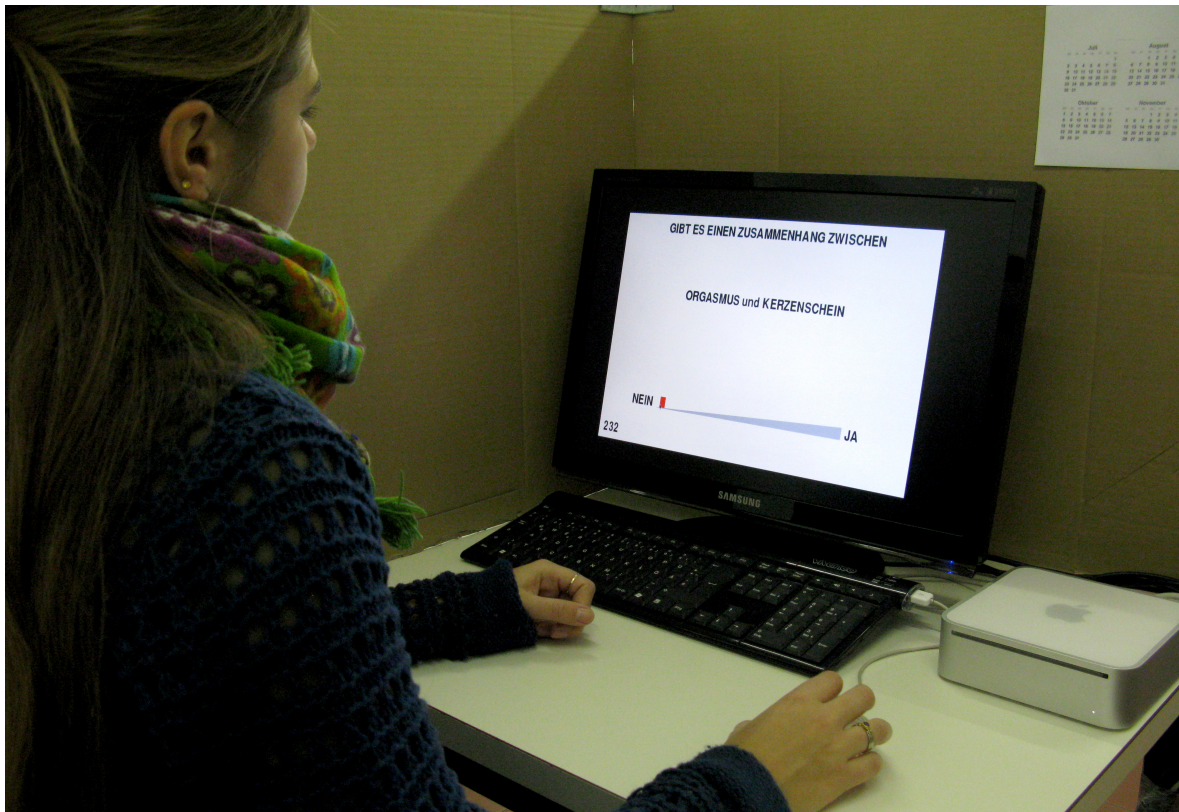


Figure 2.

Test on Word Association - Python Program

4.2. Conception Probability according to Jöchle

The conception probability was calculated according to Jöchle's table of receptivity from 1973 (Table 3). Participants were asked to write down the date of the first day of their last menstrual bleeding, as well as the average length of their cycle. The cycle lengths were then standardized to 28 days and the conception probability was chosen for >10%. The following calculation was made:

$$\text{standardized cycle length} = \frac{\text{day of cycle}}{\text{average cycle length} \times 28}$$

The participants were grouped according to their conception probability. Participants using hormonal contraceptives, were labeled as the 'control group', participants with a 10 % or higher probability to conceive as 'high conception probability (High Cp)'

and those with conception probabilities lower than 10 % as 'low conception probability (Low Cp)'.

Table 3.

Conception Probability (Cp) for Each Day of the Menstrual Cycle

Day	Cp in %	Day	Cp in %
1-4	0	15	10.5
5-6	17.2	16	4.8
7-8	29.9	17	2.5
9	23.7	18	3.1
10	30.0	19	2.8
11	32.6	20	2.0
12	40.8	21-22	4.7
13	28.3	23-24	1.9
14	26.5	25-30	0

Jöchle, 1973

4.3. Questionnaire

The questionnaire entailed the Neuroticism-Extraversion-Openness Five-Factor Inventory 'NEO-FFI' (Costa & McCrae, 1992; German translation by Borkenau & Ostendorf, 1993), the Positive and Negative Affect Schedule 'PANAS' (Watson et al., 1988), the Socio-sexual Orientation Inventory Revised 'SOI-R' (Penke & Asendorpf, 2008) and questions regarding relationship status as well as the menstrual cycle. The statistical analysis of the questionnaires was conducted with the software package 'SPSS 19' and compared with the variable 'similarity rating', in which the similarity ratings for word combinations were listed according to their respective word group affiliation.

The SOI-R consists of 9 questions, the evaluation of which results in four socio-sexual facets: attitude, behavior, desire and the sum of these three. The questionnaire is designed to identify tendencies in having uncommitted sexual relationships. Three

questions are answered per socio-sexual orientation facet: Attitude (opinion on uncommitted sex), behavior (number of sex partners) and desire.

The NEO-FFI comprises 60 questions (12 questions per personality domain), which amount to the classification of the 'Big Five' personality traits: Neuroticism, Extraversion, Openness to Experience, Agreeableness and Conscientiousness. The five personality traits are described as follows:

Neuroticism

People with high levels of neuroticism tend to feel nervous, anxious, sad and insecure. They show tendencies towards feeling awkward and worrying about their health. They are prone to unrealistic ideas, are less capable of controlling their desires and processing stressful situations.

Extraversion

People with high levels of extraversion are sociable, active, talkative, person-oriented, affectionate, optimistic and cheerful. They respond well to encouragement and like excitement.

Openness to Experience

People with high levels of openness to experience appreciate new experiences, prefer change, are inquisitive, creative, imaginative and have independent opinions. They are interested in other cultures and public affairs.

Agreeableness

People with high levels of agreeableness are altruistic, caring, understanding and sympathetic. They tend to trust other people, to cooperate and to accommodate others. They have a strong need for harmony.

Conscientiousness

People with high levels of conscientiousness are tidy, reliable, hard working, disciplined, punctual, meticulous, ambitious and systematic.

The PANAS consists of 20 items, which identify the participant's momentary mood. Participants are asked to evaluate their momentary mood on a scale of one to 10, considering the following descriptors:

Enthusiastic, interested, determined, excited, inspired, alert, active, strong, proud, attentive, scared, afraid, upset, distressed, jittery, nervous, ashamed, guilty, irritable and hostile.

5. Association Networks: The Pathfinder Method

Raw data produced by the participants, is a direct representation of rated similarities between word pairs. These direct representations are not considered informative, as they display a high density of ratings. The pathfinder method calculates average networks to facilitate the understanding of rated similarities. This method stems from Roger Schvaneveldt (1990). The resulting pathfinder network is a model of knowledge representation derived from proximity data. Words are displayed as nodes, and the rated associations between words are shown as links between the nodes. The networks are based on graph theory, which analyzes structures of nodes and links. Individual associative networks are generated, showing the rated similarities of word pairs. The associations are treated as proximity data and appear in raw proximity data (*DATANET*) as direct representations, also called *weights*. Weights signify the strength of respective associations. The pathfinder networks were generated through the software 'Pathfinder 6.3'², where the pattern of entity clusters is visualized by a tree-structure of the proximity data, showing patterns of connections between concepts.

5.1. Graph Theory

The mathematical study of structures entailing *nodes* connected through *links*, defines nodes as a finite set and the links as respective subsets of individual node pairs. Commonly, the graph is displayed as a tree diagram in which the nodes are illustrated as points and links as lines connecting these points. The alternating sequence in

² Pathfinder 6.3 acquired through Interlink; product website: <http://interlinkinc.net/Pathfinder.html>

which the nodes are connected is described as a *walk*, whereby the number of links in the walk describes the *length* of a walk. A walk can be seen as a *path*, when all its nodes are distinct (in a *cycle*, the walk contains distinct nodes except for the first and last nodes, which are identical). A tree for instance, is a connected graph which contains no cycles. The graph can be referred to as a *digraph*, if its links are directed (*arcs*) and are communicated as arrows pointing from the initial node to the next. If the links are undirected (*edges*) and shown as simple lines connecting two nodes, the graph is also undirected. The graph can be called a *network*, if the links are associated with positive real numbers like weights. *Weights* (w) provide quantitative information to accompany the network structure of the graph. The sum of the weights associated with the links in the path describes the *weight of a path*. Matrices can be used to communicate the attributes of a graph:

- The *adjacency matrix* is a $n \times n$ matrix where $a_{ij} = 1$ if the graph contains the link ' ij '. If it does not, then $a_{ij} = 0$.
- Similarly the *network adjacency matrix* represents a network, where $a_{ii} = 0$, $a_{ij} = w_{ij}$ and $i \neq j$ if the network contains the link ' ij '. If it does not, $a_{ij} = \infty$.
- The *distance matrix* of a network is also a $n \times n$ matrix, where the minimum distance from node i to j is d_{ij} . In the case of a *disconnected network*, where there is no path from node i to j , $d_{ij} = \infty$. If the network consists of undirected links, its matrix is referred to as symmetric.

5.2. The Pathfinder Network (PFNET)

Networks as models communicate patterns in proximity data and thereby allow the interpretation of various concepts. Analyzing how concepts are connected with each other, facilitates the interpretation of memory and knowledge organization.

5.2.1. The r Parameter

The DATANET is a direct representation of the distances between nodes. However, due to the density of links in the network, it is not very informative. If the DATANET link is a minimum weight path, it should have the same weight as in the PFNET. The

idea is to have the same distance matrix for both DATANET and PFNET. The character of a PFNET is determined by two parameters (r and q). The q parameter limits the amount of links (indirect proximities) included when generating the network. The r parameter defines the computation of the weight of a path from the weights of the links in the path.

A distance function is needed to compute distances in DATANETs. The distance measure should preserve the ordinal relationships between link weights and path weights. The *Minkowski distance measure* fulfills this requirement. Given the path (P), consisting of (k) links with the weights ($w_1, w_2, w_3, \dots, w_k$), the weight of a path (w_P) is calculated as follows:

$$w_P = \left[\sum_{i=1}^k w_i^r \right]^{1/r}$$

If $r = 1$, then all links in a certain path have the same weight, which determines the weight of the path. Naturally, different r parameters create different PFNETs. If the scale represents ordinal information, then the pathfinder only produces consistent PFNET structures if $r = \infty$.

5.2.2. The q parameter

The q parameter specifies an upper limit for the number of links found in a path which are used to determine the minimum distance between nodes of the DATANET. It thereby controls for the optimal density of links in the PFNET. If we have n entities, q values can range from 1 to $n - 1$. The DATANET and PFNET are the same if $q = 1$. If $q = n - 1$, there is no limit to the number of links in the paths.

5.2.3. Minimal PFNET

The minimal PFNET ($r = \infty$ and $q = n - 1$) was chosen for the current study, as it has the fewest links possible and assumes an ordinal distribution of data. The data of this

study is symmetrical, meaning the distance from node A to node B is the same as the distance from node B to node A. The resulting PFNET is therefore undirected. In order to find ideal values for both r and q parameters, possible PFNETs are correlated with the original distances. In networks that showed the highest correlations, the parameters which resulted in lowest density were chosen. (Schvaneveldt et al., 1989)

III. Results

1. Descriptive Statistics

Out of 121 participants 8 were excluded from the analysis, as they failed to note the date of the first day of their previous menstrual bleeding. All variables were tested for normal distribution. The SOI variables 'attitude' and 'sum', the NEO-FFI variables 'Neuroticism, Extraversion, Openness to experience, Agreeableness, and Conscientiousness', as well as the PANAS variables 'proud and excited, determined and attentive, upset and irritable, nervous and jittery' proved to follow a normal distribution. The SOI variables 'behavior and desire' as well as the PANAS variable 'ashamed and scared' did not follow a normal distribution. The similarity ratings followed a normal distribution within the word group combinations: 'sex_risk' and 'sex_romance', whereas the ratings in all other word group combinations did not. Participants were aged between 18 and 32 years ($\bar{X} = 22$, $SD = 2.95$, $\sigma^2 = 8.67$, $N = 110$). 109 participants reported being heterosexual, 3 bisexual and one reported being homosexual. 53 participants reported being in a committed romantic relationship (46.9%), of which most reported being very satisfied with their relationship (Table 4). 60 participants reported not being in a relationship (53.1%), of which 35 participants were looking for a partner (60.3%). Current relationship durations were reported to range from three to 108 months (Table 6).

Table 4.

Reported Satisfaction with Current Relationship of Women with Partners

Relationship satisfaction	Frequency	Valid percent
Not satisfied	1	1.9
2	0	0.0
3	2	3.8
4	3	5.7
5	4	7.5
6	18	34.0
Very satisfied	25	47.2
	<i>N = 53</i>	<i>100</i>

Participants in a committed relationship reported to generally have a regular menstrual cycle or fluctuations of one day (c. 74%). Similarly, most participants without partners (c. 63%) reported having a regular menstrual cycle or fluctuations of one day (Table 5). All participants reported a mean cycle length of 28 days, ranging from less than 20 to more than 35 days (Table 6).

Table 5.

Cycle Length Variations of all Participants

Cycle length variation	Participants with partners		Participants without partners	
	Frequency	Valid percent	Frequency	Valid percent
very regular	13	33.3	15	28.8
deviation of 1 day	16	41.0	18	34.6
deviation of 1 week	5	12.8	13	21.7
very irregular	5	12.8	6	10.0
	<i>N</i> = 39	100	<i>N</i> = 52	100

Table 6.

Average Duration of Menstrual Cycle (in Days) and Relationship Duration of Women with Partners (in Months)

	Average Duration of Menstrual Cycle (in Days)	Relationship Duration (in Months)
\bar{X}	28.19	35
Min.	< 20	3
Max.	> 35	108
SD	3.61	26.63
σ^2	12.99	708.94
<i>N</i>	109	52

Conception probability (Cp) was calculated according to Jöchle (1973). A 10% conception probability or higher was calculated for 34 participants. 44 participants

had a conception probability below 10%. 35 participants used hormonal contraceptives and were used as the control group. 10 women with partners had a high conception probability and 16 were calculated to have a low Cp the day of the word association test. 24 women without partners had a high Cp, whereas 28 women were calculated to have a low Cp. Most women of the control group (77.1%) reported being in a committed relationship (Table 7).

Table 7.

Conception Probability (Cp) Calculated for Women with and without Partners

Cp	All participants		Participants with partners		Participants without partners	
	Frequency	valid %	Frequency	valid %	Frequency	valid %
Low Cp	44	38.9	16	30.2	28	46.7
High Cp	34	30.1	10	18.9	24	40.0
Control	35	31.0	27	50.9	8	13.3
	<i>N = 113</i>	100	<i>N = 53</i>	100	<i>N = 60</i>	100

Cp Calculated according to Jöchle (1973)

Socio-sexual orientation was calculated for all participants. The three facet scores and the sum of these showed a wide variability of sexual openness within the sample. The mean scores for the respective facets however were considerably low (Table 8). The five personality facets of the NEO-FFI were calculated for all participants. The student sample encompassed women with high scores for the facets ‘openness to experience’, ‘agreeableness’ and ‘conscientiousness’, relative to ‘neuroticism’ and ‘extraversion’. The range of values is larger for ‘neuroticism’ than for the other facets, ‘agreeableness’ having the lowest variance and standard deviation, whereby participants did generally not have highest values for this facet. Generally speaking, the sample consisted of women with high values for ‘openness to experience’ (Table 9).

Table 8.

Revised Socio-sexual Orientation Inventory (SOI-R) of all Participants

	SOI-R facet scores			
	Behavior	Attitude	Desire	Sum
\bar{X}	6.64	15.41	9.75	31.94
Min.	3.00	3.00	3.00	9.00
Max.	22.00	27.00	27.00	76.00
SD	4.29	7.14	5.62	13.13
σ^2	18.36	51.01	31.61	172.45
<i>N</i>	111	111	108	108

Table 9.

'Big Five' Personality Facets Calculated for all Participants (NEO-FFI Model)

	Big five personality facets				
	N	E	O	A	C
\bar{X}	1.95	2.36	2.75	2.75	2.59
Min.	0.33	0.67	1.58	1.42	0.83
Max.	4.00	3.58	3.83	3.58	3.75
SD	0.70	0.56	0.49	0.45	0.54
σ^2	0.49	0.31	0.24	0.20	0.29
<i>N</i>	112	113	109	110	112

N = Neuroticism; E = Extraversion; O = Openness to Experience;
A = Agreeableness; C = Conscientiousness

The rotated principle component analysis of the participant's mood resulted in five representative factors shown in table 10. The Kaiser-Meyer-Olkin measure of sampling adequacy (KMO) of 0.811 and the Bartlett's test of sphericity of 1135.476 (Table 12) suggest the analyzed data to be suitable for structure detection. The proportion of variance possibly caused by underlying factors is moderately high (close to 1.0) declaring the factor analysis as useful with the data at hand. The investigated variables are related and suitable for structure detection ($p < 0.01$). As is seen in table 11, the highest percentage of variance is accounted for by the first two

components, as opposed to the following three. The extracted components explain nearly 67% of the variability in the original 20 variables.

Table 10.

Principle Component Analysis of Current Mood Reported by all Participants (PANAS Model)

Original PANAS categories	Mood Factors				
	Ashamed, scared	Proud, excited	Determined, attentive	Upset, irritable	Nervous, jittery
Active	0.162	0.271	0.630	0.075	-0.240
Enthusiastic	0.031	0.619	0.523	-0.020	-0.121
Alert	0.146	0.180	0.805	0.044	0.045
Determined	-0.098	0.350	0.680	-0.193	-0.231
Attentive	-0.262	0.205	0.770	0.023	0.171
Distressed	0.143	-0.055	0.183	0.682	0.436
Upset	0.316	-0.002	0.000	0.730	0.086
Guilty	0.769	-0.164	0.074	0.282	0.085
Hostile	0.535	0.204	0.015	0.507	-0.077
Nervous	0.464	0.146	0.060	0.232	0.585
Interested	-0.203	0.599	0.360	-0.209	0.233
Strong	-0.094	0.566	0.265	0.091	-0.537
Jittery	0.228	0.131	-0.142	0.341	0.637
Ashamed	0.752	0.060	-0.043	0.240	0.174
Proud	-0.066	0.647	0.330	0.245	-0.236
Scared	0.888	-0.011	0.048	0.050	0.194
Irritable	0.208	0.079	-0.102	0.759	0.069
Excited	0.222	0.815	0.132	0.139	0.105
Inspired	0.200	0.724	0.224	-0.033	0.172
Afraid	0.718	0.226	-0.107	0.189	0.041
<i>N</i>	<i>109</i>	<i>109</i>	<i>109</i>	<i>109</i>	<i>109</i>

Varimax Rotated and Kaiser-normalized

Table 11.

Factor Analysis of Participant's Mood - Total Variance Explained (First 5 Components shown)

Component	Initial Eigenvalues			Extraction Sum of Squared Loadings		
	Total	% Variance	Cum. %	Total	% Variance	Cum. %
1	5.170	25.851	25.851	5.170	25.851	25.851
2	4.689	23.443	49.295	4.689	23.443	49.295
3	1.270	6.348	55.643	1.270	6.348	55.643
4	1.165	5.823	61.465	1.165	5.823	61.465
5	1.095	5.477	66.942	1.095	5.477	66.942

Table 12.

Kaiser-Meyer-Olkin Measure and Bartlett-Test of Sphericity for Factor Analysis on Mood, Calculated for all Participants

KMO and Bartlett's Test		
KMO Measure of Sampling Adequacy		0.811
Bartlett's Test of	approx. Chi-Square	1135.476
Sphericity	df	190
	Sig.	0.000

Mean scores for respective mood factors show that most women felt 'proud and excited' or 'nervous and jittery'. Highest scores were obtained for the mood factor 'ashamed and scared', whereas lowest scores were obtained for 'determined and attentive' (Table 13).

Table 13.

Descriptive Statistics of the Five Mood Factors Calculated for All Participants

	Mood Factors				
	Ashamed, scared	Proud, excited	Determined, attentive	Upset, irritable	Nervous, jittery
\bar{X}	0.017	0.040	-0.005	-0.007	0.039
Min.	-1.347	-2.158	-2.448	-2.130	-1.863
Max.	5.374	2.123	2.329	2.845	2.907
SD	1.023	0.999	0.989	1.008	1.008
σ^2	1.046	0.999	0.978	1.016	1.016
<i>N</i>	109	109	109	109	109

2. Data Analysis

2.1. Average Network Comparisons with Pathfinder Software

Minimal Average PFNETs were produced for the participant groups 'High Cp', 'Low Cp', 'Control', 'Participants with partner' and 'Participants without partner'. The *r* parameter was set to infinitive and the *q* parameter was set to $n-1 = 15$. The undirected average networks have 16 nodes, 16 links, and zero loops. Network comparisons were calculated by correlating the respective average networks in the pathfinder software (Tables 14 and 15). According to the averaged network comparisons, women with partners have very similar association networks to women without partners ($c_{sim} = 0.753$). Women with or without partners have the highest degree of similarity for their averaged networks, closely followed by the comparison of women with high Cp and low Cp ($c_{sim} = 0.704$). Women with a high Cp and the control group have the lowest degree of similarity ($c_{sim} = 0.527$), closely followed by the comparison of women with a low Cp to the control group ($c_{sim} = 0.611$). The probability of obtaining these many or more links in common by chance is very small for all comparisons ($t_{prob} = 0.000$).

Table 14.

Comparisons of Averaged Pathfinder Networks of Participants with or without Partners and Different Conception Probabilities

Comparison of averaged pathfinder networks		
	With Partner and without Partner	Low Cp and high Cp
com	14.000	14.000
ccom	12.000	11.867
sim	0.824	0.778
csim	0.753	0.704
tprob	0.000	0.000

com = number of links common to both networks; ccom = com corrected for chance (difference between expected and observed com); sim = similarity of networks ($\text{com} / (\text{total links} - \text{com})$); csim = similarity of networks corrected for chance (difference between expected and observed sim), tprob = probability of obtaining this many or more com by chance³

Table 15.

Comparisons of Averaged Pathfinder Networks of Participants with Different Conception Probabilities

Comparison of averaged pathfinder networks		
	Low Cp and control	High Cp and control
com	13.000	12.000
ccom	10.867	9.867
sim	0.684	0.600
csim	0.611	0.527
tprob	0.000	0.000

³ from 'Quick Pathfinder' Product Manual; Interlink.Inc.

2.2. Illustration of Averaged Pathfinder Networks

The pathfinder program illustrates PFNETs as shown in figures 3 through 8 (see Appendix C for translation). Words of the word group 'risk' (orange) are clustered in the top left corner in all PFNETs. Sexual words (blue) are all situated in the top right corner, romantic words (green) form the central cluster in all PFNETs, whereas neutral words (purple) are situated in the bottom part. The respective word groups are isolated from others and do not mix with other word groups.

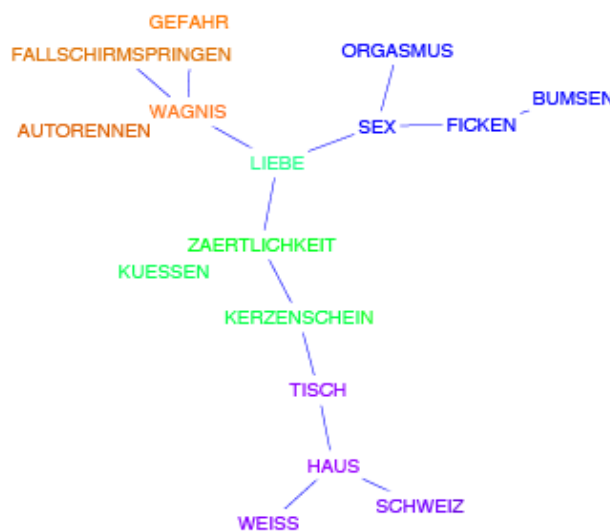


Figure 3.
Averaged Pathfinder Network for
Participants with High Cp ($N = 34$)

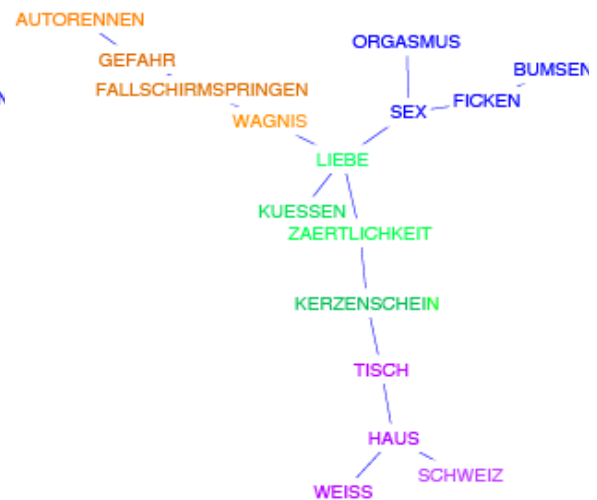


Figure 4.
Averaged Pathfinder Network for
Participants with Low Cp ($N = 44$)



Figure 5.
Averaged Pathfinder Network for the
Control Group ($N = 35$)

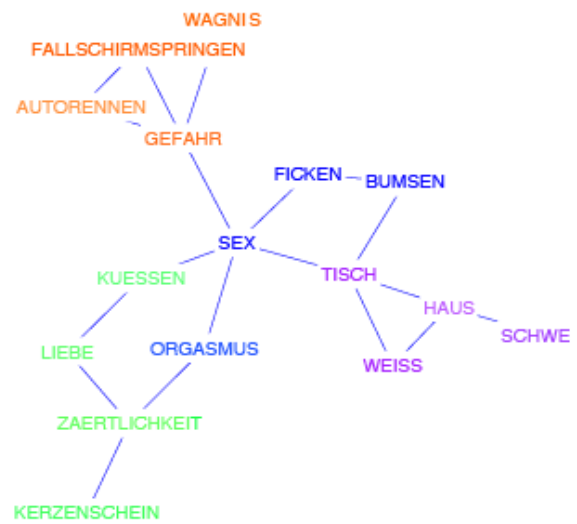


Figure 6.
Averaged Pathfinder Network for
Participants with 40% Cp ($N = 2$)

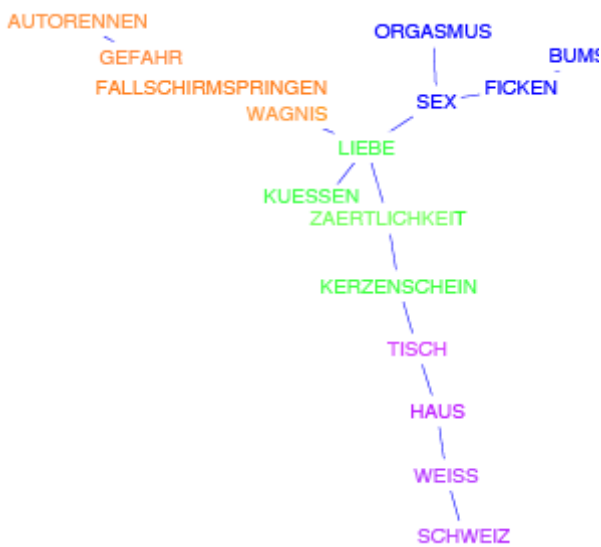


Figure 7.
Averaged Pathfinder Network for
Participants with Partners ($N = 53$)

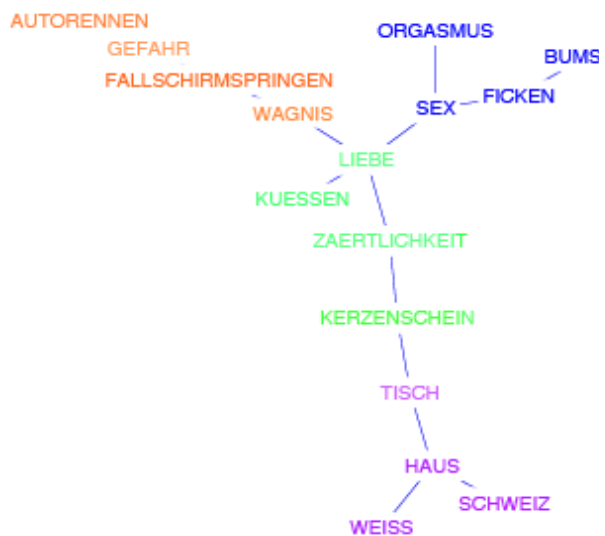


Figure 8.
Averaged Pathfinder Network for
Participants without Partners ($N = 60$)

Interestingly, the romantic word 'love' stands in the center of PFNETs for women of high Cp, low Cp, women with partners and without. 'Love' is always connected to the risk group through the risk word 'venture'. The sexual words are connected with risk words through the romantic word 'love' or 'tenderness'. 'Tenderness' is the central

word in the control groups' PFNET. The sex words of the averaged PFNET for women of the control group are situated further away from the risk words, connected with this group through three romantic words rather than one. The mean PFNET calculated for women with highest possible Cp (40%) shows a slight deviation from the other networks (Figure 6). The sexual words are mingled in with romantic words, words signifying risk are comparatively isolated and stand slightly further apart from the others. The central word here is very fittingly 'sex' rather than 'love'.

3. Analytical Statistics

As the comparisons of average networks showed no significant differences, the similarity ratings were analyzed with further statistical tests to show possible trends. With use of the Kruskal-Wallis H-Test (Monte-Carlo correction), differences between women with high Cp, women with low Cp and the control group were analyzed. The three conception probability groups did not differ in the variables 'age' ($\chi^2 = 3.32$, n.s.), 'sexual preference' ($\chi^2 = 2.62$, n.s.), 'relationship satisfaction' ($\chi^2 = 2.27$, n.s.) and 'relationship duration' ($\chi^2 = 3.56$, n.s.), three of the four 'SOI facets' (Behavior: $\chi^2 = 5.33$, Attitude: $\chi^2 = 1.82$, SOI Sum: $\chi^2 = 0.76$; n.s.), all five 'personality facets' (Neuroticism: $\chi^2 = 0.18$, Extraversion: $\chi^2 = 0.16$, Openness to Experience: $\chi^2 = 0.61$, Agreeableness: $\chi^2 = 1.46$, Conscientiousness: $\chi^2 = 1.87$; n.s.) and four of the five 'mood factors' (Ashamed and scared: $\chi^2 = 2.86$, Proud and excited: $\chi^2 = 1.27$, Upset and irritable: $\chi^2 = 1.39$, Nervous and jittery: $\chi^2 = 2.73$; n.s.). However, women of different conception probabilities differ in their self reported mood facet 'determined, attentive' and their socio-sexual orientation facet 'desire' (Table 16). Women with a higher conception probability reported feeling more sexual desire than women with a lower conception probability or women of the control group, and marginally more determined or attentive than women with lower conception probabilities. Women of the control group however, reported feeling most determined and attentive and the least sexual desire.

Table 16.

Mean Ranks for Significant Differences between Women with Different Cp

Variables	χ^2	p	df	Mean Ranks		
				High Cp	Low Cp	Control
Determined, attentive mood	6.50	0.04	2	57.18 <i>N</i> = 33	45.66 <i>N</i> = 41	63.89 <i>N</i> = 35
SOI desire	7.78	0.02	2	65.39 <i>N</i> = 32	54.49 <i>N</i> = 44	43.63 <i>N</i> = 32

Kruskal-Wallis Test with Monte-Carlo Correction

Women with partners and women without partners did not differ in the variables 'sexual preference' ($U = 1541$, n.s.), 'cycle length variation' ($U = 924$, n.s.), 'average cycle duration' ($U = 1291$, n.s.), three of the four 'SOI facets' (behavior: $U = 1222$, attitude: $U = 1309$, SOI Sum: $U = 1427$; n.s.), all five 'personality facets' (Neuroticism: $U = 1503$, Extraversion: $U = 1477$, Openness to Experience: $U = 1457$, Agreeableness: $U = 1424$, Conscientiousness: $U = 1408$; n.s.), and all five 'mood factors' (Ashamed and scared: $U = 1343$, Proud and excited: $U = 1269$, Determined and attentive: $U = 1276$, Upset and irritable: $U = 1228$, Nervous and jittery: $U = 1310$; n.s.). Depending on their relationship status, women however differ in their socio-sexual orientation facet 'desire' ($U = 1019$, p (Monte-Carlo corrected) = 0.006, $N = 108$) and age ($U = 1008$, p (Monte-Carlo corrected) = 0.002, $N = 110$). Women without partners were younger (mean rank 47.08, $N = 59$) than women with partners (mean rank 65.24, $N = 51$) and reported feeling more sexual desire (mean rank 61.93, $N = 58$) than women with partners (mean rank 45.88, $N = 50$).

Spearman correlations were conducted to examine possible relations between sexual desire, attentive and determined mood and similarity ratings within the respective word group combinations. For this, the test output was classified according to word group combination. All outputs were organized by the 10 word group combinations defined in table 17. Both the Mann-Whitney U-Test and the Kruskal-Wallis H-Test showed no significant differences between the ratings of women with different conception probabilities or relationship status (Table 18).

Table 17.

Word Group Combinations

Abbreviation	Word group combination
'sex'	Sexual words with sexual words
'sex_risk'	Sexual words with words signifying risk
'sex_romance'	Sexual words with romantic words
'sex_neutral'	Sexual words with neutral words
'risk'	Words signifying risk with words signifying risk
'risk_romance'	Words signifying risk with neutral words
'risk_neutral'	Words signifying risk with romantic words
'romance'	Romantic words with romantic words
'romance_neutral'	Romantic words with neutral words
'neutral'	Neutral words with neutral words

Table 18.

Differences Between Participant Groups in Regard to Similarity Ratings

Word group combination	Similarity ratings	
	By Relationship status (Mann-Whitney U)*	By Conception probability (Wilcoxon χ^2)*
sex	1448	0.477
sex_risk	1590	0.744
sex_romance	1332	0.582
sex_neutral	1544	2.526
risk	1481	0.001
risk_romance	1446	0.817
risk_neutral	1389	0.462
romance	1481	2.150
romance_neutral	1582	3.343
neutral	1500	1.002
<i>N</i>	<i>113</i>	<i>113</i>

*Non-significant Results, Monte-Carlo corrected

Descriptive statistics for similarity ratings per word group combination are shown in tables 19 through 21. As is seen in Table 19, mean similarity ratings within the neutral word group were low. This could possibly be interpreted as lack of identifying neutral words as being neutral. Similarly, high mean scores for similarity ratings within the word group 'risk' could imply a high measure of quality for words chosen to be part of the word group 'risk'. These results should however be interpreted with caution, as no explanatory suggestions can be made.

Table 19.

Descriptive Statistics for Similarity Ratings within Word Groups

	sex	risk	romance	neutral
\bar{X}	88.33	89.26	86.73	34.38
Min.	37.50	0.00	26.00	0.00
Max.	100.00	100.00	100.00	100.00
SD	13.93	17.40	15.91	28.60
σ^2	193.92	302.61	253.28	817.87
<i>N</i>	113	113	113	113

Highest mean scores for similarity ratings were made for the word group combination 'sex_romance', second highest for the combination 'sex_risk', and lowest for the combination 'risk_neutral'. Most ratings range from zero to 100. Minimum rating values within the word groups 'sex' and 'romance' however, start at 26 and 37.5. The combinations 'sex_neutral' (96.5) and 'risk_neutral' (58.5) were never rated to be 100 % similar (Tables 20 and 21).

Table 20.

Descriptive Statistics for Similarity Ratings between the Sexual Word Group and Others

	sex_risk	sex_romance	sex_neutral
\bar{X}	39.20	70.34	26.09
Min.	0.00	0.00	0.00
Max.	100.00	100.00	96.50
SD	28.25	22.82	25.14
σ^2	797.94	520.60	632.01
<i>N</i>	113	113	113

Table 21.

Descriptive Statistics for Similarity Ratings between the Risk Word Group and Others, and Romance Word Group with the Neutral Word Group

	risk_romance	risk_neutral	romance_neutral
\bar{X}	25.23	12.28	26.04
Min.	0.00	0.00	0.00
Max.	100.00	58.50	100.00
SD	23.02	15.49	25.94
σ^2	529.92	240.10	673.02
<i>N</i>	113	113	113

3.1. Socio-Sexual Openness Inventory and Similarity Ratings

A trend regarding socio-sexual orientation and similarity ratings of all participant groups can be seen in table 22. The higher the respective values for overall sexual openness (SOI Sum) and sexual desire, the higher the similarity ratings between sexual words and words signifying risk. Since values for desire effect the total value for sexual openness, women with high values for sexual openness equally rate sexual words and words signifying risk as similar.

Table 22.

Correlation of SOI Facet Scores with Similarity Ratings for all Participants, Classified According to Word Group Combination

Word group combination	SOI Sum		SOI desire	
	r _s	p	r _s	p
sex_risk	0.215	0.025	0.217	0.024
	<i>N</i> = 108		<i>N</i> = 108	
Spearman Correlation, 2-tailed				

The Kruskal-Wallis test showed no significant differences between participant groups in respect to ratings per word group combination. Considering participant groups separately however, showed that sexual desire was positively correlated with similarity ratings for 'sex_risk' and 'risk_romance' within the control group. Women with high Cp, who felt strong sexual desire, rated neutral words as highly similar (Table 23).

Table 23.

Correlation of SOI Desire Scores with Similarity Ratings for Women with different Cp, Classified According to Word Group Combination

Word group combination	High Cp		Low Cp		Control	
	r _s	p	r _s	p	r _s	p
sex_risk	0.116	n.s.	0.171	n.s.	0.434	0.013
risk_romance	0.179	n.s.	-0.095	n.s.	0.508	0.003
neutral	0.356	0.046	0.038	n.s.	0.020	n.s.
	N = 32		N = 44		N = 32	
Spearman Correlation, 2-tailed						

Women without partners reported feeling stronger sexual desire than women with partners, but did not differ significantly regarding similarity ratings of respective word group combinations. Both groups were therefore regarded separately as their similarity ratings were correlated with desire. Women with partners who reported

high sexual desire, rated romantic words and words signifying risk to be similar ($r_s = 0.348, p = 0.013, N = 50$).

3.2. Mood and Similarity Ratings

Further correlations were conducted for reports on momentary mood and similarity ratings between word groups. Women who reported feeling upset and irritable rated sexual words as dissimilar to other sexual words and risk words as dissimilar to other risk words. Nervous women who reported feeling jittery, perceived many similarities with the neutral word group. Sexual words, romantic words and neutral words were perceived to be similar to words of the neutral category. Women who felt ashamed and scared perceived neutral words to be similar to sexual, romantic and risk words. They also rated risk and romantic words to be similar to other romantic words as well as to words signifying risk (Table 24). No significant correlations regarding similarity ratings were found for women who felt proud and excited. Determined and attentive women however, rated sex and romance to be similar ($r_s = 0.199, p = 0.028, N = 109$).

Table 24.

Correlation of Negative Mood of all Participants with Similarity Ratings

Word group combination	upset, irritable		nervous, jittery		ashamed, scared	
	r_s	p	r_s	p	r_s	p
sex	-0.229	0.016	0.033	n.s.	-0.154	n.s.
sex_neutral	0.118	n.s.	0.334	0.000	0.238	0.013
risk	-0.190	0.048	0.170	n.s.	-0.161	n.s.
risk_romance	0.166	n.s.	0.120	n.s.	0.264	0.006
risk_neutral	0.115	n.s.	0.117	n.s.	0.222	0.021
romance	-0.135	n.s.	0.156	n.s.	-0.233	0.015
romance_neutral	0.107	n.s.	0.361	0.000	0.193	0.045
neutral	0.045	n.s.	0.273	0.004	0.029	n.s.
	<i>N = 109</i>		<i>N = 109</i>		<i>N = 109</i>	

Spearman Correlation, 2-tailed; Classified According to Word Group Combination

Since the H-Test showed a significant difference between women of different conception probabilities regarding determined and attentive mood, the respective conception groups were analyzed separately. Only one significant correlation was seen within the word group combination 'sex_risk' ($r_s = 0.350$, $p = 0.046$, $N = 33$) for women with high Cp. The more determined and attentive women with high Cp felt, the stronger the similarity between sexual words and words signifying risk were rated.

3.3. Personality and Similarity Ratings

Regarding possible influences of personality on how similar individual word group combinations were rated, only three of the five personality factors showed significant correlations. The higher the scores for neuroticism, the stronger the similarity ratings for neutral words with other neutral words. The more extroverted women were assessed to be, the stronger they rated similarities between risk words and romantic words. The higher their score for agreeableness was, the stronger women perceived romantic words to be similar to other romantic words. The personality factors 'openness to experience' and 'conscientiousness' showed no correlations with similarity ratings (Table 25).

Table 25.

Correlation of Personality Facets of all Participants with Similarity Ratings, Classified According to Word Group Combination

Word group combination	Neuroticism		Extraversion		Agreeableness	
	r_s	p	r_s	p	r_s	p
risk_romance	0.142	n.s.	0.228	0.015	-0.039	n.s.
romance	0.083	n.s.	0.031	n.s.	0.234	0.014
neutral	0.230	0.015	-0.067	n.s.	0.030	n.s.
	$N = 112$		$N = 113$		$N = 110$	

Spearman Correlation, 2-tailed

IV. Discussion

Contrary to the predictions, women did not prove to associate stronger between sexual words and words signifying risk, when fertile in their cycles. Similarly, relationship status showed no direct effects on how specific word groups were associated. Instead, the data suggests a possible 'bottom-effect' and 'ceiling-effect' present during the association task, which might have obscured associative differences between participant groups. This statistical effect describes a measurement error concerning the over- or under bidding of the measuring scale, where the rating variables per word-combination is not measured above or below a certain level. In respect to the study at hand, this statistical effect did not necessarily come about due to unfitting measurement scales, but was more likely determined by words representing respective word groups. These were most probably chosen to undoubtedly 'belong' to their individual word groups and therefore left no grey-zones in the associations between words representative of different word groups. The word selection process may have been too extensive. On the other hand, it has proven necessary to create new word-lists characteristic of the subject group. Young female students living in Austria may for instance have a slightly different colloquial vocabulary than older women who work in a different German speaking country. As this study introduced the analysis of an additional word category - risk - which was not present in Geer and Bellard's (1996) or Haslinger's (2000) association task, some of their neutral words would possibly have been considered words signifying risk. Nonetheless, specific trends became apparent in further statistical analysis. There seem to exist factors influencing linguistic associations, even though the similarity ratings were not influenced directly by relationship status or conception probability. Indirectly however, certain factors seem to influence lexical associations. Individual personalities and socio-sexual orientations were documented, so that possible influences on associative thinking was controlled for. Women with different conception probabilities and of different relationship status did however not differ in their personalities and overall socio-sexual orientation. The observed correlations with similarity ratings were only apparent on a small level, when attributes of the questionnaire were considered separately. In agreement with recent findings, individual levels of sexual desire showed some correlation with the degree to which participants rated similarities between and within word groups. Even though

relationship status or conception probability showed no effects on similarity ratings, the level of desire and mood did vary between the compared participant groups. Even though the correlations of socio-sexual orientation, mood or personality facets with similarity ratings showed interesting trends, they could not directly be traced to the participant groups of interest.

1. Socio-Sexual Desire

Women without partners and women with high conception probabilities reported feeling higher degrees of sexual desire, relative to the remaining participant groups. Since participants without partners were younger than women in relationships, it is possible that this effect could have been influenced by age. Fluctuations in the sexuality of women across the lifespan have been observed, findings were however less consistent than with men. Hayes and Dennerstein (2005) observed that sexual desire, sexual function, orgasm frequency and sexual activity declined with age, starting around the late twenties. It is also likely that women without partners have fewer opportunities to satisfy their desires and therefore experience sexual fantasies more frequently than women with partners. The documentation of participant's evaluation of their primary partner's relative quality could enable an interesting deduction in respect to desire fluctuations associated with relationship status (Pillsworth et al., 2004; Pillsworth & Haselton, 2006). Although socio-sexual orientation is largely considered as life-time stable, certain aspects of socio-sexual orientation can change throughout a life-span. One aspect of socio-sexual orientation, the sexual desire facet, has shown to even change throughout the menstrual cycle. A few days before a shift in basal body temperature occurs (around ovulation), women reported experiencing a rise in sexual desire (Stanislaw & Rice, 1988). In agreement with these findings, participants with higher conception probabilities reported higher levels of sexual desire. If an increase in sexual desire should indirectly communicate increased motivation to find sexual partners or even engage in sexual activities, it is furthermore interesting that women with high degrees of sexual desire judge sexual words and words signifying risk as highly similar. Out of all possible combinations with the word group 'risk' (except for 'risk_risk'), the combination 'sex_risk' had the highest mean similarity rating. At this point it is interesting to see that neither risk-

words were rated to be 100% similar to neutral words, nor were sexual words ever rated to be 100% similar to neutral words. Participants furthermore agreed more strongly on risk words belonging to the risk category than any other words belonging to their correct word-categories. This could be considered as the highest inter-rater reliability of sorts. These attributes are specific to the word groups 'sex' and 'risk' and could possibly have biased the correlation with sexual desire. On the whole, the higher the degree of sexual openness or sexual desire, the higher the rated similarities between sexual words and risk-words. When participant groups were analyzed separately in regard to correlations between desire and similarity ratings, however, the results showed no consistencies with these presumptions. But it can be said, that participants with higher degrees of desire, and thus sexual openness, associate sexual words closely with words signifying risk.

2. Mood

Women who reported being in a negative mood proved to associate neutral words closely with the other word categories. Being 'in a bad mood' could influence attention span or even encourage indiscriminate rating and possibly account for these correlations. Moreover, the worse their mood was, the less they associated sexual words with other sexual words, risk-words with other risk-words and romantic words with other romantic words. This could suggest that negative mood influenced the ability to 'recognize' the individual correct word group affiliation. If women with low conception probabilities had shown to be in a worse mood than women with high conception probabilities, then the influence of high progesterone levels and low oestrogen levels on semantic ability could have accounted for this possible confusion. Even though women fertile in their cycles reported being in a better mood than women with low conception probabilities, women of the control group reported being in an even better mood than women fertile in their cycles. This presumption can therefore not be made. On the whole, women who felt determined and attentive generally associated sexual words closely with romantic words. Even though there was no apparent difference in reported mood for women with different conception probabilities, a rating trend was observed for women fertile in their

cycles. The more determined and attentive women fertile in their cycles reported feeling, the higher they associated sexual words with words signifying risk.

3. Personality

Women with higher scores for personality attributes generally perceived as negative, associated neutral words closely with the other word categories. Moreover, the higher their scores for these 'negative' attributes, the less they associated sexual words with other sexual words, romantic words with other romantic words, and risk-words with other risk-words. Women with high scores for the personality attribute 'extraversion', strongly associated romantic words with words of the risk-group. Studies investigating specific personality attributes in respect to reproductive behavior have shown interesting correlates. Research in psychology has for instance found low levels of agreeableness and openness to experience to be positively associated with tendencies to engage in risk-taking behaviors. Neuroticism was however not related to any risk taking behaviors. (Hoyle, Fejfar & Miller, 2000) Contradicting the results of the current study, researchers have observed highly extraverted women to engage in risky behaviors more often than other women (Cooper, Agocha & Sheldon, 2000; Zuckerman & Kuhlman, 2000; Miller et al., 2004). The personality trait of extraversion has also shown to correlate positively with the amount of sexual partners in both women and men (Alvergne, 2010). Figueredo and colleagues (2005) observed women with high levels for conscientiousness however, to avoid unhealthy behaviors (as cited in Alvergne et al., 2010). Several studies have linked personality traits to number of offspring, suggesting possible influences on reproductive behavior (Jokela, Alvergne, Pollet & Lummaa, 2011). If extraversion should be considered a trait associated with the motivation to gather information on the environment, it does not surprise to find a positive correlation between this trait and that of the rated similarity between risk and romance in this current study. This is however purely hypothetical and would invite further thought in this area if the personality facet 'openness to experience' had shown to impact similarity ratings. The strong association between sex and risk made by attentive and sexually open women, is particularly interesting, as these characteristics could suggest a motivation to gather information on the environment.

4. Limitations

4.1. Conception Probability

One large difficulty in reviewing literature on studies of the menstrual cycle is that there are various methods in classifying menstrual cycle phases. Some divide the menstrual cycle into two phases, others into four, five or six phases. Moreover, individual phases have been determined through different methods. As was done in this study, conception probability determination was initially left up to participants, and depended on their correct documentations or even mere ability to recall the first day of their previous menstrual bleeding from memory. Fertility can be measured by physiological measures such as basal body temperature (rapid increase and peak during fertile window), cervical mucus (is less acidic and has a higher water and electrolyte content during the fertile window) and LH surges in urine (24-36 hours before ovulation). (Campbell & Reece, 2006) Moreover, there are more than one calendar-method of estimating conception probability from this starting date (for review see Wilcox, Weinberg & Baird, 1995; Wilcox, Dunson & Baird, 2000; Wilcox et al., 2004). Additionally, some would consider a conception probability above 10% as 'high', whilst others will only considered the few days leading up to ovulation as 'high'. Some researchers even use physiological measures to determine cycle phase. Many studies on human female sexuality fail to document possible accompanying factors influencing or even accounting for fluctuations in cognitive domains, such as socio-sexual orientation, relationship status, or momentary mood. These methodological variations and even to an extent short-comings, could account for the considerable inconsistencies in findings, making it difficult to specify what to document when investigating cognitive changes throughout the menstrual cycle.

4.2. Word Selection Process and the Pathfinder Method

Even though the pathfinder model proves as an effective method in processing and illustrating how knowledge is organized, the data collected during the current study proved unsuitable in showing fine differences in associative thinking. As mentioned previously, the extensive pre-study could account for the bottom- and ceiling-effect

present in the data. As the pathfinder model works with averaged association networks and then compares these, fine fluctuations could not be communicated. Moreover, participants reported some confusion considering the neutral word category, both during the pre-studies and the association task. The biased aspects of words classified as 'neutral' should be questioned and greater focus should be addressed to defining the neutral category, before similar studies are conducted. Finding words representing the neutral category deserves greater attention, as it is essential in preventing an (albeit unintentional) forceful and misrepresented correlation between the remaining word-groups. Allowing more than four words per category should also be considered for future research on this topic. As the organization of knowledge is prone to various influences such as memory of individual experiences which partly sculpt character and could determine how surroundings are perceived, it could be profitable to use a within-subjects design, so that the amount and impact of intervening variables is minimized and actual changes can be documented.

5. Conclusion

Trends observed in the current study suggest sexual stimuli and information perceived as risk-related, to be considered as reproductively relevant stimuli. Current mood, personality and socio-sexuality pose as important influences on associative thinking and should be included in future studies on fluctuations in knowledge organization. As mood and desire vary across the menstrual cycle and have shown to influence associative thought, it should be presumed that hormonal fluctuations indirectly cause slight changes in associative thinking.

V. References

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VI. Appendices

1. Appendix A

Results of the Word Selection Process - Brainstorm (German Original)

NEUTRAL	N	ROMANTIK	N	SEXUELL	N	RISIKO	N
als	1	altmodisch	3	abspritzen	2	Abenteuer	5
Angst	1	Antrag	2	Affäre	2	Abgrund	1
arbeiten	1	aufgesetzt	1	AIDS	1	Abschiebung	1
Architektur	1	Augen	2	Alkohol	1	action	2
ausgeglichen	1	Bad	3	anal	5	Adrenalin	2
Baum	1	Bauart	1	Anregung	1	AIDS	1
Baumarkt	1	Baum	1	anziehend	4	Aktien	4
Becher	3	Berührung	1	Arsch	1	Alkohol	1
beige	2	Beziehung	2	attraktiv	2	Angst	9
beschwichtigend	1	Blick	1	aufgeladen	1	antisemitisch	2
Bewegung	1	blind	1	aufgeschlossen	1	asozial	1
Bewertung	1	Blume	14	Aufklärung	1	Attentat	1
bewusst	1	Bollywood	1	Aufregung	1	Aufregung	2
Biene	1	Buch	1	aufreizend	1	ausländerfeindlich	3
Bild	1	Champagner	2	Augenkontakt	3	ausprobieren	1
Bildung	1	Dinner	12	ausgehen	1	Autorennen	6
blank	1	Duft	1	ausprobieren	1	Bankwesen	1
Blatt	1	dunkel	2	austauschbar	1	Behinderter	1
blau	1	Ehe	1	baggern	1	Bereitschaft	2
Block	1	Einfühlsamkeit	1	Bedürfnis	1	Bergsteigen	2
Boden	1	Einladung	1	Befriedigung	1	Beruf	1
Buch	4	Erregung	1	Begierde	3	Betrug	1
Cafe	1	Erwartungshaltung	1	Beidl	1	Biene	1
Chemie	1	Feuer	1	Belästigung	1	Börse	1
Computer	4	Film	1	beliebig	1	bremsen	1
das	1	Fleischbällchen	1	besteigen	1	bungeejumping	4
denn	1	Frau	2	Bett	3	Casino	1
Dualismus	1	Fürsorge	1	blasen	8	Chance	2
durchsichtig	1	Garten	1	Blick	1	Draufgänger	1
Einstellung	2	Gebäude	1	Blow-Job	1	Droge	4
Eltern	1	Gedicht	2	Bordell	1	Dunkelheit	1
Ente	1	Gefühl	5	Bravo	1	Eistauchen	1
enthaltssam	1	Gentleman	1	Brüste	3	Endorphine	1
Erklärung	1	Genuss	1	buddan	2	Entscheidung	2
Essen	1	Geschenk	2	bumsen	4	Erfolg	1
fad	2	Geschichtsepoche	4	Busen	1	Erlebnis	1
fair	1	Geste	1	Diskriminierung	1	Eurokrise	1
Familie	1	händchenhalten	3	Donnermöhre	1	Extremsport	5
farblos	4	Herz	5	Dunkelheit	1	fallschirmspringen	7
Fisch	1	Himmel	1	Eileiter	1	Faschist	1
fliegen	1	Hochzeit	6	Emotion	2	Fehler	1
Freunde	1	Hollywood	1	Empfinden	1	Feigheit	1
freundlich	1	Jahrestag	1	Erektion	1	Feuer	2
Garten	2	Jugend	1	Erotik	2	Finanzen	1
Gedanke	1	Kamin	3	fallen	1	fliegen	2
Gefühl	1	Karibikurlaub	1	Fellatio	1	Freiheit	1
Gegenstand	1	Kerzenschein	25	Fetisch	1	Freude	1
Geldtasche	1	Kitsch	5	feucht	1	Gefahr	17
gerecht	1	Klassik	1	Feuer	1	Geld	3
geruchlos	1	Klischee	1	ficken	8	Geschwindigkeit	2
Geschichte	1	Kosename	1	Fisting	1	Gewalt	1
geschlechtslos	1	Kribbeln	1	Fleischpeitsche	2	Gewinn	1

geschmacklos	4	Kunstrichtung	1	fliegen	1	Gleichberechtigung	1
Geschwister	1	kuscheln	5	Fortpflanzung	2	Grenzüberschreitung	3
Glas	1	küssen	11	Fotze	2	Großstadt	1
gleichgültig	3	Lagerfeuer	2	französisch	1	Hai	2
grau	2	Landschaft	1	Frau	1	hart	1
Gurke	1	Leidenschaft	5	Freude	1	Hass	1
Haare	1	Liebe	21	Freund	1	Helm	1
Handtuch	1	Liebesbrief	1	füßeln	1	Herausforderung	2
Handy	1	Liebesdrama	1	Fut	1	Herzklopfen	1
Haus	4	Liebeseerklärung	2	Gebärmutter	1	Hitler	1
Hautfarbe	2	Liebesfilm	1	Gedanke	1	Homosexualität	1
Holz	1	Liebespaar	1	geil	1	Hooligans	1
Hose	1	Literatur	3	Genderdebatte	1	Hure	1
Hund	1	Lustgarten	1	Geschlechtsverkehr	4	Idiot	1
Hut	1	Massage	2	Gesellschaftszwang	1	Investition	2
Jacke	1	Meeresblick	1	Gesundheit	1	Jude	3
kategorielos	1	Mondschein	5	gleichgeschlechtlich	1	Kampf	1
Katze	1	Musik	4	Gleichstellung	2	Kapitalmarkt	1
Kind	1	nackt	1	Glück	1	Kick	1
Kino	1	Nähe	1	hart	1	klettern	1
Klarheit	2	Naivität	1	heiß	1	Klippe	1
Kleidung	1	Natur	2	herausfordernd	1	Konstrukt	1
konfliktscheu	2	Paris	1	Hingabe	1	Krankheit	2
Kreis	1	Park	1	Hintern	1	Kredit	3
Kugelschreiber	1	Partnerschaft	1	Hitze	1	kriminell	1
Lampe	1	pastell	1	Höhepunkt	1	Krüppel	1
langweilig	1	Praline	1	Hosenschlange	1	leichtsinig	1
laufen	1	Reise	1	Hundestellung	1	lernen	1
Lautsprecher	1	Reizwäsche	1	Instinkt	1	Liebe	1
Lebensmittel	1	Rendez-vous	1	Inszenierung	1	Magenweh	1
Licht	1	Restaurant	1	Interesse	1	Messer	2
lösen	1	Ring	2	Inzest	1	Minirock	1
Luft	1	Romantik	3	Kamasutra	3	Mongo	1
Mediator	2	rosa	2	Kitzler	1	Moslem	1
meinungslos	8	rosarote-Brille	1	Kleidung	1	Motorrad	6
Mensch	1	Rose	12	Kondom	1	Mut	4
Metall	1	rot	1	Königskobra	1	Nacht	1
Milch	1	Ruhe	1	Kontakt	1	Nazi	4
Mitte	2	sanft	1	Körper	5	Neger	1
Münze	1	Schatz	1	Körperflüssigkeit	2	Neid	1
Musik	1	Schloß	1	Körperkontakt	1	Nervenzitzel	1
neutral	1	schmusen	2	körperlich	1	Neuanfang	1
Neutron	3	Schokolade	3	Körperspannung	1	One-night-stand	1
nichts	2	schön	1	küssen	4	Operation	1
Niemandsländ	1	See	1	Lack	1	Ostblock	1
noch	1	Sehnsucht	1	lecken	3	Poker	1
nüchtern	1	singen	1	Leder	1	Politik	2
null	2	sinnlich	1	Leidenschaft	4	power	1
Objekt	1	Sonnenaufgang	4	Liebe	3	Prozentsatz	1
objektiv	2	Sonnenuntergang	10	Lippen	2	rasen	1
Opportunist	1	Spaziergang	7	Lippenstift	1	rassistisch	1
Österreich	2	Spontanität	1	loslassen	1	rauchen	2
Park	1	Stimmung	1	Lust	6	Redbull	1
parteilos	1	Strand	2	Mann	3	Reichtum	1
Pferd	1	streicheln	4	Marketing	1	rot	2
Pflanze	1	Susi und Strolch	1	masturbieren	3	scheitern	1
pH-Wert	6	Tanz	1	Mensch	1	Schlafllosigkeit	1
Polarität	1	träumerisch	1	Minirock	1	Schlampe	1
Politik	2	Treue	1	Modeerscheinung	1	Schlange	3
positionslos	1	überladen	1	Model	1	Schnelligkeit	3
Präsentation	1	Überraschung	1	Möse	1	Schutzkleidung	1

Prüfer	1	übertrieben	1	Motel	1	Schwachstelle	1
Rad	1	Urlaub	1	Moulinrouge	2	schwarz	1
Raum	1	Valentinstag	3	Mumu	1	Schwuchtel	1
real	1	veraltet	1	Muschi	4	Selbstmord	1
Reis	2	verliebt	3	nackt	5	Selbstständigkeit	1
Richter	1	Verlobung	2	Nacktbilder	1	Selbstvertrauen	1
risikoscheu	1	Vertrauen	2	Nähe	2	Sex	1
ruhig	1	Vorstellung	1	natürlich	1	Sexist	1
Sachgegenstand	2	weiblich	1	Neigung	1	silber	1
Soft	1	Wellenlänge	1	neugierig	2	Skalpell	1
Sand	1	weltfremd	1	neunundsechzig	1	skifahren	1
Schiedsrichter	3	Wesen	1	Öffentlichkeit	1	Skorpion	1
schlafen	2	Wiese	1	onanieren	2	Spacko	1
Schuhe	1	Zärtlichkeit	5	One-night-stand	2	Spannung	2
Schule	2	Zuneigung	3	oral	5	Spaß	3
schwammig	2	Zweisamkeit	6	Orgasmus	7	Spasti	2
schwarz	1			Orientierung	3	spekulieren	3
Schweiz	10			Partner	1	Spiel	3
Schwingung	1			Peitsche	2	Sport	6
See	1			Penis	6	Staatsanleihe	1
Seife	2			poppen	2	Streit	1
Sichtweise	1			Porno	7	Stress	2
Staubsauger	1			Position	1	Sturm	1
Stillstand	2			Privatsphäre	2	Sucht	1
Straße	1			Prostitution	2	tauchen	1
Straßenbahn	1			prüde	1	Tempo	1
Student	1			Pussy	1	Tiefschnee	1
Stuhl	1			reiten	1	trauen	1
Tapete	1			Reizwäsche	1	Trottel	1
telefonieren	1			Revolution	1	Turbo	1
Teller	1			rot	2	Umzug	1
Tiere	1			Rotlicht	1	Unachtsamkeit	1
Tisch	4			runterholen	1	Unbekanntes	1
Tod	1			Sadomaso	1	Unfall	3
Topf	1			Schlampe	1	Ungerechtigkeit	1
Trantüte	1			Schmerz	1	Ungewissheit	4
trinken	2			schnell	1	unüberlegt	1
Trinkflasche	1			Schutz	1	unverhütet	1
U-Bahn	1			schwanger	1	Verkehrsschild	3
unabhängig	1			Schwanz	3	Verlust	1
unauffällig	1			Schweiß	1	Versicherung	1
unbestimmt	1			Schwenzel	1	Vertrauen	1
und	3			sehen	1	vorschnell	1
unentschieden	1			Sex	12	Waffe	1
ungeladen	3			Sex-Ikone	1	Wagnis	4
ungenau	1			Sexshop	1	Welt	1
ungesalzen	1			sexsüchtig	1	Wette	4
Universität	3			sexy	3	Zukunft	2
UNO	1			sinnlich	1	Zuwanderung	1
unvoreingenommen	3			Sommer	2		
Vatikan	1			Spaß	2		
Verbindung	1			Sperma	2		
Verhalten	1			Spiel	1		
Vermittler	2			Spiritualität	1		
Viereck	1			Stimulation	1		
vorurteilslos	1			Stundenmotel	1		
wann	1			tanzen	1		
was	1			Titten	2		
Wasser	5			unromantisch	1		
weder	1			Unterwäsche	1		
weiß	10			Vagina	2		

wer	1		Vergewaltigung	1	
wertfrei	2		Verhütung	1	
weshalb	1		verklemmt	1	
wie	1		Verlangen	1	
Wind	1		Vermehrung	1	
Wirklichkeit	1		Verschmelzung	1	
Wissenschaft	1		verspielt	1	
wo	1		Vibrator	1	
wodurch	1		vögeln	3	
zeitlos	1		vorgespielt	1	
Zeitschrift	1		Vorlieben	1	
Zeitung	1		Waschbrettbauch	1	
Zirkus	1		welzen	1	
Zwitter	1		Werbung	2	

2. Appendix B

Affiliation Rating - 40 Words (German Original)

<i>Romantik</i>	<i>Sex</i>	<i>Risiko</i>	<i>Neutral</i>
Zweisamkeit	oral	Wagnis	ph-Wert
Kerzenschein	ficken	Ungewissheit	Tisch
Sonnenuntergang	bumsen	Gefahr	meinungslos
Dinner	anal	Abenteuer	weiß
Zärtlichkeit	Lust	fallschirmspringen	Wasser
Liebe	blasen	Mut	sauber
küssen	Porno	Sport	Schweiz
Hochzeit	Orgasmus	Autorennen	Computer
Rose	Penis	Angst	Buch
Blume	Sex	Motorrad	Haus

Results of the Affiliation Rating - Frequencies

phWert-Neutral

	Häufigkeit	Prozent	Gültige Prozente	Kumulierte Prozente
Gültig trifft zu	19	48,7	48,7	48,7
trifft eher zu	6	15,4	15,4	64,1
trifft eher nicht zu	4	10,3	10,3	74,4
trifft nicht zu	10	25,6	25,6	100,0
Gesamt	39	100,0	100,0	

Tisch-Neutral

	Häufigkeit	Prozent	Gültige Prozente	Kumulierte Prozente
Gültig trifft zu	28	71,8	71,8	71,8
trifft eher zu	3	7,7	7,7	79,5
trifft eher nicht zu	1	2,6	2,6	82,1
trifft nicht zu	7	17,9	17,9	100,0
Gesamt	39	100,0	100,0	

meinungslos-Neutral

	Häufigkeit	Prozent	Gültige Prozente	Kumulierte Prozente
Gültig trifft zu	18	46,2	46,2	46,2
trifft eher zu	5	12,8	12,8	59,0
trifft eher nicht zu	5	12,8	12,8	71,8
trifft nicht zu	11	28,2	28,2	100,0
Gesamt	39	100,0	100,0	

weiß-Neutral

	Häufigkeit	Prozent	Gültige Prozente	Kumulierte Prozente
Gültig trifft zu	29	74,4	76,3	76,3
trifft eher zu	5	12,8	13,2	89,5
trifft eher nicht zu	1	2,6	2,6	92,1
trifft nicht zu	3	7,7	7,9	100,0
Gesamt	38	97,4	100,0	
Fehlend System	1	2,6		
Gesamt	39	100,0		

Wasser-Neutral

	Häufigkeit	Prozent	Gültige Prozente	Kumulierte Prozente
Gültig trifft zu	24	61,5	61,5	61,5
trifft eher zu	8	20,5	20,5	82,1
trifft eher nicht zu	3	7,7	7,7	89,7
trifft nicht zu	4	10,3	10,3	100,0
Gesamt	39	100,0	100,0	

sauber-Neutral

	Häufigkeit	Prozent	Gültige Prozente	Kumulierte Prozente
Gültig trifft zu	22	56,4	56,4	56,4
trifft eher zu	7	17,9	17,9	74,4
trifft eher nicht zu	2	5,1	5,1	79,5
trifft nicht zu	8	20,5	20,5	100,0
Gesamt	39	100,0	100,0	

Schweiz-Neutral

	Häufigkeit	Prozent	Gültige Prozente	Kumulierte Prozente
Gültig trifft zu	30	76,9	76,9	76,9
trifft eher zu	5	12,8	12,8	89,7
trifft eher nicht zu	1	2,6	2,6	92,3
trifft nicht zu	3	7,7	7,7	100,0
Gesamt	39	100,0	100,0	

Computer-Neutral

	Häufigkeit	Prozent	Gültige Prozente	Kumulierte Prozente
Gültig trifft zu	22	56,4	56,4	56,4
trifft eher zu	5	12,8	12,8	69,2
trifft eher nicht zu	3	7,7	7,7	76,9
trifft nicht zu	9	23,1	23,1	100,0
Gesamt	39	100,0	100,0	

Buch-Neutral

	Häufigkeit	Prozent	Gültige Prozente	Kumulierte Prozente
Gültig trifft zu	17	43,6	43,6	43,6
trifft eher zu	7	17,9	17,9	61,5
trifft eher nicht zu	3	7,7	7,7	69,2
trifft nicht zu	12	30,8	30,8	100,0
Gesamt	39	100,0	100,0	

Haus-Neutral

	Häufigkeit	Prozent	Gültige Prozente	Kumulierte Prozente
Gültig trifft zu	25	64,1	64,1	64,1
trifft eher zu	6	15,4	15,4	79,5
trifft eher nicht zu	3	7,7	7,7	87,2
trifft nicht zu	5	12,8	12,8	100,0
Gesamt	39	100,0	100,0	

Wagnis-Risiko

	Häufigkeit	Prozent	Gültige Prozente	Kumulierte Prozente
Gültig trifft zu	31	79,5	79,5	79,5
trifft eher zu	4	10,3	10,3	89,7
trifft eher nicht zu	3	7,7	7,7	97,4
trifft nicht zu	1	2,6	2,6	100,0
Gesamt	39	100,0	100,0	

Ungewissheit-Risiko

	Häufigkeit	Prozent	Gültige Prozente	Kumulierte Prozente
Gültig trifft zu	23	59,0	59,0	59,0
trifft eher zu	13	33,3	33,3	92,3
trifft eher nicht zu	2	5,1	5,1	97,4
trifft nicht zu	1	2,6	2,6	100,0
Gesamt	39	100,0	100,0	

Gefahr-Risiko

	Häufigkeit	Prozent	Gültige Prozente	Kumulierte Prozente
Gültig trifft zu	35	89,7	89,7	89,7
trifft eher zu	2	5,1	5,1	94,9
trifft eher nicht zu	2	5,1	5,1	100,0
Gesamt	39	100,0	100,0	

Abenteuer-Risiko

	Häufigkeit	Prozent	Gültige Prozente	Kumulierte Prozente
Gültig trifft zu	24	61,5	61,5	61,5
trifft eher zu	13	33,3	33,3	94,9
trifft eher nicht zu	2	5,1	5,1	100,0
Gesamt	39	100,0	100,0	

fallschirmspringen-Risiko

	Häufigkeit	Prozent	Gültige Prozente	Kumulierte Prozente
Gültig trifft zu	31	79,5	79,5	79,5
trifft eher zu	8	20,5	20,5	100,0
Gesamt	39	100,0	100,0	

Mut-Risiko

	Häufigkeit	Prozent	Gültige Prozente	Kumulierte Prozente
Gültig trifft zu	23	59,0	59,0	59,0
trifft eher zu	13	33,3	33,3	92,3
trifft nicht zu	3	7,7	7,7	100,0
Gesamt	39	100,0	100,0	

Sport-Risiko

	Häufigkeit	Prozent	Gültige Prozente	Kumulierte Prozente
Gültig trifft zu	12	30,8	30,8	30,8
trifft eher zu	12	30,8	30,8	61,5
trifft eher nicht zu	8	20,5	20,5	82,1
trifft nicht zu	7	17,9	17,9	100,0
Gesamt	39	100,0	100,0	

Autorennen-Risiko

	Häufigkeit	Prozent	Gültige Prozente	Kumulierte Prozente
Gültig trifft zu	29	74,4	74,4	74,4
trifft eher zu	6	15,4	15,4	89,7
trifft eher nicht zu	3	7,7	7,7	97,4
trifft nicht zu	1	2,6	2,6	100,0
Gesamt	39	100,0	100,0	

Angst-Risiko

	Häufigkeit	Prozent	Gültige Prozente	Kumulierte Prozente
Gültig trifft zu	24	61,5	61,5	61,5
trifft eher zu	13	33,3	33,3	94,9
trifft eher nicht zu	2	5,1	5,1	100,0
Gesamt	39	100,0	100,0	

Motorrad-Risiko

	Häufigkeit	Prozent	Gültige Prozente	Kumulierte Prozente
Gültig trifft zu	20	51,3	51,3	51,3
trifft eher zu	14	35,9	35,9	87,2
trifft eher nicht zu	4	10,3	10,3	97,4
trifft nicht zu	1	2,6	2,6	100,0
Gesamt	39	100,0	100,0	

Rose-Romantik

	Häufigkeit	Prozent	Gültige Prozente	Kumulierte Prozente
Gültig trifft zu	27	69,2	69,2	69,2
trifft eher zu	8	20,5	20,5	89,7
trifft eher nicht zu	2	5,1	5,1	94,9
trifft nicht zu	2	5,1	5,1	100,0
Gesamt	39	100,0	100,0	

Hochzeit-Romantik

	Häufigkeit	Prozent	Gültige Prozente	Kumulierte Prozente
Gültig trifft zu	29	74,4	74,4	74,4
trifft eher zu	6	15,4	15,4	89,7
trifft eher nicht zu	1	2,6	2,6	92,3
trifft nicht zu	3	7,7	7,7	100,0
Gesamt	39	100,0	100,0	

küssen-Romantik

	Häufigkeit	Prozent	Gültige Prozente	Kumulierte Prozente
Gültig trifft zu	32	82,1	82,1	82,1
trifft eher zu	7	17,9	17,9	100,0
Gesamt	39	100,0	100,0	

Liebe-Romantik

	Häufigkeit	Prozent	Gültige Prozente	Kumulierte Prozente
Gültig trifft zu	34	87,2	87,2	87,2
trifft eher zu	4	10,3	10,3	97,4
trifft eher nicht zu	1	2,6	2,6	100,0
Gesamt	39	100,0	100,0	

Zärtlichkeit-Romantik

		Häufigkeit	Prozent	Gültige Prozente	Kumulierte Prozente
Gültig	trifft zu	34	87,2	87,2	87,2
	trifft eher zu	5	12,8	12,8	100,0
	Gesamt	39	100,0	100,0	

Dinner-Romantik

		Häufigkeit	Prozent	Gültige Prozente	Kumulierte Prozente
Gültig	trifft zu	18	46,2	46,2	46,2
	trifft eher zu	15	38,5	38,5	84,6
	trifft eher nicht zu	6	15,4	15,4	100,0
	Gesamt	39	100,0	100,0	

Sonnenuntergang-Romantik

		Häufigkeit	Prozent	Gültige Prozente	Kumulierte Prozente
Gültig	trifft zu	28	71,8	71,8	71,8
	trifft eher zu	9	23,1	23,1	94,9
	trifft eher nicht zu	1	2,6	2,6	97,4
	trifft nicht zu	1	2,6	2,6	100,0
	Gesamt	39	100,0	100,0	

Kerzenschein-Romantik

		Häufigkeit	Prozent	Gültige Prozente	Kumulierte Prozente
Gültig	trifft zu	29	74,4	74,4	74,4
	trifft eher zu	9	23,1	23,1	97,4
	trifft nicht zu	1	2,6	2,6	100,0
	Gesamt	39	100,0	100,0	

Zweisamkeit-Romantik

		Häufigkeit	Prozent	Gültige Prozente	Kumulierte Prozente
Gültig	trifft zu	29	74,4	74,4	74,4
	trifft eher zu	8	20,5	20,5	94,9
	trifft eher nicht zu	2	5,1	5,1	100,0
	Gesamt	39	100,0	100,0	

Blume-Romantik

		Häufigkeit	Prozent	Gültige Prozente	Kumulierte Prozente
Gültig	trifft zu	27	69,2	69,2	69,2
	trifft eher zu	10	25,6	25,6	94,9
	trifft eher nicht zu	1	2,6	2,6	97,4
	trifft nicht zu	1	2,6	2,6	100,0
	Gesamt	39	100,0	100,0	

oral-Sexuell

		Häufigkeit	Prozent	Gültige Prozente	Kumulierte Prozente
Gültig	trifft zu	28	71,8	71,8	71,8
	trifft eher zu	7	17,9	17,9	89,7
	trifft eher nicht zu	2	5,1	5,1	94,9
	trifft nicht zu	2	5,1	5,1	100,0
	Gesamt	39	100,0	100,0	

ficken-Sexuell

		Häufigkeit	Prozent	Gültige Prozente	Kumulierte Prozente
Gültig	trifft zu	33	84,6	84,6	84,6
	trifft eher zu	4	10,3	10,3	94,9
	trifft nicht zu	2	5,1	5,1	100,0
	Gesamt	39	100,0	100,0	

bumsen-Sexuell

		Häufigkeit	Prozent	Gültige Prozente	Kumulierte Prozente
Gültig	trifft zu	35	89,7	89,7	89,7
	trifft eher zu	3	7,7	7,7	97,4
	trifft eher nicht zu	1	2,6	2,6	100,0
	Gesamt	39	100,0	100,0	

anal-Sexuell

		Häufigkeit	Prozent	Gültige Prozente	Kumulierte Prozente
Gültig	trifft zu	29	74,4	74,4	74,4
	trifft eher zu	8	20,5	20,5	94,9
	trifft eher nicht zu	2	5,1	5,1	100,0
	Gesamt	39	100,0	100,0	

Lust-Sexuell

		Häufigkeit	Prozent	Gültige Prozente	Kumulierte Prozente
Gültig	trifft zu	29	74,4	74,4	74,4
	trifft eher zu	8	20,5	20,5	94,9
	trifft nicht zu	2	5,1	5,1	100,0
	Gesamt	39	100,0	100,0	

blasen-Sexuell

		Häufigkeit	Prozent	Gültige Prozente	Kumulierte Prozente
Gültig	trifft zu	25	64,1	64,1	64,1
	trifft eher zu	7	17,9	17,9	82,1
	trifft eher nicht zu	2	5,1	5,1	87,2
	trifft nicht zu	5	12,8	12,8	100,0
	Gesamt	39	100,0	100,0	

Porno-Sexuell

		Häufigkeit	Prozent	Gültige Prozente	Kumulierte Prozente
Gültig	trifft zu	30	76,9	76,9	76,9
	trifft eher zu	5	12,8	12,8	89,7
	trifft eher nicht zu	2	5,1	5,1	94,9
	trifft nicht zu	2	5,1	5,1	100,0
	Gesamt	39	100,0	100,0	

Orgasmus-Sexuell

		Häufigkeit	Prozent	Gültige Prozente	Kumulierte Prozente
Gültig	trifft zu	35	89,7	89,7	89,7
	trifft eher zu	3	7,7	7,7	97,4
	trifft eher nicht zu	1	2,6	2,6	100,0
	Gesamt	39	100,0	100,0	

Penis-Sexuell

		Häufigkeit	Prozent	Gültige Prozente	Kumulierte Prozente
Gültig	trifft zu	31	79,5	79,5	79,5
	trifft eher zu	8	20,5	20,5	100,0
	Gesamt	39	100,0	100,0	

Sex-Sexuell

	Häufigkeit	Prozent	Gültige Prozente	Kumulierte Prozente
Gültig trifft zu	36	92,3	92,3	92,3
trifft eher zu	3	7,7	7,7	100,0
Gesamt	39	100,0	100,0	

3. Appendix C

16 Words Chosen for the Main Experiment - Translation

Romance	Liebe	Zärtlichkeit	kuessen	Kerzenschein
	love	tenderness	kissing	candlelight
Sex	Orgasmus	ficken	bumsen	sex
	orgasm	fuck	humping	sex
Risk	Gefahr	Wagnis	Fallschirmspringen	Autorennen
	threat	venture	parachuting	car-race
Neutral	Tisch	Haus	weiss	Schweiz
	table	house	white	Switzerland

4. Appendix D

Questionnaire

Datum: _____ Versuchsnummer: _____

Bitte antworten Sie **ehrlich und wahrheitsgetreu** auf folgende Fragen. Ihre Daten werden selbstverständlich **vertraulich** und ausschließlich zu wissenschaftlichen Zwecken verwendet. Bitte bewerten Sie **wie** die jeweiligen Aussagen **allgemein auf Sie persönlich** zutreffen durch ankreuzen folgender Abkürzungen:

SA = starke Ablehnung; A = Ablehnung; N = neutral;
Z = Zustimmung; SZ = starke Zustimmung

	Starke Ablehnung	Ablehnung	Neutral	Zustimmung	Starke Zustimmung
1. Ich bin nicht leicht beunruhigt.....	SA	A	N	Z	SZ
2. Ich habe gerne viele Leute um mich herum.....	SA	A	N	Z	SZ
3. Ich mag meine Zeit nicht mit Tagträumereien verschwenden.	SA	A	N	Z	SZ
4. Ich versuche zu jedem, dem ich begegne, freundlich zu sein.	SA	A	N	Z	SZ
5. Ich halte meine Sachen ordentlich und sauber.	SA	A	N	Z	SZ
6. Ich fühle mich anderen oft unterlegen.	SA	A	N	Z	SZ
7. Ich bin leicht zum Lachen zu bringen.	SA	A	N	Z	SZ
8. Ich finde philosophische Diskussionen langweilig.....	SA	A	N	Z	SZ
9. Ich bekomme häufiger Streit mit meiner Familie und meinen Kollegen.	SA	A	N	Z	SZ
10. Ich kann mir meine Zeit recht gut einteilen, so daß ich meine Angelegenheiten rechtzeitig beende.	SA	A	N	Z	SZ
11. Wenn ich unter starkem Streß stehe, fühle ich mich manchmal, als ob ich zusammenbräche.	SA	A	N	Z	SZ
12. Ich halte mich nicht für besonders fröhlich.	SA	A	N	Z	SZ
13. Mich begeistern die Motive, die ich in der Kunst und in der Natur finde.	SA	A	N	Z	SZ
14. Manche Leute halten mich für selbstsüchtig und selbstgefällig.	SA	A	N	Z	SZ
15. Ich bin kein sehr systematisch vorgehender Mensch.	SA	A	N	Z	SZ
16. Ich fühle mich selten einsam oder traurig.	SA	A	N	Z	SZ
17. Ich unterhalte mich wirklich gerne mit anderen Menschen.	SA	A	N	Z	SZ
18. Ich glaube, daß es Schüler oft nur verwirrt und irreführt, wenn man sie Rednern zuhören läßt, die kontroverse Standpunkte vertreten.	SA	A	N	Z	SZ
19. Ich würde lieber mit anderen zusammenarbeiten, als mit ihnen zu wetteifern.....	SA	A	N	Z	SZ
20. Ich versuche, alle mir übertragenen Aufgaben sehr gewissenhaft zu erledigen.....	SA	A	N	Z	SZ
21. Ich fühle mich oft angespannt und nervös.	SA	A	N	Z	SZ
22. Ich bin gerne im Zentrum des Geschehens.	SA	A	N	Z	SZ
23. Poesie beeindruckt mich wenig oder gar nicht.	SA	A	N	Z	SZ
24. Im Hinblick auf die Absichten anderer bin ich eher zynisch und skeptisch.	SA	A	N	Z	SZ

	Starke Ablehnung	Ablehnung	Neutral	Zustimmung	Starke Zustimmung
25. Ich habe eine Reihe von klaren Zielen und arbeite systematisch auf sie zu.	SA	A	N	Z	SZ
26. Manchmal fühle ich mich völlig wertlos.	SA	A	N	Z	SZ
27. Ich ziehe es gewöhnlich vor, Dinge allein zu tun.	SA	A	N	Z	SZ
28. Ich probiere oft neue und fremde Speisen aus.	SA	A	N	Z	SZ
29. Ich glaube, daß man von den meisten Leuten ausgenutzt wird, wenn man es zuläßt.	SA	A	N	Z	SZ
30. Ich verträdele eine Menge Zeit, bevor ich mit einer Arbeit beginne.	SA	A	N	Z	SZ
31. Ich empfinde selten Furcht oder Angst.	SA	A	N	Z	SZ
32. Ich habe oft das Gefühl, vor Energie überzuschäumen.	SA	A	N	Z	SZ
33. Ich nehme nur selten Notiz von den Stimmungen oder Gefühlen, die verschiedene Umgebungen hervorrufen.	SA	A	N	Z	SZ
34. Die meisten Menschen, die ich kenne, mögen mich.	SA	A	N	Z	SZ
35. Ich arbeite hart, um meine Ziele zu erreichen.	SA	A	N	Z	SZ
36. Ich ärgere mich oft darüber, wie andere Leute mich behandeln.	SA	A	N	Z	SZ
37. Ich bin ein fröhlicher, gut gelaunter Mensch.	SA	A	N	Z	SZ
38. Ich glaube, daß wir bei ethischen Entscheidungen auf die Ansichten unserer religiösen Autoritäten achten sollten.	SA	A	N	Z	SZ
39. Manche Leute halten mich für kalt und berechnend.	SA	A	N	Z	SZ
40. Wenn ich eine Verpflichtung eingehe, so kann man sich auf mich bestimmt verlassen.	SA	A	N	Z	SZ
41. Zu häufig bin ich entmutigt und will aufgeben, wenn etwas schiefgeht.	SA	A	N	Z	SZ
42. Ich bin kein gut gelaunter Optimist.	SA	A	N	Z	SZ
43. Wenn ich Literatur lese oder ein Kunstwerk betrachte, empfinde ich manchmal ein Frösteln oder eine Welle der Begeisterung.	SA	A	N	Z	SZ
44. In Bezug auf meine Einstellungen bin ich nüchtern und unnachgiebig.	SA	A	N	Z	SZ
45. Manchmal bin ich nicht so verläßlich oder zuverlässig, wie ich sein sollte.	SA	A	N	Z	SZ
46. Ich bin selten traurig oder deprimiert.	SA	A	N	Z	SZ

	Starke Ablehnung	Ablehnung	Neutral	Zustimmung	Starke Zustimmung
47. Ich führe ein hektisches Leben.	SA	A	N	Z	SZ
48. Ich habe wenig Interesse, über die Natur des Universums oder die Lage der Menschheit zu spekulieren.	SA	A	N	Z	SZ
49. Ich versuche stets rücksichtsvoll und sensibel zu handeln.	SA	A	N	Z	SZ
50. Ich bin eine tüchtige Person, die ihre Arbeit immer erledigt.	SA	A	N	Z	SZ
51. Ich fühle mich oft hilflos und wünsche mir eine Person, die meine Probleme löst.	SA	A	N	Z	SZ
52. Ich bin ein sehr aktiver Mensch.	SA	A	N	Z	SZ
53. Ich bin sehr wißbegierig.	SA	A	N	Z	SZ
54. Wenn ich Menschen nicht mag, so zeige ich ihnen das auch offen.	SA	A	N	Z	SZ
55. Ich werde wohl niemals fähig sein, Ordnung in mein Leben zu bringen.	SA	A	N	Z	SZ
56. Manchmal war mir etwas so peinlich, daß ich mich am liebsten versteckt hätte. ...	SA	A	N	Z	SZ
57. Lieber würde ich meine eigenen Wege gehen, als eine Gruppe anzuführen.	SA	A	N	Z	SZ
58. Ich habe oft Spaß daran, mit Theorien oder abstrakten Ideen zu spielen.	SA	A	N	Z	SZ
59. Um zu bekommen, was ich will, bin ich notfalls bereit, Menschen zu manipulieren.	SA	A	N	Z	SZ
60. Bei allem, was ich tue, strebe ich nach Perfektion.	SA	A	N	Z	SZ

Jedes der folgenden Wörter beschreibt auf unterschiedliche Weise Gefühle und Emotionen. Bitte kreuzen Sie so an, wie es Ihrem **momentanen Zustand** am ehesten entspricht.

	trifft nicht zu					trifft sehr zu				
aktiv	0	0	0	0	0	0	0	0	0	0
begeistert	0	0	0	0	0	0	0	0	0	0
wachsam	0	0	0	0	0	0	0	0	0	0
entschlossen	0	0	0	0	0	0	0	0	0	0
aufmerksam	0	0	0	0	0	0	0	0	0	0
bekümmert	0	0	0	0	0	0	0	0	0	0
verärgert	0	0	0	0	0	0	0	0	0	0
schuldig	0	0	0	0	0	0	0	0	0	0
feindselig	0	0	0	0	0	0	0	0	0	0
nervös	0	0	0	0	0	0	0	0	0	0
interessiert	0	0	0	0	0	0	0	0	0	0
stark	0	0	0	0	0	0	0	0	0	0
durcheinander	0	0	0	0	0	0	0	0	0	0
beschämt	0	0	0	0	0	0	0	0	0	0
stolz	0	0	0	0	0	0	0	0	0	0
verängstigt	0	0	0	0	0	0	0	0	0	0
gereizt	0	0	0	0	0	0	0	0	0	0
freudig erregt	0	0	0	0	0	0	0	0	0	0
angeregt	0	0	0	0	0	0	0	0	0	0
erschrocken	0	0	0	0	0	0	0	0	0	0

Wie lautet Ihre sexuelle Orientierung? ☐ heterosexuell ☐ homosexuell ☐ bisexuell

Haben Sie derzeit einen fixen Partner?

☐ Ja ☐ Nein Wenn ja, wie lange dauert Ihre Beziehung schon? ____Jahre

Wie zufrieden sind Sie mit Ihrer Beziehung?

unzufrieden ☐ ☐ ☐ ☐ ☐ ☐ ☐ sehr zufrieden

Sind Sie derzeit auf der Suche nach einem fixen Partner?

☐ Ja ☐ Nein

Wie regelmäßig ist Ihr Zyklus?

☐ sehr regelmäßig ☐ Schwankung von 1 Tag ☐ Schwankung von 1 Woche ☐ sehr unregelmäßig

Wie lange dauert Ihr durchschnittlicher Zyklus? (Bitte ankreuzen)

Weniger –20–21–22–23–24–25–26–27–28–29–30–31–32–33–34–35– mehr Tage

Wann hat Ihre letzte Menstruation begonnen?

Datum des **ersten** Tages der Regelblutung: _____

Besteht die Möglichkeit einer Schwangerschaft?

☐ Ja ☐ Nein

Benutzen Sie hormonelle Verhütungsmittel (zB Pille, Spirale...)?

☐ Ja, dieses: _____ ☐ Nein

1. Mit wie vielen verschiedenen Personen hatten Sie in den vergangenen 12 Monaten Geschlechtsverkehr?

0 1 2 3 4 5-6 7-9 10-19 20 oder mehr

2. Mit wie vielen Personen hatten Sie **nur einmal** Sex?

0 1 2 3 4 5-6 7-9 10-19 20 oder mehr

3. Mit wievielen Personen hatten Sie Sex, ohne Interesse an einer Langzeitbeziehung mit dieser Person zu haben?

0 1 2 3 4 5-6 7-9 10-19 20 oder mehr

4. Sex ohne Liebe ist O.K.

1 2 3 4 5 6 7 8 9

stimme
überhaupt
nicht zu

stimme
völlig zu

5. Ich könnte mir vorstellen, dass ich "unverbindlichen" Sex mit verschiedenen Personen genieße und mich dabei wohl fühle.

1 2 3 4 5 6 7 8 9

stimme
überhaupt
nicht zu

stimme
völlig zu

6. Ehe ich weiß ob ich mit einer Person eine Langzeitbeziehung eingehen will, möchte ich mit dieser Person **keinen** Sex haben.

1 2 3 4 5 6 7 8 9

stimme
überhaupt
nicht zu

stimme
völlig zu

7. Wie oft haben Sie Fantasievorstellungen darüber, mit einer anderen Person als Ihrem/Ihrer gegenwärtigen (oder letzten) Partner_In Sex zu haben?

- 1 - niemals
- 2 - sehr selten
- 3 - einmal alle zwei bis drei Monate
- 4 - einmal im Monat
- 5 - einmal alle zwei Wochen
- 6 - einmal pro Woche
- 7 - einige Male pro Woche
- 8 - fast jeden Tag
- 9 - mindestens einmal am Tag

8. Wie oft verspüren Sie sexuelle Erregung in Anwesenheit einer Person, die nicht Ihr/Ihre Partner_In ist?

- 1 - niemals
- 2 - sehr selten
- 3 - einmal alle zwei bis drei Monate
- 4 - einmal im Monat
- 5 - einmal alle zwei Wochen
- 6 - einmal pro Woche
- 7 - einige Male pro Woche
- 8 - fast jeden Tag
- 9 - mindestens einmal am Tag

9. Wie oft haben Sie sexuelle Phantasien mit einer Person, die Sie in Ihrem Alltag gerade erst kennengelernt haben?

- 1 - niemals
- 2 - sehr selten
- 3 - einmal alle zwei bis drei Monate
- 4 - einmal im Monat
- 5 - einmal alle zwei Wochen
- 6 - einmal pro Woche
- 7 - einige Male pro Woche
- 8 - fast jeden Tag
- 9 - mindestens einmal am Tag

10. Ihr Alter in ganzen Jahren? _____

VIELEN DANK!

Ihre Daten werden **selbstverständlich vertraulich** und ausschließlich zu wissenschaftlichen Zwecken verwendet!

VII. Abstract

Theories from evolutionary psychology predict that natural and sexual selection act on sex-typed cognitive abilities and social behavior. Triver's theory of Asymmetrical Investment (1972), Haselton and Buss' Error Management Theory (2000), as well as contemporary studies in this field, suggest reproductive strategies characteristic of women to (among others) entail the avoidance of high-risk situations during the vulnerable time of high fertility. Moreover, women show increased social attention and openness, excel in cognitive tasks favoring women, and report greater sexual motivation and desire. Investigating the processing of reproductively relevant information, aids the comprehension of sex-typed cognition and thus behavior. Knowledge is structured by organizing patterns reflecting concept relationships. Thinking in categories spares the effort of complex thinking. A previous study on this topic investigated fluctuations of associative thinking throughout the menstrual cycle (Haslinger, 2000), using Geer and Bellard's (1996) word-list of three categories 'sex', 'romance' and 'neutral'. However, the sample size was unevenly distributed and the hormone samples were partly inconclusive. 113 female students of the current study were asked to complete a test on word associations, rating 240 perceived similarities between 16 words of the categories 'romance', 'neutral', 'sex' and 'risk'. Women were predicted to perceive greater similarities between the categories 'sex' and 'risk', as well as 'sex' and 'romance', when fertile in their cycles. Women in committed relationships were predicted to associate less between 'sex' and 'risk', as the romantic component is satisfied. The test on word association was documented with a Python software programmed by Prof. Dr. Grammer and analyzed with the Pathfinder method (Schvaneveldt, 1990). Computed networks are models derived from proximity data, communicating the rated similarities between word pairs. Contrary to the predictions, associative thinking did not vary across the menstrual cycle. The data suggests a bottom- and ceiling-effect, obscuring possible differences in associations. Nonetheless, specific trends became apparent, showing women with heightened desire to associate closely between sex- and risk words. Determined and attentive mood of women with high conception probabilities was positively correlated with sex- and risk similarity, and extraversion with romance- and risk words. Mood, personality and socio-sexuality pose as important influences on associative thinking and should be included in future studies on fluctuations in knowledge organization.

VIII. Zusammenfassung

Die Error Management Theorie (Haselton & Buss, 2000), die Theorie des Asymmetrischen Investments (Trivers, 1972) sowie Studien auf diesem Gebiet besagen, dass Risikovermeidung in Phasen hoher Empfängniswahrscheinlichkeit (hEW) eine der zentralen Eigenschaften weiblicher Reproduktionsstrategien darstellt. In Phasen hEW zeigen Frauen gesteigerte soziale Offenheit und Aufmerksamkeit, erhöhtes sexuelles Verlangen sowie erhöhte Leistung in für Frauen charakteristischen kognitiven Aufgaben. Erkenntnisse über die Verarbeitung reproduktionsrelevanter Informationen tragen zu dem Verständnis gegenüber kognitiven Geschlechtsunterschieden sowie Verhalten bei. Wissen wird durch die Organisation von Mustern verarbeitet, welche Beziehungen zwischen Konzepten beschreiben. Kategorielles Denken erspart dabei den Aufwand des komplexen Denkens. Haslinger (2000) untersuchte Wortassoziationen von Frauen in verschiedenen Zyklusphasen anhand von Ähnlichkeitsbeurteilungen der Wortkategorien 'Sex', 'Romantik' und 'Neutral' (Geer & Bellard, 1996). Die erhobene Stichprobe war allerdings nicht varianzhomogen und die Hormonmessungen waren teilweise unschlüssig. Im Rahmen der eigenen Studie wurden 113 Studentinnen gebeten, 240 Beurteilungen von Wortpaaren der Kategorien 'Sex', 'Romantik', 'Neutral' und 'Risiko' abzugeben. Diese wurden mittels Python Software erhoben und als Pathfinder Netzwerke (Schvaneveldt, 1990) dargestellt. Dieses Modell der Wissensrepräsentation stellt Beurteilungen als verbindende Abstandsdaten dar. Die Netzwerke wurden hinsichtlich Beziehungsstatus und EW verglichen. Die Beobachtung, dass verpartnerte Frauen weniger eng zwischen 'Sex' und 'Risiko' assoziieren (da die romantische Komponente erfüllt ist), konnte nicht gemacht werden. Ebenso wenig assoziierten Frauen mit hEW enger zwischen den Kategorien 'Sex' und 'Risiko' sowie 'Sex' und 'Romantik'. Dafür war möglicherweise ein Boden- und Deckeneffekt verantwortlich. Die Bewertungen wurden ebenso hinsichtlich Stimmung, Persönlichkeit und sozio-sexuelle Orientierung verglichen. Frauen mit erhöhtem Verlangen assoziierten enger zwischen den Kategorien 'Sex' und 'Risiko'. Entschlossen und aufmerksam gestimmte Frauen mit hEW assoziierten enger zwischen 'Sex' und 'Risiko' und extrovertierte Frauen enger zwischen 'Romantik' und 'Risiko'. Stimmung, Persönlichkeit und sozio-sexuelle Orientierung beeinflussen assoziatives Denken und sollten in Studien dieser Art zusätzlich erhoben werden.

IX. Acknowledgements

To begin with, I would like to thank Prof. Dr. Karl Grammer, for inspiring me to set out on the 'rough and poorly chartered waters' of human ethology in the first place. A great deal of my enthusiasm is owed to his passion for human behavior. I am especially grateful for his intellectual support in programming and guiding me whenever I was stuck.

I would also like to thank my colleagues at the institute for discussing the extensive and often vulgar word-lists. In particular, I would like to thank Mag. Alexandra Mühlhauser for moral and academic support, in answering any questions I had and making me feel at home at the institute.

I am grateful to my parents, who not only supported me financially, but encourage me to reach for great things in life. They taught me to appreciate the endless complexities and wonderful connections between the things that surround us. Exposing me to so many diverse and challenging experiences contributed to the development of these interests, without which I probably never would have found my way into the field of biology.

I am incredibly lucky to surround myself with great understanding friends, who always lent an ear when I needed one. Special thanks go to my 'little big sister' Marie-Sophie Attems and my 'devil's advocate' Paul Luca Herbing, who not only never failed to confront me when I needed a new perspective, but always lit up my room.

Many thanks go to all participants involved in making this study possible in the first place.

X. Curriculum Vitae

Kristin Attems

Education:	Since 2013	Master Thesis at the Department of Anthropology
	2011-2013	Studies in Anthropology focusing on Human Ethology
	2011	Degree in General Biology
	2006-2011	University of Vienna, Austria
		Basic Courses in General Biology
	2005-2006	University of Salamanca, Spain - Spanish Language Course
	2003-2005	Degree: International Baccalaureate Diploma, 36 Points
		Danube International School, Vienna
		Higher level: Biology, Art, German
		Standard level: English A, Math, World Cultures, Norwegian, Theory of Knowledge
		Equivalent to: "Reifezeugnis eines österreichischen Oberstufenrealgymnasiums mit ergänzendem Unterricht in Biologie und Umweltkunde sowie Physik und Chemie"
	1997-2003	Danube International School, Vienna, Austria
	1993-1997	Evangelische Volksschule Karlsplatz, Vienna, Austria

Memberships: International Society for Human Ethology (ISHE)

Languages:	German	fluent / mother tongue
	Norwegian	fluent / mother tongue
	English	fluent
	Spanish	basic

Work

experience:	Mai 2013	Guestspeaker at "Department Seminar Anthropology", University of Vienna
	WS 2011	Tutor at University of Vienna : "Digitale Aufnahmeverfahren für Oberflächenmorphologie und Verhaltenskodierung am Menschen"
	Sep. 2006	2 weeks office work for Baxter AG, Austria
	Aug. 2005	Baxter AG, Austria, Laboratory Internship "Down stream processing"