

**EVALUATING PERSPECTIVE IN STUDIES  
OF SAME-SEX SEXUAL BEHAVIOR:  
AN EXPLORATORY STUDY**

**A Thesis By**

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**Abstract:**  
The literature on same-sex sexual behavior in humans and nonhuman primates consists of significantly different methodologies and perspectives. In humans, same-sex sexual behavior is typically interpreted as a sexually motivated behavior related to sexual orientation and identity. In nonhuman primates however, it is often interpreted as a non-sexual, socially motivated behavior. In this study I conduct multiple bibliometric analyses, finding that concepts related to sociosexual behavior are more prevalently found in nonhuman primate literature, whereas concepts such as sexual orientation and identity are primarily found in human literature. Based on these findings, I provide recommendations on how to address this difference between the two literatures.

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## CHAPTER 1

### INTRODUCTION

Over the past 70 years, researchers have used the terms “homosexual behavior,” “male-male sexual behavior,” and “same-sex sexual behavior” to describe sexual behavior between two male individuals of the same species. All of these terms, however, are alluding to two arguably different concepts, that of same-sex sexual behavior and that of sexual orientation. Nonhuman primate researchers generally describe same-sex sexual behavior (SSB) as; genital contact, manipulation, or both (Vasey, 1995): sexual solicitations, mounting, and other types of genital contact (Moscovice et al., 2019); and/or courtship displays, mounting, and genital contact/stimulation (Sommer & Vasey, 2006) between members of the same-sex within the same species. Despite these descriptions, the concept of SSB has not been consistently defined by authors across nonhuman primate and human sexual behavior researchers. Authors in the different fields describe similar same-sex sexual behavior through very different conceptual frameworks. Some definitions define SSB as sexual behavior between members of the same sex that would be considered mating or courtship behavior if it occurred between members of the opposite sex (Bailey & Zuk, 2009) whereas others focus on motives or functions that are specific to the same-sex interaction (Busia et al., 2018). The issue with the definition of SSB as “misplaced” mating or courtship behavior is that it models SSB after opposite-sex interactions, which assumes that same-sex sexual behavior will consistently serve similar functions or result from similar motivations as opposite-sex sexual behavior. The concept of “sexual orientation,” on the other hand, is typically applied only to humans, and generally described as a consistent sexual and/or affectional preference for a specific gender(s) (Diamond, 2003; Garnets & Kimmel, 1993). This contrasts with the definition of same-sex sexual behavior as it describes a preference that may not always be reflected in an individual’s behavior, and therefore cannot necessarily be inferred from behavioral observations. The concept of sexual orientation is markedly human, as it has its foundation in clinical psychology.

Since this paper will focus on both concepts of same-sex sexual behavior and sexual orientation, the terms “homosexual” and “homosexuality,” will all be used in reference to sexual orientation unless it is specifically used in the name of a theory, model, or author-specific concept. All sexual behavior between members of the same sex will be described as “same-sex sexual behavior” or “SSB”. Utilizing this term as Wallen and Parsons (1997) do, it allows us to analyze the behavior independent of sexual orientation.

SSB has been observed in almost all taxonomic groups including mammals, birds, reptiles, amphibians, insects, mollusks, and nematodes through a variety of forms and proposed purposes (Sommer & Vasey, 2006). Additionally, its popularity as the subject of research inquiries in the field of primatology, anthropology, and evolutionary psychology has grown considerably throughout the past twenty years. This alone has produced a plethora of influential theories attempting to explain the evolution, maintenance, and proximate or ultimate function of SSB in various species. The concept SSB is markedly different than the concept of sexual orientation (i.e. homosexuality or the consistent preference for same-sex interactions, independent of sexual behavior; Sommer & Vasey, 2006), however some researchers have argued that the precursor to sexual orientation is the evolution of same-sex sexual attraction and the subsequent development of SSB, citing that same-sex sexual attraction is a motivator of SSB (Barron & Hare, 2020). If this is true, then it makes the study of same-sex sexual behavior and the analysis of subsequent interpretations increasingly important as these arguments can be used in a variety of social and cultural contexts. The existence and variety of same-sex sexual behavior is apparent, yet the caliber of interpretation is where our efforts have fallen short in so many ways. The framing, contextualization, and perspective of research can alter the overall message of a project. When looking at the current face of sexual research in both nonhuman primates and humans, the tone is drastically different and often does not support comparative research.

## **Problem Statement**

The sexual behavior literature produced over the past 70 years has evolved past considering same-sex sexual behaviors (SSB) as clinically deviant but has subsequently formed a dichotomy of perspectives (McWhirter et al., 1990). While same-sex sexual behavior is often written about in the context of both humans (Barron & Hare, 2020; Muscarella, 2000; Muscarella et al., 2005) and nonhuman primates (Busia et al., 2018; Leca et al., 2014; Vasey, 1995), the concept of sexual orientation and identity (in relation to sexual behavior and preference) is almost exclusively discussed in terms of human populations (Kirkpatrick, 2000; Moser, 2016; Savin-Williams & Vrangalova, 2013). Within the evolutionary social sciences, which includes research on both nonhuman primates and humans, same-sex sexual behavior, desires, orientation, or motivation are often described as: a puzzle, a conundrum, as challenging evolutionary thinking, a paradox, a Darwinian paradox, or as perplexing (Bailey & Zuk, 2009; Barron & Hare, 2020; Camperio Ciani et al., 2008; Kirkpatrick, 2000; Nila et al., 2018; Vasey et al., 2007). Researchers often use these terms as it seems the behavior either does not contribute to or detracts from the reproductive success of both individuals involved. This is consistently different than the framing of articles focused on nonhuman primate SSB, where authors question whether these behaviors are truly sexually motivated (Vasey, 2002). The competing perspectives between both respective fields is certainly cause for analysis since nonhuman primates are often used as comparative models for human research.

### **Importance of Literary Articulation: Human Vs. Nonhuman**

Evolutionary research utilizes the study of nonhuman primates for a variety of reasons. Two of the most important that are relevant to this study are (1) for the advancement of the primatology field, and (2) for behavioral models in human research. Nonhuman primates are significant in human research as they exhibit similarities to humans in development, cognition, social structure and complexity, and physiology (Phillips et al., 2014). SSB is widely prevalent in nonhuman primates, as it occurs in almost every family of the primate order except for the strepsirrhines (including tarsiers) (Dixson, 2012). Among both old world and new world monkeys SSB has been observed, however old

world monkeys exhibit this behavior at a much higher rate. About 70% of old world monkey genera (those of which adequate data exists for) exhibit same-sex sexual behavior (Dixson, 2012). The higher prevalence in old world monkeys however makes sense, as this was the last group to diverge from the lineage that went on to become the greater and lesser apes (Dixson, 2012). Both captive and wild populations of nonhuman primates have been utilized for research in same-sex sexual behavior, although the latter typically produces more confident explanations as the artificial environment of captivity could alter naturalistic behavior.

Environment and social context can be significant factors in any behavioral studies of nonhuman primates. Elements such as presence of humans, small and sometimes unnaturalistic spaces, and being managed (supplied food, being handled, etc.) by humans are all consistent with captive environments (Hosey, 2005). The shift in immediate surroundings has the potential to alter behavior. For example, a normal behavior such as foraging, the act of searching for food, is significantly altered in captive environments while it is an integral behavior for typical life in the wild (Schwitzer & Kaumanns, 2003). Additionally, some reports of same-sex sexual behavior in nonhuman primates are based on artificial social settings. A study by Erwin and Maple (1976) described ambisexual (sexual attraction to both sexes) behavior between two male rhesus macaques (*Macaca mulatta*) that had been raised in wire cages with exclusive access only to their mothers. After weaning, the two individuals were given exclusive access to each other for 19 months. The following tests involved reunions with each other and introductions to familiar and unfamiliar males and females. This experiment created a social environment that was markedly different from natural context where typical wild populations consist of about 50 individuals on average (Dixson, 2012). Additionally, forced separation from conspecifics would be a rare circumstance in wild populations. The reason for this type of inquiry however was considerably different and may have been more focused on a species ability to engage in this type of behavior, whether it was natural or not. More recent investigations that utilize wild populations face the added challenge of a researcher's ability to view sexual behavior in abundance. A study by Chevalier-Skolnikoff (1974) included 500 hours of

observation of captive primates and collected 23 (out of 143 total sexual encounters) observations of female same-sex sexual behavior and 13 observations of male same-sex sexual behavior. Whereas a study by Busia et al. (2018) that included 1,800 hours of observational data of social interactions (including sexual behavior) collected ad libitum, only reported 3 cases of same sex sexual behavior. Despite the smaller, and more challenging number of observations, cases of SSB in wild contexts may be more impactful for comparative human analyses.

The close phylogenetic relationship in addition to their complex social structures and cognition make nonhuman primates excellent candidates for behavioral models to humans. Research has already shown the vast abundance of same-sex sexual behavior in the animal kingdom, but some of the data is simply not relevant to human SSB explanations. For example, wild, male garter snakes (*Thamnophis sirtalis parietalis*) have been observed mimicking female size and pheromones and are subsequently courted by other males. Researchers however, postulate that this allows the mimicking male to help with thermoregulation and to avoid predation (Shine et al., 2003). In another example, wild, male common toads (*Bufo bufo*) will amplex (also known as a copulatory embrace wherein a male will fertilize a female) other males. Researchers hypothesize these occurrences to occur because they are simply not costly to either individual (Marco & Lizana, 2002). This is why it is so important to be able to utilize other species in this type of research. Utilizing nonhuman primate models allows researchers to prioritize the similarities in social and environmental context as well as the parallels in developmental pathways (Phillips et al., 2014). This provides researchers opportunity to compare and contrast phylogenetically close species, which might assist in the development of new and unique perspectives for explanations of different phenomena. A study by Fleischman et al. (2015) utilizes the notion that affiliation acts as a motivator of homoerotic behavior in nonhuman primates to test how affiliative contexts are associated with homoerotic behavior in humans. Researchers found that in both males and females, homoerotic behavior was positively associated with affiliative contexts. Males, when in an affiliative primed context, had a higher propensity to support engagement in SSB. In females, homoerotic motivation was shown to positively correlate with

progesterone, a hormone found to support affiliative bonding. In another example, Barron and Hare (2020) propose a sociosexual hypothesis that argues same sex sexual attraction developed as one of many traits to promote prosocial behavior. Authors of this theory utilize social explanations to same-sex sexual behavior in nonhuman primates as a foundation for their own sociosexual theory.

Both nonhuman primate and human research harbor unique factors that cannot be replicated in the other field. Human research can rely on experience and personal perception whereas nonhuman primate research can only rely on actual observation of sexual behavior. While there are methodological limitations that might prevent identical data collection in human and nonhuman primates, the inherent assumptions and perspectives developed through this split in the literature is worth exploring. Nonhuman primate research on sexuality relies heavily on social and sociosexual explanations of same-sex sexual behavior which often removes sexual motivation as a contributing factor. Human research on the other hand, relies on factors of sexual orientation and identity to explain same-sex sexual behavior. This study will analyze current literature to determine if this dichotomy of perspectives exists and how that affects the literature produced.

### **Review of Theoretical Perspectives**

SSB has been the subject of study for multiple decades in a variety of fields. Evolutionary research has only recently started referring to such behavior as same-sex sexual behavior. The first theories and models on the subject were born out of a clinical origin, hence the heavy focus on self-identity and development. In nonhuman primates however, direct behavioral observation has always been the standard. This has created two completely separate ways of analyzing SSB for humans and nonhuman primates within evolutionary research. Additionally, in human research there exists a completely separate category of perspective within psychology that delves into personality, sexuality, and self-identity. Hence the theoretical foundations of SSB are grounded in a variety of fields and hypotheses. Not one proposed theory has received overwhelming, cross cultural support, but the fact is clear that there still remains heavy interest in the mechanisms which maintain SSB. The following

will review the current and past literature on theories of same-sex sexual behavior in fields such as psychology, evolutionary psychology, primatology, and evolutionary anthropology.

## **Sexual Motivation**

Sexual motivation is a recurring concept that lacks definitive understanding in multiple fields of evolutionary research. This thesis covers multiple theories and models that concern sexual motivation as an integral logistical factor, yet the term is not clearly defined in the literature. Subsequently, any non-sexual motivations lack a clear understanding as well. Sexual motivation seems to describe two factors in sexual behavior, that it follows species-typical opposite-sex (heterosexual) mating behaviors (Vasey, 2014), and that sexual stimulation is consistently sought out (Vasey & Duckworth, 2006). Others consider sexual motivation to function mechanistically and on an individual level, as a part of a chain of incentive stimuli related to conditioned or unconditioned sexual events (Ágmo, 1999). It seems that in some publications, the concept is assumed to be common knowledge as humans presumably have experienced the notion. However, the lack of definition becomes an issue when researchers begin to employ non-sexual motivations as explanations for specific sexual behaviors. The concept of sociosexual behavior comes up frequently in this thesis and its definitions are hinged on that of sexual motivation. As stated by Vasey (2014) sociosexual behavior looks sexual from the outside but is ultimately performed to achieve a social goal. Additionally, other researchers presume that the adaptive functions of sociosexual behavior are considered the primary purpose of the behavior (Vasey & Duckworth, 2006). For the purpose of this thesis as it relates to same-sex sexual behavior, sexual motivation will be considered utilizing clues from species-typical, reproductively viable sexual behavior in addition to whether sexual stimulation is being sought. While this does not capture the nuances of sexual motivation, the finite definition of the concept may require its own inquiry.

## **Nonhuman Approaches**

### ***Reproductive Functions***

Biological explanations are grounded in theories such as sexual selection, kin selection, and reciprocal altruism. Sexual selection argues that individuals will engage in intrasexual competition for access to reproductive resources that the opposite sex holds (Darwin, 1871). Many theoretical explanations (see Table 1) rely on concepts related to both intrasexual and intersexual selection. Intrasexual selection defines competition between members of the same sex for access to opposite-sex potential mates, whereas intersexual selection refers to the ability to choose. The concept of choice refers to members of one sex having the ability to preferentially choose members of the opposite sex based on specific qualities they possess. Kin selection is a type of inclusive fitness that favors the success of an individual's relative, even if it requires a cost to the individual (Hamilton, 1964). Reciprocal altruism describes the trading of seemingly altruistic acts wherein the benefit outweighs the cost (Trivers, 1971). All three of these foundational theories are utilized in various explanations of SSB.

The existing nonhuman primate literature has not utilized (to my knowledge) theories such as kin selection to hypothesize the origins of same-sex sexual behavior. Unlike the human literature, no theory has been proposed that argues same-sex sexual behavior is maintained by subsequent increase to a kin's reproductive success. However, there are theories that propose same-sex sexual behavior will benefit the same individual's reproductive success.

The proceptivity-enhancing hypothesis posits that female individuals will mimic mating patterns of rival males (by mounting other females), thus attracting dominant males to increase her chances of insemination. The mounted female is thought to be behaving altruistically towards the female mounter, although the authors believe this behavior to be upheld by either kin selection or reciprocal altruism. The receptivity-reducing hypothesis however uses intrasexual competition, wherein females utilize same-sex sexual behavior to minimize the chances that other females are also inseminated (Tyler, 1984). According to Vasey (1995), two predictions should hold in accordance with these two

hypotheses: that female same-sex sexual behavior will predominantly occur around males and that female same-sex sexual behavior should be dependent on female fertility. This hypothesis received little support and was largely refuted through further research (Vasey, 1995).

The practice hypothesis argues that same-sex sexual behavior that occurs prior to sexual maturity may function as a developmental step in preparing for successful heterosexual behavior in adulthood (Hamilton, 1914). This hypothesis has been partially supported in macaques (Goy & Wallen, 1979), bonobos (see Furuichi et al., 2014), and bottlenose dolphins (Furuichi et al., 2014). The following biological explanations utilize the concept of sexual reward, which attributes motivation to engage in same-sex sexual behavior to sexual stimulation created from same-sex mounting behaviors. It is important to note that prior to this type of theory a common theme of explanations characterized by Vasey and Duckworth (2006) as “anything but sex” was identified (p. 524). The authors highlight the paradox in which same-sex sexual behaviors were consistent with species-typical sexual response yet categorized as non-sexual in nature instead only performed to obtain some type of social benefit.

### ***Non-Reproductive Social Functions***

Many researchers have stumbled upon social regulation as potential explanations for SSB as sexual behavior is typically found as a motivator and reinforcer of social bonds (Young & Wang, 2004). One of the most common social explanations (see Table 1) for same-sex sexual behavior in nonhuman primates relies on the concept of sociosexual behavior. Sociosexual behavior has been given varying definitions over recent years, although within primatology they typically refer to similar concepts. In nonhuman primates, sociosexual behavior generally describes sexual behavior that is neither reproductive nor sexually motivated. Anzá et al. (2021) describes sociosexual behavior as, “sexual behaviors without a reproductive function” (p. 2) whereas Vasey et al. (2014) says, “sociosexual behaviors are those that are sexual in terms of their external form but are primarily enacted to facilitate some sort of adaptive social goal” (p. 574). Other researchers operate under the assumption that since SSB (or same-sex mounting) does not lead to reproductive outcomes, SSB

likely serves another social function (Sandel & Reddy, 2021). The key factor in proposed cases of sociosexual behavior is the frequent absence of true sexual motivation during interpretation (Vasey et al., 2014).

Dominance is a frequently revisited concept in the study of SSB, especially in nonhuman primates. Dominance hierarchies can provide fitness-related benefits to group-living individuals, with more dominant positions receiving higher benefit (e.g., reproductive success, higher fecundity, and higher infant survival) (Majolo et al., 2012). The dominance-assertion hypothesis asserts that SSB will reinforce the preexisting dominance structure which will reduce aggressive behavior (Wickler, 1967). Anzá et al. (2021) goes on to specify that more dominant individuals (with regard to social hierarchy) will utilize SSB to reaffirm their hierarchical position within the group. Free-ranging barbary macaques (*Macaca sylvanus*) have been found to support the dominance-hypothesis. More senior ranking males have been observed fulfilling the mounter role than the mounted (Anzá et al., 2021). The authors theorize there is an importance in asserting dominance during, or immediately after an aggressive incident due to social uncertainty (Anzá et al., 2021). Another study found that golden snub-nosed monkeys (*Rhinopithecus roxellana*) were found to comply with the dominance assertion theory, specifically finding that same-sex mounters were consistently more likely to be the higher-ranking male (Huang et al., 2017). Authors still identify the potential for SSB to serve multiple purposes within the group.

Several theories argue that SSB works to develop or maintain social bonds and relationships. The alliance formation hypothesis first described by Fairbanks et al. (1977) posits that the use of same-sex sexual behavior enhances social bonds in the context of forming strong alliances and coalitions (reviewed in Vasey, 1995). This has been observed in yellow baboons (*Papio cynocephalus*), in whom males that mounted or manipulated other males' genitals more frequently, formed the strongest and most successful coalitions and alliances against other males (Vasey, 1995). Similar forms of this behavior have been observed in bonobos (*Pan paniscus*), geladas (*Theropithecus gelada*), hamadryas baboons (*Papio hamadryas*), yellow baboons (*Papio*

*cynocephalus anubis*), and hanuman langurs (*Presbytis entellus*) (Vasey, 1995). Behaviors like this have also been referred to as the relationship reinforcement hypothesis (Anzá et al., 2021; Smuts & Watanabe, 1990). Additionally, in bottlenose dolphins same-sex sexual behavior is observed as providing an important cohesive device for establishing trust through sociosexual behavior that strengthens and maintains social relationships, like male-male alliances among Indian Ocean bottlenose dolphins (Mann, 2006). Behaviors like the latter have also been observed in the bottlenose dolphin population of Shark Bay, Australia (Furuichi et al., 2014). This hypothesis is important because it highlights some consistencies across the social and adaptive literature concerning same-sex sexual behavior in primates. All of the literature concerns the social relationships of nonhuman primates, whether preemptive or reparative.

The tension-regulation hypothesis posits that same-sex sexual behavior functions to reduce social tension (Carpenter, 1942). This is predominantly seen in bonobo (*Pan paniscus*) upon arriving at feeding sites where tension and excitement may arise over the presence of food (Vasey, 1995). This type of behavior was also observed in male bottlenose dolphins, in fact a significant portion of all male sexual behaviors in one study occurred with another male and were hypothesized to serve either antagonistic and/or affiliative purposes (Furuichi et al., 2014). This behavior is argued to be a way to either increase or decrease intrasexual aggression and/or conflict (Bailey & Zuk, 2009). However, this may reiterate previous notions about the absence of sexual motivation in same-sex sexual encounters.

In another example of social regulation, the conflict resolution hypothesis has been used to explain some forms of SSB in species of macaque. The reconciliation hypothesis is different than tension regulation because it describes same-sex mounting behavior soon after conflict (Preuschoft & van Schaik, 2000). The tension regulation hypothesis only describes social tension as the affected factor. Anzá et al. (2021) found that barbary macaque dyads who engaged in post-conflict mounts were less likely to engage again in aggressive behaviors. In the same thread, the reconciliation hypothesis is seen as a way for individuals to reestablish social bonds, which has been observed in

bonobos (*Pan paniscus*) as a way for aggressors to reconcile with conspecifics through same-sex sexual behavior (reviewed in Vasey, 1995).

***Non-functional explanations (byproducts/side effects)***

The abnormal adult hormone hypothesis argues that decreased levels of androgens may support the occurrence of male same-sex sexual behavior (Loy et al., 1984), however the data is sparing and often conflicting (Vasey, 1995). This biological hypothesis is different from the receptivity hypotheses because it posits that the presence of SSB is a side-effect of an abnormal hormone level. There is a popular second hormonal theory called the prenatal hormonal hypothesis, which argues that sex-atypical androgen levels in the natal environment will affect sexual behavior (Young et al., 1964). The theory posits that same sex sexual behavior will be more common in androgen deficient males and androgen excessive females. Results from primary and subsequent studies however were contradicting and therefore inconclusive (Vasey, 1995).

The evolutionary byproduct hypothesis posits that SSB is not an isolated genetic trait and may be considered a type of byproduct to another separate trait or suite of traits (Vasey et al., 2008). This explanation is significantly different than other approaches as the behavior would serve no explicit purpose. This has been theorized multiple times, most notable in a recent publication by Gunst et al. (2020). Sexual solicitation is another proposed theory as to why females may mount other females. Although this theory is more complex, and still circles back to opposite-sex mating behavior it is still worth mentioning as it is relatively new. Gunst et al. (2020) suggests that Japanese macaque (*Macaca fuscata*) female-female mounting may be an evolutionary byproduct of female-male mounting. Female-male is argued to be a type of special sexual solicitation performed by females in order to obtain reproductive opportunities from (perhaps) unmotivated males. This behavior is supposed to be preceded by immature, play mounting designed to attract the mountee's attention. Authors argue that because of this immature play, females began using female-male mounting to focus the attention of potential male mates and evolved the ability to receive sexual stimulation (via vulvar stimulation) while mounting a male. Subsequently, females also developed the neutral by-

product of female-female mounting because they are receiving sexual stimulation. Gunst et al. (2020) found that mating sequences with female-mounting-male interactions were observed with less repeat solicitations (i.e. females did not need to repeat or continue to perform potentially less successful sexual solicitations to the male counterpart). It is important to note that female to male mounting as a sexual solicitation was not fully supported by the data collected (Gunst et al., 2020).

Sexual reward has been examined as a potential proximate mechanism for the maintenance of SSB. In a group of free-ranging Japanese macaques (*Macaca fuscata*) female-female mounts were consistently observed paired with vulvar, perineal, and anal (VPA) stimulation. Additionally, female mounters were observed stimulating their VPA area with their tails during mounts (Vasey & Duckworth, 2006). In the same paper, authors recall previous arguments theorizing female same sex mounting to be the result of masculinization during prenatal or perinatal development. Description of Authors include this in their ultimate conclusions with a slight change: females who engaged in same-sex mounting were exposed to prenatal androgens causing their masculinization without subsequent defeminization (Vasey & Duckworth, 2006). No measurement of the pre/perinatal environment were employed before coming to this conclusion. It is important to note that the authors were combining both a functional and a side-effect hypothesis. This same hypothesis found support in pseudohermaphroditic female rhesus macaques. Those females displayed similar numbers of masculine behaviors, more than those females not exposed to prenatal androgens (Pomerantz et al., 1986). Another example of sexual motivation being used as the primary motivator for the observed behavior comes from two golden snub-nosed monkey (*Rhinopithecus roxellana*) individuals. In the study by Fang et al. (2018) out of 36 males (in an all-male band) only two were considered to be engaging in sexual behavior with sexually motivated intentions. This conclusion was reached through consideration of; suggestively longer mounts, mounts that resembled species-typical mating patterns, repeated sexual interaction, seminal emissions, and post-sexual grooming sessions. It is clear that the author was stringent in their categorization of only one dyad as being sexual motivated, whereas the rest of the mounts ( $n = 15$ ) were typically considered as sociosexual in origin. Their reasoning

being that the mounting occurred after fighting and in forced situations. However, some of the mounts took place after a subadult presented to an adult which was then followed by grooming. The other difference between the sexually and non-sexually motivated mounts was that all of the non-sexual mounts were similar in duration and pelvic thrusting was seen in only 2 cases. In the dyad that was observed in repeated mounts ( $n = 14$ ) deeper pelvic thrusting was present, which occurred during 13 of the mounts. Fang et al. (2018) did not rule out sexual motivation as a possible factor in some of the other (sociosexual) dyads, although most were thought to be influenced by the factor of social rank due to the fact that no subadult or juvenile males ever mounted an adult partner. In the case of the dyad with repeated mounts, as well, only the adult was the mounter with the subadult as the mountee. According to Fang et al. (2018) the only reciprocal mounting that ever occurred was between juvenile males immediately preceding grooming sessions. Despite attempts to consider sexual reward (genital stimulation, anal stimulation, etc.) there still remains an issue in how researchers are defining and measuring sexual motivation in nonhuman primates.

One of the most studied nonhuman primates, with regard to SSB is the Japanese macaque (*Macaca fuscata*). This is because female Japanese macaques have been observed at much higher rates engaging in same-sex sexual behavior with a myriad of explanations utilized to interpret the behaviors. Female Japanese macaques display higher intervention (support during a dyadic conflict) rates for individuals with whom they are engaged in same-sex consortships, however these were typically “conservative interventions,” meaning they still followed pre-existing dominance hierarchies (Vasey, 1996). Although this evidence might suggest a sociosexual explanation, extensive research on Japanese macaques has found evidence to suggest that female SSB may not be sociosexual in nature. Throughout the past 20 years research on this species has found that SSB is only observed during the species’ typical mating season, occurs within the temporary and exclusive consortships, produces the same endocrine profiles as those engaged in opposite-sex sexual behavior, is performed alongside incest avoidance behaviors, and frequently produces genital stimulation (reviewed in Vasey et al., 2014). Interpretation of this evidence has led some researchers to believe

SSB in female Japanese macaques to be sexually motivated, instead of socially motivated. Of course, this does not disregard other hypotheses and frameworks used outside of social and adaptive explanations.

Table 1. Nonhuman Primate Theories on Same-Sex Sexual Behavior

Reproductive Function	Description
Proceptivity Enhancing	Female same-sex mounting acts as a type of intrasexual selection, but only occurs around males and when females are fertile (see Vasey, 1995).
Receptivity Reducing	Female same-sex mounting acts as a type of intrasexual selection, but only occurs around males and when females are fertile (see Vasey, 1995).
Practice	Juvenile or immature individuals increase their reproductive success by engaging in same-sex sexual behavior with their conspecifics (see Bailey & Zuk, 2009)
Non-Reproductive Functions	
Dominance Assertion	Same-sex sexual behavior will reinforce the preexisting dominance structure which will reduce aggressive behavior (see Vasey, 1995).
Alliance Formation	The use of same-sex sexual behavior enhances social bonds in the context of forming strong alliances and coalitions (reviewed in Vasey, 1995).
Tension Regulation	Same-sex sexual behavior functions to reduce social tension, noted to have the ability of either increasing or decreasing intrasexual aggression and/or conflict (see Bailey & Zuk, 2009; Vasey, 1995).
Conflict Resolution	Utilizing same-sex sexual behavior to reestablish social bonds post-conflict (see Anza et al., 2021).
Reconciliation	Utilizing same-sex sexual behavior to reestablish social bonds after conflict (see Vasey, 1995).
Social Glue	Same-sex sexual interactions act as ways to form bonds/alliances, reduce tension/prevent future conflict, and facilitate reconciliation post-conflict (see Bailey & Zuk, 2009).
Non-Functional Explanations	
Abnormal Adult Hormone	Argues that decreased levels of androgens may support the occurrence of male same-sex sexual behavior (Loy et al., 1984).
Sexual Solicitation	Performed by females in order to obtain reproductive opportunities from (perhaps) unmotivated males (Gunst et al., 2020).
Evolutionary Byproduct	Same-sex sexual behavior is a byproduct of a separate trait (see Bailey & Zuk, 2009)
De-Scent of Sexuality	The vomeronasal organ (VNO) of ancestral primates engages in signaling by way of the transient receptor potential cation channel 2 which directed all or most sexual behavior toward members of the opposite sex (Pfau, Jordan, & Breedlove, 2019).
Sexual Reward	Individuals receive genital stimulation from engaging in same-sex sexual behavior (ex. vulvar, perineal, and/or anal stimulation) (Vasey & Duckworth, 2006).

The only animals other than humans to exhibit a preference for a specific sex with regard to sexual behavior are domestic rams (Roselli et al., 2011). Most nonhuman primates might exhibit instances of same-sex sexual behavior; however, it is often interpreted and/or observed as incidental and mixed-in to the behavioral repertoire adjacent to opposite-sex sexual interactions. One 2018 study documented same-sex sexual behavior in male spider monkeys (*Ateles geoffroyi*), but even this was limited to only three actual observations (Busia et al., 2018). Again, this article reviewed the behaviors under gaze of sociosexual explanations such as reconciliation, tension alleviation, and alliance formation. It is important to note however that this article may have been the first reported case of penile-anal intromission in male New World primate species (Busia et al., 2018). This may not come as a surprise since most of the definitions regarding same-sex sexual behavior rarely, if ever, mention any type of penile-anal intromission/penetration. What this study does highlight however, is the importance of recurring actors to the study of same-sex sexual behavior and how it relates to the study of sexual orientation.

In multiple studies of nonhuman primates same-sex sexual behavior there are recurring actors in the same behavioral contexts: *Ateles geoffroyi* (Busia et al., 2018); *Macaca fuscata* (Leca et al., 2014); *Pan paniscus* (Moscovice et al., 2019). Further, the study by (Moscovice et al., 2019) found that the chance of coalitional support by non-kin individuals was positively correlated with sexual frequency for female dyads. Although sparing, these instances resemble that of human same-sex sexual behavior since typical research in this area focuses on orientation which deals with a somewhat stable preference for a specific type of sexual experience. The support for differing hypotheses however is very different between human and nonhuman research. A study by Fleischman et al. (2015) tests the affiliation hypothesis to explain homoerotic motivation in humans, while pulling significantly from nonhuman primate literature. Their preliminary results suggest that homoerotic behavior promotes affiliation between individuals. Additionally, studies looking at sexual dominance orientation also found that self-identifying heterosexual males scored significantly lower

than homosexual males in aggression (Dickins & Sergeant, 2008). This may help explain the general tendency to apply social theories to cases of same-sex sexual behavior.

### **Human Approaches**

Human-centric theories on SSB (see Table 2) are widespread and arguably more complex than those originating in ethology. Theories focusing on human SSB and human homosexuality have the added factor of participant response with the loss of first-person observation of sexual behavior. These inherent challenges in the literature provide a markedly different perspective when tackling human sexual behavior and sexuality, both in theory and methodology. The following will summarize the current and past literature detailing empirical and theoretical perspectives concerning human sexual behavior and sexuality.

The only studies that have consistently maintained cross-regional and cross-cultural evidence are ones concerning the fraternal birth order effect, which posits that higher the number of older brothers increase the chance of homosexuality in later born male offspring (Blanchard, 2018, 2019; Bogaert, 2006). It is also important to note that the theories discussed typically focus on the term homosexuality, denoting the actual sexual orientation and not just the behaviors expressed by these individuals.

### ***Reproductive Functions***

The first, and possibly best-known theory argued to maintain homosexuality in humans is kin selection. The theory of Kin Selection was developed by W.D. Hamilton in 1963 and argues that costly behavior to an organism's own survival will be maintained as long as it favors the reproductive success of that organism's relative (Hamilton, 1963). In 1975 E.O. Wilson utilized this theory to explain sexual behavior between two members of the same sex. Wilson posits that if homosexual individuals act as helpers in raising other kin's offspring, kin selection will maintain the gene(s) for homosexuality (reviewed in Kirkpatrick, 2000). The kin selection hypothesis has not found significant empirical support in westernized populations nor in countries such as Indonesia (Nila et al., 2018). Evidence supporting this hypothesis found that androphilic males (fa'afafine) of Independent Samoa

showed significantly more avuncular behavior than gynephilic men in the same population (Vasey et al., 2007). This only partially supports kin selection because the two groups of males (androphilic and gynephilic) did not differ in giving or receiving any type of altruistic tendencies from kin (Vasey et al., 2007) The kin selection hypothesis is often confounded with another called parental manipulation. The parental manipulation hypothesis posits that parents may manipulate their offspring to forego sexual reproduction with the opposite sex, force them to become a “homosexual,” and then aid in the upbringing of their siblings or their sibling’s offspring. The reason this is often included adjacent to the kin selection hypothesis is that they both hold similar predictions (reviewed in Kirkpatrick, 2000). In short, both theories rest on the assumption that the individual that is “homosexual” will aid in the upbringing of kins’ offspring. At the time this review was written, Kirkpatrick (2000) states that, “there is as yet no compelling evidence that the number of surviving offspring or even fecundity is limited by homosexual behavior as seen in the majority of individuals practicing it.” Neither of these hypotheses have received significant empirical support, although some have expanded on this topic by using the theoretical framework of the hypothesis. A recent study by Playà et al. (2017) looked at the relationship between female attitude towards homosexuality and their potential need for alloparental care. Researchers found a positive relationship, suggesting that same-sex sexual attraction is at least partially connected to kin selection. The results were derived from an online survey conducted across 58 countries.

Other hypotheses that argue a biological component of same-sex sexual behavior and subsequent homosexual orientation focus on a type of sexual selection. Sexually antagonistic selection resolves the supposed paradox of human male homosexuality by finding higher fecundity in females. In the same thread, a hypothesis called overdominance posits that alleles maintaining SSB in homozygous state provide an advantage when occurring in a heterozygous state (Gavrilets & Rice, 2006). Both rely on hypotheses were developed through mathematical modeling.

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### ***Non-reproductive social functions***

To my knowledge, no hierarchical maintenance or development hypotheses exist in relation to human same-sex sexual behavior. However, the concept is entirely plausible in human populations and may appear in future hypotheses.

Kirkpatrick (2000) refers to reciprocal altruism as a potential propellant for homosexual orientation in humans. The reciprocal altruism hypothesis posits that there are non-conceptive benefits to same-sex sexual behavior and that it has undergone direct and positive selection (Kirkpatrick, 2000). Though this hypothesis assumes non-conceptive benefits, it does realize the potential benefit for behaviors that provide support in resource competition or that aid in cooperative defense. The reciprocal altruism hypothesis was essentially used to theorize about the social and cooperative benefits to same-sex sexual behavior and was a precursor to the alliance theory, which according to Kirkpatrick (2000) lessens the need for such behaviors to directly benefit an individual's fitness. The alliance theory would be picked up again in later years to theorize the cooperative benefits of same-sex sexual behavior in both humans and nonhuman primates.

The alliance formation hypothesis argues that same-sex alliances aid individuals in survival and reproduction, same-sex sexual behavior aids in alliance formation, and that "bisexuality" or sexual behavior with both sexes will be more common than strict same-sex sexual behavior or "homosexuality" (reviewed in Kirkpatrick, 2000). Same-sex alliances have been known to aid individuals in survival and subsequent reproduction; these alliances also have the potential to be expressed through sexual behavior (reviewed in Kirkpatrick, 2000). The alliance theory is marginally different from the alliance formation hypothesis originating from ethology. At both of their core's alliance theory and alliance formation hypothesis focus on social alliances between same-sex

individuals that might aid individuals in overall survival and/or reproduction (Muscarella et al., 2005). The same study argues for human alliance theory (of SSB) by analyzing the perception of same-sex sexual behavior by outside parties. The study found that targets who were described as engaging in same-sex sexual behavior were perceived by both males and females as expected to obtain higher social status and reproductive opportunities, in specific evolutionary contexts (Muscarella et al., 2005). However, there may be more to this theory than simple sexual enhancement of human relational bonds. Human males have been shown to engage in more pre/post-competition physical contact and proximity than females (Benenson et al., 2018). This may suggest human males' propensity for closer physical contact in regard to competitive environments. Although an expansive list, few of these theories have garnered support further than their seminal papers. A majority of the evidence supporting alliance formation rests in data on same-sex sexual behavior encouraging same-sex alliances but with the caveat that same-sex sexual behavior is not integral for the alliance. No explanation on the sexual motivation is included in this explanation. Additionally, this hypothesis rests solely on the societal conditions, and is thought to vary with the ecological needs and subsequent coalitional regulation (Kirkpatrick, 2000). Again, as a sociosexual hypothesis, the reasoning explains only the socially beneficial aspects of the sexual behavior.

At this time, no hypotheses on conflict resolution or tension regulation exist in relation to human SSB. It is possible that future hypotheses could address this concept in human populations, but for the purpose of this study there will be no evaluation of this topic in relation to humans. The prosocial hypothesis states that the evolution of same-sex sexual attraction (SSSA) can be contributed to the evolution of the collection of behaviors selected for easier social integration or prosocial behavior, including in-group tolerance, and social bonding (Barron & Hare, 2020). This is consistent with research on selection for traits that promote prosocial behavior, such as bonobos being especially adapted to cooperative communication just like other domesticated species (Hare, 2017). Barron and Hare (2020) also point out the differences between chimpanzees and bonobos in that bonobos have been selected for more prosocial behaviors and indeed they have been observed

exhibiting more same-sex sexual behavior than their chimpanzee cousins. Additionally, a study by Fleischman et al. (2015) found that in both males and females, homoerotic motivation was positively correlated with affiliative bonding. Although experimental, there does seem to be data to support the theory that alliances and coalitions may benefit from same-sex sexual behavior.

Table 2. Human Theories on Same-Sex Sexual Behavior

Reproductive Functions	Description
Kin Selection	Non-conceptive benefits to same-sex sexual behavior (see Kirkpatrick, 2000).
Parental Manipulation	Posits that parents may manipulate their offspring to forego sexual reproduction with the opposite sex, force them to become a “homosexual,” and then aid in the upbringing of their siblings or their sibling’s offspring (see Kirkpatrick, 2000).
Interfamily Conflict	Homosexuality is maintained to increase the reproductive success of male siblings and to reduce occurrences of interfamily conflict due to competition over family resources (Apostolou, 2013).
Sexually Antagonistic Selection	Alleles that maintain same-sex sexual behavior in one sex will increase fitness in the opposite sex. (see Bailey, 2009).
Overdominance	Genes that maintain same-sex sexual behavior while homozygous will provide advantages when heterozygous (see Bailey, 2009).
Balanced Polymorphism	Argues that homosexuality occurs in conjunction with another, positively selected trait (see Kirkpatrick, 2000).
<b>Non-Reproductive Social Functions</b>	
Alliance Formation (Reciprocal Altruism)	Same-sex alliances aid individuals in survival and reproduction. Same-sex sexual behavior aids in alliance formation. Bisexuality or sexual behavior with both sexes will be more common than strict same-sex sexual behavior or homosexuality (see Kirkpatrick, 2000).
Alliance Theory	Same-sex sexual behavior in humans is maintained because it supports same-sex alliances (see Muscarella et al., 2005).
Prosocial	Evolution of same-sex sexual attraction (SSSA) can be contributed to the evolution of the collection of behaviors selected for easier social integration or prosocial behavior, including in-group tolerance, and social bonding Barron & Hare, 2020.
<b>Non-Functional Explanations</b>	
Infection	Postulates that homosexuality may be a byproduct of an infectious disease or virus (Cochran et al, 2000)

### ***Non-functional explanations (byproducts/side effects)***

A myriad of nonadaptive explanations have been used to explain the supposed “conundrum” of same-sex sexual behavior and subsequent homosexuality. Utilizing infection as causation for homosexuality Cochran et al. (2000) postulates that homosexuality may be a byproduct of an infectious disease or virus. The authors hypothesize that it could be transmitted through via sexual behavior between individuals, especially since (according to the authors) male homosexuals typically have more sexual partners than heterosexual males. The authors of this hypothesis point out the many flaws of other evolutionary explanations of SSB and homosexuality as a sexual orientation, instead claiming that an infectious route eliminates these fallacies.

Currently, there are no prominent behavioral byproduct hypotheses regarding human SSB. Future hypotheses may address this subject, however at this time there will be no further analysis on the concept as it relates to this study.

### **Development, Identity, & Sexual Orientation**

Human sexual orientation has a long and storied past in human history, but for the purpose of this analysis acute focus will be given to the popularization of the concept in the social sciences during the mid-twentieth century. This will give insight to how both the single term has come to represent a myriad of definitions and identities. Based on the lasting legacy of Freud, psychoanalysts up until the mid-1900s believed in a dichotomous model of sexual orientation which focused solely on heterosexual and homosexual categorizations. Diagnoses were based on factors such as analysis of erotic fantasies, which were attributed to early childhood developmental issues, and ultimately viewed as pathological, that is anything which deviated from the “normal” heterosexual development (McWhirter et al., 1990). Research would not depart from this way of thinking until Alfred E. Kinsey in 1948 where he first introduced the Kinsey scale, which pioneered the unidimensional/bipolar model of sexual orientation. This model setup a six-point scale of continuous sexuality where 0 represented exclusive homosexuality and 6 represented exclusive heterosexuality (Kinsey et al., 1948). A later model developed by Storms in 1978 considered homoeroticism and heteroeroticism to be,

“independent, orthogonal continua” (McWhirter et al., 1990). Although a modification of the Kinsey scale, it split the concepts of homo and hetero wherein a person measuring high on homoeroticism and low on heteroeroticism would be categorized as a homosexual. According to McWhirter et al. (1990) many variations of the Kinsey scale were developed but few lasted past their conception and persisted into modern day.

Bipolar models of sexual orientation gave light to two sexual identities but ignored everything else. Any model of exclusive homosexuality must first delve into the primary questions of bisexuality. According to Money (1990) monosexuality whether it be in the form of heterosexuality or homosexuality is, "a derivative of the primary bisexual or ambisexual potential." Money uses a plethora of examples ranging from true bisexual behavior (parallel to humans) to hermaphroditic species wherein individuals are capable of both male and female reproductive roles. The point is further illustrated by evidence that early stage, mammalian embryos are "sexually bipotential," only to be confirmed into a sex by addition of specific hormones into the prenatal environment. This argument simply points to the powerful effects of the prenatal environment.

Bem (1996) proposed a theory called “Exotic becomes Erotic” which proposed that biological variables do not control sexual orientation but instead for certain developmental aspects of childhood that would affect a child’s preference for sex typical or sex-atypical environments. This paper was met with considerable critique. Peplau et al. (1998) critique of “Exotic becomes Erotic” points out that the literature cited by Bem does not provide evidentiary support for his theory and does not adequately link familiarity with later sexual orientation.

Shively and De Cecco (1993) describe the Physical-Affectional Theory of sexual orientation which places emphasis on two aspects: the physical preference and affectional preference. Affectional preference regards individual preference for male and/or female emotional partners and physical preference will refer to two spectrums of their own. Each individual, according to the theory, will possess a continuum for both heterosexuality and homosexuality. In its essence, this allows individuals to potentially be both heterosexual and homosexual which is a departure from bipolar

theories that consider homosexuality at the expense of heterosexuality. This perspective of separating factors regarding the physicality and emotion of sexuality is similar to (Diamond, 2003) and their description of the biobehavioral model of sexual orientation.

Diamond (2003) describes the biobehavioral model as a separation of the factors of sexual desire and bonding, arguing that bonding is not inherently oriented towards a single or specific gender, and argues that the biobehavioral relationship between bonding and sexual desire are bidirectional – especially among women. Other models argue against the stereotypical three-category system, as Epstein et al. (2012) does in their description of the fluid continuum model. This model argues that sexual orientation is relatively fluid and flexible with individual ranges of sexual flexibility, and that “sexual orientation tendencies” lie on varying points of the continuum.

The main aspects of sexual orientation exist through its measurement; sexual experience, psychosexual reactions, sexual attraction, sexual behavior, sexual fantasies, emotional preference, social preference, self-identification, heterosexual/homosexual lifestyle, and sexual contact (Friedman et al., 2004). Despite the variation, some significant and consistent components argue both a psychological and behavioral component exist (Kinsey et al., 1948; Sell, 1997). These components are still seen in recent definitions, which include specific qualities of sexual orientation that can be expected in individuals. According to Moser (2016) qualities of sexual orientation consist of lust, relative immutability, flexibility, early onset, consequences, and life-long persistence. These individual qualities coupled with empirical studies that have found more significant differences between relationship types (i.e. long-term versus short-term) than sexual orientation regarding age of partner, suggests predictors of sexual orientation also include components related to partner compatibility (Gobrogge et al., 2007). Additionally, a study by (Friedman et al., 2004) found 4 common themes to sexual orientation, including sexual attraction, types of attraction, relational components, and sexual behavior/self-identification. Others have found consensus regarding sexual orientation when looking at three common factors: sexual identity, sexual behavior, and sexual attraction (Legate & Rogge, 2019). Although a concrete definition of sexual orientation may not exist, a factor that all of the

descriptions share is the reliance on self-perception and experience. Many of the factors that authors denote as evidence for the existence of sexual orientation rely on experiential methods. The variety of components proposed to be factors of sexuality mirror that of how many sexual orientation categories authors propose exist.

The two most widely accepted and written about sexual orientations are homosexuality and heterosexuality, with bisexuality following in a close third (Moser, 2016). Despite this triad, multiple publications also acknowledge the arguments of Kinsey et al. (1948) and continued by Sell (1997) that sexual orientations exist on a spectrum stretching from strictly heterosexual to homosexual (Savin-Williams & Vrangalova, 2013). This suggests a general theoretical understanding that sexual orientation exists on a continuum despite the use of narrow classifications. The theoretical underpinnings of the evolutionary trajectory of sexual orientations (other than heterosexuality) are substantially more complex. Despite the agreement on the existence of a sexuality spectrum, the concept is rarely carried on further.

### **Current Study**

The following study is laid out into four components. Chapter 2 presents an analysis of current academic literature on same-sex sexual behavior in humans and nonhuman primates. Chapter 3 presents original data in the form of a pilot study, which provides proof of concept and further guidance for chapter 4, the Bibliometrix analysis. The chapter explores small subsets of article data collected from both nonhuman primate and human literature. Demographic information as well as concept usage and terms are collected and analyzed to evaluate perspective in comparative fields. Chapter 4 presents an original bibliometric analysis utilizing R and the R-tool Bibliometrix (Aria & Cuccurullo, 2017; R Core Team, 2021). Bibliographic analyses in the past have been used to understand current standings of a variety of fields, often uncovering subtle trends that may go unnoticed. In the field of evolutionary social sciences, it has been found that certain aspects of human evolution seem to systematically garner more attention from academics than others (Barrett, 2020). The chapter focuses on gaining a larger contextual picture of the current state of sexual behavior

research in academia. Chapter 5 presents the second part of the bibliographic analysis and a revised methodology. Finally, chapter 6 concludes this thesis and provides the limitations of the current study and further direction for future research in this subject.

### **Expected Outcomes**

Through this exploratory analysis, I expect to find patterns in the data to support the notion that the fields of nonhuman primate and human research are viewing same-sex sexual behavior in two completely different frameworks. This study was inspired by the suspected patterns of varying authors' conceptual framework based on the field they operate within. Although nonhuman primates and humans carry inherent methodological differences in their research, this should not confine the research either. I expect the human literature to focus more on aspects of sexual orientation and identity while nonhuman primate literature to focus more on social and adaptive explanations. Additionally, it is expected that nonhuman primate literature will be absent or mostly absent of any concept concerning sexual orientation and identity, as these are typically defined by and for human subjects with experience and perception as an integral factor. I expect to find these outcomes as part of inherent assumptions taken on by researchers instead of as intentional methodological decisions made for the purpose of each research project. I expect to find these patterns in both the pilot study and the bibliometric analysis.

## CHAPTER 2

### LITERATURE ANALYSIS

The present literature on sexual behavior is complex and at times, muddled by differences in terms and perspective. Although great strides have been made in the past twenty years, the absence of consistency between fields may be cause for concern. Significant attention has been given to the concept of sexual identity (and its many factors) that is unparalleled in the nonhuman primate literature on sexual behavior. This prompts an inquiry into why sexuality research in humans is made so complex and incomparable to sexual behavior research in nonhuman primates. The two fields simply do not seem to compare to one another in any aspect other than both are focused on primate species.

The methodological framework of both primatology and human sexual behavior research are rooted in two completely different perspectives. Primatology focuses on behavioral repertoires whereas human researchers are analyzing reported behavior as well as internal perception and experience. As Wallen and Parsons (1997) point out there is no direct correlation between nonhuman primate same-sex sexual behavior and human homosexuality. This perspective however, rests on the assumption that there is no correlate to sexual orientation in nonhumans. This is problematic because sexual orientation does not yet have a solid definition, which also means there is no standard way to measure it. Without this foundational information on sexual orientation, we cannot begin to consider its relevance in nonhuman subjects. In nonhuman primates SSB is often reported in fleeting observational data while the analysis and anecdotal data itself cannot comment on the individuals' prior sexual history, same-sex or not.

For example, dominance related hypotheses are popular in nonhuman primate literature, but are often non-transferable to human theory. In this literature, mounting is typically viewed as representation of the dominance hierarchy. In same-sex scenarios the "mounter," is considered the more dominant individual and the "mounted," the more subordinate. However, this exact perspective must be altered in human research. For one, this cannot be done by behavioral observation alone,

instead utilizing self-reported behavior from respondents. Additionally, the respondents would most likely be noting a preference for partner type. This is exemplified in a study by Valentova et al. (2014) which found that male homosexual individuals' partner height preference was regulated by preferred sex and dominance role (with regard to sexual behavior). In summary, the study found that penetrative partners preferred shorter more feminine-faced partners while the non-penetrative partners preferred taller more masculine-faced individuals (Valentova et al., 2014). This perspective only considers dominance and hierarchical position in reference to sexual behavior, not social groupings. While the nonhuman primate literature may appear to have similar results, the interpretations of each are inherently incomparable. To my knowledge there is no study that attempts to measure social hierarchical position against sexual position preference in humans who identify as homosexual or engage in same-sex sexual behavior. This suggests the need for a methodological change in the literature, one that considers both human and nonhuman species as complementary assets in understanding sexuality.

We are seeing two different types of complexity in nonhuman and human literature. In human literature the complexity comes from subject experience and identity versus observable/reportable behavior whereas in nonhuman literature the complexity lies in having only behavior to analyze. Nonhuman primates engaging in same-sex sexual behavior are typically assumed to be carrying out a social intent, wherein researchers cannot be sure that their benefit is without sexual stimulation, or some other type of reward. To counteract these inherent assumptions a methodology that includes measurable benefits of sexual behavior should be developed. For example, the presence or absence of sexual stimulation in nonhuman primate species rests on similarity to opposite-sex sexual behavior. Logically, this might allow researchers to infer whether sexual stimulation is taking place, but it does not allow confidence in the data. There is no way to ascertain whether an individual nonhuman primate is receiving sexual stimulation if the only benchmark is how similar it looks to reproductively viable sexual behavior. Whether sexual stimulation is a factor in the behavior or not, the information from its measurement would allow research to understand further why individuals are

engaging in such behavior. This would give more confidence to existing and future results on same-sex sexual behavior.

Sexuality is multi-faceted and hypothesized to serve a myriad of functions, but its theoretical framework is gathered from multiple subject areas that focus on varying developmental pathways. As we see from the literature, human behavior researchers are influenced by subject areas that focus on both human behavior and psychology. This is not mirrored in the field of primatology, which is heavily reliant on fields such as ethology and of course, anthropology. As one may notice from reviewing the present literature, it seems there is a disagreement between the two fields on what exactly same-sex sexual behavior is and how to rightfully explain the phenomenon. It is for this reason that we must evaluate the efforts of academia to this point and ensure that we are conducting such research in a responsible fashion.

## CHAPTER 3

### PILOT STUDY

#### Purpose

The division between hypotheses of same-sex sexual behavior in nonhuman primates and humans is stark and methodologically divided. In an effort to explore this phenomenon further, a pilot study was used to confirm the researchers' initial insights about the broad differences between the two sets of literature. The pilot study focused on a carefully selected subset of current literature, aimed at contextualizing the state of sexual behavior research in fields including but not limited to psychology, evolutionary psychology, evolutionary anthropology, and primatology. This brief literary exploration searched for cursory patterns between research frameworks of nonhuman primate and human sexual behavior through independent readers and evaluators. The study focused on terms, features, and key words used in a variety of peer-reviewed research articles. These data were then used to design the latter parts of this study, the bibliographic analyses. It is important to gain an accurate understanding of the field before critiquing research strategies, therefore this pilot study was designed to provide a brief understanding of how research is being framed across multiple fields dealing with issues and questions in SSB. Additionally, this section will focus on understanding conceptual framing throughout the entire article, which is why it is not being conducted in a full-scale setting. The pilot study will be used to test our methodology and provide proof of concept.

#### Method

Research articles were collected throughout March of the year 2021 through Clarivate Analytic's Web of Science Core Collection Database Search tool. The search terms "Primate Sexual Behavior" and "Human Sexual Behavior" were used in two separate search queries. In each query, the first ten listings that referred to SSB were selected, and the full record with all cited references were exported to plain text for analysis. Each article was assigned a random number and was paired with a corresponding, blank article evaluation checklist. A total of twenty-one article readers were recruited through volunteer and extra credit opportunities within the Division of Anthropology at

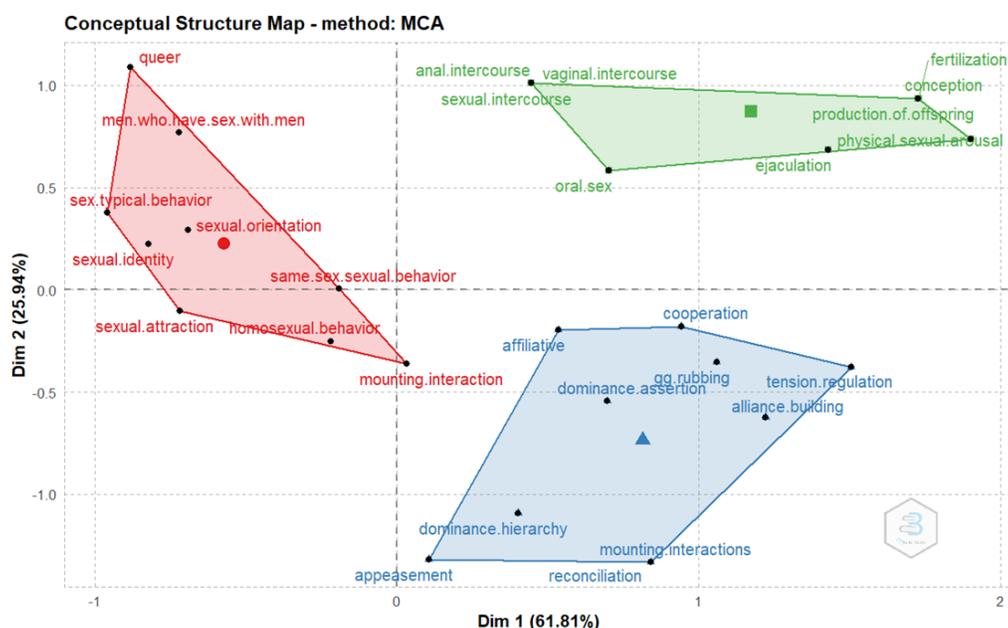
California State University, Fullerton. Each reader was assigned either one or two articles to read (if two articles were assigned one was a primate article and the other was a human article). After reading their assigned article(s), readers were instructed to fill out an article evaluation checklist, which included general article demographic information (Appendix A) (title, author, year published, first author country of origin, study subjects, type of study, and keywords) and a checklist of fifty-two terms/features (Appendix B). The terms/features list included relevant words or phrases compiled by the author. The words and phrases were chosen based on previous reviews of the literature and included terms such as: increasing investment in offspring, alliance building, sexual attraction, physiological sexual arousal, attachment/affectional bonding, sexual identity, and sex typical behaviors. Readers were instructed to check off any term/feature that was present in the corresponding article. Once readers were finished reading their assigned article(s) and filling out the corresponding article evaluation checklist, all of the data was compiled into one master list. Prior to statistical analysis, the data was checked and verified, with special attention given to discrepancies between readers. Any answers that did not match between readers was verified and corrected by the author to represent the true answer based on the information in the article. None of the variables were subjective as the term/feature listed in the checklist was either present or not in each research article. This file was then loaded into the Bibliometrix package (Aria & Cuccurullo, 2017) in R (R Core Team, 2021) for further analysis.

## **Results**

The pilot study allowed us to test out the capabilities of the R package Bibliometrix and how it might serve the bibliographic analysis planned for the latter part of this thesis (Aria & Cuccurullo, 2017; R Core Team, 2021). Chapter 3 will discuss more of Bibliometrix's full scale capabilities with regard to this type of study. Our initial needs were to run basic tests on the dataset consisting of  $n = 20$  articles. Bibliometrix was able to carry out this task, although the program's capabilities were not what was intended for the final result of this study. Included in this section are the analyses

completed through Bibliometrix in addition to other analyses performed using STATA and IBM's SPSS software.

The pilot study produced some patterns that were consistent with our expectations. Terms that related to sexual orientation, identity, and attraction loaded onto a separate factor than those terms that referred to social factors and other terms such as “mounting interactions” (see Figure 1). When three clusters were specified, the third cluster consisted of concepts of strict sexual behavior (i.e. intercourse, fertilization, physical sexual arousal, oral sex, and ejaculation). The conceptual structure suggests distinct patterns that separate identity-related concepts, social concepts, and sexual concepts. This is consistent with our expectations as these patterns follow typical trends observed in a non-systematic review of the literature.



*Figure 1.* Factorial analysis by multiple correspondence analysis of reader-chosen terms/features. 20 terms with 3 clusters. Produced by the R-package Bibliometrix (Aria & Cuccurullo, 2017; R Core Team, 2021).

Utilizing SPSS an independent sample T test was performed (see Table 3) on each term/feature of the Article Evaluation Checklist (see Appendix B). A full list of the T test results can be found in Appendix C. The concept of sexual orientation (including concepts such as homosexual, heterosexual, and bisexual) was much more prevalent in the tested human literature, with 90% of the

articles presenting human research including this concept, as opposed to only 30% of the non-human primate studies ( $t = -3.286, p = .0000$ ). Sexual orientation was the most prevalent term in the human literature out of all 52 concepts, whereas the concept of mounting interactions was the most prevalent in nonhuman primate literature (appearing in 90% of the included studies) and was rarely discussed in the human literature (appearing in only 10% of the included studies;  $t = 5.675, p = .0000$ ). The heavy use of sexual orientation in human literature is consistent with our expected outcomes, but the prevalence of a concept such as mounting interactions was not specifically foreseen. This may suggest a specific type of framing used by primate researchers as this concept is seen to a much less degree in human research.

Table 3 Partial Pilot Study Results: Social Terms/Features

Term/Concept	Subject	<i>m</i>	<i>p</i>	<i>t</i>
Trust Building	Primate	10%	0.34	1.000
	Human	-		
Alliance Building	Primate	30%	0.08	1.964
	Human	-		
Dominance Assertion	Primate	80%	0.00	4.200
	Human	10%		
Dominance Hierarchy	Primate	50%	0.01	3.000
	Human	-		
Submissiveness	Primate	30%	0.08	1.964
	Human	-		
Appeasement	Primate	30%	0.08	1.964
	Human	-		
Affiliative	Primate	50%	0.39	0.885
	Human	30%		
Prosocial	Primate	20%	0.17	1.500
	Human	-		
Tension Regulation	Primate	30%	0.08	1.964
	Human	-		
Reconciliation	Primate	30%	0.08	1.964
	Human	-		
Cooperation	Primate	20%	0.56	0.600
	Human	10%		

While the concepts of sexual identity, orientation, and gender appear far more frequently in the human literature compared to the non-human primate literature, the concept of gender non/conformity was found exclusively in the human literature, with zero of the included studies of non-human primates having any reference to this concept. This did not, however, result in a statistically significant difference in the literatures since the concept was also only rarely included in human studies (10%;  $t = -1.00$ ,  $p = .34$ ). These results are consistent with our expected outcomes and provide further evidence for the patterns of conceptual framework in the two fields.

Social concepts were more prevalent in nonhuman primate literature. Concepts such as trust building, alliance building, dominance assertion, dominance hierarchy, submissiveness, appeasement, affiliative, prosocial, tension regulation, reconciliation, and cooperation all occurred at higher rates in nonhuman primate literature.

### **Discussion**

The pilot study generally supported the expected outcomes and found preliminary support for the division of conceptual frameworks as well as confirmation of specific terms to look for in the larger bibliometric analysis. Different conceptual categories were found centered on sexual orientation/identity, sexual behavior, and social factors. This suggests that these word clusters are utilized in different research contexts. This follows our expectations as concepts describing sexual identity are typically not included with social explanations. Additionally, the concept of sexual orientation was much more prevalent in the human literature than in the nonhuman primate literature. Again, the data supports the expectation that nonhuman primate researchers are not considering sexual identity and sexual orientation as much as human researchers.

The data also show that aside from conceptual framework, there were differences in word choice between the two fields. In the nonhuman primate literature the term “mounting interactions” was heavily used whereas it was rarely used in human literature. To my knowledge, this specific term does not hold much significance on its own, but we must consider the possibility that utilizing such a term so heavily in nonhuman primates and so rarely in humans may be an attempt to distinguish the

latter as more formal. The term mounting interactions is a common term used in nonhuman literature because it describes a specific behavioral sequence. The “mounting” behavior described by primatologists is not exclusive to nonhuman primates, but the terms in which researchers use to describe the behavior differ significantly between the two fields. This again begs the question, what are researchers missing in the nonhuman primate literature when sexual acts are analyzed in strictly behavioral terms? Conversely, what are we missing in the human literature when researchers ignore strictly behavior analyses? Concepts like this might help researchers distinguish who is mounting and who is being mounted as well, but typically human literature on sexual behavior avoids the word “mounting.” While it cannot be definitively said why this distinction exists, we might consider the fact that a human researcher may not want to use this term to describe other human behavior, it might be a way to separate human from nonhuman.

Conversely, in nonhuman primate literature we see that social concepts were much more prevalent, which suggests a different framing of the research. Concepts of trust building, alliance building, dominance assertion, dominance hierarchy, submissiveness, appeasement, affiliative, prosocial, tension regulation, reconciliation, and cooperation were all more prevalent in nonhuman primate literature relative to human literature. Researchers may not realize the number of social concepts used to explain nonhuman primate SSB compared to those used to explain human SSB. Only three concepts (dominance assertion, affiliative, and cooperation) were also represented in the human literature. This suggests some fundamental differences in the way this research is being developed and produced between the two fields. The tendency to turn to social explanations may be due to the nature of behavioral observation, and the restraint researchers may experience relative to human researchers who are privy to more history and experience when it comes to sexual behavior in participants.

### **Predictions for Bibliometric Analysis**

Based upon the pilot study I expect to find similar results for the bibliographic analysis. The bibliographic analysis, however, will look at a much larger sample and will evaluate author-chosen

words and concepts instead of those chosen by third-party readers. I expect the following analysis to produce similar theoretical categorizations, but with the added factor or author perspective. I expect the nonhuman primate literature to prioritize social explanations and non-sexual motivation. I also expect the human literature to prioritize the sexual orientation and identity factors over other categories of explanation.

## CHAPTER 4

### BIBLIOMETRIX ANALYSIS PART I

#### Purpose

The initial plan for part two of this study was to perform a bibliometric analysis utilizing the results from the pilot study. This research, although exploratory, had a loose framework to follow based on previous data. To our knowledge, no other research has attempted to address this issue within academia, therefore there was no proven methodology to follow. I utilized the R package Bibliometrix for its ability to quantitatively assess bibliometric sources (Aria & Cuccurullo, 2017; R Core Team, 2021). Bibliometrix is an R-tool that performs science-mapping analyses, which allows for quantitative research in bibliometrics. R evaluates bibliometric data through three levels: sources, authors, and documents. The program then analyzes that data through three different knowledge structures: conceptual, intellectual, and social (Aria & Cuccurullo, 2017).

#### Method

The bibliometric analysis was performed using Clarivate Analytic's Web of Science Core Collection Database Search tool and the Bibliometrix package (Aria & Cuccurullo, 2017) in R (R Core Team, 2021). Article records were collected through Clarivate Analytic's Web of Science Core Collection Search tool and were subsequently exported into plain text records with full record and cited references. In order to obtain an adequate cross section of the literature specific keywords were used with targeted journal searches. The journals "Hormones and Behavior," "Archives of Sexual Behavior," and "American Journal of Primatology" were all used in our query. These journals were selected due to their focus on the specific literature. However, it was soon realized there was a disproportionate level of human sexual behavior articles relative to nonhuman primate. It was for this reason that I chose two journals ("Hormones and Behavior" and "Archives of Sexual Behavior") that would include both human and nonhuman primate literature. The "American Journal of Primatology" was chosen to supplement the lower number of nonhuman primate articles. In each journal (except for the American Journal of Primatology) two search queries were used. The first search query was

“sexual AND human NOT primat\*” while the second query was “sexual AND primat\*.” The use of the asterisk (\*) allows the search engine to fill in various versions of the word prior to the asterisk. For example, when “primat\*” is used as the search terms both the words “primate” and “primates” will show up in the search results. The decision to use this Boolean operator was made in order to increase the number of search results to cover a wider cross section of the literature. In the American Journal of Primatology there was only one search query which consisted of the following words: “sexual AND primat\*.” The articles were kept in two separate datasets, one for human ( $n = 1,000$ ) and one for nonhuman primate ( $n = 461$ ). It is important to note that the 1,000 articles in the human dataset were the *first* 1,000 articles in order of relevance to our search terms, whereas the 461 nonhuman primate articles were *all* of the available articles based on the search terms.

Frequently used terms evident from the pilot study were to be collected and used to conduct a bibliographic search in sexuality research in nonhuman primate and human subjects. This plan was carried out until the methodology was halted by a few unforeseen obstacles. Bibliometrix as a bibliometric software can perform many complex tasks related to bibliographic analysis, but there were issues when trying to look at the intended data. Bibliometrix and its user interface, Biblioshiny, have multiple menu-driven analyses that offer some customization. However, I did not realize the available tests would not fully articulate the specific study. I expected the bibliometric analysis to produce similar results to the analysis performed on the smaller dataset from the pilot study. Bibliometrix is capable of recognizing growing intellectual and conceptual structures, however, the program was unable to discard conceptual structures that were of no use to the intended analysis. The R package, while capable of performing many complex functions, was not able to exclude certain words from its analysis. Word bigrams such as “research suggested” constantly cluttered the results since those specific words are used so often in academic articles. Word choice was a strong variant among researchers, which affected the results heavily. This means that researchers might be using different terms to refer to the same concept. This is evident in articles that use the term “homosexual behavior” and others that use “same-sex sexual behavior. Additionally, the program only allowed us

to view the fifty most common words or bigrams used, which was helpful as long as the pertinent vocabularies were within the top fifty results. This issue was not anticipated, however future research may consider choosing a program that can rectify this problem. The obstacles faced in this part of our study forced us to reevaluate how to further explore the collected data while still gaining a broader view of current literature practices across primatology and human sexual behavioral research.

This chapter will consist of our originally planned methodology and the issues faced when trying to carry that out. Due to this study's exploratory nature, the methodology was continually being modified to improve the next section. Bibliometrix may have ended up a better match for our study but given our time constraints I chose to use some of Bibliometrix's tools and diverted the rest of our analysis to more familiar statistical software. Fortunately, the tests completed on Bibliometrix still provide useful insight into the initial pilot study data and the larger bibliographic data from Web of Science.

## Results

The initial analysis consisted of comparing two sets of data on sexual behavior research: human and nonhuman primate. By selecting specific search words to compile the article database, the goal was to measure the use of specific terminology within the articles to infer perspective and theoretical framing.

The most relevant words used in the total dataset ( $n = 1,461$ ) were identified utilizing the Bibliometrix package (see Figure 2). Both terms "sexual orientation" ( $n = 162$ ) and "sexual behavior" ( $n = 159$ ) were the most frequently used words in our dataset.

A factorial analysis was performed on the dataset, but it produced mixed results. Through utilization of different Bibliometrix tools, multiple versions of the analysis were performed. Allowing Bibliometrix to operate on its default settings which performed the factor analysis through multiple correspondence analysis, the program found a total of two factors (see Figure 3). The issue with this was that in order to identify the location of terms that were relevant to the study, the number of terms analyzed by the program had to be increased exponentially. Additionally, it was found that similar

words were being picked up more than once, which caused the data to be increasingly dense. For example, both the words “androgen” and “androgens” were picked up by the program and listed separately in the factorial analysis.

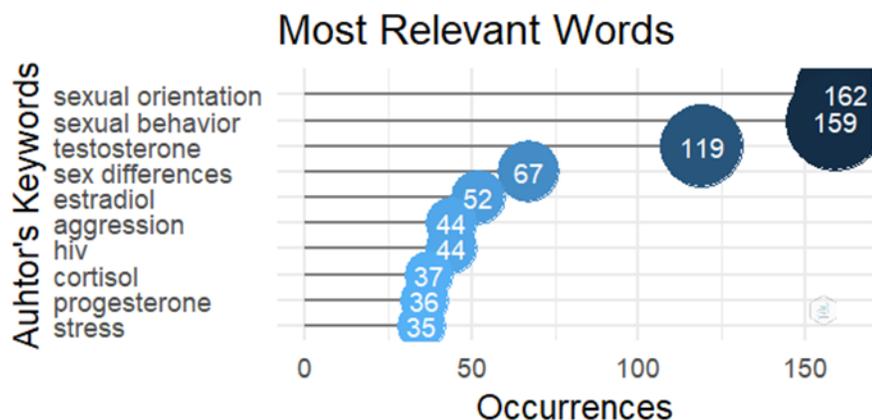


Figure 2. Most relevant words from  $n = 1,460$  articles based on author keywords. Produced by the R-package Bibliometrix (Aria & Cuccurullo, 2017; R Core Team, 2021).

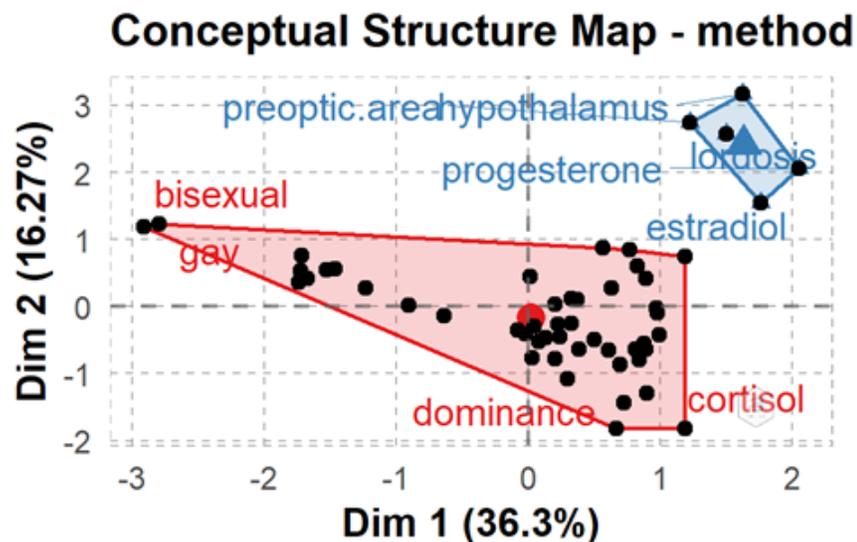


Figure 3. Factorial analysis through multiple correspondence analysis of articles ( $n = 1460$ ) author keywords. 50 terms were analyzed with 2 clusters produced through automatic generation by Bibliometrix.

Five clusters (see Figure 4) show words and phrases such as sexual identity, sexual orientation, and homosexuality loading on two separate factors than those words concerning hormones, social behavioral factors, and primates.

## Conceptual Structure Map - method

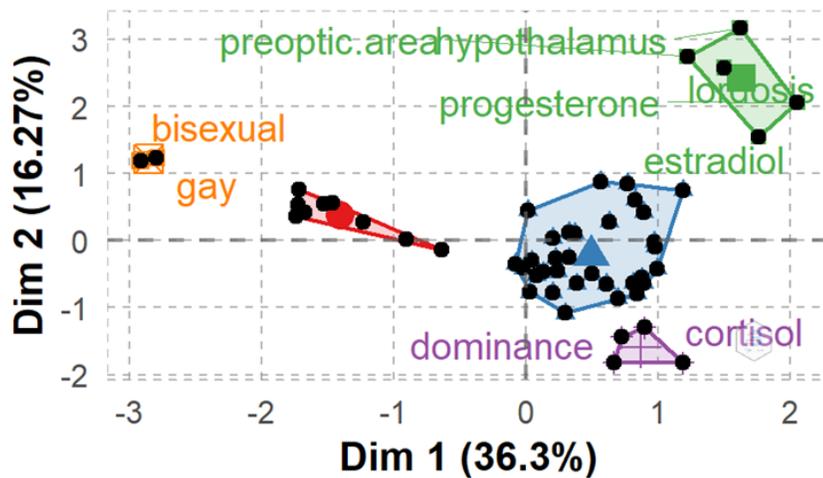


Figure 4. Factorial analysis through multiple correspondence analysis of articles ( $n = 1460$ ) author keywords. 50 terms were analyzed with 5 clusters. Produced by the R-package Bibliometrix (Aria & Cuccurullo, 2017; R Core Team, 2021)

## Discussion

The results from the Bibliometrix data does allow us to see some patterns in the literature, however it does not provide enough conclusive evidence. The factorial analysis performed in Bibliometrix was by far the most telling piece of data as patterned differences in the use of different terms were visible. Terms alluding to concepts of sexual orientation and identity were identified separately than those for concepts of social structure. However, it was apparent that this type of analysis was more concerned with quantity over framing of the concept. The results presented might suggest that (a) the patterns expected simply do not exist or (b) that the patterns do exist but in such small incidence that it cannot compete with more popularized terms and concepts. This proved problematic for this study because quantity was not the main factor under analysis. The main purpose of this study was to look at the perspective in which any and all research took, not just the most prevalent. This is further exemplified in the raw search results from Web of Science. This dataset consisted of  $n = 1,461$  total research articles (records), but only 32% of them were produced by the query specifically targeting articles that focused on sexual behavior in primates. Furthermore, when searching for primatology records that focus on sexual behavior in the American Journal of Primatology, Web of Science is only able to produce 316 (5.2%) articles out of a total 6,094 articles

spanning from 1985 to 2021. This number is further diminished to 3 (0.05%) when attempting to look for articles that mention “homosexual” and 0 records are produced when using the term “same-sex sexual behavior.” This singular search engine and database does not encompass all possible research articles, so its query results should not be interpreted as the current state of all academic research on the subject. However, Web of Science does boast a total record count of 60,252,716 which makes it an attractive database for academic queries.

The results produced from the bibliographic analysis through Bibliometrix were helpful in addressing general conceptual and intellectual structures of the literature. The structures identified were encouraging to our expected outcomes, however they did not reveal any deeper explanations to whether our expectations were true. Instead, the study found that the concepts may occur in much smaller quantity than initially thought. This may suggest intellectual variation on the subject.

### **Recommendations**

After reevaluating the aim and scope of this study, it was decided to utilize both Bibliometrix and more traditional statistical analysis programs. However, the following recommendations should provide instruction on how Bibliometrix may better suit our intended research. Additionally, I want to leave future researchers with a more solid foundation to carry out this type of research. The intent of our recommendations is not to diminish the Bibliometrix package, but rather to provide a road map of our own shortcomings for future inquiry. Due to the nature of this study, there was not a solid methodology before starting out as I intended to explore multiple methods of analysis. It was not until I was immersed in the collected data that I realized text analysis, and more realistically text analysis done by a human researcher familiar with relevant concepts, would be so important to this type of research.

The R-tool was able to recognize up to the most 50 frequently used terms (monograms, bigrams, or trigrams). However, the dataset was also inundated with other frequently used words that had no relation to our study, which was challenging because the program could only display a certain number of the most frequent words. It would have been more useful for the study to be able to view

word usage no matter the words ranking in the dataset. This was a common theme for this part of the analysis as the data was filled with unnecessary terms and concepts. One of our own oversights was not realizing that the program was designed to view overall intellectual trends and not to select specific concepts to follow their structures. This may have been possible if our two main subject areas had their own flagship journals, but they did not. By compiling multiple subsets from different journals, it was impossible to isolate specific intellectual pathways. Future research may consider solutions to this issue.

Bibliometrix, along with R were chosen to serve as this study's primary statistical analysis program because of their open-access nature and plethora of additional open-access resources. Perhaps this type of study would be better suited for a program that allows for more in-depth textual analysis in addition to statistical. In order to fully contextualize the two fields in question, both the ability to identify specific words or phrases along with matching similar or identical concepts that fall under two or more literal terms is absolutely necessary. This would provide the ability for future research to comment more confidently on author perspective and framework, as similar concepts are often shrouded in different language. For example, when speaking about same-sex sexual behavior in humans Fleischman et al. (2015) stated the following:

"The frequency of homoerotic behavior among individuals who do not identify as having an exclusively homosexual sexual orientation suggests that such behavior potentially has adaptive value.... Reflecting its central role in biological fitness, a strong neurological reward system undergirds sexual behavior, hence, it stands to reason that bonds, including between those of the same sex (homosocial), can be strengthened via sexual behavior. The affiliation hypothesis thus proposes that natural selection co-opted this reward system as a means of promoting same-sex social bonds." (p. 4).

Which is markedly different from Busia et al. (2018) talking about same-sex sexual behavior in nonhuman primates:

"Our observations reveal that homosexual penile-anal intromission occurs among wild male spider monkeys, a finding that to our knowledge has not been reported in any New World primate. Although the small number of observed cases does not allow for an in-depth analysis, our observations might be elucidated in light of two of the sociosexual explanations of animal homosexual behavior: strengthening social relationships (Bagemihl, 1999) and tension regulation (Clay & de Waal, 2015)" (p. 860).

Notice that neither of these excerpts contain the same keywords regarding same-sex sexual behavior but their structure follows the same format. Both start with stating something about a behavior observed then delve into analysis and eventual explanation or theory of explanation. In this case a human reader may be the only option to be able to categorize both of these as referring to same-sex sexual behavior. Although a challenge, the issues with Bibliometrix and its scope of analysis did prompt methodological changes that may instruct future inquiries into this subject. Of course, this type of research could very well be done by hand, and this method of work was considered, but the time was simply not available. Unfortunately, in order to make sense of researcher variation in term and concept usage, it seems as though a human that is familiar with the given concepts might be integral to finding accurate data points. This would be a potentially very exhaustive process which is why future academics should explore potential alternatives, while also considering how conceptual frameworks may be evaluated between authors and across other demographics. Another factor to consider is that the field of sexuality is relatively new in regard to the quantity of articles available to the average reader. This itself creates challenges as each author could be considered a pioneer of a specific term or concept, even if it has already been used. The issue could be that this younger field is not as well established as other more popularized areas of research, therefore terminology and conceptual frameworks are not yet consistent.

## CHAPTER 5

### BIBLIOMETRIC ANALYSIS PART II

#### Purpose

Utilizing the results of the pilot study as well as information from part I of the Bibliometrix analysis, I conducted a revised analysis to better understand the current state of academic literature concerning sexual behavior. The pilot study took a very small sample and utilized third party readers to understand trends in twenty unique articles across human and nonhuman primate literature. The bibliographic analysis was grounded in these results and was intended to understand the trends on a larger scale. This analysis was aimed at understanding whether these trends seen in a subset will hold true for larger samples. As mentioned in the previous chapter, initial attempts to complete the bibliographic analysis with the entire dataset proved difficult within our parameters. A few changes were made in order to explore this data more effectively for the purpose of this study. The dataset had to be minimized in order to more effectively assess the concepts present in each article. Additionally, the content of each article record was reduced for ease of handling. Only the absolute necessities of each record were kept.

#### Method

The bibliometric analysis for the second part of this study was performed using Clarivate Analytic's Web of Science Core Collection Database Search tool and the Bibliometrix package (Aria & Cuccurullo, 2017) in R (R Core Team, 2021). Article records were collected through Clarivate Analytic's Web of Science Core Collection Search tool and were subsequently exported into plain text records with full record and cited references. The existing dataset was used from the first Bibliometrix analysis in Chapter 3. However, the dataset was modified to be able to conduct more thorough analyses.

In order to address the aforementioned issue, a more rudimentary approach was taken for the purpose of evaluating the dataset in conjunction with the completed pilot study. The dataset was loaded into Microsoft Excel in order to sort and evaluate the best way to analyze a subset of the data.

Each dataset was then taken and sorted alphabetically by the first author's last name in an effort to randomize the subject matter. The first 150 from each list were then taken and compiled into one master subset list ( $n = 300$ ). This was done to create a more manageable dataset that our available software could more effectively run tests on as the initial, larger dataset was producing mixed results through the bibliometric analysis program. The dataset contained the following information about each article: author(s), abstract, author-generated keywords, keywords plus, publication name, and the title of the article.

Utilizing the pilot study data on the most frequent words used, a total of 11 words were chosen to test the subset. Words were chosen with aims to cover the most pertinent concepts and features of sexual behavior, in order to maximize our chances of seeing patterns, if they existed. The list of words (see Table 4) was developed using the most frequently presented words from the pilot study as well as from the factorial analysis from the same source. Similar concepts represented on the article evaluation checklists (Appendix B) were also grouped together in order to cover a wider range concepts without burdening the analyses with more terms.

## Results

Once the subset was identified, STATA was used for statistical analysis of the dataset. A total of  $n = 300$  articles were analyzed using authors' name, abstract, author keywords, keywords plus, publication name, and document title. The initial part of this analysis focused on word and concept usage by running two-sample T tests on each term (See Table 4). Each test in the following analysis assumed unequal variances. The largest difference found was with the concept of orientation and identity, which occurred in 21% of the human literature, and only 10% of the nonhuman primate literature ( $t = 2.72$ ,  $p = .0069$ ). A similar pattern was present when evaluating orientation on its own, present in 19% of the human literature and only 7% of the nonhuman primate literature ( $t = 2.9$ ,  $p = .0035$ ). Both of these tests uphold our expected outcomes that concepts of sexual identity and orientation are used more in human literature than in nonhuman literature.

The nonhuman primate literature produced expected results in regard to use of social explanations. The social variable evaluated through the statistics program was a grouped variable that included multiple social terms and concepts (See Table 4). The nonhuman primate literature represented 19% of social outcomes whereas the human literature only accounted for 9% ( $t = -2.49$ ,  $p = .0134$ ). Additionally, when looking at evolutionary frameworks by grouping the terms “evolution” and “adapt” it was found that the human literature represents 10% of its occurrence which is far less than the 21% in nonhuman primate literature ( $t = -2.58$ ,  $p = .0103$ ).

Table 4. Two-Sample T Test by Subject

Term/Concept	Subject	<i>M</i>	<i>SD</i>	<i>t</i>	<i>p</i>
Orientation	Human	0.19	0.39	2.91	0.0035*
	Primate	0.07	0.26		
Evolution	Human	0.07	0.26	-2.95	0.0035*
	Primate	0.18	0.39		
Adapt	Human	0.05	0.21	-0.51	0.6088
	Primate	0.06	0.22		
Adapt OR Evolve	Human	0.1	0.3	-2.58	0.0103*
	Primate	0.21	0.41		
Homosexual	Human	0.11	0.31	1.46	0.1447
	Primate	0.06	0.24		
Intercourse <sup>a</sup>	Human	0.07	0.25	1.03	0.3057
	Primate	0.04	0.2		
Copulation	Human	0.12	0.33	0.18	0.8579
	Primate	0.11	0.32		
Identity <sup>a</sup>	Human	0.09	0.29	2.14	0.0331*
	Primate	0.03	0.18		
Social <sup>a</sup>	Human	0.09	0.29	-2.49	0.0134*
	Primate	0.19	0.4		
Reproduction	Human	0.15	0.36	-1.2	0.2307
	Primate	0.21	0.41		
Orientation OR Identity <sup>a</sup>	Human	0.21	0.41	2.72	0.0069*
	Primate	0.1	0.3		

a – Grouped variable that contains multiple terms relating to one concept

Table 5. Concept Usage by Evolutionary vs. Non-Evolutionary Framework

Term/Concept	Subject	Non-Evolutionary			Evolutionary		
		#	<i>M</i>	<i>SD</i>	#	<i>M</i>	<i>SD</i>
Orientation	Human	135	0.19	0.4	15	0.13	0.35
	Primate	119	0.08	0.28	31	0.03	0.18
Evolution	Human	135	0	0	15	0.73	0.46
	Primate	119	0	0	31	0.9	0.3
Adaptation	Human	135	0	0	15	0.47	0.52
	Primate	119	0	0	31	0.29	0.46
Homosexual	Human	135	0.1	0.31	15	0.13	0.35
	Primate	119	0.06	0.24	31	0.06	0.25
Intercourse <sup>a</sup>	Human	135	0.07	0.26	15	0	0
	Primate	119	0.05	0.22	31	0	0
Copulation	Human	135	0.09	0.29	15	0.4	0.51
	Primate	119	0.11	0.31	31	0.13	0.34
Identity <sup>a</sup>	Human	135	0.1	0.31	15	0	0
	Primate	119	0.02	0.16	31	0.06	0.25
Social <sup>a</sup>	Human	135	0.08	0.27	15	0.2	0.41
	Primate	119	0.18	0.39	31	0.23	0.42
Reproduction	Human	135	0.12	0.32	15	0.47	0.52
	Primate	119	0.2	0.4	31	0.23	0.42
Orientation & Identity <sup>a</sup>	Human	135	0.22	0.42	15	0.13	0.35
	Primate	119	0.1	0.3	31	0.1	0.3

a – This is a grouped variable that contains multiple terms relating to one over-arching concept

We also evaluated rates of concept usage within human and nonhuman literature by whether the literature was evolutionary or not (see Table 5). A caveat to this methodology was that determining what would be considered evolutionary was strictly based on whether the terms “evolution” or “adaptation” were used in the abstract, keywords, keywords plus, or title. This of course did not cover all aspects of each article, but it should give us an idea of initial framing techniques used. The entire analysis split the dataset into two supersets, non-evolutionary (Human:  $n = 135$ ; Primate:  $n = 119$ ) and evolutionary (Human:  $n = 15$ ; Primate:  $n = 31$ ). The concepts of orientation and

identity were overwhelmingly found in the human literature for both evolutionary and non-evolutionary. However, orientation and identity concepts were found at higher rates in the human non-evolutionary literature at 22%, more than in the human evolutionary literature at 13%. This would have been expected as most of the foundational literature concerning identity and orientation originated in clinical psychology and is significantly grounded in modern day psychology.

Interestingly, in both human and nonhuman evolutionary literature the concept of intercourse was not found whereas the term copulation was found in both primate and human evolutionary (human: 40%; nonhuman primate: 13%) and non-evolutionary (human: 9%; nonhuman primate: 11%) literature.

### **Discussion**

Expected outcomes were supported by the data in the bibliographic analysis. Concepts congruent with sexual orientation and identity were present in far more human focused articles than primate. Generally, this may suggest that human research is the only field equipped or ready to assess identity as it relates to sexuality. Although it should be noted that these concepts were still present in nonhuman literature, this could be for a variety of reasons. Researchers may be referring to sexual orientation and identity, or more likely they are utilizing terms such as “homosexual behavior”. Perhaps future research might consider the issues with terms such as “homosexual,” as some use it as a precursor to behavior and others use it as a sexual orientation. Conversely, nonhuman primate literature more prevalently utilized concepts related to evolution and adaptation. A distinct division can be seen between the foci of the two sets of literature. This may be occurring for a few reasons. The first reason could be that there is an especially acute focus on concepts of sexual and social identity due to the current social state of the country. One must consider the origins of sexual psychology and its heteronormative beginnings in order to contextualize the current state of sexual identity research, especially in evolutionary fields. Additionally, we must remember that these primary studies were done so through specific methodology consistent with standard psychological practices at the time. The study of sexual orientation and identity were not born out of behavioral

observation, which should speak to the methodological differences between human and nonhuman primate literature.

Our expected outcome of nonhuman primate literature being more focused on social or adaptive outcomes was generally supported by the data. Nonhuman primate literature accounted for much more social and evolutionary literature than the human literature. This is consistent with our expectations as the methodological limitations of nonhuman primate rely on observational data for researching nonhuman SSB. This may suggest a need for new methodology and conceptual framework when researching nonhuman primate SSB. Current methodology only allows fleeting observations in the wild, complete knowledge of sexual behavior and history cannot possibly be ascertained. Conversely, captive studies may be able to carry out these requirements however, the artificial environment could be argued as an important factor of the behavior observed. Perhaps new perspectives regarding sexuality in nonhuman primates and more specifically the great apes could help improve research effectiveness and comparative model legitimacy. A new area of research exploring gender nonconformity in adolescents compared with their sexual orientation identity throughout different stages of development may provide insight into issues of SSB research. Xu et al. (2021) found that in both (human) adolescent males and females gender nonconforming behavior at 2.5 years of age was positively associated with gay or bisexual sexual orientations in late childhood and early adulthood. Nonhuman primates would of course, not fit into this exact study but slight changes to the methodology. For example, if researchers were to look for sex-atypical behavior as adolescents (instead of gender nonconforming behavior) and its correlation with subadult and adult same-sex sexual behavior. This may help researchers understand the developmental complexity of SSB in nonhuman primates. Subsequently this may provide more insight into the actual factors motivating this behavior.

Non-evolutionary human literature also represented more concepts of sexual orientation and identity. This may suggest that identity concepts are not being included in evolutionary explanatory frameworks within sexuality research, which may be attributed to evolutionary research prioritizing

behavior over underlying sexual orientation. Additionally, it is difficult for theorists to evaluate sexual orientation of ancient humans when hypothesizing how SSB would have been maintained in those populations. This may be why researchers suggest that some of the mechanisms maintaining SSB are either precursors or completely separate from sexual orientation (Barron & Hare, 2020; Muscarella, 1999, 2000; Muscarella et al., 2005).

## CHAPTER 6

### CONCLUSION

The current findings do not suggest by any means that severe methodological or conceptual flaws in nonhuman primate and human sexual behavior research exist. The data does, however, indicate that further investigation into this topic should be considered. The data collected were consistent with our expected outcomes. Concepts of sexual identity/orientation were typically found separate from those relating to strict sexual behavior and social factors. Additionally, sexual identity/orientation was found to be more prevalent in human research. There is a distinct methodological difference in how human sexuality research is conducted from evolutionary to non-evolutionary frameworks. Further, the difference is even more stark between human and nonhuman primate studies. The origins of these fields are markedly different and have developed in completely different environments with a variety of societal influences. However, the differences found are important because of the comparative and collaborative nature of these fields. As these fields are inherently influenced by one another, methodological differences should be transparently noted and adjusted.

#### Limitations

This study was limited by a number of factors. First, the final datasets were smaller than expected and could only evaluate a relatively small number of article records. This means that our interpretation of the results may not represent the entirety of the two respective literatures. As the study was limited by the available software, text analysis was unavailable for the full article. Only descriptive information (abstract, title, keywords, etc.) was available for our primary analyses, which of course does not cover all factors in the conceptual framing of a research article. In doing what little textual analysis that was possible, it was found that the software used could not discern between different versions of the same word nor between different terms for the same concept.

## Recommendations

Future research should consider multiple factors. In regard to future research on bibliometric analyses of the conceptual frameworks in nonhuman primate and human sexual behavior studies, special attention should be given to the text analysis portion. Since researcher variation was found within the same or similar concepts, one might consider using human readers who are familiar with the given subjects or terms. This may afford the research an opportunity to gather all applicable data when compiling the dataset. Additionally, if a data analysis program is employed then authors should consider its ability to track individual conceptual structures throughout different literatures.

In regard to nonhuman primate studies, future research may consider evaluating proper measurements for sexual motivation. Since so many hypotheses rely on non-sexual motivation, it seems logical that a method be developed to measure sexual motivation in nonhuman primates. A standard method to evaluating sexual motivation would allow research to arrive at more confident conclusions. Perhaps even before this step there needs to be a way to confidently conclude whether a sexual behavior is indeed sexually motivated.

It is clear that both nonhuman and human sexual research utilize varied terms for similar concepts which can create confusing and hard-to-follow conceptual structures. This is one of the factors that posed so many challenges to this study. I suggest the term “same-sex sexual behavior” or the abbreviation “SSB” be used to describe sexual behavior between two members of the same sex. By utilizing one term without the word “homosexual” (e.g., homosexual behavior) there is less chance for confusion. Creating a standard, neutral way to define sexual behavior between two or more individuals of the same sex that does not include concepts related to identity (sexual or otherwise) allows behavioral researchers to focus on behavior. This is especially important when evaluating nonhuman primate subjects as the introduction of sexual orientation/identity concepts should be an explicit purpose of the study. Additionally, it is important to note that this term should be used to describe the actual behavior, and subsequently interpreted as such. Another term that should be considered between the two literatures is “same-sex sexual preference,” describing a consistent

tendency for individuals to seek out and engage in same-sex sexual behavior, even when available, opposite-sex individuals are present. This allows researchers to categorize different types of SSB without including the concept of orientation prematurely. This term would lend itself well to both human and nonhuman primate research as it is only commenting on a behavioral attribute and nothing of identity.

Future hypotheses on SSB should be developed with special regard to sex. In an effort to explicitly state how the theory was developed and how it should be applied to other populations, original authors need to be specific about whether the sex of the individual affects its application. Researchers may consider framing SSB research in relation to the sex of the individuals being observed, which would allow future research to identify differences between sexes.

Concepts of identity should be weighed heavily as those in relation to sexual behavior and sexuality have been developed in vastly different environments since their inception. If anthropological-based studies are to evaluate behavior it may be in the research's best interest to avoid topics of identity, not because they do not matter, but because they deserve their own evaluation and attention aside from behavioral analysis. Unless it is the specific focus of the study, identity concepts should be intentionally separated from behavioral evaluation to assess same-sex sexual behavior more accurately.

## APPENDIX A

## ARTICLE EVALUATION CHECKLIST DEMOGRAPHIC INFORMATION

Title of Article:	Author(s):	Year Published:	Country of First Author:
Subjects of Study (Choose all that apply):		Type of Study:	Keywords:
Wild Nonhuman Primate		Empirical	
Captive Nonhuman Primate		Meta-Analysis	
Human - College Sample		Review	
Human - Community Sample		Non-Empirical	
		Database	
		Commentary	
		Other	

## APPENDIX B

## ARTICLE EVALUATION CHECKLIST TERMS &amp; FEATURES

#	Term/Feature	Check if applies	#	Term/Feature	Check if applies
1	Production of Offspring/Conception/Fertilization		27	GG Rubbing	
2	Increasing Investment in Offspring		28	Physiological sexual arousal	
3	Securing Future Reproductive Opportunities		29	Ejaculation	
4	Function that Benefits Kin/Inclusive Fitness		30	Orgasm	
5	Trust Building		31	Anal/Vaginal/Sexual Intercourse OR Copulation	
6	Alliance Building		32	Anal/Vaginal Intromission	
7	Dominance Assertion		33	Oral Sex	
	Using sexual behavior to claim superiority over another individual				
8	Dominance Hierarchy		34	Fellatio	
	Reaffirming the established social structure of individuals through sexual behavior				
9	Submissiveness		35	Cunnilingus	
10	Appeasement		36	Non-Sexual Motivation	
11	Affiliative		37	Non-Sexual Benefits	
	Using sexual behavior to create social or emotional bonds with others				
12	Prosocial		38	Emotional/Relationship Satisfaction	
	Using sexual behavior to help ease of social integration, within group tolerance, and social affiliation (Barron & Hare, 2020)				
13	Tension Regulation		39	Attachment/Affectional Bonding	
14	Reconciliation		40	Love/Romance	
15	Cooperation		41	Social Competition	
	Using sexual behavior in order to work together to achieve the same ends				
16	Reciprocity/Reciprocal Altruism		42	Sexual Competition	
17	Homosexual Behavior		43	Signaling Function	
18	Sexual Orientation (Homosexual/Heterosexual/Bisexual)		44	Sexual Identity	
19	Men Who Have Sex With Men (MSM)		45	Gender Identity	
20	Same-Sex Sexual Behavior		46	Queer	
21	Sexual Arousal		47	Intersex	
22	Mounting Interactions		48	Transex	
23	Sexual Attraction		49	Gender conformity	
24	Sexual Desire		50	Gender Nonconformity	
25	Sexual Satisfaction		51	Sex Typical Behaviors	
26	Sexual Fantasies		52	Sex Atypical Behaviors	

## APPENDIX C

## PILOT STUDY RESULTS

## Full Pilot Study Results

Term/Concept	Subject	N	M	SD	P	t
Production of Offspring/Conception/Fertilization	Primate	10	0.20	0.42	0.56	0.600
	Human	10	0.10	0.32		
Increasing Investment in Offspring	Primate	10	0.10	0.32	1.00	0.000
	Human	10	0.10	0.32		
Securing Future Reproductive Opportunities	Primate	10	0.10	0.32	0.34	1.000
	Human	10	0.00	0.00		
Function that Benefits Kin/Inclusive Fitness	Primate	10	0.20	0.42	0.17	1.500
	Human	10	0.00	0.00		
Trust Building	Primate	10	0.10	0.32	0.34	1.000
	Human	10	0.00	0.00		
Alliance Building	Primate	10	0.30	0.48	0.08	1.964
	Human	10	0.00	0.00		
Dominance Assertion	Primate	10	0.80	0.42	0.00*	4.200
	Human	10	0.10	0.32		
Dominance Hierarchy	Primate	10	0.50	0.53	0.01*	3.000
	Human	10	0.00	0.00		
Submissiveness	Primate	10	0.30	0.48	0.08	1.964
	Human	10	0.00	0.00		
Appeasement	Primate	10	0.30	0.48	0.08	1.964
	Human	10	0.00	0.00		
Affiliative	Primate	10	0.50	0.53	0.39	0.885
	Human	10	0.30	0.48		
Prosocial	Primate	10	0.20	0.42	0.17	1.500
	Human	10	0.00	0.00		
Tension Regulation	Primate	10	0.30	0.48	0.08	1.964
	Human	10	0.00	0.00		
Reconciliation	Primate	10	0.30	0.48	0.08	1.964
	Human	10	0.00	0.00		
Cooperation	Primate	10	0.20	0.42	0.56	0.600
	Human	10	0.10	0.32		
Reciprocity/Reciprocal Altruism	Primate	10	0.10	0.32	0.34	1.000
	Human	10	0.00	0.00		
Homosexual Behavior	Primate	10	0.70	0.48	1.00	0.000
	Human	10	0.70	0.48		
Sexual Orientation (Homosexual/Heterosexual/Bisexual)	Primate	10	0.30	0.48	0.00*	-3.286
	Human	10	0.90	0.32		
Men Who Have Sex With Men (MSM)	Primate	10	0.00	0.00	0.00*	-4.583
	Human	10	0.70	0.48		

Same-Sex Sexual Behavior (SSB)	Primate	10	0.80	0.42	1.00	0.000
	Human	10	0.80	0.42		
Sexual Arousal	Primate	10	0.10	0.32	1.00	0.000
	Human	10	0.10	0.32		
Mounting Interactions	Primate	10	0.90	0.32	0.00*	5.657
	Human	10	0.10	0.32		
Sexual Attraction	Primate	10	0.20	0.42	0.36	-0.949
	Human	10	0.40	0.52		
Sexual Desire	Primate	10	0.00	0.00	0.17	-1.500
	Human	10	0.20	0.42		
Sexual Satisfaction	Primate	10	0.00	0.00	0.34	-1.000
	Human	10	0.10	0.32		
Sexual Fantasies	Primate	10	0.00	0.00	0.34	-1.000
	Human	10	0.10	0.32		
Genito-Genital Rubbing	Primate	10	0.20	0.42	0.56	0.600
	Human	10	0.10	0.32		
Physical Sexual Arousal	Primate	10	0.30	0.48	0.08	1.964
	Human	10	0.00	0.00		
Ejaculation	Primate	10	0.30	0.48	0.08	1.964
	Human	10	0.00	0.00		
Orgasm	Primate	10	0.00	0.00	0.34	-1.000
	Human	10	0.10	0.32		
Anal/Vaginal/Sexual Intercourse	Primate	10	0.30	0.48	0.66	-0.447
	Human	10	0.40	0.52		
Anal/Vaginal Intromission	Primate	10	0.20	0.42	0.17	1.500
	Human	10	0.00	0.00		
Oral Sex	Primate	10	0.20	0.42	1.00	0.000
	Human	10	0.20	0.42		
Fellatio	Primate	10	0.10	0.32	0.34	1
	Human	10	0.00	0.00		
Cunnilingus	Primate	10	0.00	.000 <sup>a</sup>	-	-
	Human	10	0.00	.000 <sup>a</sup>		
Non-Sexual Motivation	Primate	10	0.10	0.32	0.34	1.000
	Human	10	0.00	0.00		
Nonsexual Benefits	Primate	10	0.10	0.32	0.34	1.000
	Human	10	0.00	0.00		
Emotional Relationship Satisfaction	Primate	10	0.00	0.00	0.34	-1
	Human	10	0.10	0.32		
Attachment/Affectional Bonding	Primate	10	0.00	.000 <sup>a</sup>	-	-
	Human	10	0.00	.000 <sup>a</sup>		
Love/Romance	Primate	10	0.00	0.00	0.34	-1.000
	Human	10	0.10	0.32		
Social Competition	Primate	10	0.10	0.32	1.00	0.000

	Human	10	0.10	0.32		
Sexual Competition	Primate	10	0.20	0.42	0.17	1.500
	Human	10	0.00	0.00		
Signaling Function	Primate	10	0.10	0.32	0.34	1.000
	Human	10	0.00	0.00		
Sexual Identity	Primate	10	0.10	0.32	0.02*	-2.611
	Human	10	0.60	0.52		
Gender Identity	Primate	10	0.00	0.00	0.17	-1.500
	Human	10	0.20	0.42		
Queer	Primate	10	0.00	0.00	0.04*	-2.449
	Human	10	0.40	0.52		
Intersex	Primate	10	0.00	0.00	0.34	-1.000
	Human	10	0.10	0.32		
Transex	Primate	10	0.00	0.00	0.17	-1.500
	Human	10	0.20	0.42		
Gender Conformity	Primate	10	0.00	0.00	0.34	-1.000
	Human	10	0.10	0.32		
Gender Nonconformity	Primate	10	0.00	0.00	0.34	-1.000
	Human	10	0.10	0.32		
Sex Typical Behavior	Primate	10	0.10	0.32	0.29	-1.095
	Human	10	0.30	0.48		
Sex Atypical Behavior	Primate	10	0.10	0.32	0.34	1
	Human	10	0.00	0.00		

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