Modern Diet and Stress Cause Homosexuality

A Hypothesis and a Potential Therapy

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1 Contents

2 Abstract

This e-book explores the potential interconnected, causative role of diet and stress in homosexuality. Some of the evidence that supports the hypothesis of this e-book includes increased prevalence of homosexuality in the last decades in some developed countries; higher frequency of substance use, eating disorders, anxiety, adverse childhood events among homosexuals; higher prevalence of homosexuality in the urban versus rural area, in societies with more intensive agriculture versus those with less intensive one; in the wealthy versus the poor (prior to massive industrialization); in overcrowded animals, etc. It is proposed that sexual behavior goes through six stages: spontaneous sexual arousal, attribution of arousal to an emotional cue, courtship, physical contact, stereotypical movements and orgasm, and that homosexuality arises when the urge for stereotypical movements is lacking or is sex atypical. Modern diet and/or stress may affect the development and/or functioning of the brain center responsible for the control of the stereotypical movements. This e-book proposes a potential therapy for ego-dystonic homosexuality, based mainly on diet, circadian therapy and behavioral therapy.

3 Introduction

Homosexuality is the feeling of sexual attraction toward a same-sex person. In this e-book, "homosexual" is considered a person who experiences such attractions, even when he/she also experiences heterosexual attractions and does not identify himself/herself as homosexual. Some homosexuals do not accept homosexuality and seek treatment to change it. Ego-dystonic sexual orientation is a mental disorder in the International Classification of Diseases (ICD-10), a manual approved by the World Health Organization. [**1**]

In the United States, homosexuality was considered a mental disorder until 1974, when it was removed from the Diagnostic and Statistical Manual of Mental Disorders (DSM) and was replaced by "ego-dystonic homosexuality" until 1987, when ego-dystonic homosexuality was also removed from the DSM. In 2001, homosexuality was removed as a mental disorder from the Chinese Classification of Mental Disorders, by the Chinese Psychiatric Association. The Indian Psychiatric Society declared in 2014 that homosexuality is not a disease. Currently, 72 countries legally proscribe homosexual behavior. [**2**]

Homosexuality has been observed in more than 450 animal species. [**3**] While hundreds of species have been documented engaging in homosexual acts on isolated occasions, only a handful have made it a habitual part of their live, according to Paul Vasey, a professor at the University of Lethbridge's Department of Psychology who has studied homosexual behavior in animals for decades. [**4**] Species where homosexuality is frequent include the Japanese macaques, the bonobos, the domesticated rams, etc.

3.1 Different theories explaining homosexuality

There have been different theories explaining homosexuality.

In his book "Psychopathia sexualis" (1894), based on his observations, Von Crafft-Ebing believed that homosexuality occurs when one masturbates early in life, thus halting normal sexual development and decreasing natural desires toward the opposite sex; or when one is afraid of consequences of sexual intercourse and turns to masturbation, or due to neurasthenia (a mental disorder with symptoms of fatigue, anxiety, depressed mood, etc). [**5**] But most of those who masturbate do not become homosexual.

Sigmund Freud held that humans during childhood pass through a developmental phase where bisexuality is the norm. They outgrow this phase and become heterosexual. He considered homosexuality to be the result of an arrest in development or a regress to an earlier phase of development. Other psychoanalysts, like Sandor Rado, considered it to be a neurotic symptom, the result of anxiety from heterosexual relationships, or of problematic relationships within the family. [**6**] But many homosexuals are well adapted and not neurotic. [**7**]

Genetic studies show that genes contribute to sexual orientation [**8**]. The neurohormonal theory proposes that a prenatal androgen hormonal environment similar to that of the opposite sex, predisposes to homosexuality. [**9**] The neurohormonal theory is based on the findings that homosexuality can be induced by four basic methods in laboratory animals: (a) direct perinatal androgen manipulation, (b) pharmacologically blocking or augmenting the perinatal effects of androgens, (c) maternal and neonatal exposure to androgen-depressing emotional stress, (d) the induction of immunity responses to androgens or other hormones involved in sexual

differentiation. Both the genetic and the neurohormonal theory do not explain the cases where one of the identical twins is homosexual, while the other is not. Studies with twins suggest that only in 6% to 32% of cases both members of an identical twin pair would be homosexual if at least one member is. [**10**]

The kin selection hypothesis proposes that genes predisposing to homosexuality remain in the gene pool because they confer some evolutionary advantage to the kin of homosexuals. Such evolutionary advantage has been proposed to be high sexual willingness [**11**] [**12**] [**13**] [**14**], higher fertility in female kin [**15**] [**16**], increased altruism [**17**] [**18**] etc.

In promiscuous monkeys, like Old World monkeys, [**19**] homosexual mounting is much more commonly observed among them and apes than in other nonhuman primates. [**20**]

In many animal species, same-sex mounting is observed in situations where the mounting animal wants to show its dominance to the other. Such dominance-submission interactions are more frequent in captivity (a stressful situation). [**21**] Ethologist Wolfgang Wickle suggested in 1967 that homosexual mounting serves to show dominance. He observed that same-sex mounting commonly occurred in response to aggression. [**22**]

Different studies identify gender nonconformity as predisposing factor for homosexuality. [**23**] [**24**] The association of gender nonconformity and homosexuality is not perfect. Between 6% and 62% of gender nonconforming boys and 9-44% of gender nonconforming girls develop into heterosexuals. [**25**]

Aldo Poiani, in his book "Animal Homosexuality: A Biosocial Perspective," has proposed that stress, beside its prenatal and early postnatal effect, may affect sexual orientation around the age of ten by increasing the activity of the adrenal glands. The adrenal glands release androgens, precursors of the sexual hormones estrogen and testosterone. Poiani proposes that adrenarche (when the adrenal glands have a spurt of development around the ages of six to ten) may be at the center of a potential mechanism of prepubertal development of homosexuality in humans. He adds that at best this is only one of the many mechanisms that could explain homosexuality in some individuals. [**26**]

Differences have been found in different brain areas of homosexual males and females, showing structures similar to those of the opposite sex. [**27**] These brain differences are susceptible to sexual hormones.

Situational homosexual behavior is sometimes called pseduo-homosexuality. This is observed in environments with skewed sex ratios (both in humans and animals). In a study on the monogamous bird *Sterna dougallii*, the authors notice that female birds that do not obtain male mates appear to be of low phenotypic "quality" and they have a higher fitness if they mate with each other and raise a few young than if they do not breed at all. [**28**]

In some animals, like the bonobos, homosexual behavior is thought to lower social tensions. For example, for the bonobos, anticipation of competition for food (a stressful situation) causes increased homosexual behavior. [**29**]

Another view on homosexuality is that it is a normal variation of the population, not a disease. [**30**] The first works to consider homosexuality natural were those of Alfred Kinsey and Evelyn Hooker. In "Sexual behavior in the human male" (1948), Kinsey et al. report that about 60% of pre-adolescent boys engage in homosexual activities and 37% of the male population has some

homosexual experience. According to Kinsey, given that homosexuality was frequent in Ancient Greece and at present in many cultures, it could not be unnatural. He suggests that homosexuality and heterosexuality may be learned behaviors. [**31**] Later studies show that homosexuality is not as prevalent as in Kinsey's surveys, probably due to his samples not being representative of the whole population.

Researcher Evelyn Hooker administered psychological tests to 30 homosexual and 30 heterosexual males, who were not undergoing any therapy. Based on the findings of the tests, Dr. Hooker suggested that homosexuals were as psychologically normal as heterosexuals. [**7**] This study has been criticized for using unreliable tests.

3.2 Conversion therapy

Conversion therapy (also called reparative therapy) is any treatment that aims to change sexual orientation from homosexual to heterosexual. [**32**]

Techniques used in the United States include counseling, visualization, social skills training, psychoanalytic therapy, spiritual interventions such as "prayer and group support and pressure" as well as avoidance of masturbation [**33**] [**34**].

Before 1973, conversion therapy employed aversive conditioning techniques, involving electric shock and nausea-inducing drugs during presentation of same-sex erotic images. Cessation of the aversive stimuli was accompanied by the presentation of opposite-sex erotic images, with the objective of strengthening heterosexual feelings. Another method used was the covert sensitization method, which involved instructing patients to imagine vomiting or receiving electric shocks. Behavioral conditioning tended to decrease homosexual feelings, but typically did not increase heterosexual feelings.

Psychoanalytic treatment of homosexuals is based on the work of Irving Bieber and his colleagues, published in a book, "Homosexuality: A Psychoanalytic Study of Male Homosexuals." They advocated for long-term therapy aimed at resolving the unconscious childhood conflicts that they considered responsible for homosexuality. Bieber reported a 27% success rate from long-term therapy, including success in exclusive homosexuals.

Reparative therapy is associated with Elizabeth Moberly and Joseph Nicolosi. Nicolosi's therapy aims to condition a man to a traditional masculine gender role by increasing participation in sports, increasing time spent with heterosexual men, etc. His therapy includes attending church.

Ariel Shidlo and Michael Schroeder found in "Changing Sexual Orientation: A Consumer's Report," a peer-reviewed study of 202 respondents published in 2002, that 88% of participants failed to achieve a sustained change in their sexual behavior and 3% reported changing their orientation to heterosexual. The remainder reported either losing all sexual drive or attempting to remain celibate, with no change in attraction.

Some studies show that conversion therapies can be harmful. Douglas Haldeman (2002), based on his clinical work with homosexuals, reports that following an unsuccessful therapeutic attempt to change sexual orientation, the patients have various psychological problems like poor self-esteem, depression, social withdrawal and sexual dysfunction. [**35**] Haldeman writes of conversion therapies that "such methods applied to any one else might be called by another name: torture. Individuals undergoing such treatments do not emerge heterosexually inclined; rather they become shamed, conflicted, and fearful about their homosexual feelings." [**36**]

In its 2000 position statement on conversion or reparative therapy, the American Psychiatric Association states:
"Psychotherapeutic modalities to convert or 'repair' homosexuality are based on developmental theories whose scientific validity is questionable. Furthermore, anecdotal reports of 'cures' are counterbalanced by anecdotal claims of psychological harm. In the last four decades, 'reparative' therapists have not produced any rigorous scientific research to substantiate their claims of cure. Until there is such research available, [the American Psychiatric Association] recommends that ethical practitioners refrain from attempts to change individuals' sexual orientation, keeping in mind the medical dictum to first, do no harm." [**37**]

3.3 Increase in the prevalence of homosexuality

Tolerance toward homosexual behavior has considerably increased during the 20th century. This has allowed more freedom in reporting homosexual attraction and behavior in different surveys. Indeed, most surveys show an increase in the prevalence of homosexuality in modern societies. Beside the increased freedom in reporting, it seems that prevalence of homosexuality has also increased. A study by Twenge et al. (2016) on the prevalence and acceptance of homosexuality concludes that homosexuality has increased in the last decades in the United States. The number of U.S. adults who had at least one same-sex partner since age 18 doubled between the early 1990s and early 2010s. Bisexual behavior in the United States increased from 3.1% to 7.7%. Controlling for acceptance reduced, but did not eliminate, the increase in same-sex behavior over time. [**38**] Between 1990 and 2000, homosexuality in Great Britain also increased. Mercer et al. (2014) used data from two large, national probability sample surveys of sexual attitudes and lifestyles carried out in 1990 and 2000 to assess homosexual behavior prevalence among men. Homosexual experience was reported by 8.4% of men in 2000 compared to 6.0% of men in 1990. [**39**]

Two surveys using the same methodology in Australia, in 2001-2002 and 2012-2013, also show an increase in homosexuality. In the first study, among men, 1.6% identified as gay and 0.9% as bisexual. Among women, 0.8% identified as lesbian and 1.4% as bisexual. In the second study, 1.9% of men identified as gay and 1.3% as bisexual; and 1.2% of women identified as lesbian and 2.2% as bisexual. [**40**] [**41**] The 2003-2014 Canadian Community Health Survey also shows an increase in prevalence of homosexuality during that period. [**42**] [**43**]

The increase in homosexuality is also evident in studies on different age groups. In such a study in Australia, women born in the 1960s were more than four times more likely to report female-female contact than women born in the 1930s or earlier. [**44**] The study did not find a difference in homosexuality rates in males by age group, however. A study of age groups in the United States found that the prevalence of female-female contact may have increased three to four fold for cohorts of women born between the 1930s and 1960s. It also found no increase in male-male contact. [**45**]

R. Von Krafft-Ebing in 1894, in Germany, mentions that a contemporary colleague, Ulrichs, had stated that 0.5% to 0.12% of adult males were homosexuals. A homosexual patient of Krafft-Ebing personally knew 14 homosexuals in his home town of 13,000 inhabitants and 80 homosexuals in another city with 60,000 inhabitants. [**5**] If we presume that ~30% of the population is made of males over 18, the prevalence of homosexuality in these 2 cities would be 0.3% and 0.4% respectively. Such prevalence is much lower than the prevalence of homosexuality in modern Germany. Today 7.4% of Germans identify as lesbian, gay, bisexual and transgender. [**46**]

This increase in homosexuality rates is interesting. What has also changed during the 20th century is increased substance use, obesity rates as well as increased sleep deprivation due to industrialization and artificial light. There may be a causal link between diet, substance use, sleep deprivation (or other stress sources) and homosexuality.

4 Diet and homosexuality

4.1 Epidemiologic observations

Western diet is typically made of high-sugar, high-fat food. Consumption of sugar doubled in the United States and the United Kingdom between 1900 and 1967. [**47**] Obesity rates also increased in the 20th century. [**48**]

Homosexuals have more eating disorders than heterosexuals [**49**] [**50**], which usually involve eating large amounts of high glycemic index foods and fat, or eating an imbalanced diet, leaning toward carbohydrates. Some studies show an increased rate of obesity among homosexuals. [**51**]. Gay men, lesbian and bisexual women report a higher odds of sugar-sweetened beverage consumption than straight men and women. [**52**]

Access to a high calorie diet and alcoholic drinks was limited to the social elite circles in the past. Homosexuality as well appears to have been more frequent among that group.

In the ancient Greece, homosexuality was widespread. According to Robert Flaceliere, "It appears extremely likely that homosexuality of any kind was confined to prosperous and aristocratic levels of ancient society. The masses of peasants and artisans were probably scarcely affected by habits of this kind." [**53**]

According to the authors of the Encyclopedia of Homosexuality [**54**], the notion of homosexuality as a distinctively aristocratic vice has a considerable history. In the first century A.D., the Jewish writer Philo of Alexandria wrote about sodomy (a term usually used for anal sex, which included homosexual acts). "The inhabitants owed this extreme license to the never-failing lavishness of their sources of wealth … Incapable of bearing such satiety, plunging like cattle, they threw off their necks the law of nature and applied themselves to deep drinking of strong liquor and dainty feeding and forbidden forms of intercourse." The theologian Albertus Magnus (1280) held that the vice of sodomy was more common in persons of high status than those of humble backgrounds.

In the 17th century, Sir Edward Coke, a noted English jurist, attributed the origin of sodomy to "pride, excess of diet, idleness and contempt of the poor."

In Florence, in the 15th century, sodomy cases often involved members of the social elite, indicating a proclivity for it among the Florentine aristocracy. [**55**]

That diet can have an effect on homosexual activity has been noticed by Francis Pottenger in his experiments with 900 cats and raw food versus cooked food diet, done in the 1932-1942 period. According to the book reviewer of "Pottenger's Cats: A Study in Nutrition", Pat McKay, in cats fed cooked food, "there is evidence of a role reversal with the female cats becoming the aggressors and the male cats becoming passive as well as evidence of increasing abnormal activities between the same sexes. Such sexual deviations are not observed among the raw food cats." [**56**]

There are also anecdotal reports of diet reversing homosexuality. According to Stephen Arlin and David Wolfe, authors of the book "The First Law of Nature: Raw Food Diet" [**57**], the raw food diet changes the sexual orientation of homosexuals.

4.2 Diet and gender nonconformity

Gender nonconformity in childhood and adolescence is a strong predictor for homosexuality. [**24**] Gender is used to denote the public lived role as boy or girl, man or woman. There are differences

in gender behavior. Males in general are more independent, assertive and competitive, while females are more passive, sensitive and supportive.

Gender nonconformity refers to somatic features or behaviors that are not typical (in a statistical sense) of individuals with the same assigned gender in a given society and historical era [**58**].

Individuals who are not content with their assigned gender and want to change it are called transsexuals, or transgender, or gender dysphoric.

Gender nonconforming individuals are heterogenous as a group. Depending on the cause of the gender nonconformity, they can be divided in these categories:

a) Individuals with no visible psychopathology;

b) Males who begin to show gender nonconforming behavior during puberty or adulthood and who cross-dress. Most of these males feel sexually aroused when fantasizing of being a woman. [**59**] Their behavior is called "autogynephilia" and is categorized as a paraphilia in DSM-5. Paraphilias are compulsive behaviors similar to substance and behavioral addictions.

c) Individuals with psychological disorders. Gender nonconformity in this subgroup may be the result of cognitive problems. Individuals with an autism spectrum disorder or autistic traits have increased rates of gender nonconformity. [**60**] [**61**] Schizophrenia is also more prevalent among individuals with gender dysphoria. [**62**] Psychological disorders are much more prevalent among transgenders than in the general population, even years after a sex reassignment surgery, therefore the psychiatric symptoms seem not to be solely a consequence of gender dysphoria. [**63**]

The heterogeneity in the typology of transgenders may be the reason for the finding in a recent study that the sexual hormone levels for transgender males are within the normal range, while females have slightly increased testosterone levels. [**64**]

Masculine lesbians

Gender nonconforming, masculine behavior is predictable of homosexuality in females. [**24**] Androgens, especially testosterone, are the hormones usually responsible for the masculinisation of behavior and physical features. High testosterone levels have been found in lesbians. [**65**]

Females can be exposed to high levels of androgens prenatally or postnatally.

Prenatal exposure of female fetuses to male hormones, increases the likelihood of them being homosexual. [**66**] Postnatal exposure of females to testosterone has also been linked to an increased chance of homosexuality. Around half of transsexuals report a change in sexual orientation during transitioning and this has been partially attributed to treatment with hormones, especially testosterone. [**67**] [**68**]

Androgens in the female are produced mainly by the ovary and the adrenal gland.

One of the most common reasons for high androgen production among women is Polycystic Ovarian Syndrome (PCOS). Polycystic ovaries are found in 32% to 88% of untreated female-to-male transsexuals. [**69**] [**70**] [**71**]

In a study by Agrawal et al. (2004), with 254 lesbians and 364 heterosexual women, 80% of lesbian women compared to 32% of heterosexual women had polycystic ovaries on pelvic ultrasound examination. There were no significant differences in the androgen concentrations between lesbian and heterosexual women with normal ovaries. However, lesbian women with

polycystic ovary/PCOS had a significantly higher free androgen index compared with heterosexual women with PCO/PCOS. [**72**] Agrawal et al. suggest that the high androgen levels may contribute to homosexuality in the women. PCOS is the most common endocrine disorder in women of childbearing age, affecting 5% to 10% of women in this age group. [**73**]

In a study by Manlove et al. (2008) with 34 women with PCOS, the women reported less feminine childhood behavior, less gender-typical behavior and there was a tendency toward bisexuality and fluid sexual orientation. [**74**]

In a systematic review of studies on diets, high-carbohydrate diets were associated with an increased free androgen index; low-glycemic index diets with improved menstrual regularity, reductions in insulin resistance. Weight loss improved the presentation of PCOS regardless of dietary composition in the majority of studies [**75**].

Insulin resistance and compensatory hyperinsulinemia have been recognized as a key factor in the pathogenesis of PCOS, and a diet with no high glycemic index food (no sugar and similar foods), together with low fat, is recommended for PCOS. [**76**]

Female children of women with PCOS have increased levels of androgens upon birth. [**77**] Therefore the effect of PCOS (hence of a high sugar, high fat diet) on sexual orientation may extend beyond the mother to her female offspring.

The adrenal glands

The adrenal glands are a source of increased androgen production in women and in prepubertal men (whose testicles do not yet produce testosterone). In prepubertal boys the excess of adrenal androgens leads to virilization and precocious puberty, while in prepubertal girls, it leads to inappropriate virilization. [**78**]

Girls with increased androgen production due to congenital or non-classical adrenal hyperplasia, have increased homosexuality rates. [**79**] Non-classical adrenal hyperplasia begins during childhood or adulthood. According to the authors of the study such increased rates were attributed both to the prenatal effect and masculinization of childhood behavior due to the increased androgen production by the adrenal glands.

In a study with 12 female-to-male transsexuals, six (50%) had symptoms of non-classical adrenal hyperplasia. [**71**]

About 25-30% of Polycystic Ovary Syndrome cases are due to excess production of androgens by the adrenal glands. [**80**]

High-fat diets cause adrenal hyperplasia in mice. [**81**]

Nonclassical adrenal hyperplasia is a form of adrenal insufficiency and although there are no formal studies of the effect of diet on this condition in humans (that I am aware of), in alternative medicine, a healthy diet is considered important for the health of the adrenal glands. According to Dr. Daniel Kalish, the standard American diet is "a perfect recipe for destroying your adrenal glands." He recommends eating a diet low in sugar and carbs for adrenal health. [**82**]

The adrenal glands are an essential organ in stress response, and stress exposure causes increased adrenal size in experiments with animals. [**83**] [**84**] Therefore stress may increase androgen production in susceptible women.

Feminine and hyper-masculine gays

In studies on gender nonconformity [**24**] [**85**] [**86**], men with feminized, gender nonconforming behavior have an increased risk of becoming homosexual.

Testosterone has a strong influence on masculinity. Anti-androgens and estrogens are given during hormonal replacement therapy to male-to-female transgender patients in order to demasculinize and feminize them. [**87**]

Prenatal low testosterone levels in males have been associated with increased homosexuality in adulthood. [**66**] Postnatal testosterone levels can also affect sexual orientation. Some studies have been done with eunuchs (castrated males). Testosterone levels are very low in eunuchs. In a study with eunuchs who were not transsexuals, by Brett M.A. et al. (2007), 22% of the eunuchs reported a change in sexual orientation after castration. [**88**] In another study by Handy et al. (2016), 20-30% of eunuchs reported a change after castration in the preferred gender of attraction, fantasies or relationships. The average age at castration was 43 years old. [**89**] Most of the eunuchs in both studies were taking supplemental testosterone and/or estrogen.

A considerable percentage of male-to-female transsexuals report a change in their sexual orientation during the transition process, and some of them attribute the change to the sexual hormone therapy. [**90**] Male-to-female transsexuals report a shift in sexual orientation after sex reassignment surgery (from 54% predominantly attracted to women to 25% after sex reassignment surgery). [**91**]

While males with low testosterone levels are more at risk for homosexuality because of the effect testosterone has on gender conformity, males with high testosterone levels could be more at risk due to increased sexual drive. Sexual behavior is complex and affected by factors in addition to testosterone. As a result, different studies show different testosterone levels in homosexuals: some show low levels, [**92**] [**93**], some show high levels of testosterone [**94**] and other studies show normal testosterone levels. [**95**] [**96**]

Obesity and excess weight are associated with lower testosterone levels in males and low calorie diets can improve testosterone deficiency in males. [**97**] [**98**]

Consumption of sugar causes insulin release. A study by Simon et al. (1992) with 1,292 healthy men found that as total plasma testosterone decreased with each decade of age, insulin increased with each decade of age. The inverse association between testosterone and insulin was independent of age. The association remained even when obesity was accounted for. That is, even men who were not obese had higher odds of having low testosterone if they had high insulin levels. [**99**] Males more susceptible to a negative effect of diet on reproductive hormones may be those with a problematic liver. Chronic liver diseases have been associated with feminization, hypo-androgenization and hyper-estrogenization in males. [**100**] Cirrhosis, a severe liver disease, is associated with testicular atrophy, female pattern distribution of hair, gynecomastia (development of the mammary gland). Non-alcoholic fatty liver disease is widespread in the population [**101**], including children. It affects almost 10% of all children in the United States. Approximately 1% of 2- to 4-year-olds, and 17% of 15- to 19-year-olds have non-alcoholic fatty liver disease [**102**]. Poor diet is considered the leading cause of non-alcoholic fatty liver, with the biggest offenders being sugar and fruit juices.

Non-alcoholic fatty liver disease is considered a consequence of insulin resistance. [**103**] A diet low in high-glycemic index carbohydrates, fat and alcohol is recommended for it. [**104**] Chronic stress is also associated with non-alcoholic fatty liver disease [**105**]. Melatonin, the anti-stress

hormone that is produced during the night, has been proposed as treatment for nonalcoholic fatty liver disease. [**106**].

Vitamin deficiencies have also been linked with low testosterone levels. When male children with delayed puberty were treated with vitamin A for several months, they achieved puberty similar to children treated with testosterone. [**107**] Male rats with vitamin A deficiency have low testosterone levels. [**108**] Vitamin A is abundant in organ meats, green leaves, carrots, etc. -- all foods that are scarce in today's children's menus. There are also several studies that show an association between low vitamin D levels and low testosterone levels. [**109**]

The effect of diet on testosterone may be more pronounced before and during early puberty, when the level of testosterone is still relatively low.

Low testosterone levels are associated with low self-confidence, timidity and fearfulness in males. [**110**] As it will be later discussed, low testosterone levels during childhood and puberty may interfere with the volume of a structure in the brain (sexually dimorphic nucleus in the preoptic area, SDN-POA), which has been shown to be smaller in homosexuals.

Low testosterone levels can be noticeable in obese males. Cases of transsexualism, with extremely low testosterone levels have been noted in obese men. [**111**] Historians narrate about tribes where obesity as well as feminization of males was rampant: "The most remarkable of all the nomadic tribes of the Kuban is that called the Nogays or Mongutays. The members of this are distinguished from the others by the Mongolian features, which characterize their entire physical structure. The men are obese, large and swollen, the cheek bones very prominent, the eyes deep sunken, and the beard sparse. When they are reduced by disease, or when they have attained to an advanced age, the skin of the whole body becomes wrinkled, the beard disappears altogether, and in this state they present a great resemblance to women. They become incapable of the procreative act, and their feelings as well as their actions cease to be like those of the sex to which they belong. Obliged to fly from the society of men, they seek that of women, whose dress they adopt." [**112**]

While in some males the high calorie diet lowers testosterone, in others it may increase it above normal levels. It has been proposed that a syndrome similar to PCOS exists in males and is associated with high levels of free androgens and high insulin resistance. [**113**] Both low testosterone and high testosterone in males would increase the risk for homosexuality: the former because it increases gender non-conformity, while the later because it increases sexual drive.

Adherents to the raw food diet (low-calorie, sugar-free, low fat) seem to better conserve the physical gender differences than those consuming the mainstream diet. Tonya Zavasta, the author of five books on a raw food diet, notes that aging chronic raw foodists do not begin to resemble the opposite sex, common in their peers who eat the mainstream diet. [**114**]

Another reason for feminization of males may be exposure of humans to xeno-estrogens: environmental pollutants (different pesticides, chemicals used in the manufacturing of plastics, etc.), which mimic the effect of estrogen and have been implicated in demasculinization of different species. [**115**] [**116**] Such exposure has increased considerably during the 20th century and may have a synergistic effect with diet [**117**] and sleep deprivation.

4.3 Diet and sexual arousal

In a study by Roberts Al et al. (2012) with survey data of over 9000 youth, although childhood gender non-conformity before age 11 years old, was strongly associated with youth sexual

orientation (respondents mean age=22.7 years old), most youth in the top 10% of gender non-conformity were heterosexual (59.6% heterosexual, 2.2% heterosexual with same-sex partners, 24.5% mostly heterosexual, 4.2% bisexual and only 9.5% gay/lesbian). [**118**] In another study, done in Belgium, the prevalence of gender ambivalence and gender incongruence was 1.8% and 0.9% in gay men and 4.1% and 2.1% in lesbian women, respectively. [**119**]

There are therefore other factors, beside gender nonconformity, that contribute to homosexuality. A recognized contributing factor is a high sexual drive. Homosexuality is more frequent in promiscuous primates, and it has been proposed to be a byproduct of the high sexual desire of promiscuous species. [**12**]

In mammals and humans, sexual desire is impacted by food intake. Food deprivation suppresses estrous behavior in female mammals. [**120**] Women with eating disorders, especially those with anorexia, have decreased sexual desire and increased sexual anxiety.[[**121**] Ketogenic diet, a diet with almost no carbs, low in protein and high in fat, causes menstrual dysfunction and probably lower desire, in 45% of adolescent women. [**122**]

Long water fasts are associated with lower sexual desire. Robert M. Shelton writes about the water fasts in his book "The Hygienic System. Vol. III-Fasting and Sunbathing" (1934): "To add to the religious power of the fast, sexual desires disappear and thoughts of sex cease to obtrude upon the mind. … In these days when the fallacies of psychology and psychoanalysis are on the lips of everyone and when feminine leaders declare chastity and continence to be neither desirable nor practicable and insist that they would be harmful if put into effect, methods of attaining self-control in matters of sex are frowned upon. This feature of fasting may not, therefore, appeal to many who read these lines. Fasting does increase one's control over all his appetites and passions and this will account in some measure for its use by high priests and others in the religions of old." [**123**]

Foods high in glycemic index, like chocolate, honey, bananas, figs etc. have historically been used as aphrodisiacs (although there are no scientific studies to support their use). [**124**]

Sugar acts in the reward circuit of the brain similarly to psychoactive substances (drugs) and sex. It has been proposed to be considered a drug with similarities to stimulant substances as well as opiates. It releases dopamine in the brain upon consumption. [**125**] [**126**] Sugar use has been found to cross-sensitize with alcohol [**127**], amphetamine [**128**] and cocaine use [**129**]. Children who consume a lot of sugar are more prone to consume alcohol as adults. [**130**] Alcoholics prefer drinks with the highest concentration of sugar. [**131**] Several psychoactive substances cause increased sexual arousal during withdrawal, as will be explained later. Sugar may as well have such an effect, given its similarities with psychoactive substances.

Sugar may cause increased sexual arousal several hours after its consumption. Jones et al. (1995) have done a study on sugar with healthy children aged from eight to 16. Children had a twofold increase of epinephrine (adrenaline) compared to adults several hours after sugar consumption on an empty stomach. [**132**] Increased epinephrine levels cause increased physiological arousal [**133**] and individuals in an increased physiological arousal may misattribute the arousal to sexual feelings toward the person present. [**134**] [**135**]

Studies show that the stimulating effect of dopaminergic drugs on sexual arousal is dependent on testosterone [**136**] therefore the effect of sugar may begin with the adrenarche (for 6- to 10-year-olds), when there is an increase of production of androgens by the adrenal glands. This is the age

when many children report first having sexual attractions (including homosexual ones).

High fructose corn syrup and honey are similar to sugar in sweetness and in the glycemic index. The preference for sweet foods is an evolutionary trait, because they are high in calories needed for survival. Sugar is one of the highest glycemic index food.

The combination of both gender nonconformity and high sexual desire would increase the likelihood of homosexuality. High sexual desire would also increase the likelihood of situational homosexuality.

Another way diet may increase sexual arousal is through increased testosterone levels. Testosterone increases sexual arousal [**137**] and males laden with testosterone may be involved in situational homosexuality in aggressive situations, or in populations with sex-skewed ratios. While liver diseases are associated with low testosterone levels, a syndrome similar to Polycystic Ovarian Syndrome in females has been proposed to exist in males and to be associated with high free testosterone levels. [**113**] Low-calorie, low-sugar diets are used to treat PCOS, therefore they may also work for males with a similar syndrome.

4.4 The interaction of stress with diet and its effect on sexual hormones

A high-sugar, high-fat diet increases stress, and stress increases consumption of high-sugar and high-fat foods. In an experiment involving mice, six weeks of a high-fat diet resulted in significant weight gains and elicited anxiety-like behavior and hypothalamic-pituitary-adrenocortical axis (HPA) hypersensitivity to stress. Withdrawal from the high-fat diet increased anxiety and basal corticosterone (stress hormone) levels and enhanced motivation for sugar and high-fat food rewards. [**138**]

In mice which binge daily on sugar, withdrawal from sugar causes increased anxiety and decreased dopamine release in the reward circuit in the brain, similarly to opiate withdrawal. [**139**]

Higher sugar and fat intakes can also contribute to increased sleep problems (a source of stress). Twenty-six normal weight adults, habitually sleeping 7-9 hour/night, participated in a randomized-crossover inpatient study with 2 phases of 5 nights: short (4 hours in bed) or habitual (9 hours in bed) sleep. During the first 4 days, participants consumed a controlled diet; on day five, food intake was self-selected. When self-selected, food intake was higher, with more fat and sugar. Sleep duration was not affected by the ad libitum (eating with no restrictions) day, but it was less restorative and with more arousals. The study authors conclude that high saturated fat and sugar intake is associated with lighter, less restorative sleep with more arousals. [**140**]

Sugar and fat are foods high in calories and empty in micronutrients. They usually displace from the diet the less calorific foods like leaves, tubers, other vegetables, fruits, etc. These are also foods high in micronutrients. Hence the high-sugar, high-fat diet is usually deficient in micronutrients that help the mind-body to cope with stress sources.

While a high-sugar, high-fat diet increases stress, stress also increases the consumption of such a diet. Increased anxiety may contribute to high-fat, high-sugar eating [**141**]. Acute psychological stress can lead to insulin resistance and increased appetite for carbs. [**142**]

Sleep deprivation is among the most common stressor in modern life. It increases appetite for high calorie foods, like sugary and fatty foods.

In a laboratory study of 44 healthy adults, they adults slept normally for two nights (10-12 hours in bed), followed by five consecutive sleep-restricted nights (4 hours of sleep). During sleep restriction, subjects increased daily caloric intake, sugar and fat intake, including obtaining more calories from desserts, and salty snacks. [**143**]

In a similar study with healthy 225 subjects (a very large sample), in a laboratory, sleep restriction promoted weight gain, with increased fat intake during the night. [**144**]

In a study with eleven healthy volunteers, the participants completed in random order two 14 day stays in a sleep laboratory with free access to palatable food and 5.5-hour or 8.5-hour bedtimes. The scientists measured the calories from meals and snacks consumed during each bedtime condition. Sleep was reduced by about two hours in the 5.5-hour bedtime condition. Although meal intake remained similar, sleep restriction was accompanied by increased consumption of calories from snacks, with higher carbohydrate content, particularly during the night. [**145**]

In another study, 441 Danish school children recorded dietary intake for seven consecutive days, along with accelerometer measurements estimating sleep duration at baseline and after 200 days. A one-hour lower sleep duration was associated with higher intake of added sugar (1.59 E%; $P = 0.001$) and sugar-sweetened beverages after 200 days with no change in energy density of the diet. [**146**]

Circadian disruption, common in modern societies due to artificial light use, is a source of stress. It causes decreased insulin sensitivity (insulin resistance) regardless of sleep loss. [**147**] Insulin resistance causes increased appetite for sugar and carbohydrates in general.

Stress may increase testosterone production in aggressive, extrovert males [**148**], decrease it in other males [**149**], increase testosterone in some females [**150**] [**151**], or affect the action of testosterone. Increased testosterone production in females and decreased testosterone in males would increase their gender nonconformity. Increased testosterone levels in males could increase their risk for situational homosexuality due to increased sexual drive.

Stress negatively affects testosterone action in some males. In a study by Mehta and Josephs (2010), cortisol, the hormone that is released by the adrenal glands during stressful situations, blocks the action of testosterone on dominant behaviors. [**152**]

The action of testosterone on sexual behaviors may similarly be impaired by high cortisol levels and stress.

Physical activity is a third variable, with interactions with both stress and diet. In healthy levels, physical activity lowers stress, diminishes the negative effects of a high-sugar, high-fat diet and helps normalize the sexual hormone levels.

5 Stress and homosexuality

There are different sources of stress, including physiological and emotional stressors. Physiological stressors include sleep deprivation or insomnia, extreme hyper- or hypothermia, drug withdrawal states, hunger or food deprivation. Emotional stressors include interpersonal conflict, loss of a relationship, death of a close family member, loss of a child, etc.

Stress is manifested emotionally as increased anxiety. Homosexuals score higher in childhood depression, anxiety and separation anxiety indicators than heterosexuals. [**153**] In experiments, male rats with same-sex preference show higher anxiety than mice with other-sex preference. [**154**] In experiments with mice, when the mice population became overcrowded to stressful levels, an increase in homosexuality was observed. [**155**]

5.1 Sleep deprivation and circadian disruption

Sleep deprivation is a method used to induce stress in experimental animals. Sleep deprivation increases stress, (including anxiety) [**156**] [**157**] and stress increases sleep deprivation. [**158**] Total sleep deprivation causes death in laboratory animals [**159**] and in humans [**160**].

Sleep deprivation has become a public health concern in the United States [**161**] and in many other developed countries. The average sleep duration of Americans has fallen from 8-8.9 hours, to 6.9-7 hours, mainly due to the use of artificial light. [**162**]

The sleep-wake activity, feeding, hormones and neurotransmitter production have a daily (circadian) rhythm. The rhythm has a master clock in the brain (suprachiasmatic nucleus), which is entrained by light. Artificial light has the potential to disrupt such rhythms and cause circadian disruption. Circadian disruption can be a stressor and enhancer of other stressors. [**163**]

There has been a steady increase in light pollution during the last century. [**164**] It has been estimated that light pollution is increasing on average by 6% every year. [**165**] People are using more artificial light indoors. [**166**] Adolescents in particular are prone to delay sleep and be more exposed to artificial light. [**167**]

Exposure to constant light has been suggested to increase stress [**168**] and melatonin, the hormone that is produced during the night, has been shown in different animals to have an anti-stress effect. [**169**] Persons, who experiment with no artificial light use, report considerable calming effect. [**170**] Noise, which usually accompanies light pollution, is stressful in high levels. [**171**] It has a disrupting effect on sleep, and decreases REM sleep. [**172**] Noise pollution has also been on the rise. [**173**]

Homosexuals have shorter sleep duration and sleep later than heterosexuals, according to a study by Rahman Q. [**174**]

Urban inhabitants are more exposed to artificial light and noise, less exposed to natural light and less involved in physical activities during the day. They sleep later and have more sleep deprivation than the inhabitants in rural areas. [**175**] Homosexuality rates are also higher in the cities.

In Australia, according to the Second Australian Study of Health and Relationships, homosexuality is related to living in a big city. [**176**] In Denmark, persons born in the capital had higher probability of having a gay marriage, than their peers in the rural areas. [**177**] In large American cities there is a higher prevalence of homosexuality than the national average. [**178**] A factor

contributing to this is migration of homosexuals into more accepting environments, but in a survey conducted by sociologist Edwuard Laumann et al., in 1994, homosexuality was positively correlated with urbanization of the place of residence at age 14. [**179**] This age group does not usually take independent decisions to migrate for sexual orientation reasons.

5.2 Stress from substance use

A psychoactive substance (drug) is a chemical substance that temporarily changes brain function and is consumed purposely for this effect. Psychoactive substances include alcohol, nicotine, caffeine, cocaine, amphetamine, cannabis, opioids (including prescription opioids) etc.

A known physiological stressor is drug withdrawal. [**180**] Psychoactive substances increase anxiety usually several hours after consuming the last dose of the drug and it may last for days. Anxiety disorders and drug use disorder often go together and reinforce each-other. [**181**] [**182**] Stress and anxiety increase substance use and substance use increases stress. [**180**] [**183**].

Circadian disruption has been found to increase substance use: night shift-workers have a higher likelihood of alcohol use [**184**] [**185**], rats raised in constant light increase consumption and preference for morphine, etc. [**186**]

Through a 12-year study on children, Maria Wong (2010) showed that children with sleep disorders had a twofold increase in substance use compared to the other children. [**187**]

Drugs are often used to aid in sleep and arousal (for example alcohol for sleep, coffee for awakening), but in the long term they disrupt the circadian rhythms and sleep. [**188**] Alcohol, cocaine, marijuana etc. reduce REM sleep. [**189**]

Drugs act on the reward system of the brain, similarly to sex and food. Neurotransmitters affected by substance use and sex include dopamine and serotonin. Dopamine is the neurotransmitter that signals motivation. [**190**] Serotonin signals satiation, is released after sex [**191**], during food, substance use [**192**] and lowers dopamine levels in the reward circuit.

Consumption for alcohol increased in the 20th century in the United States and Great Britain. [**193**] According to the World Health Organization's 2014 Global Status Report on Alcohol, studies have shown a trend towards more drunkenness among youths in many countries, even in those where alcohol consumption per capita has decreased. [**194**]

Death rates from drugs per 100,000 people have increased since at least the 1970s [**195**] in the United States. Many studies have shown that substance use is higher among homosexuals than the general population.

According to a meta-analysis of such studies on adolescents, done by Marshal M.P. et al., in 2008 [**196**], the odds of substance use for adolescent lesbians were 400% higher than those of heterosexuals; for adolescent bisexuals they were 340% higher and in general for the LGB (lesbian, gay and bisexual) adolescent group, the odds of substance use were 190% higher than for heterosexuals.

Homosexuals often live in a hostile social environment, and this may account for some of their substance use, but some studies conclude that their minority status does not explain all the difference. Substance use is high even among mostly heterosexuals, who do not suffer a sexual minority status. [**197**] [**198**] Mostly heterosexuals may suffer from internalized homophobia, which could also increase their substance use.

Psychoanalyst Karl Abraham noted in 1908: "The homosexual components which have been repressed and sublimated by the influence of education become unmistakably evident under the influence of alcohol." [**199**]

According to a British physician, Read (1920), when alcohol is taken to excess it brings "into active conflict with the personality different impulses and desires previously more or less successfully repressed. Of these, the homosexual impulse is found by analysis to be the most frequent." [**200**]

According to E.L. Abel, during the 1920s, some clinicians (Joel and Frankel, 1924) claimed that excessive use of cocaine could turn a heterosexual into a homosexual. [**201**]

In the 1950s and 1960s, Lawrence Hatterer, a physician, identified the use of drugs and alcohol among the triggers and perpetuators of homosexuality. [**202**] He claimed a 45% success rate in increasing heterosexual functioning of his clients. [**203**] He treated more than 600 homosexuals.

Substance use has been linked with repeated change of sexual orientation. [**204**]

There are reports of ex-gays who claim to have reversed homosexuality due to religious faith. Ex-gay ministries offer support for homosexuals wanting to change their homosexuality. [**205**] A common requirement by religious groups is that their members, regardless of sexual orientation, refrain from using drugs and alcohol. Religious rituals and requirements often have a calming and anti-stress effect.

Studies with animals support the role of alcohol (and similar drugs) consumption among homosexuals. In experiments on rats by Triana Del-Rio et al., when sexually naive male rats living in cages with only same-sex rats were administered quinpirole (a dopamine receptor D2 agonist, that acts similar to alcohol and cocaine), and/or oxytocin, the rats developed sexual preference for the male cohabitant over the female. [**206**]

In a study by Kyung An-Han (2008), with fruit flies, which have similar reaction to alcohol as humans, male flies which regularly consumed alcohol began to have sexual encounters with males and females. When the researchers lowered the level of dopamine in the brain, their homosexual behavior decreased. [**207**]

5.3 Emotional stress and other factors

Adverse events during childhood, physical and sexual abuse, have been correlated with homosexuality in different studies. In a study by Wells et al. (2011), with data from the New Zealand Mental Health Survey, a nationally representative community sample of New Zealanders aged 16 years or older were interviewed face-to-face (N = 12,992) and the non-exclusively heterosexual groups were more likely to have experienced adverse events in childhood. [**208**] In a study by Andersen et al. (2013), sexual minority persons had higher rates of adverse childhood experiences compared to their heterosexual peers. [**209**]

Homosexual/bisexual men report higher rates of childhood emotional and physical maltreatment by their mothers and major physical maltreatment by their fathers than heterosexual men. Homosexual/bisexual women report higher rates of major physical maltreatment by both mothers and fathers. [**210**]

It has been observed in different studies that sexual orientation correlates with an individual's number of older brothers, each additional older brother increasing the odds of homosexuality.

Increasing autoimmunity of the mother to the fetus is thought to contribute to this [**211**], but another factor may also be the stress involved with being the younger brother. Rough play is common among male siblings and the youngest brother would be the loser in most of the power plays, suffering emotional stress.

Situational homosexuality

Sex is associated with increased wellbeing. Intercourse lowers blood pressure reactivity to stress. [**212**] Lack of sexual partners can also be a source of emotional stress and can lead to situational homosexuality. Situational homosexuality is known to happen in single gender environments like prisons, among sailors, in harems, boarding schools, etc. The lack of sex may be most stressful for persons who have some sexual experience. Persons who react to lack of sex with a decrease in sleep could be more vulnerable to the development of situational homosexuality. An unfulfilled desire, like in the early stage of love, has been associated with decreased sleep. [**213**]

Prisons, which are notoriously associated with homosexuality, are also very stressful environments for inmates. In one-sex communities like those of sailors, soldiers, harems, boarding schools etc. there are increased rates of homosexuality. [**214**] Situational homosexuality is sometimes called pseudo-homosexuality because once the situation is resolved the person returns to heterosexual behavior.

Brain injury

Changes of sexual behavior, including homosexual acts by previously heterosexual people, have been reported in persons with brain injuries. [**215**]

5.4 Pollution

Different chemicals that disrupt the endocrine system have been implicated in gender nonconforming behavior (which is a risk factor for homosexuality), or in homosexual behavior. The chemicals act prenatally as well as after birth.

Some of these chemicals are atrazine (a herbicide), mercury, polychlorinated biphenyls, bisphenol A etc. The effect of atrazine on reproductive function has been studied extensively by Tyrone Hayes et al., who reports that it causes demasculinized, hermaphroditic frogs, at low ecologically relevant doses. [**216**]

In a study by Frederick and Jayasena on male white ibises, those male birds that ate mercury-contaminated food had higher rates of homosexual behavior [**217**]. In the male groups with the highest exposure, up to 55% of the males showed homosexual behavior. Wild white ibises are exposed to mercury through their diet of crustaceans and other small invertebrates. Mercury is an endocrine disruptor. The exposed male birds in the study produced more estrogen than testosterone compared with control birds.

Exposure to xenoestrogens is thought to have contributed to the obesity epidemic in men in developed countries. Obesity rates in males and females of developed nations are similar, while in poorer nations obesity is much more prevalent in females. That is, males in developed countries are seeing obesity rates as if they were females. [**218**]

6 Prenatal effect

Stress and diet may impact homosexuality during the prenatal period as well. The neurohormonal theory of homosexuality holds that homosexuality in males is caused by a transitory lack of testosterone produced by the fetus at the end of pregnancy, or in the case of females by excessive androgen production in the womb, due among others, to a high level of activity of the mother's adrenal glands (i.e. due to stress). As a result, when the fetus is female, its brain is masculinized, when it is male, the brain is feminized. [**9**]

Mothers of effeminate male children report more stress-proneness than other mothers. [**219**]

Such stress for the mother may come, among others, from substance use, sleep deprivation (due to artificial light, noise, substance use etc.) and a high-calorie diet. In experiments on rats, sleep deprivation in the pregnant mother increases demasculinisation in offspring. [**220**] A high-calorie diet has been implicated in lower testosterone levels for up to two subsequent generations in rats. [**221**]

Prenatal ethanol exposure lowers testosterone levels in the fetus male rats, and in one experiment exposed rats showed feminization as adults. [**222**] [**223**]

A study of 7,500 offspring and their mother found that nicotine use, but not alcohol use, during pregnancy significantly increased probability of lesbianism among female offspring. [**224**]

In a study by Dörner et al. (1980), males born during World War II and the early postwar period (1941-1947) had increased rates of homosexuality. [**225**] The authors of the study suggest that prenatal or perinatal stress may be a causative factor for homosexuality.

Thyroid dysfunction, which is very common during pregnancy and mainly due to autoimmunity, has also been implicated as prenatal factor for increased homosexuality. [**226**] Stress, including psychological stress, and the "Western diet" of high-fat, high-sugar intake, have been recognized as causative factors for autoimmune diseases. [**227**] [**228**]

7 Development of sexual partner preference

In early adolescence, spontaneous erections in males are common. [**229**] Females show increased sexual interest during the ovulation part of the menstrual cycle. [**230**] The spontaneous erections and increased sexual interest usually precede the first sexual experiences.

According to the two-factor theory of emotion, by Schachter and Singer (1962) [**134**], when physiological arousal occurs, the person uses the immediate environment to search for emotional cues to label the physiological arousal. Similarly, the individual experiencing the sexual arousal would search for such cues in the immediate environment. According to Bem's theory "Exotic is Erotic" (1996) [**23**], the opposite sex person is usually different in appearance, behavior, from the person experiencing the sexual arousal, hence his/her presence would further increase arousal and would be the more prominent emotional cue to attach arousal to. [**231**] This would lead to heterosexual attraction.

In males, when the sexual arousal becomes intensive, initially an urge to thrust occurs and later thrusting itself happens. This is a stereotyped, almost instinctive, involuntary movement. In females there are vaginal contractions during sexual arousal. They may feel the equivalent urge to "engulf". When the individual has such an urge to thrust/engulf, he/she would probably recall situations noticed by him/her, when such a movement was performed and would subconsciously seek to imitate them. Those situations involve heterosexual intercourse. The urge may be present from the early stage of sexual arousal, when it has not yet been attached to an emotional cue. Having the urge, and recalling similar acts by others, would orient the male toward females and females toward males.

Once the cue is identified, courtship begins. Humans have diversified courtship behaviors. Nevertheless, the typical courtship ritual in most cultures is one where the male plays the initiating, assertive role, while the female the proceptive and later receptive role. Proceptive behavior in the female is defined as the behavioral gestures used by a female to induce sexual interest in the male. The female displays coy behavior during courtship: she is shy, but subtly inviting. Playing the hard-to-get increases sexual desire in the male. [**232**]

Mammals have courtship rituals, which are almost identical in all members, thus strongly genetically determined. Subhuman primates also have courtship rituals, which are much more diverse than those of the other mammals, but less diverse than courtship rituals in humans. John Money (1997), called the representation of such ritual in the mind and brain as "lovemap". [**233**] He defined *lovemap as* a developmental representation synchronously existent in the mind and the brain (the mind-brain) depicting the idealized lover, the idealized love and sexual affair, and the idealized program, solo or partnered, of sexuoerotic activity projected in private imagery and ideation or in observable performance.

If the courtship ritual is successful, the person comes into physical contact with the emotional cue, which would further increase sexual arousal. During physical contact more oxytocin is released (the social bonding hormone, which is also increased during sexual activity and has a role in sexual arousal). [**234**] [**235**] The male would show stereotyped, almost reflexive thrusting movements, while the female would have vaginal contractions. These movements further increase arousal to

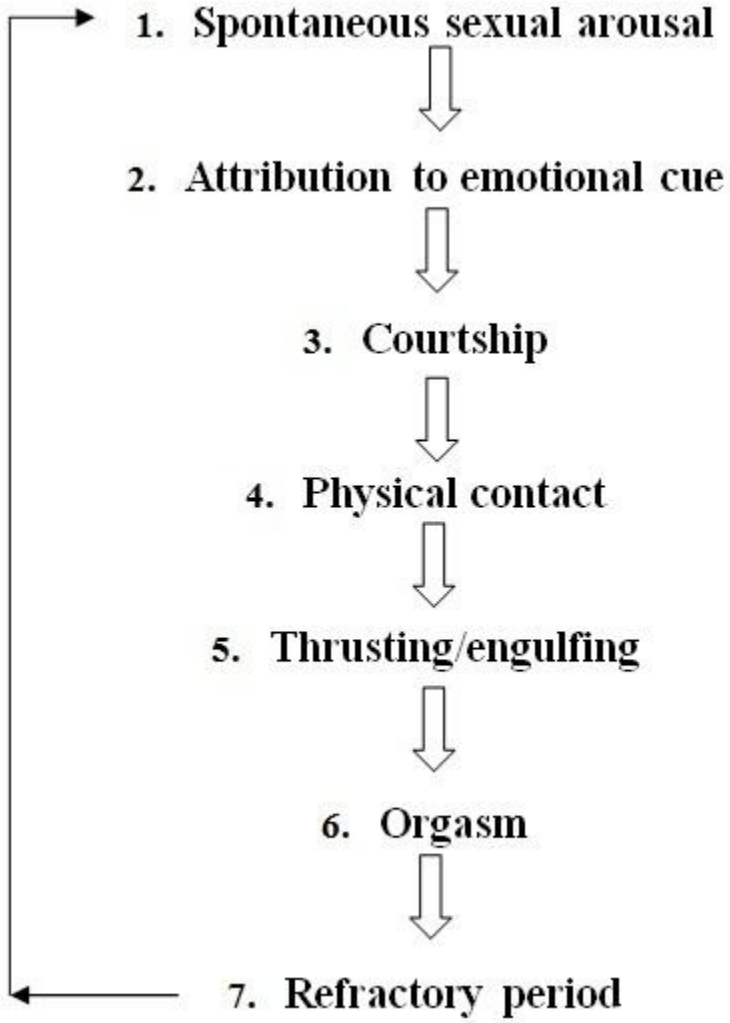
orgasm. Orgasm plays an important role in the creation of partner preference, acting as an unconditioned stimulus, while partner preference is the conditioned stimulus. [**236**] After orgasm there is a refractory period, when there is no sexual desire, neither the ability to perform.

A repeated sexual experience with a person of a given sex, would lead to the conditioned response to persons familiar in appearance to that person.

The conditioning happens during puberty, the critical period of sexual development. The occurrence of spontaneous sexual arousals decreases into adulthood.

The scheme of sexual behavior is as follows:

Figure 1.



When successful, each of the steps increases sexual arousal.

Step 2. Attribution to emotional cue, is probably decisive in determining the sexual orientation of the individual. Daryl Bem (1996) has proposed that gender nonconforming persons attribute sexual arousal to same-sex persons because they feel unfamiliar to their same-sex peers, therefore they would feel more aroused in their presence [**23**].

Another apparent distinction between homosexuals and heterosexuals is in the sexual movements.

The thrusting/engulfing instinct and lack thereof

When sexual arousal gets heightened in males, there appears an urge to thrust, and later thrusting. The thrusting is almost involuntary with the intensification of sexual arousal. It also appears during masturbation, it is not therefore only the result of heterosexual intercourse. Such an urge appears to be weak or missing during most homosexual acts (masturbation, oral sex, receptive anal sex). Giving anal sex is practiced by a minority of homosexual males. Interestingly in different cultures, like in ancient Greece, but also some modern cultures, real homosexuals are considered those who are receptive during anal sex (who do not intromit).

In females, there are also similar movements in the vaginal musculature. Vaginal contractions, which are generally involuntary, happen during sexual arousal and intercourse, and increase sexual arousal. Vaginal stimulation does not seem to be a preferred activity among lesbians. One quarter of lesbians report to have used a vibrator in the last month. [**237**]

An important role in the thrusting movements is played by the medial preoptic area (MPOA) in the brain, and specifically a structure within it, the sexually dimorphic nucleus in the preoptic area (SDN-POA), or INAH3. I will use the term "thrusting center" instead of MPOA, or SDN-POA, or INAH3, for an easier reading and understanding. When this structure is lesioned in males, the pelvic thrusting is lacking or impaired [**238**] [**239**], but masturbation is not affected. [**240**] In some experiments with animals, the males continue to find females sexually attractive but they are unable to copulate with them and do not persist in copulation. In some studies, with male rats and ferrets, lesions of the "thrusting center" modify partner preference to same-sex partners. [**241**] [**242**] In some studies, females with lesioned "thrusting center" show an aversion to intromission, although they do not seem to change their partner preference. [**243**]

In humans, the thrusting center is 2.2 times larger and has 2 times more neurons in males than females. [**244**] It is larger in heterosexual rams than in homosexual ones. [**245**] A decrease in the size of the "thrusting center" in male rats has been associated with same-sex preference. [**246**]

A study by LeVay (1991) showed homosexual men had a "thrusting center" that was smaller than that of heterosexual males and almost as large as that of women. [**27**] In another study, the magnitude of the difference was lower, not statistically significant, and homosexual men had a similar total number of neurons in it as heterosexual men. [**247**]

According to Hofman and Swaab the "thrusting center" at birth has only 20% of the cells found at 2- to 4-year-olds. It achieves its full development in males and females around the age of three. After that age, it gradually becomes smaller through the years in females. [**244**]. The authors state that: "This postnatal period of hypothalamic differentiation indicates that, in addition to genetic factors, a multitude of environmental and psychosocial factors may have profound influence on the sexual differentiation of the brain." Ahmed et al. (2013) challenge the view that this structure does not change during puberty in males. They have shown that it is enlarged with new cells during puberty in male rats and that in male rats castrated before puberty it gets smaller. [**248**] Schulz et al. (2009) propose that all the postnatal period up to late adolescence is a second window of opportunity for the sexual differentiation of the brain structures, including the "thrusting center", implicated in homosexuality. [**249**] The earlier the testosterone levels rise in the male, the most robust their effect is on sexual behavior later during adulthood.

In rams, exposure of female fetuses to increased levels of testosterone in the womb increases the

size of this structure and as adults the females show more mounting behavior (male-typical behavior). [**250**] In female rats, androgens are needed to keep the volume of the "thrusting center" from getting smaller [**251**], and its volume increases to the male size when the female rats are treated with testosterone prenatally and postnatally.

There are other studies with humans as well. In a study by Garcia-Falgueras (2008) the volume and neuron number of the "thrusting center" in castrated men was intermediate between that of males and females, but higher than in castrated, hormone-treated male-to-female transsexuals, who had a structure similar in size to that of females. In a female-to-male transsexual its volume and number of neurons was within the male range, even though the treatment with testosterone had been stopped three years before. There were no differences in the volume of the "thrusting center" in pre and postmenopausal women; therefore hormonal treatment with estrogen is not thought to affect its size. [**252**]

These data show that testosterone levels affect the size of the "thrusting center" prenatally as well as postnatally, in both females and males.

A study by Nugent et al. (2015) showed that in female rats the "thrusting center" is female type due to epigenetic changes, not genes. The authors of the study could masculinize it pharmacologically and then reverse the process. [**253**] The females who received the brain masculinizing agent engaged in significantly more mounts and thrusts towards a sexually receptive female.

Since in females the "thrusting center" gradually decreases after the ages of three to four, while in males it remains unchanged, and it gets smaller with lower testosterone levels (in castrated males), males who have low testosterone levels through their childhood and adolescent years could have a smaller, "thrusting center" due to chronically low testosterone levels. The modern diet, sleep deprivation and other stress sources cause low testosterone levels even in healthy males.

Studies on testosterone levels of homosexuals may have missed some facts. They compare testosterone levels between contemporaneous males. Testosterone levels of homosexuals compared to today's heterosexuals may not be considerably lower, but testosterone levels in young men in general seem to have gotten lower (or their action has gotten weaker) through the last century. Data from the 1940s show that the majority of young men at that time had sperm counts with averages higher than 100 million/ml. Recent studies of young men in Northern Europe show that in Denmark approximately 40 percent of the men have now sperm counts below 40 mill/mL. [**254**] Testosterone levels greatly influence sperm count, therefore they have also probably decreased (or their action has been impaired) during the last century.

The studies measuring the differences in testosterone levels between heterosexual and homosexual men may have not accounted for any possible differences between homosexuals and heterosexuals in testosterone levels during sleep. Testosterone in males peaks during sleep [**255**] and homosexuals sleep less than heterosexuals. [**174**] The sleep related rise in testosterone is linked with the first REM sleep during the night. [**256**] Interestingly, during REM sleep males experience night-time erections. [**257**] Females also experience sexual arousal episodes during sleep. [**258**] REM sleep also has an important role in the maturation of the brain in the young. [**259**] The "thrusting center", or other brain areas important for its functioning, probably develop during these REM sleeps associated with sexual arousals. The lateral preoptic area of hypothalamus is a brain site implicated in the regulation of erections during REM sleep. It is situated close to the "thrusting center".

During adolescence, the "thrusting center" is still under development and while the urge to thrust may not be present in the early sexual arousals of adolescents, it would appear later, under the influence of increasing levels of hormones and experience. Therefore, most of the human male adolescents experiencing homosexual attractions outgrow them. [**260**] This is true in the modern cultures, but also in the primitive ones, like in the Bisaasi-tedi or the Samba tribes, where homosexual relationships between adolescents are widespread but are nevertheless rare among adults [**261**]. Homosexuality is widespread among animal adolescents in some species and they outgrow it as well. [**262**]

Beside the size, other factors can affect the work of the "thrusting center". A lesion could be a reason for the urge to thrust to be missing. In some homosexuals it may be normal in size, because in some studies with transsexuals, the size of the "thrusting center" was more correlated with gender identity than with sexual orientation. [**263**] Something may be interfering with the functioning of the "thrusting center" in those homosexuals who have it at a normal size.

Use it or lose it

As the saying goes: "If you don't use it, you lose it." Can it apply to the "thrusting center" as well? There is a short-cut route to sexual reward, which does not need this center to function: masturbation. There is no need for thrusting (or engulfing in the case of women), to achieve orgasm during masturbation. If time after time orgasm is achieved without thrusting/engulfing, the brain learns that it does not need to use the "thrusting center", and won't use it. This can hamper its development during adolescence or its ability to function in the long term.

The individual will have difficulties in performing in real life sexual relationships and he/she may even lose the urge associated with the thrusting/engulfing and hence the sexual motivation for heterosexual relationships. Being an alternative route of sexual pleasure, masturbation would also weaken the resolve and motivation of the male to courtship the female or of the female to accept the advances of a male. It would increase the chances of failure for the courtship attempts.

Many studies show masturbation to be associated with stress. [**264**] [**265**] Stressed persons masturbate more than less stressed persons. [**266**] Masturbation itself, when done excessively can be a source of stress, as porn users can attest.

Masturbation occurs in 34 out of a total of 52 nonhuman primate species. It is more common in primates with a promiscuous mating system. It has been proposed that in these species, male masturbation may be a non-functional by-product of high sexual arousal. In male rhesus macaques masturbation is linked to low mating opportunities: regardless of rank, males are most likely to be observed masturbating on days in which they are not observed mating. Lower-ranking males mate less and tend to masturbate more frequently than higher-ranking males. Male masturbation events end with ejaculation in only 15% of the observed masturbation time. [**267**]

Similarly, in the Japanese macaques (a primate), masturbation with or without ejaculation, is practiced by males mainly during the breeding season. In this species, both the rate of masturbation only and masturbatory ejaculations increase as male social status and male mating success decline. [**268**]

There is on average a 5-year gap (10- to 15-year- olds for gays, 13- to 18-year-olds for lesbians) between the time when the gay/lesbian first thought they may be other than heterosexual and the time when they know for sure that they are homosexual. This time gap is on average four years for

bisexuals. During this time, they have both heterosexual and homosexual attractions. [**269**] Masturbation may swing the attraction in the homosexual direction.

R. Von Krafft-Ebing, an Austro-German psychiatrist of the 19th century, held that masturbation causes homosexuality and would say of it: "Nothing is so prone to contaminate- under certain circumstances even to exhaust- the source of all noble and ideal sentiments, which arise of themselves from a normally developing sexual instinct, as the practice of masturbation in early years. It despoils the unfolding bud of perfume and beauty, and leaves behind only the coarse, animal desire for sexual satisfaction. If an individual, spoiled in this manner, reaches an age of maturity, there is wanting in him that aesthetic, ideal, pure, and free impulse which draws one toward the opposite sex. Thus the glow of sensual sensibility wanes, and the inclination toward the opposite sex becomes weakened. This defect influences the morals, character, fancy, feeling, and instinct of the youthful masturbator, male or female, in an unfavorable way, and, under certain circumstances, allows the desire for the opposite sex to sink to nil; so that masturbation is preferred to the natural mode of satisfaction. If the youthful sinner at last comes to make an attempt at coitus, he is either disappointed because enjoyment is wanting, on account of defective sensual feeling, or he is lacking in the mental strength necessary to accomplish the act. The fiasco has a fatal effect, and leads to absolute psychical impotence. A bad conscience and the memory of past failures prevent success in any further attempts." [**5**]

An interesting fact is the use of masturbation by the Native Americans of the southwestern United States to create feminine males (mujerado) for their traditional orgies. These feminine males were used as the passive partners in the homosexual orgies. The manner they were created is narrated by Hammond, in the 19th century: "For the making of a mujerado one of the most virile men is selected, and the act of masturbation is performed upon him many times every day. The genital organs are thus brought at first, into a state of extreme erethism, so that the motion of the horse is sufficient to produce the discharge of seminal fluid, while at the same time the pressure of the body on the animal's back -- for the riding is done without a saddle -- interferes with their proper nutrition. It eventually happens that, though an orgasm may be caused, emissions can no longer be affected, even upon the most degree of excitation. Finally, the accomplishment of an orgasm becomes impossible; in the meantime the testicles and the penis begin to shrink, and in time reach their lowest plane of degradation. But the most decided changes are at the same time going on, little by little, in the instincts and proclivities of the subject. He loses his taste for those sports and occupations in which he formerly indulged, his courage disappears and he becomes timid to such an extent that, if he is a man occupying a prominent place in the council of the pueblo, he is at once relieved of all power and responsibility, and his influence is at an end." [**112**]

Hammond held that excessive masturbation (and horse riding without a saddle, which frequently leads to seminal emissions) can lead to feminization by first causing impotence. According to him, "this condition is accompanied with such moral and physical changes in the affected individuals as to cause them to look like women, and to acquire the mental characteristics and instincts of the female sex."

Masturbation may play an important role also in autogynephilia by reinforcing the paraphilic interest through orgasm. Transgender males are usually categorized in two groups: homosexual transgender and autogynephilic transgenders. Autogynephilic transgenders want to be females because they feel or have previously felt sexually aroused from the thought of being a female. Autogynephilia is a paraphilia. Autogynephilic transgenders often perform sex reassignment

surgery and have higher homosexuality rates than in the general population.

Masturbation affects interpersonal behavior and the latter affects testosterone levels. Dominant behavior increases testosterone levels. Testosterone rises in the face of a challenge, as well as after competition in the winners. [**270**] Males who achieve sexual gratification mainly through masturbation, would be less motivated to engage in dominant behavior for access to and protection of a sexual partner. They effortlessly achieve each orgasm, sidestepping the psychological endeavors needed to gain and maintain the interest of a partner. The brain, anticipating no challenges in achieving sexual gratification, could then lower testosterone levels, leading to a downward spiral of demasculinisation and masturbation.

Attachment of sexual arousal to an emotional cue seems to be fluid during masturbation. Males with paraphilic disorders, who can get sexually aroused by dozens of different cues, achieve orgasm by masturbation. Many heterosexuals view (and masturbate to) gay porn, transsexual porn, while many gays view heterosexual porn. [**271**] [**272**] Such fluidity in attachment is to be expected given the less awarding nature of masturbation compared to intercourse.

This fluidity would allow for the emergence of homosexual fantasies, later reinforced by orgasm.

Gender nonconforming behavior

Gender nonconforming behavior would negatively impact the appropriate courtship. Non-masculine males would be non-initiating in the courtship game and would lose in the competition with more assertive males. [**273**].

Unsuccessful courtship attempts would increase anxiety in the person attempting them. In successive attempts, such increased anxiety would decrease sexual arousal [**274**] and would contribute to failure of the courtship attempt.

Even if courtship succeeds, failing at sexual intercourse would again increase anxiety, decrease sexual arousal and lead to avoidance of heterosexual relationships.

Having failed at courtship and achievement of orgasm, the sexual arousal of the individual would remain unconditioned to any emotional cue and in search for one. Homosexual attractions and later homosexual behavior could develop at this stage.

Overworking the brain

Overworking a body part may bring similar consequences as underworking it. There is no reason why the brain circuit involved in sexual response should be an exception. Sexual arousal has at least three components: the wanting component which manifests as mental arousal/desire (facilitated by dopamine [**275**]), the physiological component, which manifests as erection in males and engorgement of the genitalia in women (facilitated by testosterone) and the bonding component, which manifests as attachment to the object of desire (facilitated by oxytocin) [**276**].

These three components can get decoupled like in the Persistent Genital Arousal Syndrome [**277**], where there is physiological arousal but no mental arousal (desire), in erectile dysfunction where there is mental arousal but no physiological arousal; and in platonic love, where there is attachment but little sexual arousal.

When one of these components gets into overdrive, there may be homosexual behavior.

This may be the case with drug use and in other cases of stressful situations. Psychoactive drugs are often used by adolescents and have a strong effect on sexuality. As was detailed in the chapter

on substance use, homosexual behavior often follows or is associated with substance use. In several experiments with rats, sexually inexperienced male rats treated with dopamine agonists (quinpirole, which is similar to recreational drugs), develop sexual preference for same-sex partners. Heterosexually experienced male rats are not affected by the dopamine agonists.

Why this happens is not understood, but it may be related to drugs increasing stress. Drugs increase stress especially during withdrawal [**180**]. Cocaine causes spontaneous sexual arousals and ejaculations in humans. [**201**] The effect of cocaine on erections is stronger when combined with sleep deprivation [**278**] Spontaneous erections are among the symptoms of opiate withdrawal. [**279**] Alcohol as well causes increased genital reflexes upon withdrawal. In studies with alcohol and sexual reflexes in dogs, in the 1950s, W. Horsley Gantt observed that some dogs (especially neurotic ones) had an increased duration of erection the day after experimental days, when no alcohol was given, compared to the control level at the beginning of experiment. [**280**] Increased sexual interest during alcohol withdrawal is called "hangover horn" in urban slang. [**281**]

Being in stress (like during withdrawal from psychoactive substances), the individual's reward system may be sensitized to potential rewards and, upon early signs of physiological arousal/physical pleasure due to contact, manifest increased wanting/mental arousal (increased dopamine release).

As a result, sexual interest could be manifested indiscriminately toward opposite and same-sex persons.

During drug withdrawal, serotonin levels in the brain are low. Serotonin signals satiety, the state of being sated. Low serotonin levels lower the ejaculatory/orgasm threshold. [**282**] In different experiments with animals, low serotonin levels cause some of them to prefer same-sex partners. [**283**]

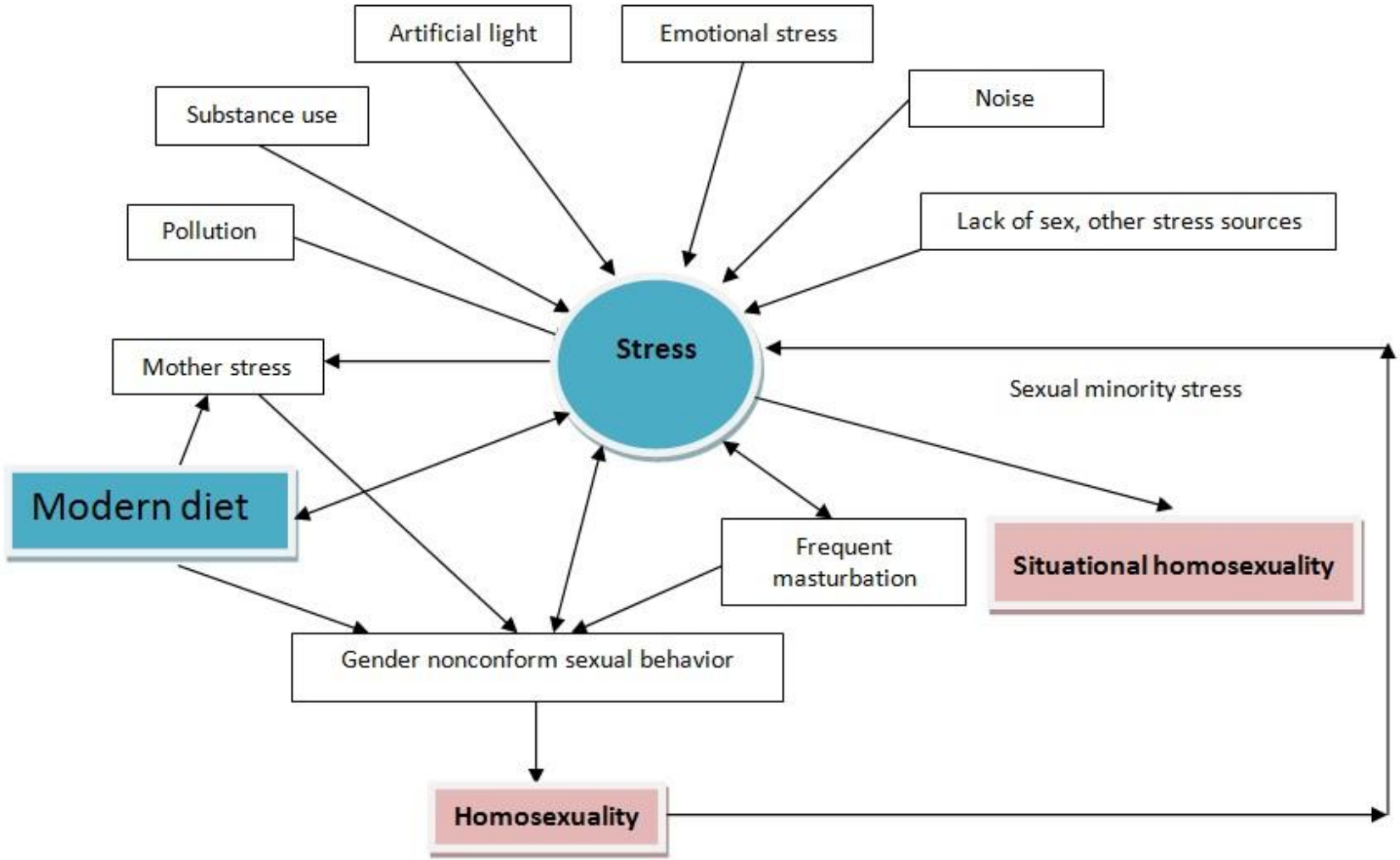
Other stressful situations, beside drug withdrawal, where homosexual activity is often noticed, are situations of competition for resources, territory or mates between same sex individuals. In such situation the mounting male shows his dominance to the other male. The aggressive male has probably high testosterone levels, which mediate both aggression and physiological arousal. [**284**] [**285**] Extraverted males may be more prone to such a behavior. [**286**]

Homosexual behavior under the effect of drugs or in situations of dominance competition is similar to situational homosexuality.

Once homosexual attractions are born, the person experiencing them may find them unwanted and get anxious when experiencing them. Such anxiety and stress would further add to the total stress load and increase the risk for homosexuality. Psychiatrist Edward J. Kempf in 1920 coined such anxiety as "homosexual panic". [**287**]

Below is a scheme of how stress and diet can cause homosexuality.

Figure 2.


Artificial light
Emotional stress
Substance use
Noise
Pollution
Lack of sex, other stress sources
Stress
Mother stress
Sexual minority stress
Modern diet
Frequent masturbation
Situational homosexuality
Gender nonconform sexual behavior
Homosexuality

8 Culture case studies

The lack of homosexuality has been noticed by anthropologists in different cultures like the Alorese, the Bororo, Ulithi, the Ifaluk, the Yanomamö, the Aka etc. In societies with social stratification there are increased rates of homosexuality. The probability of observing homosexuality was 0.28, 0.75 and 0.91 for non-stratified, moderately stratified and strongly stratified societies, respectively, in a sample of 89 societies [**261**] . The stratified societies have usually a well- developed food supply to the elite, high population pressure and resulting stress sources (increased competition, less available individual space, more environmental pollution etc.)

A similar observation is that the number of societies with homosexuality present increases with the intensity of agriculture. [**288**] Intensive agriculture typically involves a better supply, especially to the social elite, with high calorie food (fat, honey, sugar) and alcoholic drinks.

Africa

Developed countries like the United States, Canada, Australia and those in the European Union have among the highest rates of light, noise, and chemical pollution as well as high levels of alcohol [**289**] & drug consumption [**290**], and among the highest obesity rates [**291**]. These developed countries also have the highest acceptance of homosexuality in society [**292**] compared to Africa [**293**], the continent where there is the least light pollution, substance use and obesity. Some examples are the tribes of Aka and Ngantu in central Africa. In the tribes of Aka and Ngantu, which live in the tropical forest, homosexuality and masturbation are not known, there are no words for them, although they are sexually very active. [**294**]

The Hunzas

The Hunzas live in a remote area Pakistan, far from modern life. Homosexuality was not known among them, based on the recounts of a medical doctor, Robert McCarrison, who served in their area for nine years. [**295**] The diet of the Hunzas has minimal use of sugar and alcohol. McCarrison is reported to have said in a lecture: "As much sugar is imported into their country in a year, as is used in a moderately sized hotel of this city in a single day." While, according to Colonel Lorimer, the Hunzas occasionally drank a little wine at festivals. [**296**]

Ancient Rome and Greece

Ancient Rome and Greece were cultures where homosexuality was practiced and tolerated. [**297**] Wine was also widely consumed. [**298**] It had an aristocracy, which would have had the means to indulge in dietary excesses. Although an ancient city, Rome had noise pollution during the night, disrupting sleep of its citizens. To lower noise, the chariots were later banned during the night. [**299**] These factors may have contributed to the relatively high presence of homosexuality in Rome. With the fall of the Roman Empire, production and consumption of wine greatly reduced, the city became smaller, probably with less noise pollution, and these may have contributed to the lesser acceptance and presence of homosexuality in Christian cultures that followed it.

Inca Empire

Some of the people that made up the Inca empire had institutionalized homosexuality. [**300**]

When the Spanish conquistadors first encountered the art of the native Peruvians, to them, the "sodomite, homosexual and bestial perversions" (Bejarno, 1952) portrayed in such pictures had to

be due to some unique influence, and the influence they felt to be responsible was the natives' use of coca. [**301**]

Spain

Spain has the highest percentage of LGBT-identified youth in Europe [**46**] and is among the most LGBT-tolerant states in the world [**292**], with 88% of the questioned thinking that society should accept homosexuality. Madrid and Barcelona have been considered among the best travel destinations for homosexuals. [**302**] Spain has a culture of eating and sleeping too late, which would increase circadian disruption and sleep deprivation. Dinner is eaten between 9 and 11 p.m. [**303**], while in the United States and Great Britain, for example, the normal time for dinner is between 5 and 6 p.m.

Melanesia [**304**]

Ten to 20% of all tribes in Melanesia – a region in Oceania stretching 3,000 miles from Irian Jaya to Fiji -- have ritualized homosexual practices. [**305**] These practices are confined to pre-pubertal and pubertal boys and do not seem to hamper development of heterosexual orientation in the adolescents. The children are coerced into the practices when they are unwilling. The Melanesian tribes seem to have hyper-masculine features. The Melanesian tribe of Big Nambas, where ritual homosexuality is the most prominent, is an extreme form of patrilineal culture, where a very low status is accorded to women. There is also a sex ratio disparity, 126 males for 100 females, exacerbated by the chiefly system, where the chief holds a monopoly over women.

9 A potential new therapy to change sexual partner preference

An approach to ego-dystonic sexual orientation is to change the attitude of the person toward homosexuality, accepting sexual orientation as normal. An alternative route is to change the sexual partner preference.

The proposed therapy herein can be tested in Phase 1 and 2 trials. Its aim would be to move sexual partner preference of the person toward the heterosexual end in the Kinsey scale [**306**].

I will use the term "sexual partner preference" rather than "sexual orientation," because sexual orientation, as it has been used, implies a predisposition to homosexuality and such predisposition is genetic, epigenetic or due to prenatal factors and cannot be changed by this proposed therapy.

Sexual orientation has some fluidity, especially during adolescence. Different studies show the fluidity of sexual orientation, including the National Longitudinal Study of Adolescent to Adult Health in the United States. This prospective longitudinal study of a sample of U.S. adolescents began during the 1994–1995 school year, and followed the group into young adulthood, with four follow-up interviews (referred to as Waves I, II, III, IV in the literature). J. Richard Udry, the director of the study for Waves I, II and III reported that among boys who reported romantic attraction only to boys and never to girls at Wave I, 48% did so during Wave II; 35% reported no attraction to either sex; 11% reported exclusively same-sex attraction; and 6% reported attraction to both sexes. [**260**]

In a study by Katz-Wise S.L. et al., 2015, sexual fluidity in attractions was reported by 63% of females and 50% of males of same-gender orientation, aged 18 to 26. [**307**] Due to this fluidity, authors Savin-Williams and Ream proposed abandoning the notion of sexual orientation. [**308**]

Different reparative/conversion therapies aim to lower homosexual attractions/behavior and increase heterosexual attractions/behavior in the client, and different success rates have been reported. The therapists do report some success, although at low rates, even with those clients who were exclusive homosexuals when seeking treatment. [**309**] [**310**]

Given that adolescence is a time of continued sexual differentiation of the brain and modification of behavior (a window of sensitivity), the proposed therapy would be successful in lifetime exclusive homosexuals if begun as soon as homosexual attractions or gender nonconforming behavior arises (in childhood or puberty).

9.1 Healthy diet and other behavioral measures

Based on what was previously discussed, the long term following measures would be necessary to decrease and, once decreased, prevent the return of homosexual attractions:

- Keep a healthy diet with no sugar, low in high glycemic-index foods, in fat.
- Sleep adequately. The amount and time of sleep that each one needs is individual, but in general one should sleep until satiety and preferably go to sleep near sunset, because it aids in falling asleep. Sleep Hygiene has some generally applicable rules that help sleep in most persons.

  The National Sleep Foundation for example advises among others [**311**]:

  - Make sure that the sleep environment is pleasant. Mattress and pillows should be

comfortable. The bedroom should be cool. Turn the light off. Consider using blackout curtains, eye shades, earplugs, "white noise" machines, humidifiers, fans and other devices that can make the bedroom more relaxing.

- Exercise to promote good quality sleep. For the best night's sleep, most people should avoid strenuous workouts close to bedtime.
- Limit daytime naps to 30 minutes.
- Avoid stimulants such as caffeine and nicotine close to bedtime.
- Steer clear of food that can be disruptive right before sleep, like heavy or rich foods, fatty or fried meals, spicy dishes, citrus fruits and carbonated drinks.
- Ensuring adequate exposure to natural light during the day.
- Establishing a regular relaxing bedtime routine.

- Do not use drugs.
- Do not masturbate.
- Manage interpersonal conflicts and other sources of emotional stress through different therapies, including cognitive and behavioral therapy.
- Limit exposure to endocrine-disrupting chemicals.

Stopping drug use and masturbation are easier to follow once healthy sleep patterns and eating habits are put in place.

9.2 Inducing hibernation in sexuality

In wild primates, and somewhat in humans, sexuality is seasonal. It flourishes in periods of access to food and "hibernates" in periods of scarcity. While many wild primates show seasonality of sexuality, once captive they lose such seasonality. [**312**]

The seasonality of humans in sexuality has been dampened due to artificial light and year round access to food. Ancient scholars acknowledge such seasonality. Master Liu Ching, a Han Dynasty adept, would advise "In spring man may permit himself to ejaculate once every three days, but in summer and autumn he should limit his ejaculations to twice a month. During the cold of winter, a man should preserve his semen and avoid ejaculation altogether. The Way of Heaven is to accumulate Yang essence in winter. One ejaculation in winter is one hundred times more harmful than an ejaculation in the spring". [**313**]

Nevertheless, there is still some seasonality in human sexuality. During spring, when the days get longer, sexual activity increases. [**314**] [**315**]

Diet also influences sexual activity. Extremely low calorie, low-carb diets decrease sexual interest. It is an evolutionary adaptive physiology, especially in women, that reproduction (therefore sexual interest) is deferred during lean times.

In studies with women with eating disorders, a low body mass index (BMI) has been associated with a loss of libido. 75% of women with restricting and purging anorexia nervosa have a loss of libido. [**121**]

According to the author of the book "Your Brain on Porn: Internet Pornography and the Emerging Science of Addiction," Gary Wilson, people who stop masturbating go through a temporary phase of no sexuality, which can last from weeks to months. Such state is called "flatlining." [**316**]

Given the above, it would be possible to induce a temporary state, lasting weeks/months of no sexual interest and arousal, by:

- Increasing sleep amount to the maximum recommended levels. Some experts recommend 9.30 hours per night;
- Increasing exposure to night, by switching off artificial light sources earlier and do this in winter, when night is longest and exposure to sunlight is lowest. The average night time exposure in natural conditions is 12 hours per night, so this would be ideal for lights off.
- Consuming a calorie-restricted, no sugars, low fat, low-carb diet. In anorexic women, loss of libido is higher the lower the Body Mass Index gets. Therefore, overweight people may need to achieve considerable weight loss before they experience loss of libido.

During the period of no sexual interest, stimulus extinction would happen to some extent. That is, upon re-wakening of sexual interest, the response to the previous sexual stimuli will not restart at once and at the same level as previously. Time would be needed to achieve the same level as before hibernation. Discontinuation of hibernation would be an opportune time for sexual orientation change.

9.3 Discontinuation of hibernation

Once sexual hibernation is achieved, it is maintained for a period and then discontinued. I would guess that starting it at the beginning of winter and ending it in spring would take the most advantage of the long nights.

Upon discontinuing this regimen, the individual would experience increased and more frequent sexual arousals.

The calorie content is increased slowly so that the increase in sexual arousal is gradual and not to excessive levels. Going from low calorie to high calorie diets can be traumatic for the body if not done gradually.

During discontinuation, the individual has the opportunity to jumpstart heterosexual relationships. Only 28% of gays and 21% of lesbians were never sexually aroused by opposite sex members, according to a study by Bell et al (1981). [**317**]

The majority had had previous heterosexual attraction, therefore upon discontinuation of hibernation, heterosexual attraction could again resurface. Homosexual attraction could also resurface, probably weakened due to extinction.

The effect of diet, behavioral measures and stress management on the brain areas related to sexual behavior would normally be gradual, moving the balance of sexual attractions and behavior toward heterosexuality over several years.

Rewarding heterosexual attractions and ignoring homosexual ones, would help shift the sexual orientation toward the heterosexual end of the Kinsey Scale. Since sexual energy would have an outlet to express itself (heterosexual behavior), there would be no negative consequences for the mental health of the homosexual.

Persons with a longer history of homosexual attractions and those with stronger prenatal or genetic

factors would have more difficulty in achieving benefits from this therapy.

10 Bibliography

1 WHO. International Statistical Classification of Diseases and Related Health Problems 10th Revision. [Internet]. 2016 [cited 2016 November 1]. Available from: http://apps.who.int/classifications/icd10/browse/2016/en#/F66.1.

2 International Lesbian and Gay Association. Carroll A. State Sponsored Homophobia. A world survey of sexual orientation laws: criminalisation, protection and recognition. 11-th edition. [Internet]. 2016 [cited 2017 February 16]. Available from: http://ilga.org/downloads/02_ILGA_State_Sponsored_Homophobia_2016_ENG_WEB_150516.pdf.

3 Bagemihl B. Biological Exuberance: Animal Homosexuality and Natural Diversity. New York City: Stonewall Inn Editions. 1st edition; 2000.

4 Hogenboom M. Are there any homosexual animals? BBC. [Internet]. 6 Feb 2015 [cited 2017 February 10]. Available from: http://www.bbc.com/earth/story/20150206-are-there-any-homosexual-animals.

5 Krafft-Ebing, R. Von. Psychopathia sexualis. With especial reference to contrary sexual instict; A medico-legal study. Available from: https://ia801606.us.archive.org/33/items/PsychopathiaSexualis1000006945/Psychopathia_Sexualis_1000006945.pdf. 1894.

6 Friedman RM. The psychoanalytic model of male homosexuality: a historical and theoretical critique. Psychoanal Rev. 1986;73:483-519.

7 Hooker E. The adjustment of the male overt homosexual. J Proj Tech. 1957;21:18-31.

8 Långström N, Rahman Q, Carlström E, Lichtenstein P. Genetic and environmental effects on same-sex sexual behavior: a population study of twins in Sweden. Arch Sex Behav. 2010;39:75-80.

9 Ellis L, Ames MA. Neurohormonal functioning and sexual orientation: a theory of homosexuality-heterosexuality. Psychol Bull. 1987;10:233-58.

10 Lawrence S. Mayer, Paul R. McHugh. Sexuality and Gender: Findings from the Biological, Psychological, and Social Sciences. The New Atlantis, A Journal of Technology and Society. [Internet]. 2016 [cited 2017 January 15]. Available from: http://www.thenewatlantis.com/publications/part-one-sexual-orientation-sexuality-and-gender.

11 Burri A, Spector T, Rahman Q. Common genetic factors among sexual orientation, gender nonconformity, and number of sex partners in female twins: implications for the evolution of homosexuality. J Sex Med. 2015;12:1004-11.

12 MacFarlane GR, Vasey PL. Promiscuous primates engage in same-sex genital interactions. Behav Processes. 2016;126:21-6.

13 Caballero-Mendieta N, Cordero C. Enigmatic liaisons in Lepidoptera: a review of same-sex courtship and copulation in butterflies and moths. J Insect Sci. 2012;12:138.

14 Hoving HJ, Bush SL, Robison BH. A shot in the dark: same-sex sexual behaviour in a deep-sea squid. Biol Lett. 2012;8:287-90.

15 Camperio-Ciani A, Corna F, Capiluppi C. Evidence for maternally inherited factors favouring male homosexuality and promoting female fecundity. Proc Biol Sci. 2004;271:2217-21.

16 Barthes J, Godelle B, Raymond M. Human social stratification and hypergyny: toward an understanding of male homosexual preference. Evolution and Human behavior. 2013;34:155-63.

17 Jim McKnight. Straight Science? Homosexuality, Evolution and Adaptation. Routledge (August 16, 1997).

18 Dickemann M. Wilson's Panchreston: the inclusive fitness hypothesis of sociobiology re-examined. J Homosex. 1995;28:147-83.

19 Tilson R, Tenaza R. Monogamy and duetting in an Old World monkey. Nature. 1976;263:320-21.

20 Dixson A. In book: Animal Homosexuality; A biosocial Perspective. Edition: First. Chapter: Homosexual Behavior in Primates. Publisher: Cambridge University Press. Editors: Aldo Poiani, pp.381-400. 2010.

21 Rodrigues J, Liu Y. An overview of same-sex mounting in turtles and tortoises. J Ethology. 133-137;34:2016.

22 Sommer V, Vasey P. Homosexual Behaviour in Animals: An Evolutionary Perspective. Cambridge University Press; 1 edition (February 17, 2011).

23 Bem D. Exotic Becomes Erotic: A Developmental Theory of Sexual Orientation. Psychol Rev. 1996;103(2):320-335.[cited 2016 Oct 1]. Available from: http://dbem.ws/Exotic%20Becomes%20Erotic.pdf.

24 Bailey M, Zucker K. Childhood Sex-Typed Behavior and Sexual Orientation: A Conceptual Analysis and Quantitative Review. Dev Psychol. 1995;31:43-55.

25 Poiani A. Animal Homosexuality: A Biosocial Perspective. Page 141. Cambridge University Press; 1 edition (September 27, 2010).

26 Poiani A. Animal Homosexuality: a biosocial perspective. Cambridge University Press; 1 edition (September 27, 2010). Page 129. Available from: http://bit.ly/2mFJbLh.

27 LeVay S. A difference in hypothalamic structure between heterosexual and homosexual men. Science. 1991;253:1034-1037.

28 Nisbet J, Hatch J. Consequences of a female-biased sex-ratio in a socially monogamous bird: female-female pairs in the Roseate Tern Sterna dougallii. IBIS-International Journal of Avian Science. 1999;141:307–320.

29 Hohmann G, Mundry R, Deschner T. The Relationship Between Socio-Sexual Behavior and Salivary Cortisol in Bonobos: Tests of the Tension Regulation Hypothesis. American Journal of Primatology. 2009;71:223–232.

30 Drescher J. Out of DSM: Depathologizing Homosexuality. Behav Sci (Basel). 2015;5:565-75.

31 Kinsey A, Pomeroy W, Martin C. Sexual behavior in the human male. Philadelphia, Pa: W.B. Saunders; 610:666. [Internet]. 1948 [cited 2017 February 9]. Available from: https://teoriaevolutiva.files.wordpress.com/2014/02/sexual-behavior-in-the-human-male-1948.pdf.

32 Conversion therapy. Omics Group. [Internet]. [cited 2016 January 18]. Available from: http://research.omicsgroup.org/index.php/Conversion_therapy.

33 Strudwick P. Conversion therapy: she tried to make me 'pray away the gay'. In: The Guardian. [Internet]. 2011 [cited 2017 February 25]. Available from: https://www.theguardian.com/world/2011/may/27/gay-conversion-therapy-patrick-strudwick.

34 Lust, Pornography and Masturbation (Part 3 of 3). In: Refresh my Heart In Christ blog. [Internet]. 2002 [cited 2017 February 25]. Available from: https://rmhic.wordpress.com/2012/12/04/lust-pornography-and-masturbation-part-3-of-3/.

35 Haldeman D. Therapeutic Antidotes: Helping Gay and Bisexual Men Recover from Conversion Therapies. J Gay Lesbian Ment Health. 2002;5:117-130.

36 Haldeman D. Sexual orientation conversion therapy for gay men and lesbians: A scientific examination. In: J. Gonsiorek & J. Weinrich (Eds.), Homosexuality: Research Implications for Public Policy (pp. 149-160). Newbury Park, CA: Sage; 1991.

37 Just the Facts Coalition.Just the facts about sexual orientation and youth: A primer for principals, educators, and school personnel. Washington, DC: American Psychological Association. [Internet]. 2008 [cited 2017 February 10]. Available from: http://www.apa.org/pi/lgbt/resources/just-the-facts.aspx.

38 Twenge JM, Sherman RA, Wells BE. Changes in American Adults' Reported Same-Sex Sexual Experiences and Attitudes, 1973-2014. Arch Sex Behav. 2016;45:1713-30.

39 Mercer CH1, Fenton KA, Copas AJ, Wellings K, Erens B, McManus S, et al. Increasing prevalence of male homosexual partnerships and practices in Britain 1990-2000: evidence from national probability surveys. AIDS. 2004;18:1453-8.

40 Smith AM, Rissel CE, Richters J, Grulich AE, de Visser RO. Sex in Australia: sexual identity, sexual attraction and sexual experience among a representative sample of adults. Aust N Z J Public Health. 2003;27:138-45.

41 Sex in Australia 2. [Internet]. 2015 [cited 2017 February 25]. Available from: http://www.ashr.edu.au/wp-content/uploads/2015/06/sex_in_australia_2_summary_data.pdf.

42 Statistics Canada. Canadian Community Health Survey. Website [Internet]. 2004 June 15 [cited 2016 November 25]. Available from: http://www.statcan.gc.ca/daily-quotidien/040615/dq040615b-eng.htm.

43 Statistics Canada. Same-sex couples and sexual orientation. by the numbers. [Internet]. 2015 [cited 2016 November 25]. Available from: http://www.statcan.gc.ca/eng/dai/smr08/2015/smr08_203_2015#a3.

44 Jorm AF, Dear KB, Rodgers B, Christensen H. Cohort difference in sexual orientation: results from a large age-stratified population sample. Gerontology. 2003;49:392-5.

45 Sexual behavior in the United States 1930-1990: trends and methodological problems. Sex Transm Dis. 1995;22:173-90.

46 Counting the LGBT population: 6% of europeans identify as LGBT. In: Dalia Research. [Internet]. 2016 [cited 2017 February 25]. Available from: https://daliaresearch.com/counting-the-lgbt-population-6-of-europeans-identify-as-lgbt/.

47 Yudkin J. Evolutionary and historical changes in dietary carbohydrates. Am J Clin Nutr. 1967;20:108-15.

48 Komlos J, Brabec M. The trend of BMI values of US adults by deciles, birth cohorts 1882-1986 stratified by gender and ethnicity. Econ Hum Biol. 2011;9:234-50.

49 Feldman MB, Meyer IH. Eating Disorders in Diverse Lesbian, Gay, and Bisexual Populations. Int J Eat Disord. 2007;40:218-26.

50 Cella S, Iannaccone M, Ascione R, Cotrufo P. Body dissatisfaction, abnormal eating behaviours and eating disorder attitude in homo- and heterosexuals. Eat Weight Disord. 2010;15:180-5.

51 Jun HJ, Corliss HL, Nichols LP, Pazaris MJ, Spiegelman D, Austin SB. Adult body mass index trajectories and sexual orientation: the Nurses' Health Study II. Am J Prev Med. 2012;42:348-54.

52 Minnis AM, Catellier D, Kent C, Ethier KA, Soler RE, Heirendt W, Halpern MT, Rogers T. Differences in Chronic Disease Behavioral Indicators by Sexual Orientation and Sex. J Public Health Manag Pract 2016. 22 Suppl :25-32.

53 Larry Houston. Homosexuality in Ancient Greece. [Internet]. 2016 [cited 2016 December 26]. Available from: http://www.banap.net/spip.php?article121.

54 Dynes W. Encyclopedia of Homosexuality. Routledge Revivals (July 27, 2015); 1990. Available from: http://www.williamapercy.com/wiki/images/AriVice.pdf.

55 Nicolaus J. Hajek. Still a Rivalry: Contrasting Renaissance Sodomy Legislation in Florence and Venice. Black & Gold. 2015;1. Available from: http://openworks.wooster.edu/cgi/viewcontent.cgi?article=1003&context=blackandgold.

56 Pat McKay. Book Review of “Pottenger’s Cats: A study in Nutrition” [Internet]. 2008 [cited 2016 January 6]. Available from: http://www.ectownusa.net/mineralcountynevada/docs/Potenger's%20Cats%20book%20review.pdf.

57 Adam Berg. Interview with Stephen Arlin. In: Natures First Law: The Raw Food Diet Blog. [Internet]. 1998 [cited 2016 December 1]. Available from: https://naturesfirstlaw.wordpress.com/book/prologue/authors-of-n-f-l/interview-with-stephen-arlin-1998/.

58 American Psychiatric Association. Diagnostic and Statistical Manual of Mental Disorders. 5-th Edition. Page 451. Washington, DC: American Psychiatric Publishing. 2013.

59 Bailey M. The Man Who Would Be Queen: The Science of Gender-Bending and Transsexualism. Joseph Henry Press (March 10, 2003).

60 George R. Sexual orientation and gender-identity in high functioning individuals with autism spectrum disorder. DPsych(Health) thesis, School of Psychology, Deakin University. [Internet]. 2016 [cited 2017 February 17]. Available from: http://dro.deakin.edu.au/view/DU:30089386.

61 Shumer DE, Roberts AL, Reisner SL, Lyall K, Austin SB. Brief Report: Autistic Traits in Mothers and Children Associated with Child's Gender Nonconformity. J Autism Dev Disord. 2015;45:1489-94.

62 Rajkumar RP. Gender Identity Disorder and Schizophrenia: Neurodevelopmental Disorders with Common Causal Mechanisms? Schizophr Res Treatment. 2014;14:463757.

63 Dhejne C, Lichtenstein P, Boman M, Johansson AL, Långström N, Landén M. Long-term follow-up of transsexual persons undergoing sex reassignment surgery: cohort study in Sweden. PLoS One. 2011;6:e16885.

64 Olson J, Schrager SM, Belzer M, Simons LK, Clark LF. Baseline Physiologic and Psychosocial Characteristics of Transgender Youth Seeking Care for Gender Dysphoria. J Adolesc Health. 2015;57:374-80.

65 Gartrell NK, Loriaux DL, Chase TN. Plasma testosterone in homosexual and heterosexual women. Am J Psychiatry. 1977;134:1117-8.

66 Hines M. Prenatal endocrine influences on sexual orientation and on sexually differentiated childhood behavior. Front Neuroendocrinol. 2011;32:170-82.

67 Meier SC, Pardo ST, Labuski C, Babcock J. Measures of clinical health among female-to-male transgender persons as a function of sexual orientation. Arch Sex Behav. 2013;42:463-74.

68 Katz-Wise SL, Reisner SL, Hughto JW, Keo-Meier CL. Differences in Sexual Orientation Diversity and Sexual Fluidity in Attractions Among Gender Minority Adults in Massachusetts. J Sex Res. 2016;53:74-84.

69 Baba T, Endo T, Ikeda K, Shimizu A, Honnma H, Ikeda H et al. Distinctive features of female-to-male transsexualism and prevalence of gender identity disorder in Japan. J Sex Med. 2011;8:1686-93.

70 Balen AH, Schachter ME, Montgomery D, Reid RW, Jacobs HS. Polycystic ovaries are a common finding in untreated female to male transsexuals. Clin Endocrinol. 1993;38:325-9.

71 Bosinski HA1, Peter M, Bonatz G, Arndt R, Heidenreich M, Sippell WG et al. A higher rate of hyperandrogenic disorders in female-to-male transsexuals. Psychoneuroendocrinology. 1997;22:361-80.

72 Agrawal R, Sharma S, Bekir J, Conway G, Bailey J, Balen AH, Prelevic G. Prevalence of polycystic ovaries and polycystic ovary syndrome in lesbian women compared with heterosexual women. Fertil Steril. 2004;82:1352-7.

73 Karnath B. Signs of Hyperandrogenism in Women. [Internet]. 2008 [cited 2017 February 2]. Available from: http://www.turner-white.com/pdf/hp_oct08_androgenism.pdf.

74 Manlove HA, Guillermo C, Gray PB. Do women with polycystic ovary syndrome (PCOS) report differences in sex-typed behavior as children and adolescents?: Results of a pilot study. Ann Hum Biol. 2008;35:584-95.

75 Moran LJ, Ko H, Misso M, Marsh K, Noakes M, Talbot M et al. Dietary composition in the treatment of polycystic ovary syndrome: a systematic review to inform evidence-based guidelines. J Acad Nutr Diet. 2013;113:520-45.

76 Marsh K, Brand-Miller J. The optimal diet for women with polycystic ovary syndrome? Br J Nutr. 2005;94:154-65.

77 Daan NM, Koster MP, Steegers-Theunissen RP, Eijkemans MJ, Fauser BC. Endocrine and cardiometabolic cord blood characteristics of offspring born to mothers with and without polycystic ovary syndrome. Fertil Steril. 2017;107:261-268.

78 Ghizzoni L, Mastorakos G, Vottero A. Adrenal Hyperandrogenism in Children. J Clin Endocrinol Metab. 1999;84:4431-4435.

79 Meyer-Bahlburg HF, Dolezal C, Baker SW, New MI. Sexual orientation in women with classical or non-classical congenital adrenal hyperplasia as a function of degree of prenatal androgen excess. Arch Sex Behav. 2008;37:85-99.

80 Goodarzi MO, Carmina E, Azziz R. DHEA, DHEAS and PCOS. J Steroid Biochem Mol Biol. 2015;145:213-25.

81 Swierczynska MM, Mateska I, Peitzsch M, Bornstein SR, Chavakis T, Eisenhofer G et al. Changes in morphology and function of adrenal cortex in mice fed a high-fat diet. Int J Obes (Lond). 2015;39:321-30.

82 Dr Mercola. The Kalish method-An effective way to address and heal adrenal fatigue. In: Mercola. The control of your health. [Internet]. 2013 [cited 2017 February 28]. Available from: http://articles.mercola.com/sites/articles/archive/2013/07/14/adrenal-testing.aspx.

83 Jankord R, Solomon MB, Albertz J, Flak JN, Zhang R, Herman JP. Stress vulnerability during adolescent development in rats. Endocrinology. 2011;152:629-38.

84 M. Monsefi, A. Bahoddini, S. Nazemi. Effects of Noise Exposure on the Volume of Adrenal Gland and Serum Levels of Cortisol in Rat. IJMS. 2006;31.

85 McConaghy N, Silove D. Opposite sex behaviours correlate with degree of homosexual feelings in the predominantly heterosexual. Aust N Z J Psychiatry. 1991;25:77-83.

86 Udry JR, Chantala K. Masculinity-femininity predicts sexual orientation in men but not in women. J Biosoc Sci. 2006;38:797-809.

87 Cécile A. Unger. Hormone therapy for transgender patients. Transl Androl Urol. 2016;5:877–84.

88 Brett MA, Roberts LF, Johnson TW, Wassersug RJ. Eunuchs in contemporary society: expectations, consequences, and adjustments to castration (part II). J Sex Med. 2007;4:946-55.

89 Handy A, Jackowich R, Wibowo E, Johnson Th, Wassersug R. Gender Preference in the Sexual Attractions, Fantasies, and Relationships of Voluntarily Castrated Men. Sex Med. 2016;4:e51–e59.

90 Daskalos CT. Changes in the sexual orientation of six heterosexual male-to-female transsexuals. Arch Sex Behav. 1998;27:605-14.

91 Lawrence AA. Sexuality before and after male-to-female sex reassignment surgery. Arch Sex Behav. 2005;34:147-66.

92 Loraine J, Ismail A, Adamopoulos D, Dove G. Endocrine function in male and female homosexuals. Br Med J. 1970;4:406-9.

93 Kolodny RC, Masters WH, Hendryx J, Toro G. Plasma testosterone and semen analysis in male homosexuals. N Engl J Med. 1971;285:1170-4.

94 Doerr P, Pirke K, Kockott GM et al. Further Studies on Sex Hormones in Male Homosexuals. Arch Gen Psychiatry. 1976;33:611-14.

95 Barlow DH, Abel GG, Blanchard EB, Mavissakalian M. Plasma testosterone levels and male homosexuality: a failure to replicate. Arch Sex Behav. 1974;3:571-5.

96 Langevin R. Erotic Preference, Gender Identity, and Aggression in Men: New Research Studies. Page 229-230. Hillsdale, New Jersey: Erlbaum; 1985.

97 O Varlamov. Western-Style Diet, Sex Steroids and Metabolism. Biochim Biophys Acta. 2016;pii: S0925-4439(16)30143-0.

98 Fui MN, Dupuis P, Grossmann M. Lowered testosterone in male obesity: mechanisms, morbidity and management. Asian J Androl. 2014;6:223-31.

99 Simon D, Preziosi P, Barrett-Connor E, Roger M, Saint-Paul M, Nahoul K. Interrelation between plasma testosterone and plasma insulin in healthy adult men: the Telecom Study. Diabetologia. 1992;35:173-7.

100 Becker U, Gluud C. Sex, sex hormones and chronic liver diseases. Dig Dis. 1991;9:9-16.

101 Pan J, Fallon M. Gender and racial differences in nonalcoholic fatty liver disease. World J Hepatol. 2014;6: 274–83.

102 Sundaram Sh. Pediatric Non-Alcoholic Fatty Liver Disease. In: Liver Foundation Webpage. [Internet]. 2012 [cited 2017 February 27]. Available from: http://www.liverfoundation.org/chapters/rockymountain/doctorsnotes/pediatricnafld/.

103 Gaggini M, Morelli M, Buzzigoli E, DeFronzo RA, Bugianesi E, Gastaldelli A. Non-alcoholic fatty liver disease (NAFLD) and its connection with insulin resistance, dyslipidemia, atherosclerosis and coronary heart disease. Nutrients. 2013;5:1544-60.

104 Ferolla SM, Silva LC, Ferrari Mde L, da Cunha AS, Martins Fdos S, Couto CA, et al. Dietary approach in the treatment of nonalcoholic fatty liver disease. World J Hepatol. 2015;7:2522-34.

105 Liu YZ, Chen JK, Zhang Y, Wang X, Qu S, Jiang CL. Chronic stress induces steatohepatitis while decreases visceral fat mass in mice. BMC Gastroenterol. 2014;14:106.

106 Sun H, Huang F, Qu Sh. Melatonin: a potential intervention for hepatic steatosis. Lipids Health Dis. 2015;14: 75.

107 Zadik Z, Sinai T, Zung A, Reifen R. Vitamin A and iron supplementation is as efficient as hormonal therapy in constitutionally delayed children. Clin Endocrinol (Oxf). 2004;60:682-7.

108 Akazawa N, Taniguchi K, Mikami S. Effects of vitamin A deficiency on the function of pituitary-gonadal system in male rats. Nihon Juigaku Zasshi. 1989;51:1209-17.

109 Nimptsch K, Platz EA, Willett WC, Giovannucci E. Association between plasma 25-OH vitamin D and testosterone levels in men. Clin Endocrinol (Oxf). 2012;77:106-12.

110 Geracioti Th. Persistent depression? Low libido? Androgen decline may be to blame. Current Psychiatry. 2004;3:24-42.

111 Ayanian S, Irwig MS. Hypogonadism in a male-to-female transsexual with super obesity. Andrologia. 2013;45:285-8.

112 Hammond W. Sexual impotence in the male and female.Detroit: George S. Davis, 1887. Available from: https://ia902703.us.archive.org/21/items/sexualimpotencei00hammrich/sexualimpotencei00hammrich.pdf.

113 Starka L, Duskova M, Cermakova I, Vrbiková J, Hill M. Premature androgenic alopecia and insulin resistance. Male equivalent of polycystic ovary syndrome? Endocr Regul. 2005;39:127-31.

114 Tonya Zastava. How to recognise a raw foodist at first sight. In: Beautiful on raw. [Internet]. [cited 2017 February 2]. Available from: http://www.beautifulonraw.com/the-ten-biomarkers-of-a-long-term-raw-foodist.html.

115 Sonnenschein C, Soto AM. An updated review of environmental estrogen and androgen mimics and antagonists. J Steroid Biochem Mol Biol. 1998;65:143-50.

116 LeBlanc GA, Bain LJ, Wilson VS. Pesticides: multiple mechanisms of demasculinization. Mol Cell Endocrinol. 1997;126:1-5.

117 Tarapore P, Hennessy M, Song D, Ying J, Ouyang B, Govindarajah V et al. High butter-fat diet and bisphenol A additively impair male rat spermatogenesis. Reprod Toxicol. 2016 pii: S0890-6238(16)30339-2.

118 Roberts AL, Rosario M, Corliss HL, Koenen KC, Austin SB. Childhood gender nonconformity: a risk indicator for childhood abuse and posttraumatic stress in youth. Pediatrics. 2012;129:410-7.

119 Van Caenegem E, Wierckx K, Elaut E, Buysse A, Dewaele A, Van Nieuwerburgh F et al. Prevalence of Gender Nonconformity in Flanders, Belgium. Arch Sex Behav. 2015;44:1281-7.

120 Wade GN, Schneider JE. Metabolic fuels and reproduction in female mammals. Neurosci Biobehav Rev. 1992;6:235-72.

121 Pinheiro AP, Raney TJ, Thornton LM, Fichter MM, Berrettini WH, Goldman D et al. Sexual functioning in women with eating disorders. Int J Eat Disord. 2010;43:123-9.

122 Mady MA, Kossoff EH, McGregor AL, Wheless JW, Pyzik PL, Freeman JM. The ketogenic diet: adolescents can do it, too. Epilepsia. 2003;44:847-51.

123 Shelton R. The Hygienic System, Vol. III-Fasting and Sun Bathing. In: Soil and Health Library. [Internet]. 1934 [cited 2017 March 2]. Available from: http://soilandhealth.org/wp-content/uploads/GoodBooks/The%20Hygienic%20System%20Vol%20III%20Fasting%20and%20Sun%20Bathing.pdf.

124 Jung A. 19 Aphrodisiac Foods Proven to Spark Romance. In: Reader's Digest. [Internet]. [cited 2017 February 26]. Available from: http://www.rd.com/food/fun/aphrodisiac-foods/.

125 Avena NM, Rada P, Hoebel BG. Evidence for sugar addiction: behavioral and neurochemical effects of intermittent, excessive sugar intake. Neurosci Biobehav Rev. 2008;32:20-39.

126 Liester MB, Moore JD. Is Sugar a Gateway Drug? J Drug Abuse. 2015;1:1.

127 Avena NM, Carrillo CA, Needham L, Leibowitz SF, Hoebel BG. Sugar-dependent rats show enhanced intake of unsweetened ethanol. Alcohol. 2004;34:203-9.

128 Avena NM, Hoebel BG. A diet promoting sugar dependency causes behavioral cross-sensitization to a low dose of amphetamine. Neuroscience. 2003;122:17-20.

129 Gosnell BA. Sucrose intake enhances behavioral sensitization produced by cocaine. Brain Res. 2005;1031:194-201.

130 Fortuna JL. Sweet preference, sugar addiction and the familial history of alcohol dependence: shared neural pathways and genes. J Psychoactive Drugs. 2010;42:147-51.

131 Kampov-Polevoy AB, Tsoi MV, Zvartau EE, Neznanov NG, Khalitov E. Sweet liking and family history of alcoholism in hospitalized alcoholic and non-alcoholic patients. Alcohol Alcohol. 2001;36:165-70.

132 Jones TW, Borg WP, Boulware SD, McCarthy G, Sherwin RS, Tamborlane WV. Enhanced adrenomedullary response and increased susceptibility to neuroglycopenia: mechanisms underlying the adverse effects of sugar ingestion in healthy children. J Pediatr. 1995;126:171-7.

133 Mezzacappa E. Epinephrine, Arousal, and Emotion: A New Look at Two-factor Theory. Cognition and Emotion. 1999. Published online: 2010;13:181-199.

134 Schachter S, Singer J. Cognitive, social and physiological determinants of emotional state. Psychol. Rev. 1962;69:379-99.

135 McKinney K. The Effects of Adrenaline on Arousal and Attraction. Scholars: McKendree University Online Journal of Undergraduate Research. 2011;17.

136 Szczypka MS, Zhou QY, Palmiter RD. Dopamine-stimulated sexual behavior is testosterone dependent in mice. Behav Neurosci. 1998;112:1229-35.

137 Bancroft J. The endocrinology of sexual arousal. J Endocrinol. 2005;186:411-27.

138 Sharma S, Fernandes MF, Fulton S. Adaptations in brain reward circuitry underlie palatable food cravings and anxiety induced by high-fat diet withdrawal. Int J Obes (Lond). 2013;37:1183-91.

139 Avena NM, Bocarsly ME, Rada P, Kim A, Hoebel BG. After daily bingeing on a sucrose solution, food deprivation induces anxiety and accumbens dopamine/acetylcholine imbalance. Physiol Behav. 2008;94:309-15.

140 St-Onge MP, Roberts A, Shechter A, Choudhury AR. Fiber and Saturated Fat Are Associated with Sleep Arousals and Slow Wave Sleep. J Clin Sleep Med. 2016;12:19-24.

141 Rosenbaum DL, White KS. The relation of anxiety, depression, and stress to binge eating behavior. J Health Psychol. 2015;20:887-98.

142 Li L, Li X, Zhou W, Messina JL. Acute psychological stress results in the rapid development of insulin resistance. J Endocrinol. 2013;217:175-84.

143 Spaeth AM, Dinges DF, Goel N. Sex and race differences in caloric intake during sleep restriction in healthy adults. Am J Clin Nutr. 2014;100:559-66.

144 Spaeth AM, Dinges DF, Goel N. Effects of Experimental Sleep Restriction on Weight Gain, Caloric Intake, and Meal Timing in Healthy Adults. Sleep. 2013;36:981-990.

145 Nedeltcheva AV, Kilkus JM, Imperial J, Kasza K, Schoeller DA, Penev PD. Sleep curtailment is accompanied by increased intake of calories from snacks. Am J Clin Nutr. 2009;89:126-33.

146 Hjorth MF1, Quist JS, Andersen R, Michaelsen KF, Tetens I, Astrup A, et al. Change in sleep duration and proposed dietary risk factors for obesity in Danish school children. Pediatr Obes. 2014;9:e156-9.

147 Leproult R, Holmbäck U, Van Cauter E. Circadian misalignment augments markers of insulin resistance and inflammation, independently of sleep loss. Diabetes. 2014;63:1860-9.

148 Afrisham R, Sadegh-Nejadi S, SoliemaniFar O, Kooti W, Ashtary-Larky D, Alamiri F et al. Salivary Testosterone Levels Under Psychological Stress and Its Relationship with Rumination and Five Personality Traits in Medical Students. Psychiatry Investig. 2016;13:637-643.

149 Juárez-Rojas L, Vigueras-Villaseñor RM, Casillas F, Retana-Márquez S. Gradual decrease in spermatogenesis caused by chronic stress. Acta Histochem. 2017 pii: S0065-1281(16)30401-9.

150 King JA, Rosal MC, Ma Y, Reed GW. Association of stress, hostility and plasma testosterone levels. Neuro Endocrinol Lett. 2005;26:355-60.

151 Kunstmann A, Christiansen K. Testosterone levels and stress in women: the role of stress coping strategies, anxiety and sex role identification. Anthropol Anz. 2004;62:311-21.

152 Mehta PH, Josephs RA. Testosterone and cortisol jointly regulate dominance: evidence for a dual-hormone hypothesis. Horm Behav. 2010;58:898-906.

153 Petterson LJ, VanderLaan DP, Vasey PL. Sex, Sexual Orientation, Gender Atypicality, and Indicators of Depression and Anxiety in Childhood and Adulthood. Arch Sex Behav. 2016;doi:10.1007/s10508-016-0690-x.

154 García-Cárdenas N, Olvera-Hernández S, Gómez-Quintanar BN, Fernández-Guasti A. Male rats with same sex preference show high experimental anxiety and lack of anxiogenic-like effect of fluoxetine in the plus maze test. Pharmacol Biochem Behav. 2015;35:128-35.

155 Hammock JR. Behavioral changes due to overpopulation in mice. M.Sc. Thesis, Portland State University. 1971.Dissertations and Theses. Paper 1429. [Internet]. Available from: http://pdxscholar.library.pdx.edu/cgi/viewcontent.cgi?article=2428&context=open_access_etds.

156 Minkel JD, Banks S, Htaik O, Moreta MC, Jones CW, McGlinchey EL, et al. Sleep deprivation and stressors: evidence for elevated negative affect in response to mild stressors when sleep deprived. Emotion. 12:1015-20.

157 Silva RH, Kameda SR, Carvalho RC, Takatsu-Coleman AL, Niigaki ST, Abílio VC, et al. Anxiogenic effect of sleep deprivation in the elevated plus-maze test in mice. Psychopharmacology. 2004;176:115-22.

158 American Psychological Association. Stress and sleep. In: American Psychological Association website. [Internet]. 2013 [cited 2017 February 2]. Available from: http://www.apa.org/news/press/releases/stress/2013/sleep.aspx.

159 Everson CA, Bergmann BM, Rechtschaffen A. Sleep deprivation in the rat: III. Total sleep deprivation. Sleep. 1989;2:13-21.

160 Genetic and Rare Diseases Information Center. Fatal Familial Insomnia. In: Genetic and Rare Diseases Information Center website. Maryland. [Internet]. [cited 2017 February 2]. Available from: https://rarediseases.info.nih.gov/diseases/6429/fatal-familial-insomnia.

161 Centers For Disease Control and Prevention. Insufficient Sleep Is a Public Health Problem. In: Centers For Disease Control and Prevention website. Georgia, USA. [Internet]. 2015 [cited 2016 November 30]. Available from: https://www.cdc.gov/features/dssleep/.

162 Van Cauter E, Knutson K, Leproult R, Spiege Kl. The Impact of Sleep Deprivation on Hormones and Metabolism. Medscape Neurology. [Internet]. 2005 [cited 2016 November 30]. Available from: http://www.medscape.org/viewarticle/502825.

163 McEwen BS, Karatsoreos IN. Sleep Deprivation and Circadian Disruption: Stress, Allostasis, and Allostatic Load. Sleep Med Clin. 2015;10:1-10.

164 Cinzano P. The Growth of the Artificial Night Sky Brightness over North America in the Period 1947–2000: a Preliminary Picture. Astrophysics and Space Science Library. 2003;284:39-47 Available from: http://link.springer.com/chapter/10.1007%2F978-94-017-0125-9_4.

165 Hölker F, Moss T, Griefahn B, Kloas W, Voigt C, Henckel D et al. The Dark Side of Light: A Transdisciplinary Research Agenda for Light Pollution Policy. Ecology and Society. 2010;15:Art. 13.[cited 2016 December 30]. Available from: http://www.ecologyandsociety.org/vol15/iss4/art13/.

166 Fouquet R, Pearson P. Seven Centuries of Energy Services: The Price and use of light in the United Kingdom (1300-2000). Energy Journal. 27:138-179 Available from: https://www.pressestelle.tu-berlin.de/fileadmin/a70100710/Medieninformationen/2007/Pearson_and_Fouquet_7_Centuries_Light_En_Jnl_2006v27-01-a07.pdf.

167 Russo PM, Bruni O, Lucidi F, Ferri R, Violani C. Sleep habits and circadian preference in Italian children and adolescents. J Sleep Res. 2007;16:163-9.

168 Ma WP, Cao J, Tian M, Cui MH, Han HL, Yang YX et al. Exposure to chronic constant light impairs spatial memory and influences long-term depression in rats. Neurosci Res. 2007;59:224-30.

169 Pierpaoli W, Maestroni GJ. Melatonin: a principal neuroimmunoregulatory and anti-stress hormone: its anti-aging effects. Immunol Lett. 1987;16:355-61.

170 J.D. Moyer. Sleep Experiment – A Month With No Artificial Light. In: J.D. Moyer website. [Internet]. 2009 [cited 2017 February 2]. Available from: http://www.jdmoyer.com/2010/03/04/sleep-experiment-a-month-with-no-artificial-light/.

171 Westman J, Walters J. Noise and stress: a comprehensive approach. Environ Health Perspect. 1981;41:291-309.

172 Halperin D. Environmental noise and sleep disturbances: A threat to health? Sleep Sci. 2014;7:209-12.

173 Goines L, Hagler L. Noise Pollution: A Modern Plague. South Med J. 2007;100:287-294 Available from: http://www.nonoise.org/library/smj/smj.htm.

174 Rahman Q, Silber K. Sexual orientation and the sleep-wake cycle: a preliminary investigation. Arch Sex Behav. 2000;29:127-34.

175 Carvalho FG, Hidalgo MP, Levandovski R. Differences in circadian patterns between rural and urban populations: an epidemiological study in countryside. Chronobiol Int. 2014;31:442-9.

176 Richters J, Altman D, Badcock PB, Smith AM, de Visser RO, Grulich AE, et al. Sexual identity, sexual attraction and sexual experience: the Second Australian Study of Health and Relationships. Sex Health. 2014;11:451-60.

177 Frisch M, Hviid A. Childhood family correlates of heterosexual and homosexual marriages: a national cohort study of two million Danes. Arch Sex Behav. 2006;35:533-47.

178 The Williams Institute on Sexual Orientation Law and Public Policy. Gates G. Same-sex Couples and the Gay, Lesbian ,Bisexual Population: New Estimates from the American Community Survey. [Internet]. 2006 [cited 2016 December 15]. Available from: http://www.lgbtdata.com/uploads/1/0/8/8/10884149/samesexcouplesandglbpopacs.pdf.

179 Laumann E,Gagnon J, Michael R, Michaels S. The Social Organization of Sexuality: Sexual Practices in the United States. Page 309. University of Chicago Press. [Internet].University of Chicago Press. Reprint December 15, 2000; 1994 [cited 2017 January 22]. Available from: http://bit.ly/2kg8HZO.

180 Sinha R. Chronic Stress, Drug Use, and Vulnerability to Addiction. Ann N Y Acad Sci. 2008;1141:105–130.

181 Smith JP, Book SW. Anxiety and Substance Use Disorders: A Review. Psychiatr Times. 2008;5:9-23.

182 Becker HC. Effects of alcohol dependence and withdrawal on stress responsiveness and alcohol consumption. Alcohol Res. 2012;34:448-58.

183 Smith JP, Book SW. Anxiety and Substance Use Disorders: A Review. Psychiatr Times. 2008;25:19-23.

184 Trinkoff AM, Storr CL. Work schedule characteristics and substance use in nurses. Am J Ind Med. 1998;34:266-71.

185 Morikawa Y, Sakurai M, Nakamura K, Nagasawa SY, Ishizaki M, Kido T et al. Correlation between shift-work-related sleep problems and heavy drinking in Japanese male factory workers. Alcohol Alcohol. 2013;48:202-6.

186 Garmabi B, Vousooghi N, Vosough M, Yoonessi A, Bakhtazad A, Zarrindast MR. Effect of circadian rhythm disturbance on morphine preference and addiction in male rats: Involvement of period genes and dopamine D1 receptor. Neuroscience. 2016;322:104-14.

187 Wong MM, Brower KJ, Nigg JT, Zucker RA. Childhood sleep problems, response inhibition, and alcohol and drug outcomes in adolescence and young adulthood. Alcohol Clin Exp Res. 2010;34:1033-44.

188 Angarita GA, Emadi N, Hodges S, Morgan PT. Sleep abnormalities associated with alcohol, cannabis, cocaine, and opiate use: a comprehensive review. Addict Sci Clin Pract. 2016;11:9.

189 Pasch KE, Latimer LA, Cance JD, Moe SG, Lytle LA. Longitudinal bi-directional relationships between sleep and youth substance use. J Youth Adolesc. 2012;41:1184-96.

190 National Institute on Drug Abuse. 7: Summary: addictive drugs activate the reward system via increasing dopamine neurotransmission. [Internet]. 2007 [cited 2016 November 30]. Available from: https://www.drugabuse.gov/publications/teaching-packets/neurobiology-drug-addiction/section-iv-action-cocaine/7-summary-addictive-drugs-activate-reward.

191 Hull EM, Muschamp JW, Sato S. Dopamine and serotonin: influences on male sexual behavior. Physiol Behav. 2004;83:291-307.

192 Müller CP, Homberg JR. The role of serotonin in drug use and addiction. Behav Brain Res. 2015;277:146-92.

193 Agency for Healthcare Research and Quality. Marteau Th, Hollands G, Kelly M. Population Health: Behavioral and Social Science Insights. Figure 1. [Internet]. Maryland, US 2015 [cited 2016 December 1]. Available from: https://www.ahrq.gov/professionals/education/curriculum-tools/population-health/marteau.html.

194 World Health Organisation. Global Status Report. Page 31. [Internet]. 2014 [cited 2016 December 18]. Available from: http://www.who.int/substance_abuse/publications/global_status_report_2004_overview.pdf.

195 Centers For Disease Control and Prevention. Morbidity and mortality Weekly Report. CDC Grand Rounds: Prescription Drug Overdoses — a U.S. Epidemic. Figure 1. [Internet]. 2012 [cited 2016 December 1]. Available from: https://www.cdc.gov/mmwr/preview/mmwrhtml/mm6101a3.htm.

196 Marshal MP, Friedman MS, Stall R, King KM, Miles J, Gold MA, et al. Sexual orientation and adolescent substance use: a meta-analysis and methodological review. Addiction. 2008;103:546-56.

197 Kuyper L, Bos H. Mostly Heterosexual and Lesbian/Gay Young Adults: Differences in Mental Health and Substance Use and the Role of Minority Stress. J Sex Res. 2016;53:731-41.

198 Talley AE, Grimaldo G, Wilsnack SC, Hughes TL, Kristjanson AF. Childhood Victimization, Internalizing Symptoms, and Substance Use Among Women Who Identify as Mostly Heterosexual. LGBT Health. 2016 ;3:266-74.

199 Abraham. K. Selected papers of Karl Abraham.Hogarth Press. [Internet]. 1927 [cited 2016 November 30]. Available from: https://archive.org/stream/selectedpapersof032367mbp/selectedpapersof032367mbp_djvu.txt.

200 Istraelstam S, Lambert S. Homosexuality as a cause of alcoholism: a historical review. The International Journal of the Addictions. 1983;18:1085-1107.[cited 2016 November 30]. Available from: http://www.williamapercy.com/wiki/images/Homosexuality_as_a_Cause_of_Alcoholism.pdf.

201 E.L. Abel. Psychoactive Drugs and Sex. Page 99-100. Springer Science & Business Media. [Internet]. 1985 [cited 2017 January 14]. Available from: http://bit.ly/2jQo22Y.

202 Borden A. The history of gay people in Alcoholics Anonymous: From the beginning. Page 28. Routledge; 1 edition; 2006 Available from: http://bit.ly/2hjjC0c.

203 Gilula M. Changing Homosexuality in the Male: Treatment for Men Troubled With Homosexuality. JAMA. 1970;213:2086. doi:10.1001/jama.1970.03170380060033 Available from: http://jamanetwork.com/journals/jama/article-abstract/356808.

204 Ott MQ, Wypij D, Corliss HL, Rosario M, Reisner SL, Gordon AR, Austin SB. Repeated changes in reported sexual orientation identity linked to substance use behaviors in youth. J Adolesc Health. 2013;52:465-72.

205 Living Hope ministries website. [Internet]. [cited 2016 December 5]. Available from: https://livehope.org/.

206 Triana-Del Rio R, Tecamachaltzi-Silvarán MB, Díaz-Estrada VX, Herrera-Covarrubias D, Corona-Morales AA, Pfaus JG. Conditioned same-sex partner preference in male rats is facilitated by oxytocin and dopamine: effect on sexually dimorphic brain nuclei. Behav Brain Res. 2015;283:69-77.

207 Lee HG, Kim YC, Dunning JS, Han KA. Recurring ethanol exposure induces disinhibited courtship in Drosophila. PLoS One. 2008;3:e1391.

208 Wells, J.E., McGee, M.A. & Beautrais A.L. Multiple Aspects of Sexual Orientation: Prevalence and Sociodemographic Correlates in a New Zealand National Survey. Arch Sex Behav. 2011;40:155.

209 Andersen JP, Blosnich J. Disparities in adverse childhood experiences among sexual minority and heterosexual adults: results from a multi-state probability-based sample. PLoS One. 2013;8:e54691.

210 Corliss HL, Cochran SD, Mays VM. Reports of Parental Maltreatment during Childhood in a United States Population-Based Survey of Homosexual, Bisexual, and Heterosexual Adults. Child Abuse Negl. 2002;26:165-78.

211 Fraternal birth order and the maternal immune hypothesis of male homosexuality. Horm Behav. 2001;40:105-14.

212 Brody S. Blood pressure reactivity to stress is better for people who recently had penile–vaginal intercourse than for people who had other or no sexual activity. Biol Psychol. 2006;71:214–222.

213 Brand S, Luethi M, von Planta A, Hatzinger M, Holsboer-Trachsler E. Romantic love, hypomania, and sleep pattern in adolescents. J Adolesc Health. 2007;41:69-76.

214 Yang X, Attané I, Li S, Zhang Q. On same-sex sexual behaviors among male bachelors in rural China: evidence from a female shortage context. Am J Mens Health. 2012;6:108-19.

215 Baird AD, Wilson SJ, Bladin PF, Saling MM, Reutens DC. Neurological control of human sexual behaviour: insights from lesion studies. J Neurol Neurosurg Psychiatry. 2007;78:1042-9.

216 Hayes TB, Collins A, Lee M, Mendoza M, Noriega N, Stuart AA et al. Hermaphroditic, demasculinized frogs after exposure to the herbicide atrazine at low ecologically relevant doses. Proc Natl Acad Sci U S A. 2002;99:5476-80.

217 Frederick P, Jayasena N. Altered pairing behaviour and reproductive success in white ibises exposed to environmentally relevant concentrations of methylmercury. Proc Biol Sci. 2011;278:1851-7.

218 Grantham JP, Henneberg M. The estrogen hypothesis of obesity. PLoS One. 2014;10:e99776.

219 Bailey JM, Willerman L, Parks C. A test of the maternal stress theory of human male homosexuality. Arch Sex Behav. 1991;20:277-93.

220 Velazquez-Moctezuma J, Dominguez Salazar E, Cruz Rueda ML. The effect of prenatal stress on adult sexual behavior in rats depends on the nature of the stressor. Physiol Behav. 1993;53:443-8.

221 Chambers T, Drake A, Sharpe R. Does grandparents' diet affect weight and risk of hypogonadism in subsequent generations? Lancet. 2015;385:S29.

222 Hård E, Dahlgren IL, Engel J, Larsson K, Liljequist S, Lindh AS, Musi B. Development of sexual behavior in prenatally ethanol-exposed rats. Drug Alcohol Depend. 1984;14:51-61.

223 McGivern RF, Handa RJ, Raum WJ. Ethanol exposure during the last week of gestation in the rat: inhibition of the prenatal testosterone surge in males without long-term alterations in sex behavior. Neurotoxicol Teratol. 1998;20:483-90.

224 Ellis L, Cole-Harding S. The effects of prenatal stress, and of prenatal alcohol and nicotine exposure, on human sexual orientation. Physiol Behav. 2001;74:213-26.

225 Dörner G, Geier T, Ahrens L, Krell L, Münx G, Sieler H et al. Prenatal stress as possible aetiogenetic factor of homosexuality in human males. Endokrinologie. 1980;75:365-8.

226 Sabuncuoglu O. High Rates of Same-Sex Attraction/Gender Nonconformity in the Offspring of Mothers with Thyroid Dysfunction During Pregnancy: Proposal of Prenatal Thyroid Model. Ment Illn. 2015;7:5810. eCollection 2015.

227 Stojanovich L, Marisavljevich D. Stress as a trigger of autoimmune disease. Autoimmun Rev. 2008;7:209-13.

228 Manzel A, Muller D, Hafler D, Erdman S, Linker R, Kleinewietfeld M. Role of “Western Diet” in Inflammatory Autoimmune Diseases. Curr Allergy Asthma Rep. 2014;14:404.

229 Basavanthappa. Textbook of Midwifery and Reproductive Health Nursing. Page 78. Medical Publishers (P) Ltd; 2006 Available from: http://bit.ly/2jHM9jv.

230 Tarín J, Gómez-Piquer V. Do women have a hidden heat period? Hum Reprod. 2002;17:2243-2248.

231 Daryl J. Bem. Exotic becomes erotic. Psychological Review. 1996;103:320-335.

232 Dai X, Dong P, Jia JS. When does playing hard to get increase romantic attraction? J Exp Psychol Gen. 2014;143:521-6.

233 Money J. Evolutionary sexology: the hypothesis of song and sex. Med Hypotheses. 1997;48:399-402.

234 Anacker AM, Beery AK. Life in groups: the roles of oxytocin in mammalian sociality. Front Behav Neurosci. 2013;11:185.

235 Corona G, Isidori AM, Aversa A, Burnett AL, Maggi M. Endocrinologic Control of Men's Sexual Desire and Arousal/Erection. J Sex Med. 2016;13:317-37.

236 Coria-Avila GA, Herrera-Covarrubias D, Ismail N, Pfaus JG. The role of orgasm in the development and shaping of partner preferences. Socioaffect Neurosci Psychol. 2016;6:31815.

237 Schick V, Herbenick D, Rosenberger JG, Reece M. Prevalence and characteristics of vibrator use among women who have sex with women. J Sex Med. 2011;8:3306-15.

238 Chapter 4: Neuroendocrinology of Sexual Behavior in the Male. In: University of Michigan website. [Internet]. [cited 2017 March 18]. Available from: http://www.umich.edu/~psycours/531/becker.chapter4.htm.

239 Hart BL. Medial preoptic-anterior hypothalamic lesions and sociosexual behavior of male goats. Physiol Behav. 1986;36:301-5.

240 Slimp JC, Hart BL, Goy RW. Heterosexual, autosexual and social behavior of adult male rhesus monkeys with medial preoptic-anterior hypothalamic lesions. Brain Res. 1978;142:105-22.

241 Paredes RG, Tzchentke T, Nakach N. Lesions of the medial preoptic area /anterior hypothalamus (MPOA/AH) modify partner preference in male rats. Brain Res. 1998;813:1-8.

242 Alekseyenko O, Waters P, Zhou H, Baum M. Bilateral damage to the sexually dimorphic medial preoptic area/anterior hypothalamus of male ferrets causes a female-typical preference for and a hypothalamic Fos response to male body odors. Physiology & Behavior. 2007;90:438-449.

243 Meerts SH, Clark AS. Lesions of the medial preoptic area interfere with the display of a conditioned place preference for vaginocervical stimulation in rats. Behav Neurosci. 2009;123:752-7.

244 Hofman MA, Swaab DF. The sexually dimorphic nucleus of the preoptic area in the human brain: a comparative morphometric study. Journal of Anatomy. 1989;164:55-72.

245 Roselli CE, Larkin K, Resko JA, Stellflug JN, Stormshak F. The volume of a sexually dimorphic nucleus in the ovine medial preoptic area/enterior hypothalamus varies with sexual partner preference. Endicronology. 2004;145:478-83.

246 Houtsmuller E.J, Brand T, de Jonge FH, R.N.J.M.A. Joosten., van de Poll N.E, Slob A.K. SDN-POA volume, sexual behavior, and partner preference of male rats affected by perinatal treatment with ATD. Physiology & Behavior. 1994;56:535-41.

247 Byne W, Tobet S, Mattiace LA, Lasco MS, Kemether E, Edgar MA. The interstitial nuclei of the human anterior hypothalamus: an investigation of variation with sex, sexual orientation, and HIV status. Horm Behav. 2001;40:86-92.

248 Ahmed EI, Zehr JL, Schulz KM, Lorenz BH, DonCarlos LL, Sisk CL. Pubertal hormones modulate the addition of new cells to sexually dimorphic brain regions. Nat Neurosci. 2008;11:995-7.

249 Schulz KM, Molenda-Figueira HA, Sisk CL. Back to the future: The organizational-activational hypothesis adapted to puberty and adolescence. Horm Behav. 2009;55:597-604.

250 Roselli CE, Stadelman H, Reeve R, Bishop C, Stormshak F. The ovine sexually dimorphic nucleus of the medial preoptic area is organised prenatally by testosterone. Endocrinology. 2007;148:4450-4457.

251 Dugger BN, Morris JA, Jordan CL, Breedlove SM. Gonadal steroids regulate neural plasticity in the sexually dimorphic nucleus of the preoptic area of adult male and female rats. Neuroendocrinology. 2008;88:17-24.

252 Garcia-Falgueras A, Swaab DF. A sex difference in the hypothalamic uncinate nucleus: relationship to gender identity. Brain. 2008;131:3131-46.

253 Nugent BM, Wright CL, Shetty AC, Hodes GE, Lenz KM, Mahurkar A et al. Brain feminization requires active repression of masculinization via DNA methylation. Nat Neurosci. 2015;18:690-7.

254 Andersson AM, Jorgenssen N, Main KM, Toppari J, Rajpert-De Mayts E, Leffers H et al. Adverse trends in male reproductive health: we may have reached a crucial 'tipping point'. Int J Androl. 2008;31:74-80.

255 Evans JI, Maclean AM, Ismail AA, Love D. Circulating levels of plasma testosterone during sleep. Proc R Soc Med. 1971;64:841-2.

256 Luboshitzky R, Zabari Z, Shen-Orr Z, Herer P, Lavie P. Disruption of the nocturnal testosterone rhythm by sleep fragmentation in normal men. J Clin Endocrinol Metab. 2001;86:1134-9.

257 Schmidt MH, Valatx JL, Sakai K, Fort P, Jouvet M. Role of the lateral preoptic area in sleep-related erectile mechanisms and sleep generation in the rat. J Neurosci. 2000;20:6640-7.

258 Fisher C, Cohen HD, Schiavi RC, Davis D, Furman B, Ward K. Patterns of female sexual arousal during sleep and waking: Vaginal thermo-conductance studies. Archives of Sexual Behavior. 1983;12:97-122.

259 Marks GA, Shaffery JP, Oksenberg A, Speciale SG, Roffwarg HP. A functional role for REM sleep in brain maturation. Behav Brain Res. 1995;69:1-11.

260 Udry R, Chantala K. Risk Factors Differ According to Same-Sex and Opposite-Sex Interest. Journal of Biosocial Science. 2005;37:481-497.

261 Barthes J, Crochet PA, Raymond M. Male Homosexual Preference: Where, When, Why? PLoS One. 2015;10:e0134817.

262 Hubbard Th, Verstraete B. Censoring Sex Research: The Debate Over Male Intergenerational Relations. Page 53. Routledge (September 2, 2013). Available from: http://bit.ly/2l7baD7.

263 Zhou JN, Hofman MA, Gooren LJ, Swaab DF. A sex difference in the human brain and its relation to transsexuality. Nature. 995;378:68-70.

264 Spenhoff M, Kruger TH, Hartmann U, Kobs J. Hypersexual behavior in an online sample of males: associations with personal distress and functional impairment. J Sex Med. 2013;10:2996-3005.

265 Karila L, Wéry A, Weinstein A, Cottencin O, Petit A, Reynaud M et al. Sexual addiction or hypersexual disorder: different terms for the same problem? A review of the literature. Curr Pharm Des. 2014;20:4012-20.

266 Austin Institute for the Study of Family and Culture. Regnerus M, Gordon D. Social, emotional and relational distinctions in patterns of recent masturbation among young adults. [Internet]. 2014 [cited 2017 February 5]. Available from: http://www.austin-institute.org/wp-content/uploads/2014/02/Masturbation-Patterns-among-Young-Adults.pdf.

267 Dubuc C, Coyne SP, Maestripieri D. Effect of mating activity and dominance rank on male masturbation among free-ranging male rhesus macaques. Ethology. 2013;119.

268 Thomsen R, Soltis J. Male Masturbation in Free-Ranging Japanese Macaques. J. International Journal of Primatology. 2004;25: 1033.

269 Pew Research Center. A Survey of LGBT Americans. Attitudes, Experiences and Values in Changing Times. [Internet]. 2013 [cited 2017 January 29]. Available from: http://www.pewsocialtrends.org/files/2013/06/SDT_LGBT-Americans_06-2013.pdf.

270 Mazur A, Booth A. Testosterone and dominance in men. Behav Brain Sci. 998;21:353-63.

271 Downing MJ Jr, Schrimshaw EW, Scheinmann R, Antebi-Gruszka N, Hirshfield S. Sexually Explicit Media Use by Sexual Identity: A Comparative Analysis of Gay, Bisexual, and Heterosexual Men in the United States. Arch Sex Behav. 2016 doi:10.1007/s10508-016-0837-9.

272 Escoffier J. Imagining the She/Male: Pornography and the Transsexualization of the Heterosexual Male. Stud Gend Sex. 2011;12:268-281.

273 Slatcher R, Mehta P, Josephs R. Testosterone and Self-Reported Dominance Interact to Influence Human Mating Behavior. Soc Psychol Personal Sci. 2011;2:531-539.

274 Brien SE, Smallegange C, Gofton WT, Heaton JP, Adams MA. Development of a rat model of sexual performance anxiety: effect of behavioural and pharmacological hyperadrenergic stimulation on APO-induced erections. Int J Impot Res. 2002;14:107-15.

275 Giuliano F, Allard J. Dopamine and male sexual function. Eur Urol. 2001;40:601-8.

276 Diamond LM. What does sexual orientation orient? A biobehavioral model distinguishing romantic love and sexual desire. Psychol Rev. 2003;110:173-92.

277 Aswath M, Pandit L, Kashyap K, Ramnath R. Persistent Genital Arousal Disorder. Indian J Psychol Med. 2016;38:341-343.

278 Andersen ML, Palma BD, Rueda AD, Tufik S. The effects of acute cocaine administration in paradoxical sleep-deprived rats. Addict Biol. 2000;5:417-20.

279 Osborne A, Shippenberg T. Neurobiology of opioids. Page 315. Springer; 1991.

280 Kissin B, Begleiter H. The Biology of Alcoholism: Volume 2: Physiology and Behavior. Page 512-513. Plenum Publishing Corporation, New York. [Internet]. 1972 [cited 2017 January 21]. Available from: http://bit.ly/2jjAELO.

281 Hangover Horn! Get it on with morning after sex. [Internet]. 2012 [cited 2017 February 5]. Available from: http://www.prevent-hangovers.com/hangover-horn.html.

282 de Jong TR, Veening JG, Waldinger MD, Cools AR, Olivier B. Serotonin and the neurobiology of the ejaculatory threshold. Neurosci Biobehav Rev. 2006;30:893-907.

283 Zhang S, Liu Y, Rao Y. Serotonin signaling in the brain of adult female mice is required for sexual preference. Proc Natl Acad Sci U S A. 2013;110:9968-73.

284 Batrinos M. Testosterone and Aggressive Behavior in Man. Int J Endocrinol Metab. 2012;10:563–568.

285 Escasa MJ, Casey JF, Gray PB. Salivary testosterone levels in men at a U.S. sex club. Arch Sex Behav. 2011;40:921-6.

286 Smeets-Janssen MM, Roelofs K, van Pelt J, Spinhoven P, Zitman FG, Penninx BW et al. Salivary Testosterone Is Consistently and Positively Associated with Extraversion: Results from The Netherlands Study of Depression and Anxiety. Neuropsychobiology. 2015;71:76-84.

287 Chuang HT, Addington D. Homosexual panic: a review of its concept. Can J Psychiatry. 1988;33:613-7.

288 Kyle R. What Accounts for Cross-Cultural. Chrestomathy: Annual Review of Undergraduate Research, School of Humanities and. 2009;8:99-114 Available from: http://chrestomathy.cofc.edu/documents/vol8/kyle.pdf.

289 World Health Organisation. World Status Report on Alcohol. [Internet]. 2004 [cited 2017 February 2]. Available from: http://www.who.int/substance_abuse/publications/global_status_report_2004_overview.pdf.

290 UNODC. Drug statistics and trends, Table 16. [Internet]. 2010 [cited 2017 February 2]. Available from: https://www.unodc.org/documents/wdr/WDR_2010/2.0_Drug_statistics_and_Trends.pdf.

291 World Health Organisation. Prevalence of overweight, ages 18+, 2010-2014 (age standardized estimate, Male). [Internet]. 2014 [cited 2017 February 2]. Available from: http://gamapserver.who.int/gho/interactive_charts/ncd/risk_factors/overweight/atlas.html.

292 Pew Research Center. The Global Divide on Homosexuality. [Internet]. 2013 [cited 2016 November 30]. Available from: http://www.pewglobal.org/2013/06/04/the-global-divide-on-homosexuality/.

293 Human Rights Campaign Foundation. Report: The state of human rigts for LGBT people in Africa. [Internet]. 2014 [cited 2017 February 2]. Available from: http://www.humanrightsfirst.org/sites/default/files/HRF-HRC-Africa-Report.pdf.

294 Barry S. Hewlett, Bonny L. Hewlett. Sex and searching for children among Aka Foragers and Ngandu farmers of Central Africa. African Study Monographs. 2010;31:107-25.

295 Horne R. Health and Survival in the 21-st century. HarperCollins Publishers Pty Limited; 1992. [Internet]. [cited 2017 February 2]. Available from: http://soilandhealth.org/wp-content/uploads/02/0201hyglibcat/020122horne.21stcentury/020122ch14.html.

296 Rodale J. The Healthy Hunza. Rodale Press, Emmaus, PA. [Internet]. 1949 [cited 2017 February 2]. Available from: http://soilandhealth.org/wp-content/uploads/02/0203CAT/020302rodale/020302intro.html.

297 Prioreschi P. Another medical journey to ancient Rome and Roman medicine with medical historian. Surg Neurol Int. 2015;6:104.

298 Engs, Ruth C. Do Traditional Western European Drinking Practices have Origins in Antiquity? Addiction Research. 1995;2:227-239 Available from: http://hdl.handle.net/2022/17485.

299 Goines L, Hagler L. Noise Pollution: A Modern Plague. South Med J. 2007;100:287-294.

300 David F. Greenberg. The construction of homosexuality. Page 165. University Of Chicago Press; 1990.

301 E.L. Abel. Psychoactive Drugs and Sex. Springer; 1985.

302 Anderson E. Five reasons why it is good to be gay in Spain. In: The Local website. Stockholm, Sweden. [Internet]. 2016 [cited 2017 February 2]. Available from: http://www.thelocal.es/20160517/five-reasons-why-its-good-to-be-gay-in-spain.

303 Spanish Sabores. When are Spanish mealtimes? [Internet]. 2015 [cited 2017 February 2]. Available from: http://spanishsabores.com/2015/06/17/spain-dining-guide-when-are-spanish-mealtimes/.

304 Brown P. Review of: Gibert H. Herdt, Guardians of the Flutes: Idioms of Masculinity: A Study of Ritualized Homosexual Behavior. New York: McGraw-Hill Book Co., 1981. Available from: https://ojs.lib.byu.edu/spc/index.php/PacificStudies/article/viewFile/9241/8890.

305 Herdt G. Ritualized Homosexual Behavior in the Male Cults of Melanesia, 1862-1983: An introduction. In: williamapercy.com. [Internet]. 1984 [cited 2017 March 3]. Available from: http://www.williamapercy.com/wiki/images/Ritualized_Homosexual_Behavior.pdf.

306 Kinsey Institute. The Kinsey Scale. [Internet]. [cited 2017 February 2]. Available from: https://www.kinseyinstitute.org/research/publications/kinsey-scale.php.

307 Katz-Wise SL, Hyde JS. Sexual Fluidity and Related Attitudes and Beliefs Among Young Adults with a Same-Gender Orientation. Arch Sex Behav. 2015;44:1459-70.

308 Savin-Williams RC, Ream GL. Prevalence and stability of sexual orientation components during adolescence and young adulthood. Arch Sex Behav. 2007;36:385-94.

309 Phelan J, Whitehead N, Sutton P. What Research Shows: NARTH's Response to the APA Claims on Homosexuality.A Report of the Scientific Advisory Committee of the National Association for Research and

Therapy of Homosexuality. [Internet]. 2009 [cited 2017 February 2]. Available from: https://media.wix.com/ugd/ec16e9_04d4fd5fb7e044289cc8e47dbaf13632.pdf.

310 Nicolosi J, Byrd AD, Potts RW. Retrospective self-reports of changes in homosexual orientation: a consumer survey of conversion therapy clients. Psychol Rep. 2000;86:1071:88.

311 Sleep Hygiene. In: National Sleep Foundation Website. [Internet]. [cited 2017 March 22]. Available from: https://sleepfoundation.org/sleep-topics/sleep-hygiene.

312 Breeding Periods. In: Encyclopedia Britannica. [Internet]. [cited 2017 February 14]. Available from: https://www.britannica.com/animal/primate-mammal/Breeding-periods.

313 Reid D. The Tao of Health, Sex, and Longevity: A Modern Practical Guide to the Ancient Way. Page: 256. Fireside (July 15, 1989). Available from: http://bit.ly/2lyfApp.

314 Markey PM, Markey CN. Seasonal variation in internet keyword searches: a proxy assessment of sex mating behaviors. Arch Sex Behav. 2013;42:515-21.

315 Levin M, Xu X, Bartkowski J. Seasonality of sexual debut. Journal of Marriage and Family. 2002;64:871–884.

316 Wilson G. Your Brain on Porn: Internet Pornography and the Emerging Science of Addiction. Commonwealth Publishing; 2014.

317 Nardi P, Schneider B. Social Perspectives in Lesbian and Gay Studies: A Reader. Page 268. Routledge Publisher. [Internet]. 1998 [cited 2017 February 5]. Available from: http://bit.ly/2kfaw87.