Maximilian T. P. von Andrian - Werburg

Sex / Gender

A Revised Integrative Model for Sex / Gender
Differences and Its Application on Media Research

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I dedicate this thesis to my daughter Charlotte.

Acknowledgments

If I have seen further it is by standing on the shoulders of giants.

Isaac Newton (1643–1727)

I distinctly recall an incident from my eighth-grade year at a German secondary school. My parents and I were summoned to the principal's office to discuss the possibility of me being transferred to a lower-level educational institution due to poor academic performance and concerning social behavior. I am deeply grateful to Mr. Herman Sirtl for his faith in me. His advocacy was instrumental in preventing a transfer that could have negatively impacted my educational path, especially given my working-class background. I also extend heartfelt thanks to Mr. Rainer Krause, who was an outstanding teacher during my elementary school years.

The next significant impact on my education career was not getting a place for vocational training in 2006 based (again) on bad grades. This was the drive for me to decide to attend high school, where my grades and educational success improved drastically. I sincerely thank my parents, Ursula and Karl Klaubert, for believing in me and providing me with financial support up to my Masters's degree without them ever having experienced any significant educational or financial support from their parents. However, I want also to thank my grandparents, Anna and Alfred Klaubert and Karin and Hans Köstler who provided me with the work ethic of the protestant German and Austrian workers, farmers and small business owners they were.

Regarding my higher education leading to the submission of this thesis, I thank my supervisor Frank Schwab, who made it not only possible to provide me with the highest degree of academic freedom possible but also for becoming a literary father figure and a personal friend for me.

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Preface

The recent debates about sex and gender issues regarding, for instance, language use (e.g., Kricheli-Katz & Regev, 2021), sport (e.g., Camporesi & Hämäläinen, 2021; Loland, 2020), economy and related choices of careers and occupations (e.g., Breda et al., 2020; Falk & Hermle, 2018) or scientific theories and their "problematic" implications (Baumeister & Twenge, 2002; Rudman, 2017) are fought with harshness and are pursued with an extreme sense of urgency in society but also in psychology (Honeycutt, 2019). Dependent on political alignment, parties opt for societal change or preservation regarding gendered language, a third-gender entry in passports, or trans athletes' participation in women's sports. Related societal distortions make it almost surprising, from the viewpoint of 2023, that research and the reasoning about sex and gender have a comparable long tradition in social science (Fausto-Sterling, 2012; Muehlenhard & Peterson, 2011).

A first approach to apply different meanings to the terms "sex" and "gender" dates back to a series of publications first authored by John Money in the 1950s (Muehlenhard & Peterson, 2011). For instance, Money and Hampson (1957) argued, by falling back on research conducted by Konrad Lorenz about ducklings, that there might be a brief phase in human life shortly after birth in which it would be possible to imprint a certain gender role on a human being independent of its actual sex. Accordingly, to Money and Hampson (1957), humans are borne blank of sex/gender. They could be (psychologically healthy) reared as either male or female if only the individual nurturing approach were applied early enough. The research of John Money will be more thoroughly discussed in the next chapter. However, it is important to note that his nurture-only approach towards sex/gender fatally failed once empirically applied (Colapinto, 2000). Furthermore, he was not the first to give the terms sex and gender separate meanings. Del Giudice (2022) mention an earlier differentiated use of the terms "sex" and "gender" in a publication in the 1940s by Madison Bentley. Bentley (1945) wrote an essay about the competition between available resources and demands and its impact on the sanity of developing children. In the essay, she used the term sex to describe the child's biology while she described gender as the "socialized obverse of sex" (Bentley, 1945, p. 228).

However, neither the semantic differentiation of Bentley (1945) nor Money and Hampson (1957) received serious enough admiration in the scientific community. Published studies about sex and gender-related phenomena often show a very loose, somewhat ambiguous use of the terms (Muehlenhard & Peterson, 2011). Often, sex and gender are used synonymously. If different meanings are applied, studies frequently use no central definition but rather an arbitrary reference in the case of sex to denominate different biological variables like sex chromosomes, sex differences in the levels of androgens and estrogens, or the reproductive anatomy (Del Giudice, 2022; Muehlenhard & Peterson, 2011). On the opposite, the term gender addresses any (assumed to be) socially constructed or learned dimensions regarding femininity and masculinity (e.g., Bem, 1974; Spence et al., 1975). Femininity and masculinity address gender roles described to be shaped, developed, and sustained by social influence (Bem, 1974; Bussey & Bandura, 1999; Döring, 2013). However, using sex and gender in such an ambiguous way is problematic because it leads to a lack in conceptual clarity. Furthermore, to treat the terms completely disconnected is empirical inaccurate. A disconnected treatment fuels "nature vs. nurture" or more specific "sex vs. gender" debates which are antiquated (Buss, 2020; Muehlenhard & Peterson, 2011) but, continue to exist quite persistent up to this day (Honeycutt, 2019). Recently, Eagly and Wood (2013) pledged in a summary of 25 years of psychological research on sex/gender differences for a more unified approach. The haystack of published books and studies of which the diverse field of sex/gender research consists might already yield the knowledge to synthesize and advance the debate about sex/gender phenomena (e.g., Bischof-Köhler, 2022; Buss, 2020; Eagly, 2018; Eagly & Wood, 2013).

Contrary to sometimes opposing viewpoints, ignorance about, and misunderstandings regarding what "the other side" beliefs to be genuine about the etiology and drives of human behavior and particularly sex/gender differences (e.g., Eagly, 2018; Eagly & Wood, 2013; Pinker, 2003; Sherry, 2004) it is possible to synthesize the different schools of psychology that research sex/gender phenomena (Berenbaum & Beltz, 2021; Bischof-Köhler, 2022; Buss, 2020; Eagly, 2018; Eagly & Wood, 2013; Neyer & Asendorpf, 2018). In the following, like already done above, the term "sex/gender" will be used to highlight that both terms are deeply intertwined (Eagly, 2018).

The dissertation will attach to and advance the current state of knowledge about sex/gender and media-related phenomena. In the upcoming chapters, this dissertation highlights that a human's sex/gender is the output of a complex interacting system (Neyer & Asendorpf, 2018), which

affects the human's (media) related attitudes, behavior, and desires (Chapter 1). On an empirical basis, it will become apparent that the current state of sex/gender research in media psychology is poor (Chapter 2). Building on the previous chapters, an emphasis of this dissertation will be the better assessment of sex/gender differences in pornography content preferences and use, a media content prominently used in a hedonistic fashion to satisfy needs and desires (Chapter 3). The last empirical chapter of the thesis will focus on sex/gender differences in the use of and preferences for sad films, at first sight, a non-hedonistic or eudaimonic media content (Chapter 4). The final chapter will include a general discussion and highlight that this thesis can only be the first drop of an ocean of research objectives that an integrative view on sex/gender yields (Chapter 5).

Contents

Chapter 1

A Revision of the Integrative Model for Sex/Gender Differences

Different authors tried to create models that subsume the fragments of which actual sex/gender consists and aimed to highlight their interaction (Fausto-Sterling, 2012; Neyer & Asendorpf, 2018). Originating in differential psychology, Neyer and Asendorpf (2018, p. 383) drew a synthesis of findings by different schools of psychology that research phenomena around sex/gender. The Integrative Model for Sex/Gender Differences (IMSGD) (Neyer & Asendorpf, 2018) is very comprehensive and has been previously used as a meta-theory to identify potential topics to consider for empirical research (e.g., Schwab, 2010). It shows with a single figure that neither nurture (in the form of social-cultural influences) nor nature (in the form of biological-evolutionary influences) alone can sufficiently explain sex/gender differences (Neyer & Asendorpf, 2018, p. 383). In its original form, the IMSGD subsumes explanation approaches based on social, cognitive, cultural, and evolutionary psychology. The schools' different findings are not contradictory but rather complementary to each other. In combination, they describe different facets of the phylogenetic, ontogenetic, proximate, and ultimate causes for sex/gender differences in the best sense of Tinbergen (1963). Tinbergen (1963) argued that it is necessary to ask four "whys?" to sufficiently describe the etiology of human behavior. Accordingly, a researcher should ask what the proximate causes of a (behavioral) phenomenon are (first why?) as well as what the developmental causes in a respective individual's lifespan were (ontogenetic, second why?). Furthermore, the question needs to be answered how the phenomenon has been developed through evolution (phylogeny, third why?) and finally, what the ultimate benefits in natural/sexual selection (Darwin, 1859, 1871) have been (fourth why?). A translated version of the IMSGD is displayed in Figure 1.1.

Neyer and Asendorpf (2018, p. 383) describe the etiology of sex/gender to be affected by a biological-evolutionary pathway on the left side of Figure 1.1, and a social-cultural pathway at the right side of it. In the terms classic

Figure 1.1

The Integrative Model for Sex/Gender Differences

Note. Based on and translated to English from *Psychologie der Persönlichkeit [Psychology of Personality]* (6th ed., p. 383), by F. Neyer & J. Asendorpf, 2018, Springer. In the original model created by the authors, each path was numbered to aid in their discussion throughout their chapter. However, this version omitted the enumeration for ease of understanding and a clearer model overview. Instead, the paths are verbally referred to as necessary. It is worth noting that the cited source does not explain the lines depicted in the figure, but they have been included to provide a complete visual representation of the model.

sense, sex is to be attributed to the variables of the biological-evolutionary pathway, and gender is to be attributed to variables of the social-cultural one (Bentley, 1945). Each box represents different entities, which are primarily supposed to affect their successor variables. This antecedence is visually highlighted with arrows. For instance, the model describes genetic sex to determine hormonal sex (testicles are the primary producer of testosterone in humans, the premier androgen (e.g., Knickmeyer & Baron-Cohen, 2006; R. J. Nelson & Kriegsfeld, 2017; Robinson et al., 1977)) and subsequently physical sex. However, physical sex also affects the social-cultural pathway at quite an early stage by being described as impacting the division of labor. Representing a second influence, the ecological context of culture also affects the division of labor, which is seen as a cause for gender stereotypes. Other entities in the model are characterized to be in a reciprocal interaction like the one in which proximate psychological sex/gender interacts with the gender-typical environment. According to Neyer and Asendorpf (2018, p. 384), this interaction describes an individual's own choices regarding its (social) environment, like the voluntary separation of playmates by sex in toddlers or preferences for gendered toys or leisure time activities (Bischof-Köhler, 2022). The respective gender-typical environment will facilitate social learning of the feminine and masculine gender roles (Bem, 1974; Troche & Rammsayer, 2011) and related behavior scripts (Bandura, 1969; Bussey & Bandura, 1999). These social influences will also affect and shape psychological sex/gender. The model in its original form, though only published in a German textbook, is an enormously valuable contribution to the literature because it integrates the different schools of psychology researching sex/gender differences into a comprehensive model. However, the model in its original form, as displayed in Figure 1.1, is in parts wrong and has an astonishing simplistic view of the biological-evolutionary pathway. Furthermore, Neyer and Asendorpf (2018) neglected influences on psychological sex/gender of which empirical evidence points towards an impact on sex/gender and which should be accounted for (e.g., Piferrer, 2013).

1.1 A Revision of the Biological-Evolutionary Pathway

The primary intentions of the IMSGD are most praiseworthy. It enables a comprehensive, holistic view of psychological sex/gender. It emphasizes that, for instance, differences related to psychological sex/gender

are caused by both nature and nurture variables (Bischof-Köhler, 2022; Fausto-Sterling, 2012; Neyer & Asendorpf, 2018). Therefore, it has a great potential for researchers to quickly identify potential variables for studies about sex/gender-associated phenomena. However, corrections are needed—in this section regarding the biological-evolutionary pathway.

1.1.1   Sexual Selection - The Second Force of Evolution

Beginning in the upper left corner of Figure 1.1, the sex-typical evolutionary environment is supposed to affect the genetic sex only utilizing natural selection. The sex-typical evolutionary environment is not to be understood as some archaic landscape (Bennett, 2018). Instead, the term refers to the parts of the environment of evolutionary adaptedness (EEA) that put different selective pressures on the sexes of a species (Bennett, 2018; Bowlby, 1969). The EEA can be best described, for the case of Homo Sapiens, to be the statistical summary of the selective pressures our ancestors had to face during the phylogeny of our species (Buss, 2019; Mayr, 2001). Current archaeological findings prompt the emergence of Homo Sapiens around 300.000 years ago in Pleistocene Africa (P. Roberts & Stewart, 2018).

Regarding the evolution of sex differences in Homo Sapiens, women and men show similar traits if the same selective pressures took place in the EEA but are supposed to be different in traits on which sex-specific selective pressures worked during a long time of Homo Sapiens phylogeny (Bischof-Köhler, 2022). For instance, evolutionary psychology researched that behavior and traits around mating yield considerable sex differences (e.g., Buss, 1998; Buss & Schmitt, 1993). Women and men faced different selective pressures in reproduction (Buss, 1998; Buss & Schmitt, 1993). Only men are affected by paternal uncertainty, and both sexes differ in the minimal amount of parental investment, where women are confronted with an extreme disadvantage (Bischof-Köhler, 2022; Trivers, 1972). For instance, this unequal minimum of parental investment (Trivers, 1972) is a significant influence factor for nowadays females to be the on average by far choosier sex regarding a potential mate compared to men (Bischof-Köhler, 2022; Buss, 1998; Buss & Schmitt, 1993; Clark & Hatfield, 1989; Edlund et al., 2021).

Furthermore, men focused more on youth and fertility because the traits ultimately cue a higher chance of conception. At the same time, women look on average for status and the ability and willingness to provide resources and care to a mate in men because of women's higher minimal parental investment (Buss, 1998; Buss & Schmitt, 1993). Of course, humans

are unaware of these ultimate outcomes because their mating preferences result from unconscious cognitive processes related to cognitive adaptations evolved through selective pressures (Cosmides & Tooby, 1994). However, accepting this blindness towards a phenomenon's underlying processes is unacceptable for science (Dienes, 2008; Tinbergen, 1963; Vollmer, 2002).

With an emphasis on sex/gender differences, Neyer and Asendorpf (2018) did not discuss and therefore ignored the second source for selective pressures. Charles Darwin described a second force that drives the evolution of species, which he called sexual selection (Darwin, 1871). It is handed down that he expressed frustration about the feathers of the peacock's tail that yielded in their beauty and colorfulness a disadvantage in natural selection (Hiraiwa-Hasegawa, 2000). Related selective pressures (e.g., by predators) should have weeded the trait long ago. However, Darwin reasoned that the peacock hens must have developed a mating preference for the colorful tails and feathers and that female mating preferences caused the ultimate drive for the peacock tails to develop despite opposing selective pressures of natural selection (Darwin, 1871; Hiraiwa-Hasegawa, 2000). Building on Darwin's work, the peacock's tail is nowadays described as the archetype of a "costly signal" (Zahavi, 1975). These traits, skills, and possessions are hard to gain and keep and may often cause disadvantages in terms of survival (e.g., the male peacock is better visible to predators because of his tail). Nonetheless, the development of such traits also cues as an evolutionary fitness indicator (Mayr, 2001) for both the same (e.g., Hennighausen et al., 2016) and the opposite sex (Zahavi, 1975). The term "fitness" in an evolutionary context describes the ability to survive until reproduction, an important aspect that does not necessarily favor the strongest or healthiest species members but the fittest ones in those above, reproductive sense (Buss, 2019; Mayr, 2001). Accordingly, a costly signal has to be hard to acquire and should be fake proof/consistent as an honest signal (G. Miller, 2001; Zahavi, 1975). The organism with the respective trait shows that it could develop this trait despite environmental hardships and, therefore, has "good genes" and an ability to require more resources than it needs for mere physiological survival. For instance, in humans, a costly signal can be producing art and music, acquiring expensive cars and other luxurious consumption, or doing extreme sports like running a marathon or going base jumping (Hennighausen et al., 2016; G. Miller, 2001; Saad, 2010). G. Miller (2001) related the, compared to the speed of development of other traits, swift development of the human brain to a "runaway" sexual selection process with women putting especial emphasis on the cognitive abilities of their male spouses.

In favor of Neyer and Asendorpf (2018), there is a debate if sexual selection should be considered a component of natural selection rather than a second force that drives evolution (Hosken & House, 2011). However, it is still very reasonable to assume sexual selection to be a specific second drive of evolutionary change that puts traits like peacock tails beyond the fitness optimum for natural selection. This separation of concepts was also initially intended by Charles Darwin (Darwin, 1871; Hosken & House, 2011). The present work will also pursue Darwin's original approach because it emphasizes processes around mating and sexuality, a domain strongly influenced by biological-evolutionary variables (Buss, 1998; Buss & Schmitt, 1993; Clark & Hatfield, 1989; Edlund et al., 2021; Trivers, 1972) and will be of relevance in later chapters of this thesis. Furthermore, sexual selection frequently acts stronger compared to natural selection (Hosken & House, 2011) and facilitates traits that would not have occurred given the selective pressures of natural selection only (Darwin, 1871). Therefore, sexual selection is a second, full-fledged force of evolution that often contradicts natural selection.

Sexual selection facilitated sexual dimorphism in different species like the peacock (Darwin, 1871; Zahavi, 1975) and is, as previously mentioned (G. Miller, 2001), suspected to have caused the rapid growth of the human brain in Homo Sapien's phylogeny. In disadvantage to Neyer and Asendorpf (2018), the authors did, as previously mentioned, not even discuss sexual selection as a potential facet of natural selection. Accordingly, the authors have neglected the force that might be especially relevant for developing sex/gender differences (Darwin, 1871). Therefore, the first correction to the IMSGD displayed in Figure 1.1 needs to be the attachment of sexual selection on the pathway between the sex-typical evolutionary environment and genetic sex.

1.1.2 Genetic Sex - A Dichotomy?

A recent ruling of the German Federal Constitutional Court (BVerfG, 2017) forced the German parliament and subsequent federal institutions to acknowledge a third gender called "divers" (English approximation: miscellaneous) in official documents like passports or ID cards. A person suffering from Turner syndrome (e.g., Turner, 1938) sued against the German state, arguing that a particular law (Personenstandsregistergesetz) was unconstitutional because it did not allow for gender entries different from male or female in official documents. The Federal Constitutional Court ruled in favor of the suing party, arguing that the German term

"Geschlecht" which does not differentiate between sex and gender, cannot be defined by biological variables exclusively. Social and cultural factors should also be addressed, breaking the previously "Geschlecht" defining dichotomy of primary sexual characteristics. Furthermore, regarding the Turner syndrome of the suing person, the court argued that the person's respective chromosomal sex could also not be certainly determined to be either male or female.

Turner syndrome is a disorder of sex development (DSD) where one gonosome is missing leaving the fetus with only 45 chromosomes in total, including one X chromosome (Lin et al., 2019; Sybert & McCauley, 2004; Turner, 1938). Most pregnancies end with a miscarriage if the fetus suffers from this DSD. Individuals that do not suffer from being spontaneously aborted develop a female sex phenotype and are, in most cases, reared as women. Humans born with the DSD suffer from infertility, a short neck, and a characteristic facial appearance caused by, for instance, a low posterior hairline (Lin et al., 2019). Other inherited DSDs exist like, for instance, the XYY-Syndrome (Jacobs & Strong, 1959) where an additional Y chromosome, or the Klinefelter syndrome (XXY) (Jacobs & Strong, 1959; Visootsak & Graham, 2006) where an additional X chromosome is present. These conditions, like Turner syndrome, are rare and result in infertility. All possible forms of DSDs, including the ones that do not affect the average development of reproductive anatomy (e.g., Hirsutism (Ferriman & Gallwey, 1961)), are estimated to amount at maximum to about 1.7 % of life births (Blackless et al., 2000).

This thesis aims to pursue a scientific, quantitative-empirical approach that is descriptive, non-normative, and unpolitical (e.g., Dienes, 2008; Vollmer, 2002). Suppose in the following, the exclusive term sex is used. In that case, it is assumed that there is a dichotomy in sex which appears undoubtedly to be true (with a highly conservative estimation in favor of any DSDs) for more than 98.3 % of the human population (Blackless et al., 2000). The presence or absence of an active sex-specifying region on the Y chromosome (SRY) determines genetic sex, which consists of a single gene (Berta et al., 1990; Blackless et al., 2000; Kashimada & Koopman, 2010; Sekido & Lovell-Badge, 2013; A. H. Sinclair et al., 1990). This gene acts as a switch that turns on a complex regulatory process centering around, for instance, the Sox9 gene, which is apart of other genes responsible for male sexual development, and remains at the recent focus of research (e.g., Gonen & Lovell-Badge, 2019).

If the SRY gene is absent like in biological women or dysfunctional, like in the Swyer Syndrome (Massanyi et al., 2013) where humans born with the condition are called XY females, a female sex phenotype with ovaries and a vagina will most likely develop if the pregnancy is uninterrupted. In most women, these ovaries will start to produce larger gametes (eggs) compared to the ones men produce (Bhargava et al., 2021). Therefore, these humans are most accurately addressed as having female sex or being girls/women.

If the SRY gene is present in a human's genotype and subsequent gene expressions works correctly, a male sex phenotype with testis will develop. Accordingly, from a biological point of view, such a human is most accurately addressed to have male sex or being a boy/man. Men possess in their utmost majority testis and a penis and produce smaller gametes (sperms) compared to the ones women produce (Bhargava et al., 2021). Being male or female by sex is the most determining factor of actual sex/gender attribution by most humans themself as well as by their social environment (Bhargava et al., 2021; L. Ellis et al., 2008; Federici et al., 2022; Zucker, 2017).

Though, it needs to be mentioned that some conditions exist where according to Blackless et al. (2000), the sex dichotomy truly does not fit an individual, even from the "SRY-perspective" pursued in this thesis. However, true hermaphrodites where both testes and ovaries are present or humans born with idiopathic sexual ambiguity amount to 1 life-birth in 100.000 or less (Blackless et al., 2000). The complete androgen insensitivity syndrome (CAIS), where a mutation on the X chromosome causes a dysfunction in testosterone receptors (Oakes et al., 2008; van Hemmen et al., 2017), leads to another type of XY females (Oakes et al., 2008). These humans, most often reared as females, have functional testis in the abdomen and produce testosterone in a typical male range (with no biological effect). Prevalence of CAIS is estimated at around 1 in 20,000 up to 1 in 99,000 genetic males (Oakes et al., 2008). As briefly mentioned in the introduction of this thesis, there is a recent debate about sex/gender issues in sports (e.g., Camporesi & Hämäläinen, 2021; Loland, 2020). Until the 1990s, sex determination in female athletes was conducted by testing for the SRY-gene (Ferguson-Smith & Ferris, 1991). The test yielded an accurate result regarding their sex for 503 of 504 tested athletes.

Suppose the goal is to do justice and correctly address every individual within society as a government should aim. In that case, enabling a third-sex entry in official documents appears most reasonable. The German Federal Constitutional Court (BVerfG, 2017) argued from that position and

assumed a specific prevalence of people with a DSD in Germany that can neither be called male nor female. However, the quantitative-empirical approach pursued in this thesis ultimately aims to generalize knowledge to the population rather than research particular sub-groups (Dienes, 2008; Vollmer, 2002). In the best sense of research economy principles that aim to produce generalizable knowledge like Occam's razor (Vollmer, 2002), it appears most reasonable to pursue the assumption of sex being a dichotomy. By the current knowledge, this dichotomy appears true for the utmost majority of the German as well as the Worldwide population (Blackless et al., 2000).

1.1.3   Hormonal Sex - A Subcategory of Physical Sex

Figure 1.1 (Neyer & Asendorpf, 2018) describes that hormonal sex affects the physical sex causally. This precedence is partially true because certain hormones like the Müllerian inhibiting hormone play a crucial role in sex differentiation of the genital ridge (Bhargava et al., 2021). However, Neyer and Asendorpf (2018) do not discuss the hormonal influence on early phases of sex differentiation. They rather argue that hormonal sex is a predictor of physical sex because the prenatal organizing action of androgens like testosterone and its aromatized byproducts, the estrogens cause sex differences in human brain structures (Bhargava et al., 2021; Del Giudice, 2022; Kight & McCarthy, 2020). Neyer and Asendorpf (2018) address these with the bullet point "neuronal" in the IMSGD-variable representing physical sex. From an ontogenetic perspective, androgens like testosterone and estrogens strongly impact brain organization. For instance, the development of sex differences in the hippocampus is triggered by androgens (Kight & McCarthy, 2020). Though, both androgenic and estrogenic effects depend on a lock and key principle like in the case of the SDS mentioned above CAIS. In CAIS, the lock (in the form of androgen receptors) is broken, and testosterone cannot trigger masculinizing effects in affected humans (Oakes et al., 2008). Therefore, not only the mere levels of androgens and estrogens within humans are crucial for brain masculinization or femininization. But also, like in the case of CAIS, the different sensitivity of certain brain areas towards these hormones (Del Giudice, 2022). For instance, this organizing action is associated with the on average better spatial ability of men compared to women or sex differences in eating behavior and disorders (Bhargava et al., 2021). However, these sex differences related (brain structure) organizing effects of androgens and estrogens do not preempt physical sex but are driven by it. The most

important androgen and estrogen producers are the testes or the ovaries. These primary sexual characteristics are most often accompanied by a penis or a vagina, which are the premier determining factors of physical sex (Bhargava et al., 2021; Federici et al., 2022; Zucker, 2017). Therefore, Neyer and Asendorpf (2018) are incorrect in describing hormonal sex causally affecting physical sex. The variables interact reciprocally, and physical sex should have a stronger impact on hormonal sex than vice versa.

In the case of testosterone, all human fetuses are naturally exposed to some levels of the androgen produced by maternal ovaries, and adrenal glands and being released from their mother's body fat (Knickmeyer & Baron-Cohen, 2006). However, the Leydig cells in the testes are the premier source of testosterone, which elevates its level enough to masculinize the brain and cause large parts of sex differentiation. The testes start testosterone production around week eight of pregnancy (Hines et al., 2015; Knickmeyer & Baron-Cohen, 2006). Comparing testosterone levels of male to female fetuses in amniotic fluency during mid-gestation, male ones showed, in a classic study by Robinson et al. (1977), mean testosterone levels of 224 pg/ml in comparison to 39 pg/ml for females with no overlap of respective curves.

From a psychological perspective, sex differences in the brain occur more of interest than early sex differentiation related to, for instance, the Müllerian inhibiting hormone. Nonetheless, there is a reciprocal interaction between hormonal and physical sex. However, in this interaction, hormonal sex will be more vigorously determined by physical sex than vice versa. Therefore, it appears best to describe hormonal sex as a sub-dimension of physical sex. Still, there needs to be emphasized that without certain hormones like the Müllerian inhibiting hormone, the physical sex will not develop. Without functional testis/ovaries, no average hormonal levels will occur to affect the sexes in the sense of Neyer and Asendorpf (2018).

Apart from genetic sex and primary sexual characteristics where most humans can be assigned to have either female or male sex (Blackless et al., 2000), all sub-dimensions of physical sex become distributions when groups of individuals are considered because associated traits (e.g., physical strength (Courtright et al., 2013)) are different for every individual. These distributions show variation within each group and overlap between the groups of women and men (Beltz et al., 2020; Bischof-Köhler, 2022).

1.1.4 A Revised Biological-Evolutionary Pathway for Sex/Gender Differences

As previously mentioned, women and men, defined as discussed in subsection 1.1.2, can be expected to behave and experience in an equal manner if the same selective pressures of sexual and natural selection took place for both sexes (Bischof-Köhler, 2022; Darwin, 1859, 1871). This was not the case during Homo Sapiens phylogeny in the domains of mate choice, reproduction, and raising offspring (e.g., Buss, 1998; Buss & Schmitt, 1993; G. Miller, 2001; Trivers, 1972) as well as in, to these domains related inter- and intrasexual competition (Fisher & Cox, 2011; Hennighausen et al., 2016; Trémolière et al., 2015) (see Section 1.1.1).

For instance, the origins of sex differences in physiology like skeletal and muscle strength (e.g., Lundsgaard & Kiens, 2014; B. M. Roberts et al., 2020) as well as in metabolism (e.g., Tiller et al., 2021) but also in the brain (Del Giudice, 2022; Kight & McCarthy, 2020) can be related to a different effect of selective pressures on the sexes. Intrasexual competition related to sexual selection appears to have played a crucial role in males, on average, much higher upper body strength compared to women (Sell et al., 2012). The causes of human sex differences in cognitive traits are briefly addressed in Section 1.1.3. A revised biological-evolutionary pathway of the IMSGD is displayed in Figure 1.2.

Regarding Figure 1.2, it needs to be mentioned that some theories argue that sex differences are primarily caused not by biological-evolutionary but rather social-cultural influences. For instance, Social Role Theory (Eagly, 1987; Eagly & Wood, 2012) assumes that most cognitive sex differences are caused by the impact of societal stereotypes forcing an individual to act in a specific manner following her/his position in society. However, there is overwhelming empirical evidence that stereotypes are not the exclusive driver of sex/gender differences and that social-cultural or "nurture only" explanations fall short in explaining such differences (Pinker, 2003). Eagly (2018) has recently acknowledged the deficits of "nurture only" explanations and criticized that feminist sex/gender research has become too orthodox with an ever more exclusive focus on nurture variables. Accordingly, nature-inclusive approaches should receive more research attention to grasp the underlying processes of sex/gender-associated phenomena fully.

International large-scale studies with sample sizes surpassing 10,000 participants show that as more sex/gender egalitarian and liberal societies become, the larger sex/gender differences get. For example, women and

Figure 1.2

The Revised Biological-Evolutionary Pathway of the Integrative Model for Sex/Gender Differences
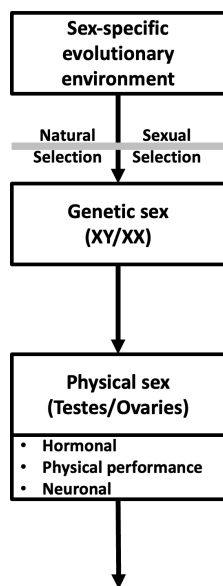
Note. The grey boundary represents the shift from phylogenetic and ultimate causes to ontogenetic causes of sex (Tinbergen, 1963).

men tend to choose more gender-stereotypical subjects to study in more gender-equal societies (Falk & Hermle, 2018). Such sex differences are not only tied to occupation but also to personality traits (Mac Giolla & Kajonius, 2018). Women score on average higher in all Big Five personality traits compared to men with an association of $r = .69$ between the size of the sex difference and the countries gender equality index (Mac Giolla & Kajonius, 2018). These phenomena are addressed with the term *gender-equality paradox*. They came to attention because of increasing sex differences that were supposed to decrease with a rise of gender equality in respective societies. However, these phenomena might not be as paradoxical if one understands culture as a complementary, often taming force of human nature (Pinker, 2012). Culture should not be seen as a force that enscripts every trait a human has on a hypothetically blank slate (Pinker, 2003). As previously mentioned, it is crucial to overcome oversimplified "nature or nurture only" approaches and focus on a more integrative approach. Such an approach has the potential to grasp a more comprehensive picture of the complexity of human behavior, which appears to be affected by a complex interplay of nature and nurture variables (Buss, 2020; Eagly, 2018; Malamuth, 1996; Pinker, 2003; Sherry, 2004; Weber et al., 2015).

1.2 A Revision of the Social-Cultural Pathway

Different from the biological-evolutionary pathway, Neyer and Asendorpf (2018) appear to describe better the basic social and cultural processes that affect psychological sex/gender subsumed by the social-cultural pathway of Figure 1.1. Species members of Homo Sapiens left Pleistocene Africa 200,000 to 100,000 years ago and settled all continents permanently except Antarctica, which has no native population up to this day (Convey & Peck, 2019; P. Roberts & Stewart, 2018). During and after that initial settlement phase, humans faced very different ecological conditions, including highly hostile environments like the north African and Arabian deserts, different rain forests, or the high elevations of Tibet (P. Roberts & Stewart, 2018). Homo Sapien's greatest strength, which made it possible to best these hardships, appears as being a "generalist specialist" with the capabilities to cooperate and learn within a group. P. Roberts and Stewart (2018) describe primarily social learning as a critical factor to Homo Sapien's success in settling the planet because no single individual could acquire sufficient knowledge alone. Instead, combining different approaches and perspectives towards a task within a group proved to be the more suc-

cessful option. Nonetheless, Neyer and Asendorpf (2018) neglected some crucial interactions between variables of the social-cultural pathway and the biological-evolutionary one. The authors have neglected to discuss potential ecological variables that could affect psychological sex/gender, as the following sections will show.

1.2.1 Epigenetics: The Ecological Context of Culture and its Possible Influence on Genetic Expression of Sex

In different vertebrates, for instance, in certain species of fish, artificial environmental conditions like growing up in captivity can lead to a change in sex dimorphism of size, a bias in sex ratios, or even to complete infertility of one sex compared to growing up in the species respective natural habitat (e.g., Penman & Piferrer, 2008; Piferrer et al., 2012). These changes are caused by an alternation of gene expression related to a phenomenon called epigenetics, which can be defined as "changes in gene function that are heritable and that do not entail a change in DNA sequence" (Wu & Morris, 2001, p. 1103). This change in gene expression is primarily caused by maintenance proteins affecting DNA methylation, the modification of histones, and an altered expression of microRNAs (Brock & Fisher, 2005; Piferrer, 2013).

Epigenetic processes are also crucial for human sex differentiation (Dupont et al., 2009). Women possess two redundant X chromosomes as outlined in Section 1.1.2. Therefore, the expression of in sum one X chromosome needs to be silenced by epigenetics to control for an otherwise inevitable gene overflow (Dupont et al., 2009). However, environmental influences can also alter human gene expression with a less desirable outcome. Different Endocrine Disrupting Chemicals (EDCs) are up to this day used in industrial manufacturing processes (e.g., Cimmino et al., 2020) and can detrimentally affect sex differentiation of humans that are exposed, or of which their ancestors were exposed to EDCs (Ho et al., 2017). For instance, Bisphenol A (BPA) is widely applied in producing polycarbonate plastics to package food, beverages, and medical products (Cimmino et al., 2020; Vilarinho et al., 2019). If a human is exposed, BPA accumulates in different tissues and binds to estrogen and androgen receptors causing feminizing effects. It causes malfunctions in different organs, including the reproductive ones, and is potentially carcinogenic (Cimmino et al., 2020). BPA activates the receptors for estrogens but inhibits the ones for androgens (Auger et al., 2013). Severely, BPA can cause epigenetic, heritable impacts because it is strongly supposed to lead to a bias in the aforementioned

epigenetic mechanisms (Brock & Fisher, 2005; Piferrer, 2013) like DNA methylation. This bias in DNA methylation can cause severe illnesses and reproductive defects in the directly exposed and future generations (Cimmino et al., 2020).

BPA is only one example of different EDCs, though it is comparably problematic because of its widespread use. Adapting the perspective of the IMSGD (Neyer & Asendorpf, 2018), BPA is part of the ecological context of every culture that uses plastic for food packaging or other products. Furthermore, microplastic exposes all humans to BPA to a certain degree because it has polluted the whole planet (Shahul Hamid et al., 2018). Therefore, BPA, exemplary for other EDCs, yields an environmental influence rooted in the ecological context of culture (microplastic, production of plastic/industrialization). It can change epigenetic processes affecting sex differentiation (Auger et al., 2013; Cimmino et al., 2020; Vilarinho et al., 2019). Therefore it can, exemplary for other EDCs, alter the translation from genetic to physical sex. Accordingly, a new path has to be added to the IMSGD, highlighting the influence of epigenetic processes triggered by environmental conditions that can affect sex differentiation. The path is displayed in Figure 1.3.

Epigenetics in social science is still in its infancy, though there are, apart from EDCs, other environmental influences considerably altering human gene expression (Adkins et al., 2018; Douhard & Geffroy, 2021; Helle et al., 2009). For instance, severe trauma can affect a human's gene expression, possibly leading to a higher vulnerability for PTSD in subsequent generations (Lehrner & Yehuda, 2018; Ryan et al., 2016). Furthermore, epigenetics might also be crucial in maintaining a balanced sex ratio within human populations. Recent research shows that environmental influences like temperature and possibly processes within the male body alter the sex ratio of spermatozoa through different mechanisms, including epigenetic ones (Douhard & Geffroy, 2021; Helle et al., 2009). However, when this dissertation was written, there needed to be more knowledge about epigenetic processes and circumstances in which epigenetic change might occur. It is too early to conclude the trigger mechanisms of epigenetic processes and epigenetics' reach into and effects on the human genome. Any further argumentation about gene-environment interaction would remain highly speculative at the current knowledge point. Though, in a few years, the mediating path between the ecological context of a culture and gene expression of sex displayed in Figure 1.3 might require an update.

Figure 1.3

Epigenetic Processes Are Triggered by Environmental Influences Like Endocrine Disrupting Chemicals, Which Can Affect Gene Expression, Causing Lasting Heritable Change.

Epigenetic processes

Ecological context of the culture

Genetic sex (XY/XX)

Physical sex (Testes/Ovaries)
- Hormonal
- Physical performance
- Neuronal
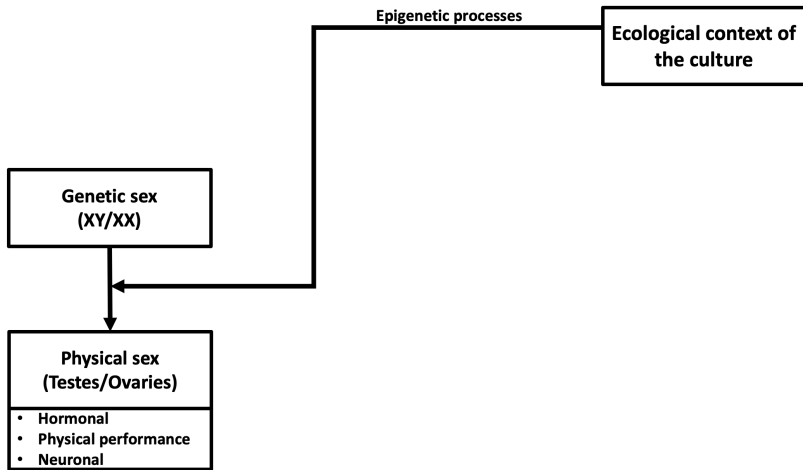
1.2.2 Physical Sex and Ecological Context: How They Interact to Shape Cultural Division of Labor

The physical sex and the ecological context of a culture interact with each other and affect the division of labor (Neyer & Asendorpf, 2018). Regarding sex differences in physical performance, a meta-analysis subsuming up to 596 single effects from up to 108,736 participants found an average $d = 1.71$ for the size of the sex difference in muscular strength, of $d_{av.} = 1.81$ in cardiovascular endurance and of $d_{av.} = -0.05$ in movement quality (Courtright et al., 2013). Positive values of the average ds cue for better male performance. Given Jacob Cohen's classic interpretation guidelines regarding the size of d (Cohen, 1988), men compared to women perform on average better in muscular strength and cardiovascular endurance with effects sizes that surpass more than twice the threshold for a large effect ($d \approx 0.80$). In comparison, the average d for movement quality is far below the effect size of a small effect ($d \approx 0.20$) and appears at -0.05 to be negligible from an empirical point of view. Therefore, women show, on average less strength and endurance than men, and there is no practically substantial difference between the sexes in movement quality.

Hormonal sex differences, like the lower natural levels of testosterone in women compared to men, predict and cause a significant part of men's, on average, far better physical performance capabilities (Dandona et al., 2021; Oti et al., 2016; M. Sinclair et al., 2016). For instance, testosterone and its derivatives facilitate, beyond a lot of other physiological outcomes (Oti et al., 2016), better muscle growth and a higher bone density in men compared to women (Dandona et al., 2021; M. Sinclair et al., 2016).

Regarding neuronal sex differences that potentially affect the division of labor, for instance, women and men show, on average, the same intelligence. However, the male population has higher variability in it, like in most other traits (Smarr et al., 2021), compared to the female population (e.g., Del Giudice, 2022; Johnson et al., 2008). This higher variability causes more men to appear on both ends of the intelligence distribution. The sex difference is potentially reflected in sex ratios of different fields of academic occupations like maths, physics, or computation science. However, how much variation is explained by nature or nurture influences is intensely contested. Academia appears stuck in a "nature vs. nurture" debate regarding the topic (Baye & Monseur, 2016; Gray et al., 2019).

The following paragraphs will outline several more important predictors rooted in physiological sex and cultural and ecological contexts. Though, whole areas of science like human behavioral ecology (e.g., Nettle et al.,

2013) or ecological anthropology (e.g., Moran, 2018) research phenomena that emerge from the interaction of human nature with different ecological contexts. The paragraphs below cannot claim to give a complete overview of any social influence rooted in a culture's ecological context on human sex/gender. Though, it highlights some fundamental aspects.

1.2.2.1 The Disposable Male Sex

The sex differences in essential physical abilities (Courtright et al., 2013) are related to a difference in labor division (Trémolière et al., 2015). On average, men pursue, independent of culture, more physically demanding and hazardous work resulting in the majority of global workplace fatalities being male (e.g., Osca & López-Araújo, 2020; Stergiou-Kita et al., 2015). Furthermore, men share the main burden in fighting at wars, translating into men being disproportionately killed during war times both in combatant and non-combatant status (e.g., Holter, 2002). This phenomenon, where men pursue the most dangerous tasks in society on average, is labeled *male disposability*. The phenomenon is supposed to originate in behavioral dispositions developed through intrasexual selective pressures caused by sexual selection (Puts et al., 2023; Trémolière et al., 2015). (Surviving) men ultimately benefit from a larger supply of potential mates in a female-biased sex ratio.

Because behavior is rooted in biopsychosocial causes, related dispositions are reflected and augmented by cultural norms like chivalry, resulting in a societal gender bias that puts an on average higher value towards women (FeldmanHall et al., 2016). For instance, in a study of Rudman and Goodwin (2004), women showed an in-group gender bias in favor of other women, while men preferred other men less than women showing an out-group bias. Another study highlighted differences in moral dilemma situations where male participants put lower emphasis on the life of male compared to female (fictional) agents (Trémolière et al., 2015). Male participants preferred to kill three (fictional) men compared to one woman when confronted with a moral dilemma. Though, such male (anti-)utilitarian decisions are strongly influenced by the reproductive value of the fictive actors in the respective dilemmas (e.g., Buss, 1998; Buss & Schmitt, 1993; Saad, 2013).

Additionally, men are, on average, more prone to inflict harm. The development of males, on average greater muscular strength and endurance (Courtright et al., 2013) is supposed to be in parts related to an adaptation towards the selective pressure for men to fight other men (e.g., Puts et al.,

2023; Sell et al., 2012). For women, on the other hand, a male-biased sex ratio appears to present a more ambiguous outcome due to an increased potential for violence in societies with a male overpopulation (Schacht et al., 2014). Therefore, male disposability as a phenomenon associated with the division of labor between the sexes appears to be deeply influenced by human nature, which ultimately might cause but also proximately interacts with societal norms like chivalry.

1.2.2.2 Plough vs. Shifting Cultivation

Another interaction between the, on average, greater male strength and endurance (Courtright et al., 2013) with a culture's ecological context is based on the human cultural techniques of crop planting and ground preparation. Alesina et al. (2013) argue that both within and between countries, the past reliance of (parts of) a society on either shifting cultivation (with hoes or digging sticks) compared to plow cultivation strongly predicts division of labor nowadays. Both ground preparation methods depend on the quality of the soil. For instance, ground with many stones close to the surface makes plowing impossible. When plow cultivation is the prevalent method of ground preparation, men have a natural advantage in labor due to more upper body strength (Courtright et al., 2013), which is required to control the plow and a potential animal that is pulling it (Alesina et al., 2013). Accordingly, to the authors, traditional gender roles in plow-reliant societies confine women stronger to domestic work. Historic plow use predicts lower female participation in the labor force, lower female participation in politics, and a lower share of companies in female ownership. An additional negative predictor regarding these variables was a tropical climate and, being a coping factor (positive predictor), the historic herding of large animals, which positively predicts female participation in nowadays workforce.

1.2.2.3 Pathogen Prevalence and Gender Equality

Another significant factor regarding gender roles, rooted in the ecological context of a culture, is the pathogen prevalence in the respective environment. According to Varnum and Grossmann (2017, p. 2), pathogen prevalence is $r = .77$ associated with the declining gender inequality in the US between 1951 and 2011. A school of thought in evolutionary psychology, labeled the Santa Barbara School in honor of the place of occupation of their founders, John Tooby, and Leda Cosmides, supposes that the mind consists of specific modules that were developed in human phylogeny due to the

selective pressures of different adaptive problems (e.g., Cosmides & Tooby, 1997). For instance, these modules evolved through the above-discussed problems women and men had to face in mating (Buss, 1998; Buss & Schmitt, 1993) like paternal uncertainty (Trivers, 1972) or an unbalanced minimal parental investment (Buss, 1998; Buss & Schmitt, 1993). Accordingly, the reproductive and the survival module might (e.g., Saad, 2010, 2013) respond to pathogen prevalence, possibly influencing the pursuit of a slower or faster life history strategy (Roff, 1992; Stearns, 1992). Compared to other species like rodents or turtles, humans are bound to a slow life history strategy where one has fewer offspring and puts more emphasis on rearing them. However, there is variation within the human population (e.g., B. J. Ellis et al., 2009; Figueredo et al., 2014; Voland, 2009). On the extremes of the related distribution, humans pursue either the strategy of having (for humans) a large number of offspring with a comparatively low amount of invested resources into these or, on the opposite side, a low amount of offspring with a high amount of resources invested. Of course, there is always an interaction between such behavioral dispositions and the environment. For instance, Varnum and Grossmann (2017) discuss that the decline in pathogen thread might have, on average, contributed to American women (possibly by affecting cognitive processes within the reproductive and survival modules) pursuing slower life history strategies leading to a higher emphasis on education and occupation nowadays. A respective path for the revised IMSGD is displayed in Figure 1.4.

1.2.3   The Division of Labor and Stereotypes

Stereotypes and their impact on individuals are a classic field of research in psychology (e.g., Appel & Weber, 2021; Ellemers, 2018; Hilton & von Hippel, 1996). They result from the efficient human cognitive architecture allowing for fast information processing in social situations where information is scarce or cognitive resources are limited (Bodenhausen, 1990). According to Hilton and von Hippel (1996, p. 240) "stereotypes are beliefs about the characteristics, attributes, and behaviors of members of certain groups". They can be based on accurate representations of a perceiver's reality but are often exaggerated compared to it (Hilton & von Hippel, 1996; Wühr et al., 2017). This way of stereotype formation is formalized in the path labeled "External perception" displayed both in images 1.1 and 1.5. Gender stereotypes can be divided with the terms *communion* and *agency* (Bakan, 1966; Ellemers, 2018). Communion means immersion into the respective social group, for instance, through providing warmth

Figure 1.4
Pathogen Prevalence Triggers Slower or Faster Life Strategies in Humans Causing Psychological Sex/Gender Differences
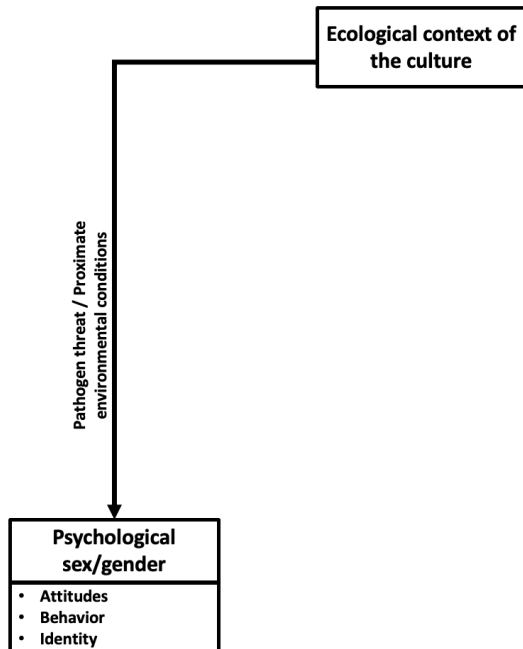
and care (Bakan, 1966). Agency, on the other hand, means independence from the respective social group through, for instance, assertiveness and performance. Communion and agency are associated with the gender roles of femininity and masculinity and have often been treated synonymously in research (Echabe, 2010). However, Echabe (2010) showed that the terms are semantically different from femininity and masculinity (Bem, 1974) and instead describe occupational roles instead of core gender identity. Regarding the formation of stereotypes, four major processes have been identified (Hilton & von Hippel, 1996, pp. 244-248):

At first, stereotypes can be formed because of self-fulfilling prophecies causing a person to subconsciously conduct a particular behavior towards another person of a different societal group, triggering the addressed person to behave in a previously assumed manner. Secondly, a nonconscious detection of a group member's behavior can be used to generalize on other members of the respective group. Thirdly, there can be an illusory attribution of behavior. This illusory attribution primarily affects minority groups which are, on average, viewed even more negatively if they behave identically to a majority group within a given society. Finally, out-group members can be perceived as more homogeneous than in-group members, triggering a subjective uniformization of traits and behavioral expectations about them.

Given the discussed topics in Section 1.2.1, a society in which, for instance, plow cultivation was prevalent, the related distribution of labor with greater confinement of women towards work at home and related maternal care certainly has triggered stereotypes of women towards communion. On the other hand, men were forced by plow cultivation to pursue more work, separated from the rest of their family members, possibly causing social roles about agency. Furthermore, the discussed phenomena regarding male disposability will have facilitated such social roles of men that do not emphasize social warmth and care. Ellemers (2018) reviewed the literature about gender stereotypes and highlighted that they could affect social norms, which are part of a gender-typical environment, causing the reproduction of gender stereotypical behavior in psychological sex/gender. Women and men aim to be good group members and act accordingly towards social expectations (Bussey & Bandura, 1999). This can diminish the interest in domains one finds valuable and impair individuals' life outcomes. Therefore, in line with the original IMSGD (Neyer & Asendorpf, 2018) in Figure 1.1, stereotypes affect the gender-typical environment. The respective path between respective variables highlights this relationship.

1.2.4   Gender Typical Environment

Comparable to the ecological context, whole fields of psychology like social psychology research phenomena centered on the interaction of the broader social environment with human attitudes, behavior, and identity (e.g., Aronson et al., 2021). As outlined by Neyer and Asendorpf (2018), humans live in and interact within specific (social) environments. The gender-typical environment is a subset of these environments and affects psychological sex/gender traits. Psychological sex/gender influences a human's choices for or against certain parts of the gender-typical environment. For instance, the interaction with certain friends, music preferences, and other social influences can be located in the gender-typical environment (Neyer & Asendorpf, 2018). This interaction is highlighted by the two reciprocal arrows visualizing an interaction in both images 1.1 and 1.5 (Section 1.5) between psychological sex/gender and the gender-typical environment.

The media might be best located in the social environment and have a subset with the gender-typical environment (Bandura, 2001; Bussey & Bandura, 1999). Accordingly, media selection, use, and effects are often related to sex/gender (Bussey & Bandura, 1999; Ferguson, Cruz, et al., 2008; Ferguson, Rueda, et al., 2008). For instance, men are significantly more prone to watch pornography compared to women (Hald & Mulya, 2013; Price et al., 2016; von Andrian-Werburg et al., 2023) and show different content preferences for different types of pornography (Hald & Štulhofer, 2016; von Andrian-Werburg et al., 2024). In turn, erotic novels, sometimes called "women's pornography" and other forms of written erotica, are much more stronger used by women compared to men (e.g., Salmon & Symons, 2003). Regarding the second largest mass media content by the number of frequent users (von Andrian-Werburg et al., 2023), men also appear to be more hardwired towards negative news (Grabe & Kamhawi, 2006). At the same time, women prefer news with a more positive valence. Furthermore, Ferguson, Rueda, et al. (2008) identifies the male sex as a vulnerability (Ingram & Luxton, 2005) to suffer from adverse effects of violent media use. In contrast, the female sex could yield a higher vulnerability towards adverse effects of social media use (Holland & Tiggemann, 2017).

Social norms around gender will also be relevant in later parts of this dissertation. They are strongly affected by gender stereotypes discussed in Section 1.2.3. Item batteries can assess an individual's conformity towards gendered norms (Mahalik et al., 2003, 2005; Parent & Moradi, 2010, 2011). The content of these batteries also gives an overview of the content

of gendered norms in (western) societies. The Conformity to Masculine Norms Inventory (CMNI) assesses 11 dimensions labeled, for instance, being focused on winning, showing emotional control, being prone to take risks, or being self-reliant (Mahalik et al., 2003). These traits can be subsumed by the already introduced umbrella term agency (Bakan, 1966). On the other hand, the Conformity to Feminine Norms Inventory (CFNI) assesses eight dimensions like thinness, modesty, (being) domestic, or (taking) care of children (Mahalik et al., 2005). As described, these terms also align towards communion (Bakan, 1966). The duality between the terms agentic and communal, introduced by Bakan (1966), indeed appears well suited to give gender-related stereotypes an organizational framework.

1.3 Media Psychology at the Intersection between the Gender-Typical Environment and Psychological Sex/Gender

Media psychology focuses on effects emerging in the interaction between the individual and the social in the form of media content (e.g., Hennighausen & Schwab, 2015). It is, therefore, best introduced between the gender-typical environment and psychological sex/gender. Media psychology "is concerned with the inter- and intra-personal psychological dimensions underlying the impact and use of any medium of communication, irrespective of the nature of the subject matter being communicated" (Fischoff, 2005, p.2). Translated to the IMSGD, it researches phenomena around psychological sex/gender that are triggered by and interact with media use.

Media psychology officially emerged as a distinct field in psychology in 1986 with the foundation of the Media Psychology Division in the American Psychological Association (APA) (Rutledge, 2013). The German equivalent, the Media Psychology Division of the German Psychological Society, was founded in early 2000 (Mangold et al., 2004). It intersects with communication science, sociology, and other fields within psychology like social psychology (Rutledge, 2013). All subjects above research from different perspectives phenomena within a human's social environment and these phenomena' interaction with a human's psychological dimensions like her/his behavior, attitudes, or identity, including sexed/gendered aspects of the abovementioned dimensions. Accordingly, these perspectives are

quite often related to each other, which appears to be especially the case for communication science, media psychology, and social psychology (e.g., Günther & Domahidi, 2017; Winterhoff-Spurk, 2007).

To distinguish media psychology from its related fields like communication science, one is tempted to state that it would intensely focus on the inter- and intra-personal psychological processes in response to any media content or media effects research. In theory, communication science, on the other hand, should have a stronger focus on the "extrapsychological" communication processes and structures (e.g., Lasswell, 1948). Though, that is no reliable distinguishing criteria. In a comparable recent review about the most researched topics in 19 top communication journals, of which some date back to the 1930s, Günther and Domahidi (2017) showed that communication science also puts a very high emphasis on topics, Fischoff (2005) would define to be a genuine part of media psychology. In the top 15 topics of published communication science studies, topic labels like "media use", "comparative research, and media stereotypes" as well as "media violence and media effects" occured that highlight how firmly attached both fields of research are to each other (Günther & Domahidi, 2017). Regarding the distinction towards social psychology Winterhoff-Spurk (2007) wrote that media psychology had been called to be applied social psychology during a meeting of the German Psychological Society in the early 2000s. The author replied with a satirical response and argued that such a label would not do justice to the field as media psychology has a broader theoretical scope with references towards John B. Watson, Paul F. Lazarsfeld, or Sigmund S. Freud (Winterhoff-Spurk, 2007, p. 339). Rutledge (2013, p. 56) explained the most distinguishing characteristic of media psychology, in comparison to the fields mentioned above, to be the on average high literacy about (media) technology combined with native knowledge of most media psychologists about psychology itself. These criteria might be a very fluent way of distinguishing media psychology from other fields, but Rutledge (2013) argued that any other, more specific definition approach would be elusive.

This dissertation seeks an integrative approach to sex/gender differences in media selection, use, and effects. It is not the main aim to theoretically align to (evolutionary) media psychology, (evolutionary) communication science, or another field of psychology. However, the tensions between the theoretical scopes of the abovementioned references towards Watson, Lazarsfeld, and Freud (Winterhoff-Spurk, 2007) outline the interplay between biological-evolutionary and social-cultural variables in this thesis.

1.4   Psychological Sex/Gender

The state of research on psychological sex/gender appears comparable to the state of the field of psychology before the introduction of Gestalt Theory (e.g., Lewin, 1939). Eagly (2018), as a self-labeled feminist psychologist, wrote a critique on the nowadays strong focus on social-cultural variables that is often accompanied by ignorance or even denial of the influence of biological-evolutionary influences for the explanation of human psychological phenomena. Despite being the mother of Social Role Theory (Eagly, 1987), she recognized that a mere social-cultural perspective falls short in explaining sex/gender differences. Her paper was a response to her receiving the Kurt Lewin Award from the Society for the Psychological Study of Social Issues. Eagly (2018) noted that Lewin described behavior B to be a function of person P and Environment E or $B = f[P, E]$ (e.g., Lewin, 1936, 1939) and used his formula to highlight that P has a solid biological component which needs to be much more at focus in future research.

Kurt Lewin argued, by falling back on physics Quantum Field Theory (e.g., Dirac, 1927), that the whole is not adequately addressed to be a qualitative more compared to the sum of its parts. Instead, the whole possesses different entities compared to the sum of its parts, meaning that the whole has definite properties (Lewin, 1939, p. 885). Translated to sex/gender research, isolated research about nature or nurture influences can only fall short of grasping the whole of sex/gender.

For this dissertation, sex/gender is defined as the output of a system that subsumes single sex and gender-related variables. This output can consist of the visual appearance of a human (e.g., gendered styles of dressing) and a human's behavior, attitudes, and desires (psychological sex/gender). The system is fueled by sex which develops as discussed in the sections 1.1.2 and 1.1.3. Sex consists of the categories male and female for most of the human population that does not suffer from a severe form of DSD (Blackless et al., 2000).

However, in this dichotomy, sex already begins to show variation in the subdimensions of physical sex (e.g., Beltz et al., 2020). Furthermore, social-cultural influences start to work potentially even before conception, as discussed in section 1.3 through epigenetic influences and in later life phases in the case of section 1.2.4 by processes triggered through the gender-typical environment. Accordingly, social learning and internalizing gender roles begin shortly after birth. Bussey and Bandura (1999) describe in a classic article how Social Cognitive Theory (SCT) explains gender

development and differentiation. According to SCT, children might be born to be biological men or women but society, by different agents of social-ization like parents, peers, the school system, or media exposure, teaches them how to behave masculine or feminine. This process is based on social learning. Bussey and Bandura (1999) explain that the developing infant recognizes very soon after birth its sex and starts to increasingly internalize societal norms about desired gendered behavior according to a perceived social group centered around their sex. Subsequently, children adapt their behavior towards socially desirable, gendered traits for different reasons, such as wanting to be a good group member. This process ultimately leads to the socialization of gender roles, with women and men being pressed to adapt their behavior toward society's expectations.

On the other hand, biological-evolutionary influences do not end with birth. It should have become clear by now that Money and Hampson (1957), cited on the first page of this dissertation, who argued that humans are blank of sex/gender and could either be reared as male or female, were and are catastrophically wrong in their assumptions. Indeed, the belief about an overwhelming influence of social-cultural variables caused, in the case of David Reimer, a patient of John Money, fatal harm as he committed suicide in the aftermath of a wrong gender assignment which was conducted by John Money (Colapinto, 2000; Diamond, 1997). Different prenatal hor-monal levels of boys and girls cause different cognitive structures resulting in sex differences in play behavior and toy preferences (Bischof-Köhler, 2022). The selection of certain "places" within the gender-typical environ-ment is not a pen on a blank slate (Pinker, 2003) but is instead driven by comparable hardwired preferences affected by sex (Bischof-Köhler, 2022). A meta-analysis including all available twin studies 50 years prior to the analysis showed an average heritability (h^2) of 49 % for the variance of all ever-assessed human traits (Polderman et al., 2015). These were, for instance, physiological traits like variation in the skeletal muscles and the variation of social values, which are also partially heritable. Of course, this cannot be generalized to psychological sex/gender, though the analysis of-fers a great cue about the importance of biological-evolutionary influences on human attitudes, behavior and identity.

Different from baseline sex, gender is not a dichotomy but a fluent construct around masculinity and femininity (Bussey & Bandura, 1999, p. 683). Indeed, Bem (1974) showed already in the 1970s that gender can at least be separated by the dimensions above and a human's level of androgyny defined in the difference score between masculinity and feminin-ity. Masculinity and femininity are not binary but appear as distributions.

Therefore, society determines which behavior is considered appropriate for males or females and affects, through the process of social learning, psychological sex/gender (Bussey & Bandura, 1999). For instance, the rise in gender equality and a shift in society about the socially desirable traits for women and men has created the demand to update certain items of the BEM Sex Role Inventory (BSRI). Some BSRI items no longer yielded a meaningful difference between masculinity and femininity in women and men due to societal changes (Bem, 1974; Troche & Rammsayer, 2011).

Quite recently, a large number of different gender labels have occurred. Though, in a survey of 19,385 US high school students, participants overwhelmingly identified to be either male or female, with other denominations being used in just approximately one % of all reported gender labels (White et al., 2018). Therefore, pursuing a possible perpetual amount of gender labels strongly conflated with sexual identity appears not fruitful.

Most humans denote their sex/gender identity following their sex (White et al., 2018; Zucker, 2017). However, as the assessed dimensions of BSRI (Bem, 1974; Troche & Rammsayer, 2011) show variation, it becomes clear that gendered attributes are fluent. Biological women can score high in masculinity or be assessed as androgen, feminine, or low in masculinity and femininity. The same is true for biological men. Therefore, psychological sex/gender is best described as having a biological core which might be the strongest predictor of both internal and external gender attribution (Federici et al., 2022). However, as soon as it comes to actual behavior or attitudes, the fluency of gender can be operationalized on the dimensions femininity and masculinity, which are closely related but not identical with the dimensions communion and agency (Bakan, 1966; Bem, 1974; Döring, 2013; Echabe, 2010). From this empirical perspective, it appears most accurate to describe psychological sex/gender as a multidimensional construct. This construct is tied to biological sex but shows variation within the subdimensions of physical sex and is fluent regarding social gender roles. The psychological sex/gender causes stereotypes through external perceptions highlighted with and labeled at an arrow towards gender stereotypes both in Figure 1.1 and 1.5. Though, as stereotypes can have a true, though exaggerated, core (Hilton & von Hippel, 1996; Wühr et al., 2017), there might also be some active contribution in stereotype formation by the individuals targeted by stereotypes. This process is highlighted and labeled with a second arrow in the models.

1.5   A Revised Model for Sex/Gender Differences

Different leading scholars in psychology, as diverse as self-labeled feminist psychologists Alice Eagly (Eagly, 2018; Eagly & Wood, 2013) or David Buss as probably the most prominent evolutionary psychologist (Buss, 2020) have called for a more integrative view on sex/gender and nature/nurture influences on human attitudes, behavior, and identity. The IMSGD of Neyer and Asendorpf (2018) yielded an excellent starting point to structure the processes that underlie psychological sex/gender. Though, the original model needs to be revised, as discussed in the previous sections of this chapter. Therefore, in synthesizing the previous argumentation, a revised version of the IMSGD can be viewed in Figure 1.5.

Figure 1.5 highlights an even greater interplay of different variables than the original model displayed in Figure 1.1. Sexual selection (Darwin, 1871) and a revised placement of hormonal sex (e.g., R. J. Nelson & Kriegsfeld, 2017) within the biological-evolutionary pathway have been added to correct some mistakes of Neyer and Asendorpf (2018). Furthermore, epigenetic influences (e.g., Adkins et al., 2018; Dupont et al., 2009) and pathogen threat have been added. These new paths highlight that not only does the biological-evolutionary pathway affect variables in the social-cultural one, but there is reasonable evidence to assume that environmental variables also affect gene expression and psychological sex/gender. This influence can take place directly as well as through the biological-evolutionary pathway. The relationship between nature and nurture is not unidirectional. Accordingly, Figure 1.5 visually displays the meta-theory of this dissertation, which will be subsumed by more specific theories, if necessary, in the following chapters.

Figure 1.5

The Revised Integrative Model for Sex/Gender Differences (RIMSGD)
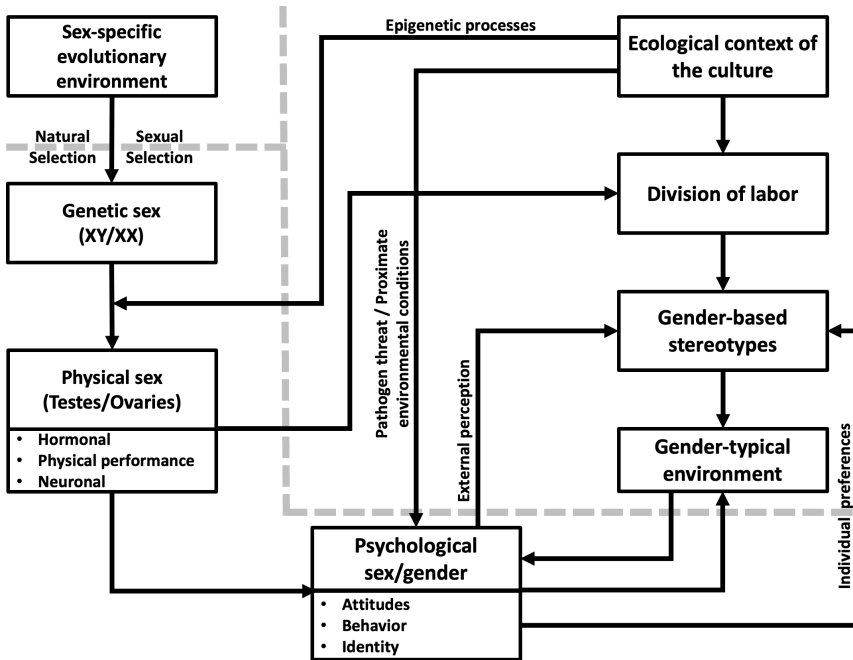
Note. The model is divided into three distinct areas by the grey boundary. The area surrounding the sex-specific evolutionary environment emphasizes the phylogenetic and ultimate causes of psychological sex/gender, as outlined by Tinbergen (1963). The area covering the social-cultural pathway represents ontogenetic causes for psychological sex/gender while including proximate social stimuli originating from the gender-typical environment. The final area is situated within humans and interacts with the other variables according to the displayed pathways.

Chapter 2

Literature Review: Biological-Evolutionary Influences on Sex/Gender Differences in Media Selection, Use, and Effects

The mainstream of media psychology and communication science has neglected the use of biological-evolutionary explanation approaches (Hennighausen & Schwab, 2015; Malamuth, 1996; Schwab, 2010; Sherry, 2004; Weber et al., 2015). This unawareness had drawn persistent criticism from a minority of researchers, starting almost when media psychology was recognized as a distinct field.

Beginning in the mid-1990s, Malamuth (1996) criticized that an exclusive focus on social-cultural variables confined scientific reason to a poor state. The author advocated for the consideration of evolutionary theory in pornography research. Other authors agreed on the basic argument that there is a "nature blindness" not only in pornography but also in general media research (Hennighausen & Schwab, 2015; Schwab, 2010; Sherry, 2004). Indeed, a more or less open-stated blank slate assumption (Pinker, 2003) is still present in large parts of the field. Accordingly, mainstream media psychologists often describe the human mind metaphorically as computer hardware, of which only culture provides the software for (Hennighausen & Schwab, 2015). Apart from some noteworthy exceptions (e.g., Hennighausen & Schwab, 2015; Lange & Schwab, 2018; Schwab, 2010) little is known about potential biological-evolutionary predictors for media selection, use and effects. Much more research has been conducted on social-cultural predictors, even more so when it comes to reasoning about media effects on sexed/gendered behavior, exemplarily for an explanation attempt about the impact of gendered stereotypes on academic performance (e.g., Appel & Weber, 2021).

Nurture-only explanations might be so prevalent in media psychology because the subject was founded when the zeitgeist in social science strongly favored social-cultural explanation approaches (Eagly, 2018; Sherry, 2004; Winterhoff-Spurk, 2007). The field was and still is firmly attached to neo-behavioristic and social learning approaches, which might discuss the possibility of biological-evolutionary influences on human behavior and experiences (e.g., Bussey & Bandura, 1999) but assume the superiority of social-cultural influences (Hennighausen & Schwab, 2015; Winterhoff-Spurk, 2007). Regarding sex/gender differences, even fear exists that the consideration of biological variables might lead to the support of antiquated societal norms or the construction of new norms potentially hostile towards women (L. Ellis et al., 2008; Sherry, 2004). However, this is a moralistic fallacy where it is assumed that an inevitable scientific fact must not be out of moral reasons or that ethical research might create dangerous knowledge and therefore should not be conducted (Davis, 1978; E. C. Moore, 1957). On the other hand, the (fictive) generalization, for instance, that men, due to their on average stronger upper body (Courtright et al., 2013) would be supposed to be the "natural" leaders in society is, of course, a naturalistic fallacy where one impermissibly deducts societal norms from descriptive knowledge. Researchers should be sensitive to both fallacies in their theoretical rationale when they draw conclusions about their research or discuss their data (Davis, 1978; E. C. Moore, 1957; G. E. Moore, 1903; Vollmer, 2002).

As has already been outlined in Section 1.4, every unilateral focus on biological-evolutionary or social-cultural variables will fall short of explaining human sex/gender phenomena, including differences between women and men (Buss, 2020; Eagly, 2018; Eagly & Wood, 2013; Sherry, 2004). The RIMSGD in Figure 1.5 shows that psychological sex/gender differences and other psychological sex/gender associated phenomena can only be sufficiently explained if the whole is considered (Eagly, 2018; Lewin, 1936, 1939). This whole consists of a complex interaction between nature and nurture, or synonymously biological-evolutionary and social-cultural variables. Nevertheless, given the discussed state of research around sex/gender differences in media psychology, it appears reasonable to try to assess which peer-reviewed studies exist that have considered biological-evolutionary predictors for sex/gender differences.

Certainly, no shortage exists of discovered sex differences regarding media selection use and effects (L. Ellis et al., 2008). L. Ellis et al. (2008) published a comprehensive book that aims to list all studies that have reported any sex difference in humans. The authors collected more than

18.000 publications and assumed they might have grasped about half of all published studies that reported sex differences up to that point. They summarized their findings in thematically ordered tables about specific topics (e.g., preferences for cultural artifacts). Regarding sex differences about preferences surrounding communication media L. Ellis et al. (2008, p. 446-449) identified 11 topics:

1. Adolescent girls like to watch more TV compared to boys.

2. Both sexes like male TV characters more than female TV characters.

3. Men prefer adventure/exploration movies and television programs more than women.

4. There are mixed findings about sex differences in the preferences for humor, cartoon, and comedy content.

5. Men use more pornography than women.

6. Women prefer quiz/game shows more than men.

7. Women prefer romantic movies and television programs more than men.

8. Men prefer science/education movies and television programs more than women.

9. Men prefer sports programs more than women.

10. Men show a higher preference for violence in movies and television programs than women.

11. Men display a higher interest in computers and the internet. Especially towards the more technical aspects of computers and the internet than women.

Though, L. Ellis et al. (2008) did not assess if any biological-evolutionary variables were used to explain these findings. The authors listed studies that reported sex differences in their results and did not emphasize the study's theory. Therefore, their publication is rather suited as a source of information for the first research question than as a substitution for this chapter:

RQ 1: How many studies exist that consider biological-evolutionary variables to explain sex/gender differences in media selection, use, and effects?

Apart from merely counting possibly published studies, it is also interesting how potential studies align their theory with the RIMSGD. Further, it might be of scientific value to ask about the broader topic of the respective studies. Therefore, the second and third research questions ask:

RQ 2: How do the studies align towards the RIMSGD?

RQ 3: Which research topics do these studies cover?

2.1 Methods

This literature review is based on two search waves for relevant literature. One was conducted in August 2018, but due to the time that went on until the finalization of this dissertation, another literature search was done in August 2022 to actualize the previously not published results. The following sections will outline the eligibility criteria for studies, the information sources and search strategies, and the management of study records.

2.1.1 Eligibility Criteria

Studies needed to be published in a peer-reviewed journal in the English language to be eligible for inclusion. These comparable conservative criteria had to be applied because considering biological-evolutionary theory in the explanation approach for sex/gender differences is a sensitive issue (L. Ellis et al., 2008). Therefore, it should be done only on the highest scientific standards possible, of which mandatory peer review is a significant contributing factor (D'Andrea & O'Dwyer, 2017). Furthermore, the English language ensures that the article is aimed at an international reconsideration and should be written following international scientific standards. Accordingly, if studies matched the aforestated inclusion criteria, they needed to consider the influence of biological-evolutionary variables in their theoretical rationale to predict any media selection, use, or effect. To make predictions about the influence of biological-evolutionary variables is again a very conservative selector because it excludes any studies that would discuss their data from a biological-evolutionary point of view.

However, fields that use biological-evolutionary variables, like evolutionary psychology, have been harshly criticized for evaluating their ideas in the discussions of gathered data, only (e.g., Gannon, 2002). Indeed, one could expect a high-quality study to formulate assumptions before data collection. Therefore, any studies that considered the effects of variables attached to the EEA (Bennett, 2018; Bowlby, 1969), sexual and natural selection (Darwin, 1859, 1871), genetic sex (Berta et al., 1990; Kashimada & Koopman, 2010), physical sex (e.g., Beltz et al., 2020) including hormonal, physical and neuronal variables as well as epigenetic processes (Lehrner & Yehuda, 2018; Ryan et al., 2016) were potentially eligible for inclusion into this literature review. Figure 2.1 displays potential variables of the RIMSGD.

Figure 2.1

Variables for Study Eligibility of the Revised Integrative Model of Sex/Gender Differences for the Literature Review
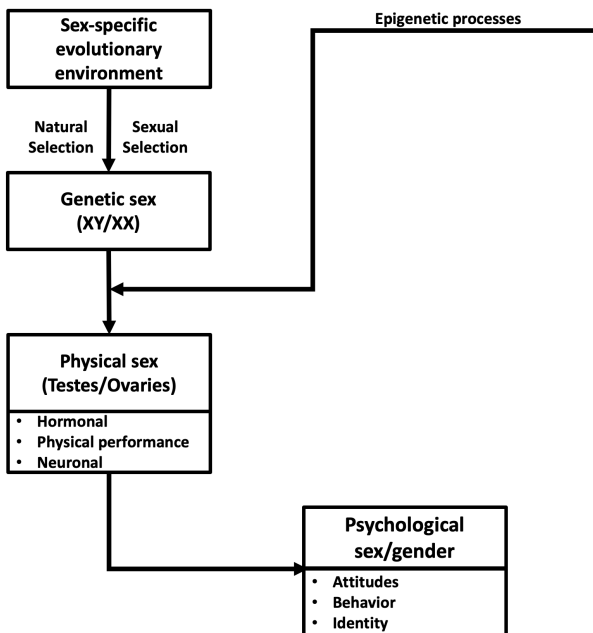
Regarding the time frame, studies will only be included in the review if they have been published no earlier than 2000 and no later than the end of 2021. The year 2000 appears appropriate to start the inclusion of studies because it attaches at the midpoint of time between two significant critiques concerning negligence towards biological-evolutionary variables in different fields of media research (Malamuth, 1996; Sherry, 2004). Malamuth (1996) critique had no major impact as it was later expanded by (Sherry, 2004). The middle ground allows assessing potential reactions to Malamuth (1996). Because Malamuth (1996) criticized media research prior to his publication, it appears not very worthwhile to consider even earlier studies. The end time for inclusion is related to the finalization of this dissertation in early 2023.

2.1.2   Information Sources and Search Strategy

The *SSCI-Database* of the *Science Citation Index* and *PsycInfo* were used for the literature review to get a potentially broad scope of high-quality studies. The SSCI is comparable conservative and lists only high-quality journals. PsycInfo was used to search within psychology itself specifically. PsycInfo is the premier search engine for international psychological research. Finally, studies collected by L. Ellis et al. (2008) were also assessed about a potential fit to the eligibility criteria described above.

Regarding the search strategy for SSCI and PsycInfo, different combinations of search terms were applied, which can be exemplified by the search logic listed below:

(((Media* OR Internet OR Broadcasting OR Publishing OR Television) AND (Sex OR Gender) AND (Natural Selection OR Sexual Selection OR Evolution OR Endocrinology OR Endocrine OR Hormones OR Genes OR Genetics OR Chromosomes OR Epigenetics OR Proximate OR Ontogenesis OR Phylogenesis OR Ultimate OR Testosterone OR Progesteron OR Serotonin OR Estrogen OR Estradiol OR Chromosomes OR Evolutionary Psychology OR Digit Ratio)))

The large number of findings that the above-stated search term and further combinations produced were reduced after each initial search to potentially relevant fields only. These were for the Science Citation Index:

Psychiatry OR Neurosciences OR Biochemistry & Molecular Biology OR Behavioral Sciences OR Psychology Educational OR Psychology Biological OR Neuroimaging OR Psychology Multidisciplinary OR Psychology Social OR Psychology OR Psychology Clinical OR Psychology Experimental OR Clini-

cal Neurology OR Psychology Developmental OR Social Sciences Biomedical OR Reproductive Biology OR Biology OR Biochemical Research Methods OR Evolutionary Biology OR Communication OR Developmental Biology

And for PsycInfo:

Social & Instinctive Behavior OR Sexual Behavior & Sexual Orientation OR Genetics OR Physiological Psychology & Neuroscience OR Psychosocial & Personality Development OR Sex Roles & Women's Issues OR Mass Media Communications OR Linguistics & Language & Speech OR Communication Systems OR Marketing & Advertising

Finally, the reference section of any eligible journal article was assessed to search for potential articles not found by the above-applied search algorithm and further combinations used.

2.1.3   Management of Study Records

Of all studies found and assessed for this review all titles, and if the title appeared promising, the abstracts were read consciously by a human reviewer. If studies appeared suitable, they were read in-depth, and a final decision was made about the respective study's eligibility for the chapter. A flow chart of the study selection process is presented in Figure 2.2. Studies will be reported thematically sorted according to their broad topics and the relevant variables of the RIMSGD in Figure 2.1 below. For comprehensiveness, only key theoretical predictions, small parts of the methodology, and findings of studies will be presented. As this study is a literature review to identify biological-evolutionary predictors of sex/gender differences for media selection, use and effects, no emphasis will be put on the statistical methods of respective articles or articles discussion.

2.2   Results

The flow chart in Figure 2.2 graphically displays the mechanisms and outcomes of the study selection process. Eligible studies will be sorted in line with the RIMSGD, whose relevant parts for this review have been displayed in Figure 2.1.

Regarding RQ1, 39 studies have been found that were published between 2000 and 2021 and which considered biological-evolutionary variables in their predictions of sex/gender differences for media selection, use, and effects. Of these, 31 aligned towards the sex-specific evolutionary environment. One was about genetic sex, and seven dealt with physical sex.

Figure 2.2

Flow-Chart of the Literature Review Regarding Biological-Evolutionary Variables to Predict Sex/Gender Differences for Media Selection, Use, and Effects
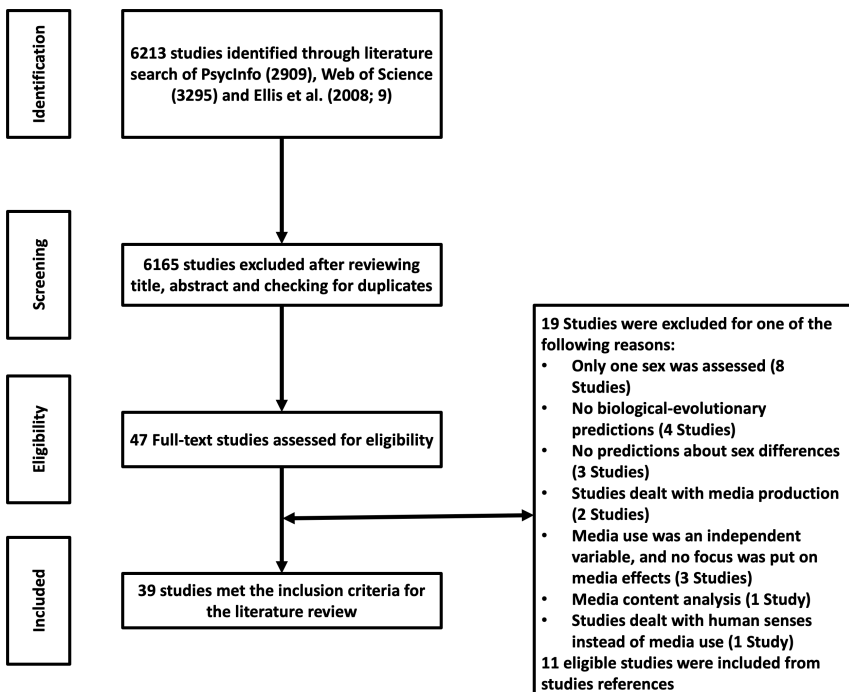
Two studies were based on neuronal sex differences, and five on hormonal sex differences (RQ 2). Below is a detailed overview of the specific research areas and topics that respective studies cover (RQ 3).

2.2.1 Humans Select and Use Media in Accordance to Their Cognitive Adaptations Evolved Through Selective Pressures Originating in the EEA

The first variables of the RIMSGD that have been addressed in practical research about sex/gender differences in media selection, use, and effects are cognitive adaptations that are supposed to have originated from the sex-specific evolutionary environment, which is a subset of the EEA. A significantly often used theoretical framework to argue for such adaptations has been the SST (Buss, 1998; Buss & Schmitt, 1993) as well as the parental investment theory (PIT; Trivers, 1972). However, SST builds upon PIT, and its assumptions are interwoven into SST's argumentation. Accordingly, most studies are about mate choice, whose cognitive adaptations are theorized to affect media selection, use and effects nowadays. In sum, 31 studies ultimately consider the influence of cognitive or behavioral adaptation to predict sex/gender differences in media selection, use, and effects. In the following, these studies are clustered regarding their broader topics and briefly outlined below.

2.2.1.1 Exploring the Potential of Online Dating Advertisements as an Indirect Data Source for Assessing Claims from Parental Investment and Sexual Strategies Theory

This review's largest thematic cluster of studies centers around research that primarily aims to evaluate predictions from SST (Buss, 1998; Buss & Schmitt, 1993) and PIT (Trivers, 1972). The major predictions of these theories are that women will be, on average, more long-term oriented in relationships. At the same time, men will, on average, try to pursue short-term mating strategies more often. Accordingly, women should put, on average, a premiere on a potential partner's resources and traits to acquire these. One's resources might be reflected in the height of financial income, social status, and the degree of assertiveness and extroversion. Furthermore, women will be prone to secure these resources and demand commitment from a potential partner. On the other hand, men should be stronger focused on fertility traits like youth and the pleasing physical appearance of their mate.

Oda (2001) assessed 417 female and 1247 male mating advertisements in a Japanese magazine and hypothesized that women should prefer older men with a high amount of resources most often and be, in general, the choosier sex. Men, on the opposite, were supposed to show a preference for younger aged women compared to their age. Furthermore, the author suspected an interaction between mate value and choosiness for physically attractive females and resource-rich men. Both groups were supposed to express higher demands on a potential partner. The author coded gathered advertisements on the dimensions of physical appearance and health, stature, intelligence, financial and social status, as well as existing family commitments (to have children). Oda (2001) acknowledged that universal mating preferences, as hypothesized by SST, could be detected in advertisements assessed. Men, on average, wished for significantly younger partners than women, and women appeared to be the choosier sex as they made more demands towards a potential mate. Indeed, more physically attractive women made higher demands than less physically attractive ones. Men higher in resources showed no differences in choosiness compared to less wealthy men.

A study by Gil-Burmann et al. (2002) assessed comparable predictions like the ones of Oda (2001) in a Spanish newspaper. The authors collected 7415 dating advertisements published between 1996 and 2000 and assessed the advertisements about physical attractiveness, socioeconomic status, family commitment, sexual fidelity, age requirements, and the presence of tolerance towards children. Gil-Burmann et al. (2002) also counted the number of total traits sought and offered. According to the author's predictions, women, on average, expressed a desire for older men. The age difference was largest for young women and decreased for older women. Men expressed a desire for younger women compared to their age. This age difference increased for older men. Women looked for more traits and, therefore, were supposed to be the choosier sex. The women who wrote the advertisements offered, on average, youth and beauty and searched for resources and status in return. Men, on average, desired these traits and offered their resources and status in exchange.

Pawlowski (2002) got access to the number of replies on 551 dating advertisements placed by males and 617 by females in a local lower Silesian (Poland) newspaper. The authors coded related advertisements about attractiveness, resources, commitment, social skills, height, and weight. Women more often offered physical attractiveness and demanded resources and commitment in return than men. Men more often offered resources compared to women. Positive predictors for replies towards female adver-

tisements were if advertisers had never married, reported less education, were younger, of small height, and were lightweight. For men, positive predictors were being previously divorced, separated, or widowed, having high education and resources, being older, and being tall. These traits account for desirable mating traits for each sex, as supposed by SST.

Dawson and McIntosh (2006) assumed premier attributes in heterosexual mate choice to be physical attractiveness for women. For men, premier attributes should be the ability to provide material resources and to be dominant in social interactions. However, the authors noted that women and men not high in these traits also reproduce. Therefore, the authors assumed that coping strategies exist where a lack of, for instance, attractiveness will be coped with desirable secondary mating characteristics like an upbeat personality. One hundred fifty-one profiles were assessed on Yahoo Personals with a picture and at least five sentences of personal description, including disclosure of their yearly income. The physical attractiveness of the profiles was rated by two raters of the opposite sex and described personal characteristics were coded based on the profile descriptions. Males highlighted secondary mating traits inverse to their reported financial resources. Unlike initial predictions, females advocated secondary mating characteristics independent of physical attractiveness. Only women who actively described themself to be attractive advocated such traits less.

Alterovitz and Mendelsohn (2009) asked if, even after reproductive age, women will still prefer older men and men younger women irrespective of their fertility. Furthermore, men were hypothesized to offer more status-related information than women, while women should be more eager toward status-related information compared to men. To test their hypotheses, Alterovitz and Mendelsohn (2009) assessed online dating ads on Yahoo written by 300 heterosexual women and 300 heterosexual men of different age groups (aged between 20 and 75+ years) and geographical locations in the US. Variables of analysis were the desired age preference between partners and the self, the social status sought and offered, physical attractiveness sought and offered, and selectivity, operationalized as the number of traits sought after. The older men were, the younger their desired partner had to be. Women expressed, up until the age of 74, on average desires towards older mates, which turned only at age 75+ to a desire for a younger partner. Men provided significantly more status-related information than women, independent of age, while women were more eager to demand such traits. Men were also significantly more likely

to request attractiveness, while the percentage of women and men that reported traits of physical attractiveness was not significantly different. Finally, women appeared to be more demanding than men of all ages.

Dunn et al. (2010) assessed preferred partner age differences in online dating between 14 cultures as diverse as Australia, Brazil, China, Indonesia, Kenya, and Ukraine, as well as between the countries with a Christian or Muslim majority population. The authors gathered data from publicly accessible online dating profiles and acquired 22,400 cases. Cross-culturally women and men expressed mating preferences consistent with SST hypotheses (e.g., Buss & Schmitt, 1993). Males looked, on average, for women significantly younger than themself, while women showed a desire for older males. The results of Dunn et al. (2010) strongly cue for a universal focus of men on female traits, signaling high fertility and reproductive value. No evidence was found for Muslim or Christian religious influences to alter these supposedly universal mating preferences.

T. C. Kelley and Hare (2010) coded partner advertisements from AshleyMadison.com, a website framed to be about casual dating for users in existing relationships. The authors assumed that such users could act differently to the mating strategies hypothesized by SST because hypothesized demands towards a partner could have already been satisfied in the existing relationship (Buss & Schmitt, 1993). For instance, women in a relationship might emphasize more on physically attractive partners as their demand for resources could have already been satisfied. For coupled men, T. C. Kelley and Hare (2010) assumed an opposite direction of desires away from physical attractiveness as child rearing might already occur in the existing relationship. To assess these assumptions, the authors analyzed in summary 400 heterosexual dating advertisements of 200 women and 200 men. The results show no deviation between the advertisements of pair-bonded humans compared to singles' advertisements. More pair-bonded men were advertising for partners compared to women, which were more often single despite the framing of the website. Significantly more men searched for casual sex compared to women, which on the opposite, looked significantly more often for long-term relationships. Men were more likely to display themself as wealthy in their advertisements, while women more often searched for a wealthy mate.

Reynolds (2010) aimed to replicate a classical study about personal advertisements. In 1977 long before SST was introduced, Harrison and Saeed (1977) discovered that women were more likely to describe themselves as physically attractive and looked for financial security, commitment, and a partner with an older age compared to men in dating advertisements.

Men more often looked for attractiveness, offered financial security, and wanted a younger partner than women. Reynolds (2010) argued with the plausibility of the previous findings due to SST and empirical research conducted before their replication study. However, they asked if switching from printed advertisements to online dating and changing dating culture might not have impacted these mating preferences. To test this, the authors gathered 350 personal descriptive essays from heterosexual online dating profiles from major online dating services in the US. Three raters coded these regarding different criteria (e.g., offering youth, offering beauty, offering income). Results of Reynolds (2010) replicated Harrison and Saeed (1977). Technological development and cultural change did not impact the above-described sex differences in dating advertisements.

Russock (2011) tried to assess SST predictions about partner preferences between women and men and between hetero- and homosexual daters. The authors analyzed 800 personal advertisements from 9 print and 26 online newspapers in the US, UK, and Canada. Two hundred of these advertisements were from women seeking women, men seeking men, or their heterosexual counterparts. Consistent with SST predictions, heterosexual men searched for physical attractiveness significantly more than heterosexual women. Women, in general, also searched more often for resources than men. Lesbians expressed comparable mate choice preferences to heterosexual men, advocated the least physical attractiveness, and looked for resources less often than heterosexual women. They preferred significantly older partners than heterosexual men but significantly younger partners than heterosexual women. Homosexual men differed not from heterosexual men and displayed comparable mating preferences to their heterosexual counterparts.

J. M. Kelley and Malouf (2013) analyzed 347 heterosexual ratings following blind dates whose results were published in columns of The Washington Post and The Boston Globe, two prominent American newspapers. As blind daters were matched previously, a bias by the newspaper became visible to match younger women with older men. This bias might have led to age difference being no significant predictor of respective blind dates rating what would have been expected due to the previously well-established preferred age difference by sex interaction. As assumed, women appeared more demanding in blind dating as they gave their dating partner lower ratings than their male counterparts.

Miklousic (2017) researched sex differences regarding mate attraction and sexual signaling behavior on Facebook (Buss & Schmitt, 1993). Twenty Facebook profiles (ten female and ten male) were randomly drawn from

a pool of 1386 profiles and rated by 31 volunteers on nine psychological traits. Individual traits were displayed physical strength, access to resources, ambition, social status, intelligence, physical appearance, youthfulness, activity level, and flirtatious behavior (Miklousic, 2017, p. 301). Results showed that females signaled more youthfulness and features of good physical appearance in their Facebook profiles. Men, in contrast, displayed more traits that highlighted access to resources, ambition, and social status. No significant differences were found in signaling intelligence, physical ability, activity level, and flirtatious behavior.

Sevi et al. (2018) investigated how sociosexuality and sexual disgust sensitivity affect sex differences in Tinder usage to aim for casual sex. The authors surveyed 163 Tinder users in the US aged between 18 and 53 years old. Results suggested that sociosexuality and sexual disgust sensitivity affected Tinder usage differently for men and women. For men, both sociosexuality and sexual disgust sensitivity predicted Tinder use for casual sex. For women, sexual disgust sensitivity was not a significant predictor but predicted sociosexuality, which in turn became a significant mediator between sexual disgust sensitivity and tinder use for casual sex. Men were more motivated to use Tinder to search for casual sex, scoring higher on sociosexuality and lower on sexual disgust sensitivity than women.

2.2.1.2 Jealousy, Gossip, and Deception in Social Media Use and Online Dating

A two-study paper by Stieger et al. (2009) researched the effects of sex, age, and appearance deception in online chats. The authors used the SST as a theoretical framework for their research (Buss & Schmitt, 1993). The first study consisted of a structured online interview of $n = 147$ international participants using Microsoft Instant Messenger (Stieger et al., 2009). Both sexes reported they would be more disturbed if a same-sex chat partner had tricked them about her/his actual sex. A second study consisted of an online questionnaire with $n = 454$ participants who already had experience with online deception. A differentiation occurred between the disturbance of the deception categories and whether the deceptive behavior occurred in an everyday chat or a flirt. Women and men were equally disturbed by gender switching, regardless of whether they were looking for a potential partner. However, women were significantly more disturbed by age deception than men, which was even perceived as more severe when done by a potential

mate (in a flirt). The younger the potential deceived were, the more they were disturbed by age deception. No significant sex differences were found in appearance deception.

Guadagno and Sagarin (2010) assume, based on PIT, that men should, on average, react more jealousy to sexual infidelity compared to emotional infidelity (e.g., the partner falls in love with somebody else). At the same time, women should respond with more distress to emotional infidelity compared to sexual infidelity. The authors conducted a questionnaire-based study with 332 undergraduate students about sex differences in jealousy online and offline. As hypothesized, men reported in both contexts to be more jealous if their partner engaged in (cyber-)sex with another person. In contrast, women were more jealous if their partners had an extra-pair emotional bond. However, participants also reported being more jealous in the real world than online.

Toma and Hancock (2010) examined the role of physical attractiveness in profile self-presentation and the use of deception in online dating, relying on SST in their theoretical rationale. The authors predict a sex difference where women might be more deceptive about their physical attractiveness than men. To test their assumptions, Toma and Hancock (2010) recruited a sample of 80 online daters (40 women, 40 men) from four mainstream online dating services (Match.com, Yahoo! Personals, American Single, and Webdate). Participants were invited to the laboratory and confronted with a printout of their online dating profiles. They were asked to disclose the accuracy of their profile statements, and pictures were taken to rate their objective physical attractiveness. Furthermore, height, age, and weight were assessed. Consistent with the assumed sex differences, women engaged in more photographic self-enhancements than men.

According to a study by McAndrew and Jeong (2012) the use of social media is influenced by cognitive adaptations related to intrasexual comparison and competition. Both men and women engage in gossip about same-sex individuals, but women are more inclined towards it. The study surveyed 1,026 Facebook users (735 female) using a questionnaire to assess their website usage behavior. Results showed that women used Facebook more frequently than men and checked other women's pages more often. Additionally, they were more interested in the relationship status of other women and tended to view other women's profile pictures more often than men viewed other men's pictures.

Tifferet and Vilnai-Yavetz (2014) investigated sex differences on Facebook profiles based on evolutionary theory. Accordingly, men were supposed to benefit in mate choice stronger from social status, and women

were supposed to benefit more from appearing as good caretakers. Therefore, the authors assumed more traits of agency to be displayed in male profile pictures (e.g., fewer family photos) and more traits of communion to be displayed in the profile pictures of females (e.g., more family photos) (Bakan, 1966). In sum, 500 Facebook profiles were analyzed by an experienced rater with a coding checklist for traits displaying either agency or communion. In line with the hypotheses, males displayed more status-associated features and risk-taking behavior in their profile photos than women. In contrast, female profile photos more often displayed family relationships and emotional facial expressions. In female profiles, cover photos (on top of the Facebook timeline) were frequently identified to present family members. Moreover, females more often upload cover photos compared to males.

Hudson et al. (2015) researched sex differences in (cyber-)jealousy following different cues on Facebook. Researchers relied heavily on evolutionary theory, including predictions from SST (Buss & Schmitt, 1993) to hypothesize that women would be the, on average, more jealous sex and that the use of different emoticons like a winking smiley towards a respective boy or girlfriend of an opposite sex member would moderate sex differences in jealousy. Men were supposed to express their jealousy in a more aggressive and women in a more emotional response. $N = 371$ participants were instructed to imagine that they borrowed their boy-/girlfriends laptop to check e-mails. The Facebook profile of their imagined boy-/girlfriend on the laptop was opened with an inbox message from an opposite-sex member. The message asked what the boy-/girlfriend would be up to later and either contained a smiley (smiling or winking) or did not. After the stimulus exposure, participants completed an open-ended qualitative question coded for the responses indicated and the extremity of the reactions. Furthermore, participants reported on a jealousy scale. Women reported confiding others and verbally confronting their partner, while men reported acting out more aggressively, indicating to confront their partner and the message sender. Regarding the extremity of reactions, men reacted more extremely in scenarios that included a winking smiley, while women reacted more jealously in scenarios where no emoticon was present. Regarding the jealousy scale, as hypothesized by Hudson et al. (2015), women reported being more jealous than men, independent of the presence of a smiley.

Kolesnyk et al. (2021) tried to shed more light on the prevalence and determinants of deceptive self-presentation in physical attractiveness and personal achievements on social media platforms. Based on evolutionary

theory, the authors assumed that men would be more likely to misrepresent their accomplishments. At the same time, women would be more likely to be deceptive about their physical appearance. The authors assumed the level of gender equality in society to interact with deceptive self-representation. In sum, 12,257 adult participants from 25 countries were assessed from nationally representative panels. Results show that men and women indeed engage in deceptive self-presentation. Women were interculturally more likely to lie about their physical appearance, while men were more prone to lie about their accomplishments. In societies with higher gender equality, the deceptive self-presentation in physical appearance decreased, while it did not affect deceptive self-presentation in accomplishments. Higher gender equality also leads to a drop in sex-atypical deception behavior.

2.2.1.3   Sex Differences in Media-Mediated Information Processing

A study by Grabe and Kamhawi (2006) analyzed sex differences in the response towards differently valenced news. The average news story shows a strong bias toward negative news. This bias is supposed to be caused by journalists (instinct-blind) exploiting the biological-evolutionary "hard wiring" of humans to put a premier of their attention on potential threads to ultimately encounter or avoid these. Furthermore, a male bias in the industry was hypothesized to let predominantly male journalists create content for a male audience which is more prone to negative news. Accordingly, there appears to be a sex difference where more men than women watch the news. To assess their assumptions about a gender bias and a higher male preference towards negative news Grabe and Kamhawi (2006) assigned 75 college students to one of four groups differing in story content, message valence (positive, negative, ambivalent), and story order. Results show that positive news framing benefits the recognition memory of women while men's recognition benefits from negative news frames. No sex difference in recognition occurred in ambiguous framed news.

Kamhawi and Grabe (2008) expanded the findings of the study outlined above of Grabe and Kamhawi (2006) with a follow up-study. They assumed that men are stronger drawn to negative news because they have a stronger behavioral disposition to encounter potential threats compared to women. At the same time, women are more focused on positive news due to cognitive adaptations regarding offspring survival and thread avoidance. The authors assessed 75 participants and presented different positively or negatively valenced news reports varying in length between 10 and 40

minutes in a different order. Furthermore, Kamhawi and Grabe (2008) assessed enjoyment, identification with story characters, and the audience's appreciation of the stories presented. Comparable to the previous study, women tended to avoid negative news and enjoyed negative valenced content less than men. They also were less able to identify with the news report's story characters and were less appreciative of the journalistic effort in this story. Men reported an opposite pattern of behavior.

Grabe and Samson (2011) tested for sex differences in the perception and evaluation of a sexualized news anchor aligning on evolutionary assumptions about attractiveness. Accordingly, men should respond stronger toward visual sexual cues compared to women. Their sample consisted of 390 participants assigned to a sexualized or unsexualized news condition. In the sexualized condition, a 24-year-old, professional, average-weight female news anchor was dressed in a tight-fitting jacket and skirt. This nuanced her waist-to-hip ratio; she wore bright red lipstick and a necklace. In the unsexualized condition, the anchor wore a shapeless and loose-fitting dress to deemphasize the waist-to-hip ratio. She also wore no necklace or lipstick. The anchor was placed in a professional news setting and reported similar local topics in both conditions. Participants watched a respective news sequence and reported about her perceived professionalism and their remembrance of her appearance and the news content. Though men perceived the anchor as more professional in the sexualized condition, they also remembered less news content as their attention was focused on the news anchor's appearance. On the contrary, women remembered the visual appearance and the news content more strongly than men.

In a follow-up study, Grabe et al. (2012) tried to assess if women engage in intrasexual competition with a sexualized news anchor. Based on evolutionary theory, the authors assumed that if cognitive adaptations for the intrasexual competition were triggered, women might tend to derogate a sexualized news anchor more than an unsexualized one and be more derogatory towards a female news anchor compared to men in general. Accordingly, the authors assumed female derogation tactics should have a specific repertoire. This repertoire should consist of indirect ways to express aggression, like questioning the news anchor's physical appearance, professional competence, or personality to devalue her mating relevant traits specifically. 390 participants were assigned to one of the two anchor conditions similar to the one of Grabe and Samson (2011). After exposure to the stimuli, participants were asked to write five descriptive phrases to capture their impression of the anchor. Also, participants were obliged to state the best and worst qualities of the anchor. Comments

were coded if they were derogatory, and if the comment was derogatory, its thematic gist was assessed and categorized. While men showed no difference in derogatory comments between the conditions, women were twice as likely in the sexualized version to make derogatory comments. While no significant sex difference occurred in the unsexualized condition, women also made significantly more derogatory comments compared to men in the sexualized condition. Especially the news anchor's physical appearance was devalued. However, comments centered not on her physical traits but on how she dressed or wore her makeup. Furthermore, her personality was criticized regarding agreeableness, conscientiousness, and emotional stability.

Samson (2018) investigated how sexual cues in the form of sex appeal in advertising affect the information processing of men and women. Based on previous results and evolutionary theory, the author suspects sex to interact with information processing, for instance, regarding the brand recall of an advertisement. The authors displayed 16 advertisements (five with and five without sex appeal, six masking advertisements) to 146 participants (75 women) and assessed different dependent variables like brand recognition and recall. Indeed, a significant sex-by-brand recognition interaction and a sex-by-brand recall interaction occurred. Men recalled and recognized the advertised brands less in the sexualized conditions of the displayed advertisements than women.

2.2.1.4 Sex Differences in the Preferences for and the Use of Video Game Content

Levene and Dickins (2008) examined the evolutionary roots of social dominance orientation (SDO) in the environment of World of Warcraft (WoW). The authors assumed a vital biological-evolutionary component in SDO in which men display, on average, higher levels than women and tried to rule out social-cultural only explanations for this sex/gender difference. The game offered a gender-equal environment where no sex per se dominated the other due to social role expectations. To evaluate these assumptions, Levene and Dickins (2008) assessed $N = 308$ active WoW players (80 women) aged between 16 and 52 years old and surveyed their SDO and two characteristics of their WoW avatar (sex, level). The player's sex was a significant predictor of SDO, with men scoring higher than women. Furthermore, a minor effect of avatar sex was found in a significant ANOVA main effect, a hint for some effect of character sex (players with male characters report a higher SDO).

Violent games are exceptionally competitive and are more often used by men than women (Kasumovic et al., 2015). Respective authors tried to shed more light on the traits of individuals that select and play violent video games from an evolutionary perspective. In the first sample, the authors assessed violent video game use, demographics, and status-related variables (e.g., education) as well as relationship status, state, and presence of children from 467 participants (158 women between 18 and 67 years ($M_{age} = 30.92$ years)) that originated in the US or Puerto Rico. Significant predictors of violent video game use were the male sex, a higher interest to engage in sexuality, and a high mate value. However, the effect of mate value was driven by women who reported feeling like a better mate for a potential male partner if they showed expertise in such video games. Kasumovic et al. (2015) attempted to replicate the gender-by-mate value interaction and also aimed to identify further conscious mating-related motivations for playing violent video games in a second study. They drew another sample of 462 respondents between 18 and 67 years ($M_{age} = 30.68$ years) and reassessed large parts of their questionnaire from study 1 with methodological refinements. Results showed that the male sex, now a younger age, mate value, sexual interest, and a motivation to use violent video games for mating were significant predictors of violent video game use. An interaction between sex and mating motivation but not mate value occurred. This interaction was caused by women who reported playing violent video games to appear sexier and more attractive to a potential male partner. A mediation analysis showed that this also subsequently translated to a higher self-perceived mate value for women.

Palomäki et al. (2016) hypothesized, based on evolutionary predictions about mate selection, that female poker players are more often bluffed upon because men are more eager to represent status and wealth towards women. To assess their assumptions, the authors drew a sample of $N = 502$ participants in an age range from 16 to 67 ($M_{age} = 29.99$ years) who made bluff/do not bluff decisions in four simulated poker tasks against for opponents represented as avatars. These were either entirely male, of mixed gender, or completely female. In line with the assumptions of Palomäki et al. (2016), the all-female avatar table was significantly more bluffed than the male table.

2.2.1.5 Sex Differences in Smartphone and Internet Usage Behavior

Lyle and Sullivan (2007) assumed criminal internet file sharing to be a form of costly signaling (Zahavi, 1975). File uploading is a delinquent behavior that costs time and puts one at risk of litigation, viruses, and hackers. Because women are the more selective sex regarding mate choice, men should more actively use costly signals to attract a mate. Furthermore, men can use costly signals to best other men in intrasexual competition. Lyle and Sullivan (2007) assessed 331 undergraduate participants' (183 women) file-sharing behavior and motives with a multidimensional questionnaire. As hypothesized, the prevalence of file sharing was significantly higher for men than for women. Men spent more time, uploaded more in peers' presence, and were more likely to be identified as uploaders by friends than women. Females were more sensitive about the origins of their downloads but did not recognize a (potential) mating signal associated with uploading.

Veissière and Stendel (2018) wrote a theoretical argument about smartphone addiction and how it is impossible to become addicted to the smartphone itself. Instead, the associated cognitive mechanisms related to social interactions might over-function in the hypersocial context of smartphone use. Accordingly, smartphone and social media use is driven by the evolved, basic human need to be monitored and monitor others. As technology allows for unprecedented ways to outlive these tendencies, human monitoring can become hypernatural with adverse consequences. Veissière and Stendel (2018) predict that women, as the more social sex, might be more vulnerable to hypernatural monitoring, which appears to be plausible given the cited literature by the authors.

Prendergast et al. (2018) argue that women are more sociable than men because sociability fosters women's fitness and increases their desirability as a mate. Because sociability is positively related to trust, women should be more likely to believe in online recommendations than men. Furthermore, as women show a more robust avoidance response towards negative stimuli rooted in traits that ultimately benefit the survival of their offspring, they are hypothesized to be more trusting towards positive recommendations and more distrusting towards negative ones than men. The authors recruited 180 participants (90 women) and randomly assigned these to an authentic restaurant review that was either positive, negative, or mixed. After the treatment, the trustworthiness of the review was assessed with a questionnaire. On average, women showed higher trust in online recommendations but did not trust positively or negatively valenced news differently than men. In a second qualitative study, the author tried to

assess sex differences in the experiences and perceptions of online recommendations. In sum, 15 participants were assessed in an interview. At the core, women appear to trust more recommendations from social networks where than can ask questions and interact socially, while men are more prone to recommendations from expert blogs.

2.2.1.6 Sex Differences in Pornography Use and Effects

Wright and Vangeel (2019) combined predictions from a social learning approach, the $_3$AM model of sexual socialisation (Wright, 2011) as well as evolutionary theory in form of the SST (Buss & Schmitt, 1993). The authors discussed which theory would better explain associations between pornography consumption and sexual permissiveness within and between the sexes. The $_3$AM model describes pornography as a source of social acquisition of sexual scripts, which can be accordingly activated and, with a higher probability, be applied following pornography use. Wright and Vangeel (2019) used longitudinal data between 1990 and 2016 from the General Social Survey (GSS). This ongoing, full-probability US national survey examines the social beliefs and behaviors of residence-inhabiting adults aged 18 or older. Their combined sample size amounts to $N = 21,517$. Men were moderately more sexually permissive than women. In opposition to a mere social learning approach, pornography use did not produce equality in sexual permissiveness, as a mere social learning approach would argue. Instead, there is an interaction between men's higher likelihood to consume pornography, men's, on average, higher permissiveness, and the content of pornography.

2.2.2 Genetic Sex

One study considered a potential interaction between genes and sex causing problematic internet use (PIU) (Li et al., 2014). In China, there exist 4.8 internet-addicted men for one woman, and the authors tried to identify both environmental and genetic influences of PIU to understand its etiology better. The trait of effortful control of one's behavior was assessed as a critical coping variable for PIU. Li et al. (2014) used data from the Beijing Twin Study, which consisted of 825 Chinese adolescent twin pairs (615 monozygotic, 110 dizygotic, 449 female, 376 male). PIU was assessed from the twin and parents' perspectives with a questionnaire for each party. Boys scored significantly higher than girls in measures of PIU. Intraclass correlations in monozygotic twins were higher than in dizygotic ones, indicating an effect of genes. Boys scored lower in the trait of effortful

control compared to girls. For boys, genetic effects accounted for 66% of variation in PIU, while for girls, it was 58 % indicating sex interacts with other genetic factors. Regarding social influences that affect PIU, girls are, on average, more closely monitored in China, and resulting environmental pressures, as well as a higher disposition for the trait effortful control in girls partly due to genetic influences, is supposed to decrease girls' vulnerability for PIU.

2.2.3 Physical Sex

Of the 39 studies eligible for this review, five dealt with hormonal influences, and two dealt with neuronal influences on sex differences in media selection, use, and effects.

2.2.3.1 Sex Differences in Hormone Secretion and Differences in Prenatal Exposure to Androgens Affect Media Selection, Use, and Effects

Hemmeter et al. (2005) assessed sex differences in response to different kinds of VR environments. The authors assessed the cortisol responses of 94 participants (37 women) exposed to a dynamic or static and stressful or control condition. Men react on average with a greater cortisol secretion than women in stressful situations. When participants were exposed to the dynamic and stressful VR environment, participants showed an increase in cortisol partially modified by sex. Though women and men responded with an increase in cortisol in the dynamic, stressful condition, women's secretion decreased in either the mere dynamic or mere stressful condition. For men, cortisol increased in the dynamic VR condition and remained constant in the exclusive stressful condition.

Millet and Dewitte (2007) assumed that a higher brain masculinization caused by more substantial exposure to prenatal androgens might influence the reaction towards an aggressive music video, possibly also interacting with sex. To assess variation in brain masculinization, the authors used digit ratio (2D:4D), a ratio between the length of the index (2D) and ring (4D) finger, which is hypothesized to be related to prenatal androgen exposure with a lower digit ratio being associated with a higher amount of androgens exposed (Manning, 2002). Ninety-six participants (47 men) saw either an aggressive or non-aggressive music video. They completed different aggression measures (trait physical aggression, aggressive reactions towards fictional scenes) and a 2D:4D assessment. 2D:4D was not related to women's trait of physical aggression but men's with a lower 2D:4D, indeed being associated with a higher trait of physical aggression.

Canan et al. (2017) assessed if a lower 2D:4D is related to more problematic and pathological internet use. Furthermore, the authors assumed that there might be an interaction with sex, and men could be more vulnerable if they have a lower 2D:4D compared to women. The authors surveyed 652 students (369 women) from a Turkish university about their problematic internet use. Also, the students' digit ratio was assessed. Indeed, a lower 2D:4D lead to higher problematic and pathological internet use. For men, a low 2D:4D was stronger associated with pathological internet use than for women, with gender being a moderator of the inverse relationship between 2D:4D and pathological internet use.

Müller et al. (2017) also assessed problematic internet use with similar assumptions compared to the ones of Canan et al. (2017). They surveyed 217 participants (140 women) about their problematic internet use and assessed their digit ratio. A lower 2D:4D was again associated with problematic internet use. However, unlike previous research, the effect was driven by the sample's female and not male participants.

Kim et al. (2018) again assessed problematic internet use in a sample of 653 Korean middle school students. Apart from other measures, they assessed the digit ratio of participants. Again, the digit ratio was in an inverse relationship with internet addiction—however, this time only for the male and not the female sample.

2.2.3.2 Neuronal Sex Differences Affect Video Game and Website Uses and Gratifications

Lucas and Sherry (2004) assumed that different uses and gratifications might explain sex/gender differences in video game genre selection and use time. Experiencing challenge, arousal, diversion, fantasy, competition, and social interactions might predict the choice of a specific genre and its usage frequency. Sex/gender differences can occur as men and women differ in the predictors of these uses and gratifications based on differences in the preferences for social interactions, the neuronal architecture (e.g., the on average better male mental rotation capability), and gender norms regarding video games (e.g., computer games are for boys). Lucas and Sherry (2004) assessed game genre preferences and respective uses and gratifications of video game use as described above (e.g., experiencing challenges) and the time played during a typical week of a sample of 544 US college students (313 women and 231 men). Females liked video game content more when it resembled traditional games (e.g., card/dice) and

reported experiencing less of the uses and gratifications in video game play than males. Males preferred physical enactment games (e.g., shooter) and imagination video games (e.g., strategy) significantly more than females.

Stenstrom et al. (2008) explored if sex differences in spatial navigation translate to online website navigation. The authors assumed these sex differences to be caused by selective pressures in the EEA as men are supposed to have been more eager to hunt and, given this to be the case, had to navigate more considerable distances. Women were supposed to have been more eager to collect food and possibly had, on average, in humans' phylogeny to adapt to shorter distances to cover and navigate. These adaptations are supposed to have fostered an Euclidean orientation style that builds on geometric properties in the environment in men nowadays and a more landmark-focused style in women. To see if these styles translate into online search behavior, Stenstrom et al. (2008) created two mock online bookstores and assessed with a questionnaire if the sexes reported differing times and experienced disorientation by accomplishing a given task (finding certain books). The stores were manipulated regarding the navigational structure and either contained book advertisements in deep structured categories (e.g., Homepage/Non-Fiction/Academic and Professional) or wide structured, single-layered categories (e.g., Biology). In sum, 34 participants used both bookshops in random order. Indeed, men reported spending significantly less time on the deeper structured website and less time completing a task than women. No sex difference was found for the more widely structured web store. No significant sex differences were found in the more expansive structured store or regarding the feelings of disorientation.

2.3   Discussion

This review ultimately aimed to evaluate the current journal-published state of research regarding biological-evolutionary predictors for sex/gender differences in media selection, use, and effects. Accordingly, the literature search revealed 39 studies that considered biological-evolutionary variables to predict any of the sex/gender differences of relevance for this review. Regarding the general aim of this dissertation, the research was conducted to acquire possible directions for the following empirical chapters of the thesis.

In the review, the largest cluster of 31 studies was based on assumptions about cognitive adaptations originating in sex-specific pressures of the environment of evolutionary adeptness. The theories most used in published studies appear to be SST (Buss, 1998; Buss & Schmitt, 1993) and PIT (Trivers, 1972). A large subcluster of 13 studies dealt with online dating. The next largest subcluster contained seven studies about jealousy, gossip, and deception in general social media use or online dating, firmly based on SST and PIT predictions. The subcluster about media-mediated information processing contains five studies about sex differences in news and advertisement processing. This subcluster was strongly associated with intrasexual competition, which SST and PIT again inspired. The next three subclusters deal with sex differences in video game content (three studies), differences in smartphone and internet usage behavior (three studies), and one study evaluated sex differences in pornography use and effects from a genuine nature/nurture approach by comparing SST with Social Role Theory (Wright & Vangeel, 2019). Apart from SST and PIT, costly signaling theory was used in one study (Lyle & Sullivan, 2007; Zahavi, 1975). Other researchers that relied not explicitly on these theories pursued a general evolutionary psychological approach most accurately described to be based on the Santa Barbara School (e.g., Cosmides & Tooby, 1994) acknowledging cognitive adaptations causing sex/gender differences in the use, selection or effects of modern media.

Regarding the subsequent primary variable of the RIMSGD, one study assessed assumptions about genetic sex differences and different outcomes of a gene/environment interaction for women and men (Li et al., 2014). Respective studies authors used twin study data of whose sample problematic internet use was also assessed.

Furthermore, physical sex differences affect media selection, use, and effects. This influence occurs through proximate hormone secretion in the form of changes in cortisol levels and the effects of brain masculinization caused by prenatal androgen exposure, measured with 2D:4D (five studies). Finally, two studies dealt with neuronal sex differences ontogenetically associated with brain masculinization.

In summary, relevant theories used in research are SST and PIT, which have been tested through the cultural-independent occurrence of hypothesized traits like, for instance, higher choosiness of women regarding a potential mate. Gene and heritability assessments would be best accessible for a media psychologist by participating in a separate twin study. An especially easy-to-assess predictor whose use has been published in journal-based research appears only to be 2D:4D as a presumed biomarker for brain

masculinization. Figure 2.3 visualizes variables considered so far in empirical published studies that considered parts of the biological-evolutionary pathway of the RIMSGD.

Figure 2.3

Topics Addressed by Studies Eligible for the Review (Highlighted in Black)
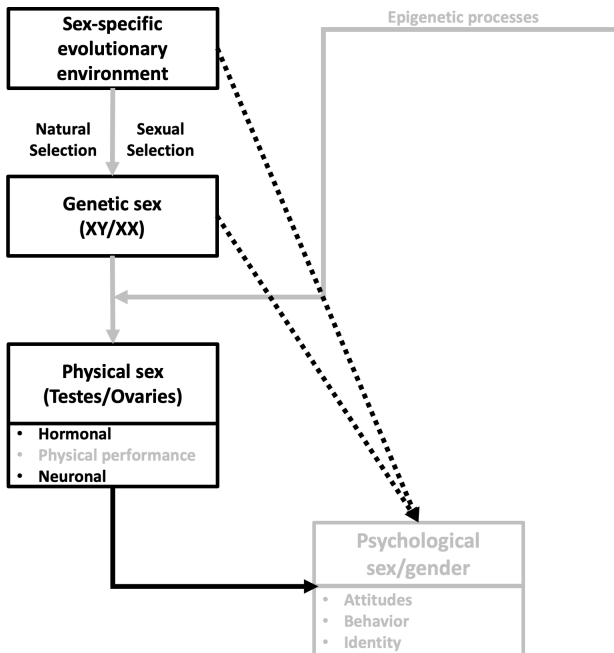
Note. The dotted arrows show the logic of argumentation in the studies about respective variables. It becomes apparent that the studies focused on single topics, which, most often, were correlational related to psychological sex/gender.

The majority of studies in this review have been published by evolutionary psychologists who aimed to evaluate SST and PIT predictions with indirect behavioral data from online dating and partner advertisements. Though not initially assessed, it is still noteworthy that most studies appear to originate not from the research of genuine media psychologists. At best, one could state that research about sex differences is interdisciplinary.

However, when one is honest, it is undoubtedly driven in its majority by evolutionary psychologists, which appear to be only moderately interested in actual media research.

2.3.1 Limitations

This review was conducted with the most scientific rigor possible. Still, it has limitations and shortcomings. The first limitation is that the search algorithm and its deviations are limited in scope. The algorithm used searches for extensive categories of biological-evolutionary predictors with literally spelled types of media channels (e.g., TV). This approach appeared as the best option for approximating media selection, use, and effects. However, the semantic ambiguity in the independent variables and the relative specificity of written-out media channels in the algorithm might have caused that relevant research, for instance, about "slang labeled" media use (e.g., sexting (Buss, 2022)) could not have been detected. Furthermore, relying on the premiere search engines only to search for respective articles (PsycInfo, SSCI-Database/Web of Knowledge) might have led to a narrow perspective that might have caused the further missing of relevant articles. Apart from using more search engines, other ways of the literature search process could have been pursued more extensively. For instance, L. Ellis et al. (2008) contacted every specialist they could find to ask for available studies. They used a far more sophisticated approach in their literature research than the one in this review. However, the book of L. Ellis et al. (2008) has multiple authors, and more human resources were available compared to this review. Nonetheless, L. Ellis et al. (2008) assumed that their pervasive approach enabled them to detect approximately 50 % of all studies published so far. Compared to L. Ellis et al. (2008), most certainly, more than 50 % of published studies were not detected by the reviews' very conservative approach. Though, to the authors best knowledge no studies apart the cited ones exist that deal about the outlined topics.

Another limitation is the mere focus on studies that only made predictions about differences between men and women. Eight studies the literature search revealed appeared, at first sight, to be eligibly dealt with a single-sex only (e.g., Kornhuber et al., 2013; Taylor, 2008). These studies had to be excluded from further review, which narrows the scope of this review.

Finally, the question why this chapter has been a literature review only and not a meta-analysis arises. As this review focused on predictor variables on such a broad topic of media selection, use, and effects, the studies

eligible for this review are highly heterogeneous in their background. The only field that appears mono-thematically enough to pursue a meta-analysis reasonably would be the subcluster around dating advertisements and SST. However, evaluating the SST is different from the aim of this dissertation. Furthermore, many of the SST predictions have already been evaluated with meta-analyses (e.g., Endendijk et al., 2020).

2.3.2 Conclusion and Outlook

A pessimistic conclusion for this review would be that research about biological-evolutionary variables to predict sex/gender differences for media selection, use, and effects has only been conducted in scientific niches. Furthermore, these niches were accidentally created by researchers who are, in the majority, not genuinely interested in media-related phenomena. Instead, researchers wanted to test initially non-media-related theories with indirect behavioral data that occasionally happened to be media content. An outlook for the field would be that, as for SST and PIT, overwhelming evidence has been gathered that the research community's interest might dwindle on biological-evolutionary predictors for media research. The content of this dissertation will most certainly be ignored like the critiques of Malamuth (1996), Sherry (2004), or Hennighausen and Schwab (2015). Research about biological-evolutionary variables might, at best, remain its niche and be pointed out every few years to require more research.

However, the current lack of biological-evolutionary predictors and integrative approaches to better understand media selection, use, and effects can also be described as a blank slate on which scientists can research as much as they desire. It appears that the tide is shifting away from mere social-cultural explanation approaches not only in the view of a few enthusiasts but rather by researchers one can attribute towards the scientific elite in their respective fields (e.g., Eagly, 2018; Endendijk et al., 2020; Wright & Vangeel, 2019). If this change continues, there is a real chance to be a pioneer for work contributing to this shifting zeitgeist in media psychology. Then works like Schwab (2010) or Hennighausen and Schwab (2015) can be appreciated as pioneering contributions for a more holistic view on media-related phenomena uniting biological-evolutionary and social-cultural explanation approaches. The subsequent chapters aim to contribute to this cause.

Chapter 3

The Impact of Sex/Gender on the Use and Preferences of Gangbang and Rough Sex Pornography

Given the results of Chapter 2, integrative research about sex/gender differences has been comparably limited in scope and media contents assessed. If journal-published research exists, it has been driven chiefly by evolutionary psychologists, not native media psychologists. This poor state of research is not caused by a general lack of studies about media selection, use and effects but rather because media psychology's mainstream is still focused on social-cultural predictors and explanation approaches (Hennighausen & Schwab, 2015). Very few studies in native media research used an accurate integrative view that considered both biological-evolutionary and social-cultural theories and predictors (e.g., Grabe et al., 2012; Wright & Vangeel, 2019). However, this lack of research leaves room for pioneering work.

A considerable sex/gender difference in media selection and use is the one about the frequency of pornography use, where men consume, on average, far more pornography compared to women (Martyniuk & Dekker, 2018; Petersen & Hyde, 2010; Price et al., 2016; von Andrian-Werburg et al., 2023). The term "pornography refers to any type of sexually explicit material that has the intent of producing arousal in those who consume it" (Lehmiller, 2018, p. 402). Petersen and Hyde (2010, p. 32) found a weighted average $d = 0.46$ based on two US and one Australian representative, self-report studies (NHSLS, ASHR, GSS) highlighting a higher pornography use frequency of men. Questionnaire-based results about pornography use in Germany (Martyniuk & Dekker, 2018) have been recently replicated with web tracking data (von Andrian-Werburg et al., 2023). In line with previous research, men show a much higher frequency of pornography use in Germany both in self-report and actual behavioral data (von Andrian-Werburg et al., 2023). This chapter will evaluate the

underlying causes for this sex/gender difference regarding some types of pornography from a biopsychosocial perspective as outlined in the RIMSGD (Figure 1.5).

3.1 Previous Explanation Approaches for Sex/Gender Differences in Pornography Use and Their Limitations

From a humanities point of view, the sex/gender difference in pornography use frequency is often explained from a social-cultural perspective only. In a standard narrative, originating in feminist essays, pornography is supposed in its mainstream to be produced for a male audience and supposedly does not depict the sexual interests of women (e.g., Hambleton, 2016; Sun et al., 2008). This underrepresentation of female viewpoints and desires is described as one premier reason for the sex/gender difference in pornography use frequency. Accordingly, advocates of this position often call for producing more female-friendly content and a larger share of female directors in the porn industry. Some very extreme feminist standpoints have argued that mainstream pornography is, benevolently paraphrased, hostile towards women (e.g., Dworkin, 1981). From this viewpoint, pornography use is supposed to facilitate women's objectification, guides its audience to an instrumental approach toward sexuality, and ultimately, normalizes rape. However, when one is looking at actual pornography content, objectification takes place in it but also affects male and not only female actors (Klaassen & Peter, 2015). Accordingly, empirical data does not support the assumption of an exclusive focus on female objectification or a general aim to derogate women in pornography. Though, content differences in pornography can be affected by the sex of the director (Sun et al., 2008). For instance, there are more women-only scenes in female-directed pornography and, surprisingly, more hostile acts toward them. However, a director's sex generally appears to have a minor influence on a movie's content. The most substantial influence is the audience's demand for behavior that reflects its desires and ultimately yields a high monetary reward for the industry (Sun et al., 2008). Regarding the effect of pornography use, it appears not to cause hostility towards women because frequent pornography users hold more gender egalitarian attitudes compared to non-users (Kohut et al., 2016; D. J. Miller et al., 2020; Speed et al., 2021). Ferguson and Hartley (2009) showed an inverse relationship between the availability of

pornography and the actual prevalence of rape in the US. As the availability of pornography dramatically increased, the number of rapes decreased in the assessed timespan. Instead, the aforementioned feminist critique on pornography of being harmful to women and sexuality has recently been criticized because it was not able to provide any significant empirical evidence for its assumptions (Cawston, 2019).

Another societal group that advocates strongly against the use and availability of pornography is the religious conservative. Through its political influence, certain US states labeled the widespread use of pornography a public health crisis (K. M. Nelson & Rothman, 2020). However, from an empirical perspective, its usage frequency follows the pattern of a typical leisure time behavior (Morichetta et al., 2021; Williams et al., 2020). Published longitudinal use patterns show an escapist, at a certain point saturated (Grubbs et al., 2022), nature of pornography use who competes with other leisure time behaviors like watching soccer games (von Andrian-Werburg et al., 2023). Furthermore, pornography use appears not to cause significant adverse effects in the general population (Ferguson & Hartley, 2009; von Andrian-Werburg et al., 2024). For instance, the cause of self-labeling oneself as pornography addicted is not rooted in a highly addictive nature of pornography itself but in a mismatch between an individuals pornography use and her/his own moral and religious standards (e.g., Floyd & Grubbs, 2022; Short et al., 2015).

3.1.1 Sex/Gender Differences in Pornography Content Preferences - An Empirical Perspective

Women and men report the same central reasons to watch pornography (Burtăverde et al., 2021). These are the satisfaction of one's sex drive, being inspired for one's sexual acts, and regulating one's mood and emotions. The sex drive is rooted in human biology (Lippa, 2009). Traits around mating appear to be one of the best-researched areas with strong evidence for sex differences (Buss, 1998; Buss & Schmitt, 1993; Trivers, 1972). Therefore, it is reasonable to suppose that a strong biological component affects the sex/gender differences in pornography use frequency. Men possess on average a higher sex drive (Lippa, 2009), benefit stronger from a short-term mating strategy (Buss, 1998; Buss & Schmitt, 1993), and are more receptive towards visual sexual cues (Rupp & Wallen, 2008). These sex differences might explain parts of the sex/gender difference in pornography use frequency. However, there are not only differences in pornography usage frequencies but also different content preferences.

The first sex/gender difference in content preferences towards sexually explicit material is that women tend to use much more sexual-explicit literature than men (Salmon & Symons, 2004; Salmon & Symons, 2003). However, this literature has to be viewed in its nuances because it overlaps strongly with eroticism, which is different from pornography as it also includes an emotional or artistic component apart from exclusively aiming to cause sexual arousal (Lehmiller, 2018). In women's erotic literature, different genres exist that aim to satisfy female desires towards partner traits and their mating strategies (Kruger et al., 2003; Salmon & Symons, 2004; Salmon & Symons, 2003; Taylor, 2008). For instance, a female protagonist meets an unbound, wild, high-value mate. During the storyline, she catches his devotion and transforms him into a caring partner and reliable potential father. The respective narrative will include the literary description of sexual encounters, but it is, unlike most online pornography, not exclusively focused on these.

When it comes to actual video-based/online pornography, sex/gender differences exist not only in use frequency but also in content preferences (Hald & Štulhofer, 2016; von Andrian-Werburg et al., 2024). Hald and Štulhofer (2016) surveyed the use of 27 different types/genres of pornography (e.g., anal, big boobs) and detected different preference clusters for women and men. In a more comprehensive analysis that additionally considered sexual fantasies and behavior, von Andrian-Werburg et al. (2024) were able to show that women and men report not only different patterns of pornography use but differences in the larger patterns of how women and men live sexuality and fantasize about it. In the author's network analyses, pornography use was not part of network communities (clusters of variables that show a solid relationship) they attributed towards mainstream sexuality. However, non-mainstream communities like the one about BDSM included pornography use that accompanied matching sexual fantasies and behavior. Apart from these findings, compared to research on pornography use frequency, the research about pornography content preferences has been sparse. The first study known to the author that quantitatively assessed different content preferences in modern online pornography was conducted by the previously cited Hald and Štulhofer (2016). Pornography use has and still is in the majority of studies assessed only with different Likert scales or open-ended items measuring, for instance, the general pornography use frequency in an average week per minute (Kohut et al., 2020). Therefore, scientific coverage of a noteworthy sex/gender difference in pornography content preferences has only recently been started (Salmon et al., 2019).

3.1.1.1   **Women's Paradox Pornography Content Preferences**

When women use video-based pornography, most online porntubes (e.g., Pornhub.com) provide, the premier choices of many women aim for pornography depicting different kinds of rough sex. This can include topics of dominance and submission like they are displayed in BDSM genres as well the display of gangbangs (Salmon et al., 2019). Pornhub.com/insights frequently publishes usage trends that show a higher interest of women in gangbang pornography compared to men.

However, these findings appear surprising because such preferences could reasonably be attributed to the male audience of pornography. Based on SST (Buss, 1998; Buss & Schmitt, 1993), one could hypothesize that women should put more emphasis on pornography that yields a broader context depicting a stable relationship and sexual acts about love, warmth, care, and devotion (Salmon et al., 2019). Though, in the typical gangbang setting, this is not the case. The term's meaning might have changed due to modern pornography towards "one girl serving many males in succession" (Partridge & Beale, 1991, p. 445) in a heterosexual context. However, it can also be understood as "a violent multi rape of one female" (Partridge & Beale, 1991, p. 445). For women to frequently use such content appears to be a paradox (Salmon et al., 2019). Therefore, this study aims to put more insight into pornography use preferences centering around rough sex like gangbang or topics about dominance and submission from a sex/gender perspective.

Pornography use is not an isolated phenomenon but part of the more extensive network consisting of (weak) reciprocal relationships between pornography use, sexual fantasies, and behavior (von Andrian-Werburg et al., 2024). Accordingly, women display not only an interest in medial depicted forms of practices one could generally attribute towards rough sex but also actively initiate and engage in related sexual behavior. How rough sex can be defined is still a matter of debate (Herbenick et al., 2021). There are individual differences in which sexual practices account for rough sex for single individuals. Herbenick et al. (2021, p. 1188) assessed two clusters that summarize rough sexual practices: The first one consists of hair pulling, being pinned down, hard thrusting, spanking, throwing someone onto a bed, and tearing someone's clothes off. The second cluster lists biting, being tied up, slapping, choking, scratching, punching, making someone have sex, and other sexual practices to account for rough sex.

Different US probability samples show that most respondents consensually engage in many of the above-listed behaviors with a high rate of enjoyment (Burch & Salmon, 2019, 2022; Herbenick et al., 2021). Subsequently, the aim of these behavior appears not to be to commit violence against a partner (Burch & Salmon, 2019). Instead, practitioners report engaging in rough sex for recreational purposes (Burch & Salmon, 2019). The novelty of particular situations appears to increase the experienced sexual pleasure. In a study by Burch and Salmon (2022), surveying a sample of 734 undergraduate college students, significant predictors for the frequency of initiating consensual rough sex were the female compared to the male sex ($\beta = 0.13$), previous pornography use ($\beta = 0.11$) and the search for sexual novelty ($\beta = 0.38$) but not the desire to commit aggressive acts against a partner ($\beta = 0.07$). In the study of Herbenick et al. (2021), a bisexual orientation and the use of alcohol were significant predictors of engaging in rough sex.

Regarding pornography, Salmon et al. (2019) used a convenience sample that consisted of 155 participants and compared female and male pornography preferences. Different from previous findings published by Pornhub.com/insights, men significantly reported to prefer more pornographic content about gangbangs and threesomes compared to women. In contrast, women compared to men reported a non-significant higher preference for pornography, displaying different BDSM and rough sex practices. A lower preference for gangbang pornography in women than men appears at first sight, contradictory to the finding published by Pornhub.com/insights about women putting a premier interest in such content (Salmon et al., 2019). However, one needs to be aware that men show a much larger interest in pornography in general, and a higher interest of men in a pornographic type/genre does not necessarily have to lead to inferences about women's pornography preferences. Furthermore, the sample size of Salmon et al. (2019) appears underpowered to achieve reliable results. Still, the finding about women descriptively expressing a higher preference towards rough sex pornography like specific BDSM genres compared to men is noteworthy, especially in the light of a generally higher preference of men towards pornography. Furthermore, Salmon et al. (2019) assessed predictors for the preference for gangbang pornography. A preference towards gangbangs was significantly predicted by a participant's infidelity intentions ($\beta = 1.73$, $R^2 = .13$). These were, in turn, significantly predicted by a participant's sociosexual orientation ($\beta = 0.41$, $R^2 = .17$). Other assessed pornography contents were not tested for potential predictors. A closer assessment of the phenomenon is thoroughly needed.

3.1.2   An Integrative Approach towards Sex/Gender Differences in the Use of Rough Sex Pornography

Given the RIMSGD displayed in Figure 1.5, exhaustively discussed in Chapter 1, different predictors come to mind that can be hypothesized to explain parts of the variation of women's and men's preferences towards pornography around gangbangs, BDSM and other rough sexual practices. Previous research has shown that variables related to a fast life history strategy (Roff, 1992; Salmon et al., 2019; Stearns, 1992), as well as a need for sexual novelty, predict such pornography use (Burch & Salmon, 2022).

From the biological-evolutionary pathway of the RIMSGD, the first predictors that appear reasonable to test are indeed different mating strategies pursued by women and men (Buss, 1998; Buss & Schmitt, 1993) as well as variation in life history strategies between the sexes (B. J. Ellis et al., 2009; Figueredo et al., 2014; Roff, 1992; Stearns, 1992; Voland, 2009). A human's sex is the crucial variable to approximate different approaches to life history and sexual strategies and has already been considered in previous research (Salmon et al., 2019). As described in Chapter 1, sex is caused by the gonosom configuration, which leads through sex differentiation to a dichotomy in the reproductive anatomy. Men's and women's specific reproductive anatomies lead to sex differences in hormonal levels like testosterone. These cause either brain femininization or masculinization. The variation in androgens and estrogens generates further changes during the lifespan, including changes in proximate mental and behavioral processes (R. J. Nelson & Kriegsfeld, 2017). To the author's best knowledge, no study has shown the genetic or neuronal bases of SST or life history theory. Bischof-Köhler (2022, pp. 147-148) describes the organic bases for sex differences in parental investment in women having ovaries and being the sex that has to carry out the product of internal fertilization. However, given the overwhelming evidence for, for instance, SST, discussed in previous chapters, it is most reasonable to assume that more complex organic bases of psychological processes exist which are related to sex determination and differentiation. Therefore, sex appears to be a reasonable variable to consider in this study.

Given the previously conducted studies about the use of rough sex pornography (Burch & Salmon, 2022; Salmon et al., 2019), the female compared to the male sex should lead to higher use of respective content. However, not only sex but also the life history stage in its most basic forms of age is a detrimental factor for pornography use (Hill & Kaplan, 1999; Martyniuk & Dekker, 2018; Price et al., 2016; von Andrian-Werburg et al.,

2023). Pornography use increases on average with puberty and gradually decreases as age rises post-adolescence (Peter & Valkenburg, 2016; Price et al., 2016). With increasing age after adolescence, humans gradually switch their focus away from their reproductive efforts onto their offspring's survival and reproduction of their kin (Hill & Kaplan, 1999). Additional variables that approximate an individual's fast or slow life history strategy are the sex drive (Ostovich & Sabini, 2004) and sociosexual orientation (Penke & Asendorpf, 2008) because a strong desire for sex and a variety of different sexual partners supplement a fast life history strategy. Therefore, the first hypothesis assumes:

H1: Biological-evolutionary variables influence the use of gangbang and rough-sex pornography.

H1$_a$: The female compared to male sex predicts the use of gangbang and rough sex pornography.

H1$_b$: A younger, though at least pubertal, age predicts the use of gangbang and rough sex pornography.

H1$_c$: Sociosexual orientation will positively predict the use of gangbang and rough sex pornography.

H1$_d$: The sex drive will positively predict the use of gangbang and rough sex pornography.

Other potentially consequential variables for explaining the use of gangbang and rough sex pornography intersect between the biological-evolutionary and the social-cultural realms. These variables are a troubled upbringing (e.g., suffering sexual abuse in childhood) and delinquent behavior in childhood and youth. Both dimensions have been considered in previous research about aggression to predict violent media use and possibly the enactment of violent behavior (e.g., Ferguson, Cruz, et al., 2008; Ferguson, Rueda, et al., 2008). Variables like the received love by one's parents, as well as adverse influences like physical, verbal, or sexual abuse (Ferguson, Rueda, et al., 2008), originate proximately in the social environment. However, the behaviors themself show (like all human traits (Polderman et al., 2015)) heritability which highlights a biological component in their etiology (Ingram & Luxton, 2005; Isen et al., 2022). Furthermore, the quality of love that parents express towards their children should be strongly associated with their particular life-history strategies (Hill & Kaplan, 1999).

The desire to commit aggressive acts on a partner was not a significant predictor for engaging in rough sexual practices in previous research (Burch & Salmon, 2019). However, pornography use has been described to act as some vent or coping mechanism for unfulfilled sexual desires (e.g., Byrne, 1976). The findings of Burch and Salmon (2019) were related to consensual rough sex and might, therefore, not be true for pornography use. To assess the possibility of pornography being a coping mechanism for unfulfilled aggressive and antisocial tendencies, an aggression research perspective based on the Catalyst Model of Violent Crime (CMVC) appears well suited (Ferguson, Cruz, et al., 2008; Ferguson, Rueda, et al., 2008). Ferguson, Rueda, et al. (2008) argue in the CMVC that actual acts of committed violence, as well as a troubled upbringing, can be a predictor for problematic violent media use. Problematic violent media use consists, according to the CMVC, of a vicious circle between one's violent cognitions that root in a troubled personality and one's violent media use, ultimately altering the way a perpetrator commits violent acts. Translated to rough sex pornography, a user with a disposition to violence might also want to enact sexual violence. This desire can be partially satisfied with pornography, where it is outlived only cognitively. However, a behavior previously encountered in pornography can inspire how a perpetrator conducts an act (e.g., choke or beat a sexual partner, as one has encountered in a previously watched pornography clip). Though, media use is never the cause of violent behavior but rather a disposition to violence which has ontogenetically developed through stressful life events and different (biological-evolutionary) risk factors (Ferguson, Rueda, et al., 2008; Ingram & Luxton, 2005). To assess the behavioral outcome of such stressful life events Burt and Donnellan (2009) separated aggression in childhood and youth into three distinct dimensions, which are physical aggression, rule-breaking, and social aggression. Adding these up to the variables of family conflicts by Ferguson, Rueda, et al. (2008) hypothesis 2 states:

H2: Prevalent family conflicts and juvenile violent and rule-breaking behavior predict the use of gangbang and rough sex pornography.

H2$_a$: Experienced physical violence in childhood positively predicts the use of gangbang and rough sex pornography.

H2$_b$: Experienced verbal abuse in childhood positively predicts the use of gangbang and rough sex pornography.

H2$_c$: Experienced sexual abuse in childhood positively predicts the use of gangbang and rough sex pornography.

H2$_d$: Experienced family love in childhood negatively predicts the use of gangbang and rough sex pornography.

H2$_e$: Conducted physical aggression in childhood and youth positively predicts the use of gangbang and rough sex pornography.

H2$_f$: Conducted social aggression in childhood and youth positively predicts the use of gangbang and rough sex pornography.

H2$_g$: The level of rule-breaking in childhood and youth positively predicts the use of gangbang and rough sex pornography.

A variable that can be more strongly attributed to the social-cultural realm is the sexual socialization of an individual, which attaches in the RIMSGD to the gender-typical environment. Research persistently shows a gender difference in sexual socialization where men are more permissively socialized compared to women and are perceived more positively if they engage in the same sexual behavior than women (Endendijk et al., 2020, 2022; Lottes & Kuriloff, 1994; Prentice & Carranza, 2002; Zaikman et al., 2016). This gender difference is related to a sexual double standard in society that despises permissive female sexuality while it encourages male permissive sexuality (Endendijk et al., 2022). Lottes and Kuriloff (1994) divide the social influence on sexuality into the parent's influence (e.g., if the mother would have felt okay with sex outside of marriage) and the peer influence. The peer influence divides again between a casual approach towards sexuality (e.g., the friends suggest sexually easy dates to each other) and status-associated influence (e.g., men with the most sex are the most highly regarded). Given the previous research, more permissive sexual socialization by the parents might lead to higher use of gangbang and rough sex pornography. More casual and status-associated peer social-ization might also increase the use of rough sex pornography. Hypothesis 3 assumes:

H3: A more permissive sexual socialization will positively predict the use of gangbang and rough sex pornography.

H3$_a$: A more permissive sexual socialization by the parents will positively predict the use of gangbang and rough sex pornography.

H3$_b$: A more permissive sexual socialization by peers will positively predict the use of gangbang and rough sex pornography.

The final hypothesis can be best attributed to psychological sex/gender. Because novelty is a premier drive to engage in rough sex behavior (Burch & Salmon, 2019), the trait of sensation seeking, which includes the search

for novelty, should be considered as a predictor for the use of rough sex pornography (Vallone et al., 2007). Additionally, the Dark Triad (narcissism, psychopathy, and Machiavellianism) (Paulhus & Williams, 2002) might be of relevance as men score on average higher in Dark Triad traits and higher scores accompany a short-term mating orientation (Jonason et al., 2009, 2017). Finally, previous research showed that traits of the Dark Triad are positively related to pornography use (Kasper et al., 2015). Therefore, hypothesis 4 assumes:

H4: Differences in personality affect the use of gangbang and rough sex pornography.

H4$_a$: A higher degree of sensation seeking will positively predict the use of gangbang and rough sex pornography.

H4$_b$: A higher score on narcissism will positively predict the use of gangbang and rough sex pornography.

H4$_c$: A higher score on psychopathy will positively predict the use of gangbang and rough sex pornography.

H4$_d$: A higher score on machiavellianism will positively predict the use of gangbang and rough sex pornography.

3.2 Methods

The data used for the analysis of this section has been initially assessed by von Andrian-Werburg (2017) and von Andrian-Werburg et al. (2024). However, the reanalysis of the data conducted in this chapter is original and has never been published previously. Furthermore, this chapter pursues a Bayesian approach which explicitly allows for the reanalysis of data as long as the data can provide meaningful insights into new hypotheses (for a discussion see: Dienes, 2011). The ethics committee of the Institute Human-Computer-Media of the University of Würzburg evaluated the original research project and expressed no ethical concerns regarding the study.

3.2.1 Sample

The data file initially contained the responses of 1496 participants. All participants who reported being younger than 18 years old or having given wrong answers purposefully were excluded ($n = 38$ participants). For instance, some participants reported being only two years old or commented

in an open-ended questionnaire item not to have responded to the survey seriously. To filter any participants that did not take enough time to consciously report the questionnaire, the fastest 2.5 % of the remaining 1458 participants were screened out ($n = 37$ participants). The average time to complete the questionnaire was approximately 24 minutes, while these participants finished the questionnaire between approximately 4 and 13 minutes. Because sex is seen as a dichotomy in this thesis as described in Section 1.1.2, every participant had to be excluded that did not report to be either of female or male sex ($n = 10$ participants). Previous study results show differences between the pornographic preference clusters of heterosexual and non-heterosexual women and men (Hald & Štulhofer, 2016). The number of homosexual participants was too low to conduct a separate analysis. Therefore exclusive homosexual participants had to be excluded from the sample ($n = 84$ participants). Finally, participants were excluded that did not respond to one of the response variables as outlined in Section 3.2.2.1 ($n = 4$).

$N = 1323$ participants remain in the final sample. It consists of 785 women and 538 men with an average age of $M = 28.91$ years ($SD = 9.63$). Regarding participants' education, 13 participants reported they still attended school, 2 left schools without graduating, 226 held a secondary school certificate, 593 had a high school, and 455 had a university/college degree. 34 participants reported holding a different (and unspecified) kind of degree.

3.2.2 Instruments

A professional translator translated all English scales described in this section into German. She was not informed about the aims and hypotheses of this or the original research objective. This section will only discuss the scales relevant to the hypotheses.

3.2.2.1 Pornography Content Preferences

The data originally included survey responses about all 27 types of pornography developed by Hald and Štulhofer (2016). These types describe different pornography "genres" or categories one will encounter on a porntube like Pornhub.com to preselect topics of pornographic content. These types include categories such as "Amateur", "Oral sex" or "Big breasts". They were introduced in the survey with the question "How often do you watch movies of the following porn categories?" and assessed on a 5-point intensity scale which started with the minimum 1 = *never*, 2 = *rarely*, 3 =

occasionally, 4 = *often*, to the maximum 5 = *always*. Hald and Štulhofer (2016, p. 859) also surveyed types they labeled non-mainstream pornography. Such pornography included "sadomasochism", "fetish (including latex)", "violent sex (including simulated rape, aggression, and coercion)", "bondage & dominance (including disciplining)" and "bizarre/extreme".

Rough sex consists of different sexual practices partially reflected by the above-discussed non-mainstream pornography items. Therefore, the items representing (parts of) rough sexual practices described by Herbenick et al. (2021) were selected. These were "bondage & dominance (including disciplining)", "sadomasochism", and "violent sex (including simulated rape, aggression, and coercion)". Not included were "bizarre/extreme" and "fetish (including latex)" as both "bizarre/extreme" pornography as well as "fetish (including latex)" pornography is not defined per se to include rough sexual practices. However, such practices might be incorporated into rough sex pornography (Lehmiller, 2018). Finally, in line with the findings of Salmon et al. (2019), the category "gangbang (one woman and three or more men)" was considered eligible for further analysis. Items were considered as single response variables because particular types describe behaviors that are, at their core, different from each other and can occur in entirely independent instances (Lehmiller, 2018).

3.2.2.2 Sexual Orientation and Biological-Evolutionary Predictors of Pornography Use

The following section describes the measures for the biological evolutionary predictors for hypothesis 1 or the filter used in the sample description regarding sexual orientation.

Sex and Age. Döring (2013) advocates for a reflected assessment of sex and gender in questionnaires. According to the author, an item surveying sex must be unambiguous, exclusive, and exhaustive. Every participant needs to be competent to understand the item in an equal manner (unambiguous) and be able to choose a single available category (exclusive). Furthermore, all empirical occurring traits need to have a response option on the item (exhaustive). The survey asked for the German term "Geschlecht" which does not differentiate between sex and gender. It offered the response formats of female, male, or "other". Given the previous discussion in Chapter 1, it is exclusive and exhaustive. Though, a minor ambiguity is included in the item because participants were not asked if their response represented their sex or gender. However, from an empirical

perspective, this ambiguity is neglectable. The discussion in Section 1.1.2 highlights that for an extreme majority of the population, sex determines the response towards such a nominal question about sex/gender. Therefore, it appears reasonable to assume that participants reported their respective sex in the questionnaire. As the second essential biological variable, age was assessed with an item that asked how old participants were in years.

Sexual Orientation. Sexual orientation was assessed with a continuous scale ranging from 1 = *exclusively homosexual* to 101 = *exclusively heterosexual* to allow participants to express nuances regarding their inclination towards sexual orientation. Participants were defined as exclusively homosexual if they reported a score of up to 20 and excluded from the analysis as described in the sample description in Section 3.2.1.

Sociosexual Orientation. This study will use global sociosexual orientation to test hypothesis 1, which does not require SOI-R's subdimensions. The sociosexual orientation was assessed with the sociosexual orientation inventory in its revised form (SOI-R, Penke & Asendorpf, 2008). The SOI-R assesses global sociosexual orientation by averaging all nine items and the subdimensions of sociosexuality, which are a person's attitude towards, behavior regarding, and desire for uncommitted sex (3 items each). The attitude items (e.g., "sex without love is OK") are scored on a scale ranging from 1 = *strongly disagree* to 9 = *strongly agree*. The behavior items (e.g., "With how many different partners have you had sex within the past 12 months?") offer a numeric rating scale ranging between 1 = *0 (partners)* to 9 = *20 or more*. The desire items (e.g., "How often do you have fantasies about having sex with someone with whom you do not have a committed romantic relationship?") survey the occurrence frequencies of fantasies about uncommitted sex or the feeling of sexual arousal on a scale between 1 = *never* to 9 = *at least once a day*. The complete list of items, including all scale anchors, is published by Penke and Asendorpf (2008, p. 1135).

Sex Drive. Sex drive was assessed with the Sex Drive Questionnaire (SDQ), which consists of four items that aim to measure the strength of a respondent's sex drive without necessitating the respondent to have an actual sex partner (Ostovich & Sabini, 2004, p. 1257f.). The items ask with a varying amount of response formats:

- "How often do you experience sexual desire?" (1 = *never*; 2 = *less than once a month*; 3 = *about once a month*; 4 = *about once a week*; 5 = *several times a week*; 6 = *daily*; 7 = *several times a day*)

- "How often do you orgasm in an average week?" (1 = *never*; 2 = *1-2 times*; 3 = *about once per week*; 4 = *several times a week*; 5 = *daily*; 6 = *several times a day*)

- "How many times do you masturbate in the average month?" (1 = *never*; 2 = *1-2 times*; 3 = *about once per week*; 4 = *several times a week*; 5 = *daily*; 6 = *several times a day*)

- "How would you compare your level of sex drive with that of the average person of your gender and age?" 1 = *very much lower* to 7 = *very much greater*

Because the items vary in the absolute numerical values with two six- and two seven-point items, items have to be z-standardized before they are averaged (Ostovich & Sabini, 2004).

3.2.2.3 Vulnerabilities and Cues for a Troubled Personality

Hypothesis 2 assumes that different stressful life events and coping mechanisms affect the use of gangbang and rough sex pornography.

The first measure of this life stress is the Family Conflict Scale (FCS, Ferguson, Cruz, et al., 2008). In its original form, it assesses with 49 items specific dimensions of a difficult upbringing and is, in excerpts, part of the available data. The complete FCS includes subscales for sexual and physical abuse, exposure to drug abuse, experienced love from the family, neglect, and failure to provide for basic needs, the degree of value put to education in the family, use of spanking for discipline, verbal abuse and insulting language as well as being a witness of domestic violence (Ferguson, Rueda, et al., 2008, p. 324). The data file contains the use of spanking, verbal abuse, and experienced family love, assessed with their complete list of items. The questionnaire for the initial research project was lengthy, and the other dimensions were not relevant or redundant to the dimensions above (e.g., physical abuse is redundant to spanking). Therefore, specific dimensions were assessed with a single item only.

The thoroughly assessed dimensions reflect a large portion of the variables of relevance for hypothesis 2. Considering the behaviors Herbenick et al. (2021) describe rough sex to consist of, the premier dimension of relevance from the FCS is spanking for discipline. The scale assesses, with four

items, the experience of physical punishment during childhood, without consideration of context or reason (e.g., "One or both of my parents would slap their children in the face"). Furthermore, in childhood, verbal abuse (e.g., "One or both of my parents often told me that they hated me") is a significant environmental stress factor (Ingram & Luxton, 2005). It could also lead to violent media preferences because it normalizes abuse and derogatory behavior (Ferguson, Rueda, et al., 2008). Because pornography has, per definition, a sexual dimension, potential sexual abuse might also be of relevance and had been assessed with a single item ("One or both of my parents engaged in sexual behavior with me"). Finally, the experienced love by one's family should act as a coping factor if the use of gangbang and rough sex pornography has an etiology of possibly clinical concern. All items were assessed on the same scale consisting of 1 = *did not apply at all*, 2 = *did a little apply*, 3 = *did mediocre apply*, 4 = *did mostly apply* up to 5 = *did totally apply*.

The second item-battery available was the 32-item long Subtypes of Antisocial Behavior Questionnaire (STAB, Burt & Donnellan, 2009). It measures delinquency and antisocial behavior in three distinct categories. These categories are physical aggression (10 items, e.g., "felt like hitting other people"), rule-breaking (11 items, e.g., "broke into a store, mall or warehouse"), and social aggression (11 items, e.g., "blamed others"). Participants were asked how often they engaged in each behavior before becoming 18 years old on a scale starting at 1 = *never*, 2 = *hardly ever*, 3 = *sometimes*, 4 = *frequently* to 5= *nearly all the time*.

3.2.2.4 Parents' and Peers' Social Influence on Sexuality

Hypothesis 3 assumes a social influence on the use of gangbang and rough sex pornography. A human's premier sexual socialization instances are the parents and peers (Baumeister & Twenge, 2002). Therefore, the parental and peer sexual socialization scales appear well suited to assess a potential influence on one's pornography usage behavior (PSSSs, Lottes & Kuriloff, 1994). The PSSSs assess parents' and peers' attitudes towards uncommitted sexuality. Parent's social influence is measured with eight items (e.g., "My mother would have felt okay about my having sex with many different people"). The peer's sexual socialization towards a casual approach is assessed on 12 items (e.g., "My friends disapprove of being involved with someone who was known to be sexually easy (reverse coded)"). All items were assessed on the same five-point intensity scale with labeled extremes only from 1 = *strongly disagree* to 5 = *strongly agree*.

3.2.2.5   Sex/Gender and Pornography

Hypothesis 4 assumes an impact of personality on the preference for gang-bang and rough sex pornography. Personality dimensions relevant to the hypothesis are sensation seeking and the dark triad. Sensation seeking was measured with the Brief Sensation Seeking Scale (Vallone et al., 2007). It uses four items (e.g., "I would like to explore strange places"), which are rated on a scale from 1 = *strongly disagree* to 5 = *strongly agree* with labeled extremes only.

The Dark Triad was surveyed with the Short Dark Triad Scale (D. N. Jones & Paulhus, 2014). It consists of the subdimensions machiavellianism (e.g., "It's not wise to tell your secrets"), psychopathy (e.g., "I like to get revenge on authorities"), and narcissism (e.g., "People see me as a natural leader"). All subdimensions are assessed on nine items each which are rated from 1 = *disagree strongly*, 2 = *disagree*, 3 = *neither agree nor disagree*, 4 = *disagree strongly*, to 5 = *strongly agree*.

3.2.3   Data Analysis

The results were analyzed with *R* version 4.2.2. After filtering the sample as described in Section 3.2.1, missing values were imputed using non-parametric random forest imputation with the package *missForest* in version 1.5 (Stekhoven & Buhlmann, 2012). As Table 3.1 and Figure 3.1 will show, the response variables of the following analysis assess behavior that does not follow a normal distribution. Large shares of participants reported having never used the specific pornographic content. Therefore, an ordinal Bayesian regression was applied, which does not require normally distributed data and is suitable to provide reliable results given even the severely skewed distributions of assessed pornography use variables (Bürkner & Vuorre, 2019; Liddell & Kruschke, 2018). In line with the recommendations made by Bürkner and Vuorre (2019), the package *brms* in version 2.18.0 was used to compute respective ordinal regressions. Weakly informative Cauchy priors with a mean of 0 and a scale of 2.5 were applied as advised by Gelman et al. (2008). Bayesian McKelvey-Zavoina R^2 was computed regarding general model fit as described by Gelman et al. (2019) to keep the reporting of the results as comparable as possible to a Frequentist analysis.

All hypotheses were assessed in a single regression analysis for each response variable without block-wise inclusion of predictors. Each variable is, in theory, part of the system of which psychological sex/gender consists. From this perspective, proximate pornography use is the system's outcome

though it can potentially also influence the system as outlined in Chapter 1. Still, many regression coefficients (17 explanatory variables by four response variables equals 68 single coefficients) remain to be tested. In such a context, a Bayesian approach is superior to a Frequentist one as it does, apart from other benefits, not suffer from family-wise error (Dienes, 2011, 2016).

The gold standard for Bayesian hypothesis testing is the Bayes factor (BF) which describes the likelihood of one hypothesis over an alternative one given the prior belief and evidence (data) (Dienes, 2016; Kass & Raftery, 1995; Ly et al., 2016). There are different options for how a BF can be expressed. These are BF_{01} (which reads "H_0 over H_1"), BF_{10} (which reads "H_1 over H_0") or the natural logarithm of the aforementioned two. The logarithmization leads to equal scales above and below a BF = 1 (which would indicate equal evidence for both hypotheses). This uniformization of scales makes plotting for, during the analysis, increasing sample sizes easier. In this section, the BF_{01} will be used because it primarily aims at an audience that received a Frequentist statistical education where smaller values of a Frequentist p indicate a lower α-error probability determining the decision of a discovered effect is significant or not ($p < .05$). H_0 will assume that there is no effect ($B = 0$) and H_1 that a particular predictor has a $B \neq 0$.

To concisely articulate Bayes Factors (BFs), Jeffreys (1961) initially proposed descriptive labels, which were later refined by Lee and Wagenmakers (2013). Specifically, a BF_{01} value of 1 indicates no evidence. Values ranging from 1 to 3 suggest anecdotal evidence, 3 to 10 indicate moderate evidence, 10 to 30 signify strong evidence, 30 to 100 denote very strong evidence, and values exceeding 100 imply extreme evidence in support of H0. Conversely, for H1, a BF_{01} ranging from 1 to 1/3 implies anecdotal evidence, 1/3 to 1/10 indicates moderate evidence, 1/10 to 1/30 suggests strong evidence, 1/30 to 1/100 signifies very strong evidence, and values below 1/100 denote extreme evidence in favor of H1.

Because Bayesian approaches have to rely on simulations (van de Schoot et al., 2021), an often expressed concern, especially by scientists unfamiliar with Bayesian statistics, is that the results might be unreliable based on some mischosen prior or a computing/simulation error. All analyses presented below have also been assessed with a Frequentist ordinal regression. No significant deviations were found regarding the regression coefficient outcomes. However, Bayes Factors are a more conservative approach (and arguably a better one (Wagenmakers, 2007)) compared to p-values as, for instance, they do not overstate the evidence for the null hypothesis (Rouder

et al., 2009). An effect in a Frequentist regression of whose *p*-value was, for instance, just slightly below the significance limit might not be meaningful from a Bayesian perspective. Therefore, BFs can point to different conclusions regarding regression coefficients compared to *p*-values.

Regarding the assumptions of the analyses presented below, the proportional odds assumption held for all variables. Applying standard recommendations about testing for multicollinearity in psychology (Field, 2017, e.g.,) that VIFs (Variance Inflation Factors) below ten are sufficient to suppose that multicollinearity should be no issue affecting results, no concerns regarding multicollinearity arose. Verbal abuse in childhood displayed the highest VIF = 2.33. The average VIF for all variables was 1.65. VIFs remained the same for all regressions as the correlations between the predictors did not change between response variables which appears reasonable, given the shared nature of all response variables. The Bayesian regressions proved stable, the chains converged, and no concerns regarding autocorrelation arose.

3.3 Results

Table 3.1 contains the descriptive statistics of all variables relevant to the analysis. A visual inspection of the response variables distribution is displayed in Figure 3.1. Though the variation of the response variables appears in three to four cases, even for an ordinal approach relatively limited with a $Mdn = 1$ and the median absolute deviation (MAD) = 0, the graphical output shows that there is still enough variation on each variable to reasonable pursue with an approach for variance analysis.

3.3.1 An Integrative Approach on the Predictors of Pornography Use About Bondage & Dominance

Table 3.2 shows the Bayesian ordinal regression's results for the first response variable assessed, which is the use of bondage & dominance pornography.

Hypothesis 1 assumes that the female sex (H1$_a$), a younger—though post-juvenile —age (H1$_b$), a higher sociosexual orientation (H1$_c$), and a higher sex drive (H1$_d$) predict the use of bondage & dominance pornography. Table's 3.2 results show that, indeed, the female sex with very strong evidence and the sex drive with extreme evidence in favor of H1$_a$ and H1$_d$ predict the use of bondage & dominance pornography.

Table 3.1

Descriptive Statistics of the Response and Explanatory Variables (N = 1323)

Variables	$Mdn(MAD^1)$	$Min./Max.$
Response variables		
Bondage & Dominance	1.00(0)	1.00/5.00
Sadomasochism	1.00(0)	1.00/5.00
Violent Sex	1.00(0)	1.00/5.00
Gangbang	2.00(1.48)	1.00/5.00
Explanatory variables		
Sex[2]		
Age	26.00(5.93)	18.00/78.00
Sociosexual orientation	4.78(1.81)	1.00/8.67
Sex drive[3]	0.07(0.71)	-2.65/1.94
Childhood physical violence	1.00(0)	1.00/5.00
Childhood verbal abuse	1.22(0.33)	1.00/5.00
Childhood sexual abuse	1.00(0)	1.00/5.00
Childhood family love	4.00(1.19)	1.00/5.00
Juvenile physical aggression	1.80(0.59)	1.00/4.80
Juvenile social aggression	2.27(0.67)	1.00/5.00
Juvenile rule-breaking	1.27(0.27)	1.00/3.91
Parents sexual socialization	3.00(1.24)	1.00/5.00
Peers sexual socialization	2.75(0.62)	1.00/4.58
Sensation seeking	3.00(0.74)	1.00/5.00
Machiavellianism	2.78(0.66)	1.00/4.89
Narcissism	2.67(0.66)	1.00/4.67
Psychopathy	2.00(0.49)	1.00/4.89

Note. [1]Median absolute deviation, [2]785 women and 538 men (dummy-coded, women = 0), [3]z-standardized.

Figure 3.1

Plots of Response Variables of the Ordinal Bayesian Regression Analysis
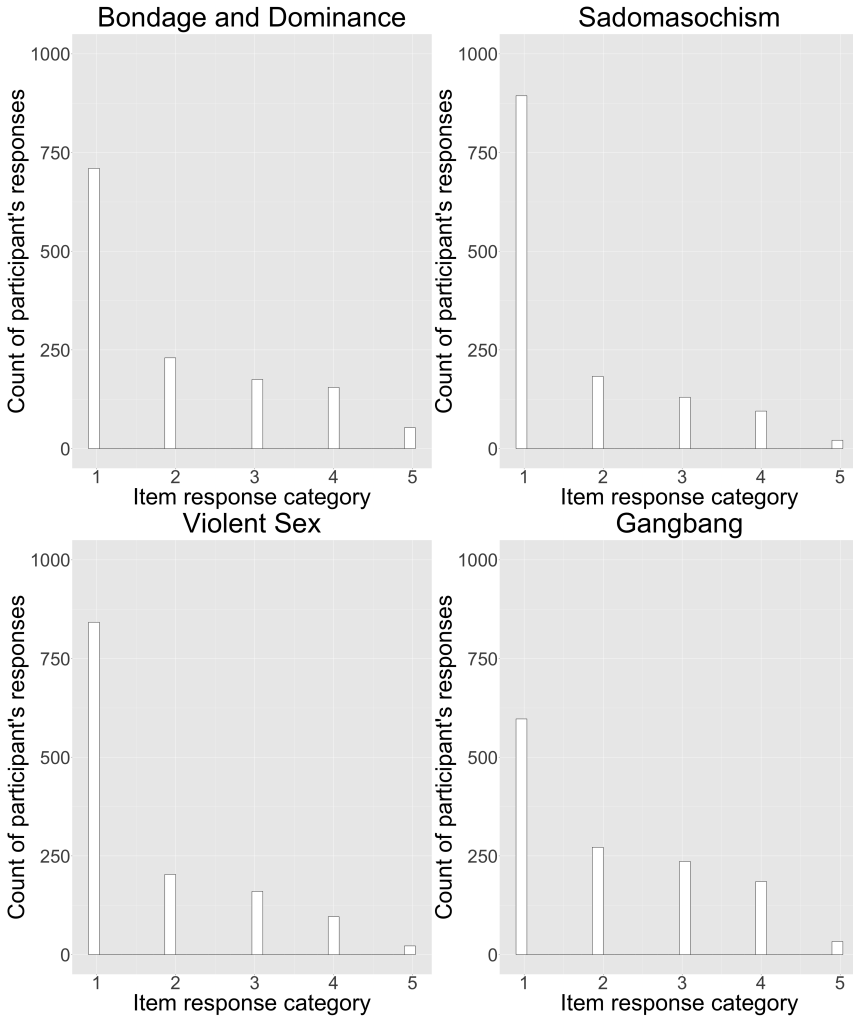
Note. All items were reported on a 5-point intensity scale introduced by the question "How often do you watch movies of the following porn categories?" which started with the minimum 1 = *never*, 2 = *rarely*, 3 = *occasionally*, 4 = *often*, to the maximum 5 = *always*.

Table 3.2

Bayesian Ordinal Multiple Regression to Predict the Frequency of Use of Bondage & Dominance Pornography

Explanatory variables	B	$Est.\ Error\ B^1$	$95\%\ CI^2$	BF_{01}
Hypothesis 1				
Sex[3]	-0.59	0.15	[-0.88,-0.32]	0.03
Age	0.02	0.01	[0,0.03]	18.39
Sociosexual orientation	0.11	0.04	[0.03,0.19]	2.58
Sex drive	0.70	0.09	[0.52,0.88]	< 0.01
Hypothesis 2				
Childhood physical violence	-0.17	0.10	[-0.36,0.02]	8.58
Childhood verbal abuse	0.35	0.13	[0.10,0.61]	0.72
Childhood sexual abuse	-0.05	0.08	[-0.20,0.10]	39.03
Childhood family love	0	0.07	[-0.13,0.13]	53.57
Juvenile physical aggression	0.22	0.12	[0,0.44]	4.59
Juvenile social aggression	-0.18	0.12	[-0.40,0.03]	9.13
Juvenile rule-breaking	0.13	0.17	[-0.21,0.45]	15.07
Hypothesis 3				
Parents sexual socialization	0.10	0.06	[-0.02,0.23]	15.06
Peers sexual socialization	0.24	0.10	[0.03,0.43]	3.06
Hypothesis 4				
Sensation seeking	-0.01	0.08	[-0.17,0.15]	39.81
Machiavellianism	0.17	0.10	[-0.02,0.37]	9.46
Narcissism	-0.15	0.11	[-0.36,0.06]	12.68
Psychopathy	0.10	0.15	[-0.17,0.37]	19.75

Note. $R^2 = .16$, $95\%\ CI^2 = [0.12,0.20]$, [1]Bayesian approximation to $SE\ B$, [2]Bayesian credibility interval, [3]Dummy-coded (women = 0, men = 1).

In the case of the female sex, it is about 97 times more likely that the female sex increases the use of bondage & dominance pornography. In the case of the sex drive, it is more than 100 times more likely that an elevated sex drive increases the use of bondage & dominance content. For the female sex, the effect falls with a probability of 95% between $B = 0.88$ to at least $B = 0.32$. For the sex drive between $B = 0.52$ and $B = 0.88$. Empirical evidence pointed towards age and sociosexual orientation being no predictors the use of bondage & dominance pornography. There is anecdotal evidence in the case of soxiosexual orientation and even strong evidence for an effect of age in favor of H_0.

Regarding hypothesis 2, childhood traumas, received love, and juvenile antisocial behavior are hypothesized to predict the use of bondage & dominance pornography. Apart from experienced verbal abuse (H2$_b$), which according to the data, affects the use of bondage & dominance pornography with anecdotal evidence, the majority of variables appear not to affect the use of bondage & dominance pornography. Respective BFs range between moderate to very strong evidence in favor of H_0.

Hypothesis 3 states that more permissive sexual socialization would increase the use of bondage & dominance pornography. Hypothesis 3 can not be upheld for the media content given BFs between moderate to strong evidence in favor of H_0.

According to hypothesis 4, different personality variables are supposed to affect the use of bondage & dominance pornography. Neither the dark triad nor sensation seeking seems to affect the use of the media content, with BFs ranging between moderate to very strong evidence in favor of H_0.

3.3.2 An Integrative Approach on the Predictors of Pornography About Sadomasochism

Table 3.3 displays the Bayesian ordinal regression's results for the second response variable of interest, which is the use of pornography that displays sadomasochism.

As with the previous section, hypothesis 1 assumes that female sex (H1$_a$), age as described (H1$_b$), higher sociosexual orientation (H1$_c$), and higher sex drive (H1$_d$) predict the use of sadomasochistic pornography. Table's 3.3 results show that the sex drive with extreme evidence in favor of H1$_d$ predicts the use of such pornography. The female sex, age, and sociosexual orientation were no predictors. For these variables, BFs point to anecdotal up to moderate evidence in favor of H_0.

Table 3.3

Bayesian Ordinal Multiple Regression to Predict the Frequency of Use of Sadomasochistic Pornography

Explanatory variables	B	$Est.\ Error\ B^1$	$95\%\ CI^2$	BF_{01}
Hypothesis 1				
Sex[3]	-0.39	0.16	[-0.71,-0.09]	1.32
Age	0.03	0.01	[0.01,0.04]	1.38
Sociosexual orientation	0.11	0.05	[0.05,0.20]	4.48
Sex drive	0.57	0.09	[0.38,0.74]	< 0.01
Hypothesis 2				
Childhood physical violence	-0.21	0.11	[-0.42,0.02]	4.58
Childhood verbal abuse	0.28	0.14	[0,0.56]	0.75
Childhood sexual abuse	0.01	0.09	[-0.16,0.18]	37.76
Childhood family love	0.05	0.07	[-0.09,0.19]	53.57
Juvenile physical aggression	0.28	0.11	[0.04,0.53]	2.04
Juvenile social aggression	-0.01	0.13	[-0.25,0.23]	26.46
Juvenile rule-breaking	0.17	0.18	[-0.19,0.54]	11.83
Hypothesis 3				
Parents sexual socialization	0.05	0.07	[-0.09,0.19]	34.74
Peers sexual socialization	0.10	0.11	[-0.11,0.31]	20.09
Hypothesis 4				
Sensation seeking	0.12	0.09	[-0.06,0.29]	17.11
Machiavellianism	0.14	0.11	[-0.07,0.35]	13.78
Narcissism	-0.17	0.11	[-0.39,0.05]	9.17
Psychopathy	0.12	0.15	[-0.18,0.42]	16.91

Note. R^2 = .15, $95\%\ CI^2$ = [0.11,0.20], [1]Bayesian approximation to $SE\ B$, [2]Bayesian credibility interval, [3]Dummy-coded (women = 0, men = 1).

For hypothesis 2, childhood traumas, received love, and juvenile antisocial behavior are hypothesized to predict the use of sadomasochistic pornography. There is anecdotal evidence for an influence of verbal abuse (H2$_b$). However, most variables appear to not affect the use of bondage & dominance pornography, with BFs ranging between anecdotal to very strong evidence in favor of H_0.

Hypothesis 3 assumes that more permissive sexual socialization increases the use of sadomasochistic pornography. The supposed relationship appears not to take place, given BFs pointing to strong evidence in favor of H_0.

Regarding hypothesis 4, different personality variables are supposed to affect the use of sadomasochistic pornography. However, none of the discussed variables appear to affect the use of pornographic content. BFs are pointing towards moderate up to strong evidence in favor of H_0.

3.3.3   An Integrative Approach on the Predictors of Pornography About Violent Sex

Table 3.4 displays the Bayesian ordinal regression's results for the third response variable, which is the use of violent sex pornography.

Regarding hypothesis 1, female sex, age, a higher sociosexual orientation, and a higher sex drive are supposed to predict the use of violent sex pornography. Table's 3.4 results show that indeed, sex (H1$_a$) and sex drive (H1$_d$) predict with extreme evidence as well as sociosexual orientation (H1$_c$) with moderate evidence the use of pornography about violent sex. Age was, with extreme evidence, no predictor of violent sex pornography.

Hypothesis 2 assumes childhood traumas, received love, and juvenile antisocial behavior to have an effect on the use of violent sex pornography. However, none of the predictors appeared to affect the use of the pornographic media content, with BFs ranging between anecdotal to very strong evidence in favor of H_0.

Hypothesis 3 suspected more permissive sexual socialization to increase the use of violent sex pornography. This relationship appears not to occur, given BFs pointing to strong evidence in favor of H_0.

For hypothesis 4, different personality variables are supposed to affect the use of violent sex pornography. However, none of these appear to have a particular influence. Respective BFs range between anecdotal up to moderate evidence in favor of H_0.

Table 3.4

Bayesian Ordinal Multiple Regression to Predict the Frequency of Use of Violent Sex Pornography

Explanatory variables	B	$Est.\ Error\ B^1$	$95\%\ CI^2$	BF_{01}
Hypothesis 1				
Sex[3]	-0.73	0.16	[-1.03,-0.42]	< 0.01
Age	0.01	0.01	[-0.01,0.02]	306.90
Sociosexual orientation	0.18	0.05	[0.10,0.27]	0.12
Sex drive	0.73	0.10	[0.55,0.92]	< 0.01
Hypothesis 2				
Childhood physical violence	-0.24	0.10	[-0.44,-0.05]	1.82
Childhood verbal abuse	0.19	0.13	[-0.07,0.45]	9.55
Childhood sexual abuse	0.06	0.09	[-0.12,0.22]	30.64
Childhood family love	-0.13	0.07	[-0.27,0.02]	9.16
Juvenile physical aggression	0.22	0.12	[-0.03,0.46]	5.56
Juvenile social aggression	0.07	0.12	[-0.17,0.31]	22.21
Juvenile rule-breaking	0.16	0.18	[-0.19,0.51]	11.57
Hypothesis 3				
Parents sexual socialization	0.12	0.07	[-0.02,0.25]	12.17
Peers sexual socialization	0.08	0.22	[-0.13,0.30]	22.84
Hypothesis 4				
Sensation seeking	-0.07	0.09	[-0.24,0.09]	25.69
Machiavellianism	0.13	0.11	[-0.08,0.34]	14.61
Narcissism	-0.06	0.11	[-0.29,0.16]	25.31
Psychopathy	0.37	0.15	[0.07,0.66]	1.13

Note. R^2 = .22, $95\%CI^2$ = [0.17,0.26], [1]Bayesian approximation to $SE\ B$, [2]Bayesian credibility interval, [3]Dummy-coded (women = 0, men = 1).

3.3.4 An Integrative Approach on the Predictors of Gangbang Pornography

Table 3.5 displays the Bayesian ordinal regression's results for the fourth and final response variable of part one of this study which is the use of gangbang pornography.

Table 3.5

Bayesian Ordinal Multiple Regression to Predict the Frequency of Use of Gangbang Pornography

Explanatory variables	B	$Est.\ Error\ B^1$	$95\%\ CI^2$	BF_{01}
Hypothesis 1				
Sex[3]	-0.12	0.14	[-0.39,0.15]	5.58
Age	0.03	0.01	[0.02,0.04]	< 0.01
Sociosexual orientation	0.20	0.04	[0.12,0.28]	< 0.01
Sex drive	0.48	0.08	[0.32,0.65]	< 0.01
Hypothesis 2				
Childhood physical violence	0.07	0.09	[-0.12,0.25]	5.99
Childhood verbal abuse	0	0.13	[-0.26,0.25]	5.65
Childhood sexual abuse	-0.12	0.08	[-0.28,0.04]	3.17
Childhood family love	-0.05	0.06	[-0.18,0.08]	8.44
Juvenile physical aggression	0.12	0.12	[-0.11,0.35]	3.64
Juvenile social aggression	0.14	0.12	[-0.07,0.36]	2.86
Juvenile rule-breaking	0.03	0.17	[-0.30,0.36]	4.11
Hypothesis 3				
Parents sexual socialization	0.03	0.06	[-0.10,0.15]	10.01
Peers sexual socialization	0.30	0.10	[0.10,0.49]	0.09
Hypothesis 4				
Sensation seeking	0.04	0.08	[-0.11,0.19]	7.95
Machiavellianism	0.07	0.09	[-0.11,0.25]	5.58
Narcissism	-0.03	0.10	[-0.23,0.17]	6.79
Psychopathy	0.02	0.13	[-0.25,0.29]	5.22

Note. R^2 = .18, $95\%\ CI^2$ = [0.15,0.22], [2]Bayesian credibility interval, [3]Dummy-coded (women = 0, men = 1).

Table's 3.5 results show that age (H1$_b$), sociosexual orientation (H1$_c$), and sex drive (H1$_d$) predict the use of pornography about gangbang pornography. The female sex was no predictor as there is moderate evidence in favor of H_0. Again, female sex, age, higher sociosexual orientation, and higher sex drive are supposed to predict the use of gangbang pornography (H1).

Regarding hypothesis 2, childhood traumas and received love, as well as juvenile antisocial behavior, are hypothesized to have an effect on the use of gangbang pornography. Though, there is no evidence for such relationships. All BFs point from anecdotal to moderate evidence in favor of H_0.

Hypothesis 3 assumes that more permissive sexual socialization increases the use of gangbang pornography. Indeed, more permissive sexual socialization through peers increases the use of gangbang pornography (H3$_b$) with strong evidence. An influence of the parents' sexual socialization appears not to be the case given the strong evidence in favor of H_0.

Finally, hypothesis 4 assumes that different personality variables affect the use of gangbang pornography. However, none of the assessed variables appear to affect the use of such pornographic content, with BFs pointing towards moderate evidence in favor of H_0.

3.4 Discussion

The first study of this chapter tried to shed more light on the predictors of the use of rough sex and gangbang pornography from an integrative, biopsychosocial perspective. Rough sex pornography use was operationalized by different types of pornography (Hald & Štulhofer, 2016). It enclosed the mediated display of bondage & dominance (including disciplining), sadomasochism, and violent sex (including simulated rape, aggression, and coercion). Furthermore, the use of gangbang (one woman and three or more men) pornography was tested for the same predictors.

Hypothesis 1 received mixed but consistent evidence for most of its explanatory variables. The most likely predictor of all four assessed types of pornography was the sex drive, which yielded the most decisive BFs on all four response variables. The sex drive assesses, as described in paragraph 3.2.2.2, with two of its four items, the masturbation and orgasm frequency. To masturbate and ultimately satisfy one's sex drive is the premier reason to watch pornography in the first place (Burtăverde et al., 2021; Morgan, 2011). Therefore, a relationship between the sex drive and all four response variables to occur is perfectly reasonable.

Another response variable receiving convincing evidence was sociosexual orientation which predicted the use of violent sex and gangbang pornography. As described in paragraph 3.2.2.2, sociosexual orientation assesses the number of sexual partners, the desire to have uncommitted sex, and the attitude towards such sexual behavior. To be associated with violent sex (including simulated rape, aggression, and coercion) and gangbang

pornography but not with the other two explanatory variables also appears very sound because the predicted variables assess content that shows sexual acts without commitment. This is different from behavior potentially displayed in sadomasochistic and bondage & dominance pornography, which more often might, in reality, take place in some form of a committed relationship with the mantra "safe, sane and consensual" (Lehmiller, 2018, p. 371).

Older age predicted the use of gangbang pornography but not in the way initially hypothesized. This age effect (hypotheses were assessed two-sided) might be related to habituation where older participants could have used pornography for a longer time and subsequently might have progressed towards more extreme content (Love et al., 2015). Previous research shows that the users of extreme content previously watched mainstream pornography and only gradually shifted to more extreme forms of pornography to experience stimulation by novel material (Seigfried-Spellar & Rogers, 2013). However, the period of previous pornography use was not assessed, and the argument remains speculative.

Finally, sex was not a convincing predictor of sadomasochism and gangbang pornography. Therefore, these types appear to be not appalling differently to women or men. However, their use is driven by the afore-discussed predictors like a high sex drive, a high sociosexual orientation, and in the case of gangbang porn, an older age. Given all BFs and effect sizes, it appears that irrespective of sex, a search for novel experiences to maximize one's sexual arousal appears to be the primary cause to use sadomasochistic and gangbang pornography. However, this is different for bondage & dominance and violent sex pornography, where female sex meaningfully increased the use of denominated types. Interpreting these results from a media psychologist's perspective, one could assume that women high in sex drive have progressed towards such extreme types by continued use of pornography. These types could help to still maximize sexual arousal by an excitation transfer of arousal into the sexual realm that was initially caused by an adverse stimulus (e.g., Zillmann, 1971; Zillmann et al., 1972). However, again this interpretation remains speculative at the current point of knowledge.

Hypothesis 2, which assumed specific environmental stressors, received no substantial evidence. Instead, the evidence points towards null effects. Only anecdotal, and, therefore, very weak, evidence ($BF_{01} = 0.72$) was found that verbal abuse positively predicts the use of bondage & dominance as well as sadomasochistic porn ($BF_{01} = 0.75$). Therefore, despite fears of a clinical component of pornography use (e.g., K. M. Nelson & Rothman,

2020), no significant adverse life experiences convincingly predicted the use of the explanatory variables. These results align with recent findings of pornography research highlighting pornography use to be, for the utmost majority of its users, just a normal leisure time behavior (e.g., Grubbs et al., 2022; Morichetta et al., 2021; von Andrian-Werburg et al., 2023). Furthermore, given that interactions exist between pornography use, sexual fantasies, and sexual behavior (von Andrian-Werburg et al., 2024), the findings are also in line with previous research about rough sexual behavior (e.g., Burch & Salmon, 2019, 2022; Herbenick et al., 2021) which showed a rather recreational background for engaging into such sexual practices. The anecdotal evidence for verbal abuse predicting the use of bondage & dominance, and sadomasochistic porn appears neglectable in the light of gangbang and violent sex pornography with BFs of 5.65 and 9.55, indicating for a null effect of these variables.

Hypothesis 3 received, comparable to hypothesis 2, no evidence for any effect except for one explanatory variable. It appears that sexually permissive peers can increase the use of gangbang pornography. Possibly sexually permissive peers can facilitate a casual approach to sexuality which fits potentially well with the discussed impersonal nature of gangbang content. The parents' sexual socialization appears to not influence the use of gangbang and rough sex pornography. On average, there was relatively strong evidence for a null effect for all other response variables.

Finally, results show substantial evidence for a null effect regarding all predictors of hypothesis 4. The assessed personality variables appear not to affect the use of gangbang and rough sex pornography.

Concerning the application of variables assumed to be of relevance for the discussed sex/gender difference by the RIMSGD, Figure 3.2 visually highlights variables in black whose topics are addressed in the study. Age as a representative of an individual's life-history stage attaches to the sex-specific parts of homo sapiens EEA and, theoretically, to physical sex. In contrast, sex, as assessed per self-report, attaches to physical sex (self-description, see Section 1.1.2). However, it is in theory determined by genes (see also Section 1.1.2). Regarding social-cultural predictors, the sexual socialization affected by gender-based stereotypes can be rooted in the gender-typical environment. At the same time, a more or less troubled upbringing can be attributed to the social environment in which the gender-typical environment is a subset. The sociosexual orientation and the sex drive attach, like the Dark Triad and sensation seeking towards the attitudes and behavior traits of psychological sex/gender. Past juvenile aggression might also be best accounted towards the behavior component

of psychological sex/gender. The arrows in black of Figure 3.2 highlight the (in theory) pursued paths of argumentation and theorized causal relationships. As outlined in Chapter 1, all variables attributed to psychological sex/gender have a biopsychosocial etiology.

Figure 3.2
RIMSGD Variables of the First Study About Sex/Gender Differences and Pornography Use
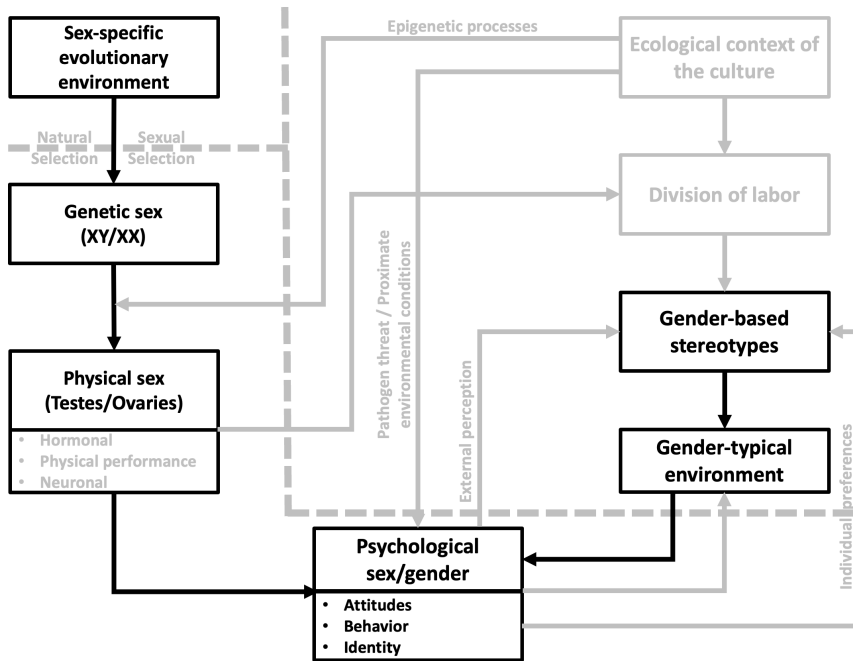
3.4.1 Limitations

This dissertation evaluates different sex/gender differences regarding media selection, use, and effects. The presented study falls short of achieving this aim. It pursues an integrative approach but severely lacks in the operationalization of the RIMSGD, as Figure 3.2 shows. Each topic in the model represents an enormous amount of possible variables to consider, and this study does not even come close in operationalizing these. However,

looking honestly at the scope of Figure 3.2, it becomes apparent that a truly comprehensive operationalization of the RIMSGD will most likely not be possible within social science. For instance, the role of epigenetic mechanisms in pornography preferences would be a subject worth considering but research about them would not be realistically possible without being a trained geneticist or cooperating with one. However, core gender-based variables like BSRI (Bem, 1974) should have been part of the analysis to further nuance the influence of sex/gender. Here, it becomes evident that a reanalysis of existing data at a certain point has disadvantages as it often can not be fully adapted for new research questions. The BSRI was not included in the existing data. Furthermore, the life-history stage was assessed with age only. Better measurements like Mini-K (Figueredo et al., 2014) exist, which, however, were also not included in the data.

Another limitation of this study is a lack of generalizability. Though the sample did not have an exclusively academic background, it still consisted of many young participants with (pre-)academic education. Evolutionary-biological and, therefore, potential cultural-universal variables predicted the largest share of variation in the response variables. However, this still does not mean that the results can be generalized towards participants with, for instance, an older age because these might well be in a different life-phase (e.g., Figueredo et al., 2014; Voland, 2009) caused by, for instance, their menopause, the presence of (grand-)children or effects of senescence.

Finally, the study outlined in this chapter has been questionnaire-based. Questionnaires are an efficient scientific method to quantify a participant's experiences and behavior. However, when it comes to pornography research, the method has recently been criticized because pornography researchers showed a very loose approach towards the operationalization of pornography use (Grubbs & Kraus, 2021; Kohut et al., 2020; Marshall & Miller, 2019). The construct has been measured with various scales and scale anchors (Marshall & Miller, 2019), and the present study is a perfect example of this. It used an arbitrary introduction to the pornography usage measure without providing participants a definition of which media content is considered pornography. This is problematic as Willoughby and Busby (2016) showed that, for instance, participants dependent on their religiosity would perceive different kinds of media content to be pornographic. Furthermore, evidence has been presented that participants can tend to underreport their pornography usage to possibly appear in a more social-desirable manner (Morichetta et al., 2021; Rasmussen et al., 2018). A social-desirability bias might have affected the results of the present study, especially regarding the non-mainstream types of pornography tested. Fi-

nally, because the survey participation was open for everybody above 18 years with an internet access without any form of financial incentive a strong self selection might have taken place towards participants that are interested in sexual topics and, possibly, very sexually active. More data from different sources compared to a convenience sample is needed to add reliability to the studies findings.

3.4.2 Conclusion

The study aimed to assess the etiology of the preference for gangbang and rough sex pornography by pursuing an integrative approach toward sex/gender. The results of the study align well with previous research (e.g., Burch & Salmon, 2019, 2022; Herbenick et al., 2021; Salmon et al., 2019). Female participants reported using bondage & dominance, and violent sex pornography more than men and, to an equal extent gangbang and sado-masochistic pornography. In line with previous research (Burch & Salmon, 2019, 2022; Herbenick et al., 2021; Sun et al., 2008), there appears to be no explanatory variable that would imply a clinical component of gangbang and rough sex pornography use. Instead, hedonistic, recreational motives like the satisfaction of one's sex drive predict the use of such pornographic content (Burch & Salmon, 2019, 2022; Herbenick et al., 2021). The results of this study replicate a null effect for the assumption that pornography use has a clinical component (K. M. Nelson & Rothman, 2020) or that it is a patriarchal tool to oppress women (Dworkin, 1981; Kohut et al., 2016; D. J. Miller et al., 2020; Speed et al., 2021).

Regarding the paradox of pornography use by women, the study's evidence shows that the phenomenon might be resolved by women high in sex drive and sociosexual orientation who use visual pornography in an amount comparable to men. This explanation seems especially plausible for the use of sadomasochistic and gangbang pornography, where the BFs were indecisive or pointed towards a null effect of sex. However, this explanation can not be fully applied to the use of bondage & and violent sex pornography. Given previous research about women's erotic literature (Kruger et al., 2003; Salmon & Symons, 2004; Salmon & Symons, 2003; Taylor, 2008) it should further be considered that the content displayed in these types somehow attaches to women's sexual interests, causing an even higher use of these types for women compared to men. The results match the finding that pornographic content appears more hostile towards women if the movie was produced by a female director (Sun et al., 2008).

Possible explanation approaches for this phenomenon might be that an excitation transfer in women interacts with a habituation effect, causing women to use (and produce) more of such extreme content dealing with violent sex compared to men (Love et al., 2015; Zillmann, 1971; Zillmann et al., 1972). Similarly, a fast life-history strategy of these women might still be plausible to explain parts of such pornography use. However, evaluating this assumption requires more research as a proper measure for a fast life-history strategy was not part of the study. Finally, at the current level of assessment, it can not be ruled out that some core-gender variables like sex roles (Bem, 1974) might also explain more parts of variation in the preference for the particular types of pornography. More research is thoroughly needed.

3.5   A Follow-Up Study About Women's Use of Bondage & Dominance and Violent Sex Pornography

The results of the previous study showed that the female compared to the male sex is—with convincing evidence—a predictor for the use of bondage & dominance as well as violent sex pornography. This finding is in line with published research showing that women report a higher interest in rough sex, both in pornography and sexual behavior, compared to men (Burch & Salmon, 2019, 2022; Herbenick et al., 2021; Salmon et al., 2019). However, sex was no predictor for sadomasochistic or gangbang pornography replicating the findings of Salmon et al. (2019). From the sex/gender perspective this thesis pursues, it is fascinating that women reported using even more bondage & dominance as well as violent sex pornography compared to men. The null effects regarding the sex difference for using sadomasochistic and gangbang pornography can be explained by a minority of women high in sex drive who use a comparable amount of pornography compared to men. However, this explanation does not fully apply to the other two types. More research is needed regarding the use of bondage & dominance, as well as violent sex pornography, and the focus will rest on these types for the remaining chapter. Furthermore, only women (as operationalized throughout this thesis) will be researched because respective types of pornography seem to have a unique appeal to at least a minority of them. From an evolutionary-biological point of view, as described by the particular pathway of the RIMSGD, the discovered sex differences could indicate that the content displayed in bondage & dominance and violent sex pornography might somehow attach to a female (minority) mating strategy, possibly

attached to a fast life-history strategy. In general, biological-evolutionary predictors like the sex drive had the most substantial and most plausible effect on the use of assessed types of pornography. However, a strong sex drive might only indicate a fast life history strategy. Different life history variables like age, and life stress variables, like experiencing abuse in childhood or showing delinquent behavior during puberty, were assessed, tested, and subsequently showed a null effect. However, the measurement of life stress and a potentially resulting fast life-history strategy (Figueredo et al., 2014; Voland, 2009) can still be refined. Therefore, a better measurement of life history strategy should be assessed to out rule this conclusion. The Mini-K scale (Figueredo et al., 2014) has been developed to assess a fast or slow-life history approach and will be, apart from sex drive, included in the upcoming hypothesis. Furthermore, the early onset of menarche is predicted by different stressful life events (Yermachenko & Dvornyk, 2014). The menarche is a critical component of female maturity and has a detrimental impact on female sexuality (Schwarz & Hassebrauck, 2006, 2008). Therefore, the time of its onset should also be considered from a life-history perspective. Hypothesis 1 of this study assumes:

H1: Biological-evolutionary variables will predict women's use of bondage & dominance as well as violent sex pornography.

H1$_a$: The sex drive will increase the use of bondage & dominance as well as violent sex pornography.

H1$_b$: A faster life history strategy will increase the use of bondage & dominance as well as violent sex pornography.

H1$_c$: An earlier onset of menarche will increase the use of bondage & dominance and violent sex pornography.

An alternative explanation, as outlined above, would be that the de facto minority of women (Price et al., 2016; von Andrian-Werburg et al., 2023) high in sex drive who uses visual pornography requires ever-novel content still to experience sexual arousal (Love et al., 2015). Therefore the previous timespan the minority of women has used pornography might be a predictor of the use of bondage & dominance as well as violent sex pornography. Accordingly, hypothesis 2 states:

H2: A longer timespan of previous pornography use will increase the use of bondage & dominance as well as violent sex pornography.

Finally, a limitation of the previous study was that even though it included specific social-cultural predictors of pornography use, like the parents' and peers' sexual socialization, it lacked a proper operationalization of the outcomes of these social influences. Following the social-cultural pathway of the RIMSGD, different social influences are theorized to impact the development of gender roles and other gendered behavior, which for instance, influence how dominant (male gender role) or submissive (female gender role) humans behave in social interactions (Bem, 1974; Bussey & Bandura, 1999). The expression of respective gender roles might also influence women's preferences towards types of pornography about dominance and submission. Furthermore, despite different studies showing that pornography users hold more gender egalitarian attitudes and that pornography appears not per se to be hostile towards women (Klaassen & Peter, 2015; Kohut et al., 2016; D. J. Miller et al., 2020; Speed et al., 2021) it remains questionable if this applies to all sex/gender-associated attitudes. Different beliefs about so-called rape myths (Schwendinger & Schwendinger, 1974) exist, potentially internalized by women themself. These myths are empirically incorrect but persistently reoccur. They assume that rape often happens with at least some consent or implicit invitation by the victim or that men have uncontrollable sexual desires that must be satisfied. Such myths act as a societal justification to commit violence against women (Gerger et al., 2007). Given the assessed pornographic content, such myths appear as a reasonable predictor to test for particular types of pornography. Therefore, hypothesis 3 assumes:

H3: The outcome of societal influences will predict women's use of bondage & dominance as well as violent sex pornography.

H3$_a$: The masculine gender role will affect the use of bondage & dominance as well as violent sex pornography.

H3$_b$: The feminine gender role will affect the use of bondage & dominance as well as violent sex pornography.

H3$_c$: The belief in rape myths will affect the use of bondage & dominance as well as violent sex pornography.

3.6 Method

The data used for the following analysis originates from a multi-purpose survey that aimed to advance the findings of the previous study outlined in this chapter, apart from other purposes as disclosed in the introduction. The results are original and have not been published prior to this dissertation. The mulit-purpose survey was approved by the ethics committee of the Institute Human-Computer-Media.

To address the limitations of the previous study, no convenience sample was recruited. The questionnaire was distributed online to a market research panel, and participants received payment for the study. This approach was pursued to get a broader, more representative age and education range in the sample. Furthermore, a less strong self-selection bias was assumed to have taken place. Due to ethical obligations, participants could still refuse participation in the study. However, they received a different kind of incentive for participation, which should have mitigated a bias toward participants curious about sexual topics.

3.6.1 Power Analysis and Target Sample Composition

Because the research project aimed at multiple purposes, a Frequentist power analysis was conducted. A Bayesian approach does not suffer from the same limitations regarding power as the uncertainty in its results becomes larger when the empirical evidence (the sample size) gets weaker (Wagenmakers et al., 2008). Therefore, it is a more suitable approach to deal with more diminutive sample sizes and should work well with a sample size determined for a Frequentist analysis.

The target sample size was determined for a multiple linear regression. The analysis was assumed to be the premier approach for Frequentist hypothesis assessment in the multi-purpose study. Using *G*Power 3.1* (Faul et al., 2007, 2009), power was computed for a two-tailed test regarding the single regression coefficients. The lower threshold for a small effect (f^2 = .02) with a power of .95 (α = .05) was used to aim to detect any, if only slightly meaningful, predictors. The analysis yielded a target sample size of 652 participants (Cohen, 1988). However, as these were very conservative assumptions, the final sample size was decreased to 600 participants due to cost issues. A sample size of N = 600 still surpasses by far the required size to detect the specific lower threshold for a small effect with the minimal permissive power of .80, which would result in a target sample size of N = 395 given the other parameters to be constant.

To achieve at least an approximation of the composition of age and education of women in Germany, the eligibility criteria to participate in the study were adjusted onto five age groups (18 to 24, 25 to 34, 35 to 44, 45 to 54, and 55 to 69 years) and three levels of education (low, average and high) by using that last available data of 2017 micro census in Germany (e.g., Destatis, 2018). The last age group consisted of a more extensive age range (55 to 69 years) as women in the respective group are supposed to use the smallest amount of pornography and have the largest share of non-users (Martyniuk & Dekker, 2018; Price et al., 2016). Therefore a more prominent focus was placed on women at a younger age, where pornography use appears to be a phenomenon of far more empirical relevance. The quota calculations yielded the following target sample distribution as displayed in Table 3.6.

Table 3.6

Age and Education Quota for the Panel Sample

Age group/Education	Low	Average	High
18-24 years	11	22	34
25-34 years	21	36	64
35-44 years	26	42	50
45-54 years	40	67	48
55-69 years	50	55	34

Regarding Table 3.6, participants were rated to have a low education when they reported having left school without a degree or holding up to a certificate of secondary education (in Germany: Hauptschulabschluss), to have an average education if they held a secondary school certificate (in Germany: Realschulabschluss), and to be highly educated if they held at least a high school diploma that entitles for entry into a college/university (in Germany: Abitur).

3.6.2 Sample

Due to the sampling procedure, the questionnaire had to be sent out to more participants as they would be eligible. A quota check was implemented at the beginning of the questionnaire resulting in a screen-out if the participant was not eligible (e.g., if he was male or if the quota had already been completed). In summary, this process caused the questionnaire to be offered to 1646 potential participants, of whom 600 took part in the survey. To keep sexual orientation comparable to the previous study, participants who

reported being exclusively homosexual were excluded from the analysis (20 participants). Furthermore, one participant did not report her sexual orientation and was also excluded. These filters yielded a final sample size of $N = 579$ women with an average age of 43.25 years ($SD = 13.85$ years). Of these, 145 reported holding a certificate of secondary education, 213 reported holding a secondary school certificate, and 221 reported holding at least a high school diploma. The final sample composition is displayed in Table 3.7. A minor deviation from the target quota occurred due to technical limitations (e.g., two participants starting the questionnaire approximately simultaneously and surpassing the original quota).

Table 3.7
The Age and Education Distribution of the Panel Sample (N = 579)

Age group/Education	Low	Average	High
18-24 years	12	22	33
25-34 years	20	35	59
35-44 years	29	43	53
45-54 years	37	63	46
55-69 years	50	55	35

3.6.3 Instruments

This section will only discuss the scales relevant to the hypotheses. All scales used had been translated from English to German in previous research projects by a professional translator or were available in an official German translation.

3.6.3.1 Pornography Use

To compensate for the limitations of the pornography use measure used in the previous study, participants were initially provided with a definition of pornography. Accordingly, for media content to be considered pornographic, it should display sexual behavior with the primary aim of causing sexual arousal in recipients (von Andrian-Werburg, 2017). A single ordinal item followed the definition, which assessed the frequency of general pornography use. Only if participants reported using pornography at all the items for bondage & dominance and violent sex (including simulated rape, aggression, and coercion) were surveyed besides other types of pornography (Hald & Štulhofer, 2016). At first, participants were asked if or if not

they used the particular types. If they reported doing so, they could write down how many minutes they estimated to watch respective types in an average week. This yields a response format of 0 = *no use* and 1 = *use* for the response variables in the upcoming analysis.

Regarding the measure of previous frequent pornography use, participants were asked a single question: "Since how many years do you use pornography regularly?". Subsequently, they were given an open response format to report respective years.

3.6.3.2 Sex Drive, Menarche, and K-Factor

The sex drive was assessed with the same instrument outlined in Section 3.2.2.2, and the resulting scale was computed with the same procedures.

Menarche was assessed with two items asking for the age in years (first item) and months (second item) as it took place. The months were divided by 12 and summarized with the reported years to obtain the age of menarche in years.

The "speed" of participants' life history strategy or the K-factor was assessed with the Mini-K, a short form of the Arizona Life History Battery (ALHB) (Figueredo et al., 2014). The Mini-K consists of 20 items (e.g., "I often get emotional support and practical help from my blood relatives."), measured on a seven-point intensity scale with numerical anchors and three labels at the extrema and the midpoint of the scale. Respective labels were: -3 = *Disagree Strongly* to 0 = *Don't Know/Not Applicable* up to 3 = *Agree Strongly*. Despite its displayed numerical anchors, the Mini-K was technically measured on a scale ranging from 1 to 7 and entered the data in this form.

3.6.3.3 Sex Roles/Gender

The sex roles were measured with the premier instrument of assessing gender (Döring, 2013), the BSRI (Bem, 1974) in its revised German form (BSRI-R Troche & Rammsayer, 2011). As outlined in Chapter 1, a societal and possibly ecological development, the societal expectations towards gendered behavior have changed since the introduction of the BSRI. Based on that development, the sexes show no longer meaningful differences on the original scales. Therefore, Troche and Rammsayer (2011) assessed different socially desirable traits for women and men nowadays and included these in the BSRI scales. Furthermore, the authors dropped the items from the original measure that no longer yielded a meaningful difference in societal expectations toward women and men. The BSRI-R uses 15 items

each to assess the feminine (e.g., "Eager to soothe hurt feelings") and masculine gender roles (e.g., "Willing to take a stand"). The items were rated on a seven-point intensity scale with labeled extremes beginning at 1 = *Doesn't apply to me at all* to 7 = *Applies full and all towards me*.

3.6.3.4   Rape Myth Acceptance

The degree of acceptance of rape myths was measured with the modern myths about sexual aggression scale (Gerger et al., 2007) in its short form consisting of 9 items (Süssenbach & Bohner, 2011). The items provided different statements (e.g., "A lot of women strongly complain about sexual infringements for no real reason, just to appear emancipated") concerning such myths. Participants reported their acceptance grade on a four-point intensity scale with labeled extremes only, beginning with *Do not agree* and ending with *Do strongly agree*.

3.6.4   Data Analysis

The data analysis was done with the same basic procedures outlined in the previous study. Again *R* version 4.2.2 was used for computing the analyses. Missing values were imputed with a non-parametric random forest imputation as described in Section 3.2.3. Because the response variable differentiates only between use (=1) and non-use (=0), binomial-logistic Bayesian regressions were computed with the package *brms* in version 2.18.0. Weakly informative Cauchy priors with a mean of 0 and a scale of 2.5 were applied as advised by Gelman et al. (2008). No informative priors were used to keep the analysis comparable to a Frequentist one. However, given the sample size, it appears most reasonable to suppose that any prior within a statistically sound range would not have a determining effect on the analysis results.

Bayesian McKelvey-Zavoina R^2 was again computed to assess general model fit (Gelman et al., 2019). BF_{10} were computed and interpreted as outlined in Section 3.2.3 of the previous study. Again, all analyses were as well assessed with a Frequentist binomial-logistic regression. No substantial deviations were found regarding the regression outcomes. Applying the recommendations of Field (2017) to look for VIFs greater than 10, no concerns regarding multicollinearity arose. The largest VIF in the regression regarding bondage & dominance was 1.43 (feminine gender role, average VIF = 1.21), and regarding violent sex was 1.44 (feminine gender role, average VIF = 1.17). The Bayesian regressions proved stable, the chains converged, and no concerns regarding autocorrelation arose.

3.7   Results

Table 3.8 displays the descriptive statistics relevant to the conducted analyses. Approximately 9.5% of the whole sample reported using bondage & dominance pornography for an average of 16.67 minutes per week. Violent sex pornography was used by about 5.2% of the sample at an average of 17.57 minutes per week.

Table 3.8
Descriptive Statistics of the Response and Explanatory Variables (N = 579)

Variables	$M(SD)$	$Min./Max.$
Response variables[1]		
Bondage & Dominance[2]	16.67 (17.19)	1.00/90.00
Violent Sex[3]	17.57 (21.18)	1.00/100.00
Explanatory variables		
Sex drive[4]	-0.01 (0.83)	-1.64/2.74
Mini-K	4.79 (0.84)	1.10/7.00
Menarche	13.12 (1.58)	7.25/22.00
Previous pornography use	6.67 (9.67)	0/50.00
Masculine gender role	4.29 (1.13)	1.00/7.00
Feminine gender role	5.22 (0.98)	1.00/7.00
Rape myth acceptance	2.04 (0.69)	1.00/4.00

Note. [1]Users of response variables reported their usage in average minutes per week, [2]524 non-users (coded 0) and 55 users (coded 1), [3]549 non-users (coded 0) and 30 users (coded 1), [4]z-standardized.

3.7.1   An Advanced Integrative Approach for the Predictors of Pornography Use About Bondage & Dominance

Table 3.9 displays the Bayesian binomial-logistic regressions regression's results for the use of bondage & dominance pornography.

Given the results of Table 3.9, hypothesis 1 received mixed evidence. It stated that the sex drive, a faster life-history strategy, and an earlier onset of menarche predict the use of bondage & dominance pornography. The usage-increasing effect of sex drive predicting bondage & dominance pornography was replicated with extreme evidence ($H1_a$). However, null effects occurred with moderate evidence for Mini-K ($H1_b$) and the onset of menarche ($H1_c$).

Table 3.9

*Bayesian Binomial-Logistic Regression to Predict the Use of Bondage &
Dominance Pornography*

Explanatory variables	B	$Est.\ Error\ B^1$	BF_{01}	OR	$95\%\ CI^2$
Hypothesis 1					
Sex drive	1.06	0.23	< 0.01	2.88	[1.90,4.52]
Mini-K	-0.11	0.21	5.32	0.89	[0.59,1.37]
Menarche	-0.14	0.10	5.68	0.88	[0.72,1.05]
Hypothesis 2					
Previous pornography use	0.03	0.01	15.56	1.03	[1.00,1.06]
Hypothesis 3					
Masculine gender role	0.11	0.15	7.07	1.12	[0.84,1.51]
Feminine gender role	-0.32	0.19	1.73	0.72	[0.50,1.06]
Rape myth acceptance	0.25	0.22	3.45	1.28	[0.84,1.96]

Note. $R^2 = .28$, $95\%\ CI^2 = [0.17,0.40]$, [1]Bayesian approximation to $SE\ B$, [2]Bayesian
credibility interval.

Regarding hypothesis 2, strong evidence shows that the timespan of
previous pornography use does not affect the use of bondage & dominance
pornography. Therefore, hypothesis 2 had to be discarded.

Hypothesis 3 assumes that gender roles, as well as an acceptance of
rape myths, will predict the use of bondage & dominance pornography.
None of the respective sub-hypotheses received empirical evidence for the
presence of any effect. For the feminine gender role (H3$_b$), a null effect
received anecdotal evidence. For the masculine gender role (H3$_a$) and rape
myth acceptance (H3$_c$), a null effect received moderate evidence.

3.7.2   An Advanced Integrative Approach for the Predictors of Pornography Use about Violent Sex

Table 3.10 displays the Bayesian binomial-logistic regression results to
predict the use of violent sex pornography.

Again, hypothesis 1 assumed that the sex drive, a faster life-history
strategy, and an earlier onset of menarche predict the use of violent sex
pornography. Based on the regression's results as outlined in Table 3.10,
hypothesis 1 received mixed but more substantial evidence compared to the
previous section. As with the previous analysis, the convincing effect of sex
drive on the use of violent sex pornography was replicated with extreme
evidence (H1$_a$). For menarche (H1$_c$), with anecdotal evidence, a negative

Table 3.10

Bayesian Binomial-Logistic Regression to Predict the Use of Violent Sex Pornography

Explanatory variables	B	$Est.\ Error\ B^1$	BF_{01}	OR	$95\%\ CI^2$
Hypothesis 1					
Sex drive	1.05	0.28	< 0.01	2.86	[1.66,5.12]
Mini-K	-0.33	0.28	1.84	0.72	[0.42,1.23]
Menarche	-0.32	0.14	0.62	0.72	[0.55,0.94]
Hypothesis 2					
Previous pornography use	0.04	0.02	8.57	1.04	[1.00,1.07]
Hypothesis 3					
Masculine gender role	0.03	0.20	4.93	1.03	[0.70,1.54]
Feminine gender role	-0.04	0.26	3.94	0.96	[0.59,1.61]
Rape myth acceptance	0.76	0.29	0.09	2.13	[1.23,3.78]

Note. $R^2 = .38$, $95\%\ CI^2 = [0.24,0.51]$, [1]Bayesian approximation to $SE\ B$, [2]Bayesian credibility interval.

effect was discovered. According to the posterior distribution, with each year participants reported having been older at menarche, the chance of using violent pornography decreased in the median by 28% with a 95% probability of decreasing the likelihood of use between 45 and 6%. Mini-K (H1$_b$) was, with anecdotal evidence, no meaningful predictor for the use of violent sex pornography.

Again, previous pornography use appears not to affect the use of bondage & dominance pornography, with moderate evidence for a null effect. Hypothesis 2 is discarded.

Hypothesis 3 stated that the gender roles, as well as an acceptance of rape myths, would predict the use of bondage & dominance pornography. Moderate evidence was found for gender roles not predicting the use of violent sex pornography (H3$_a$, H3$_b$). However, rape myth acceptance (H3$_c$) received strong empirical evidence to be a meaningful predictor.

3.8 Discussion

The second study of this chapter aimed to advance the results of the previous one by assessing complementary predictors for bondage & dominance and violent sex pornography with a more representative, entirely female

sample. It addressed some of the previous study's fundamental limita-
tions, and the state of evidence now allows for more empirically grounded
conclusions compared to the first study.

Regarding hypothesis 1, the effect of sex drive was replicated with a
more diverse sample for both response variables. Any other biological-
evolutionary predictor did not predict the use of bondage & dominance.
However, an earlier onset of menarche increases the chance of using violent
sex pornography. The Mini-K did not affect the response variables. Indeed,
a faster-life history strategy appears to affect the use of violent pornography.
The null effect of Mini-K can not be interpreted as an exclusion criterion
for this explanation. The authors of the instrument themself stated that
Mini-K is a short scale and does not fully assess traits around a fast life
history strategy (Figueredo et al., 2014).

Inspired by the results of the previous study, hypothesis 2 targeted the
assumption that women who use bondage & dominance as well as violent
sex pornography are used to pornography and have made a subsequent
progression towards these types of pornography (Love et al., 2015). How-
ever, hypothesis 2 received no empirical evidence. Instead, the analysis
highlighted that no such relationship exists. The null effect is a significant
finding because it replicates that pornography does rather not have such a
quasi-addictive component like a build-up of tolerance causing the use of
extreme forms would imply (Grubbs et al., 2022). Furthermore, it disproves
the aforestated assumption about a potential excitation transfer needed
by seasoned porn users to feel still sexually aroused (Love et al., 2015;
Zillmann, 1971; Zillmann et al., 1972).

Regarding hypothesis 3, the gender roles hypothesized to represent
society's influences on gendered behavior in humans were no predictor for
the response variables. As with the previous study (e.g., sexual socializa-
tion), this shows that no general derogatory societal influence regarding
gender exists which would cause women to use such types of pornography.
However, the acceptance of rape myths increased the likelihood of using
violent sex pornography but not the one about bondage & dominance. Rape
myths represent parts of a society's misogynist beliefs (Schwendinger &
Schwendinger, 1974). Therefore, they account for a derogatory societal
influence that increases women's use of violent sex pornography. This
variable needs more consideration and should also be assessed for men in
a future research project.

Figure 3.3 visually highlights variables that represent the broader topics
of predictors that proved meaningful for the response variables assessed.
Mini-K and menarche, as representatives of life history strategy attach to

the sex-specific evolutionary environment, are translated through genetic sex into physical sex and attach in the case of menarche also towards hormonal sex which triggers menarche (Bischof-Köhler, 2022; Schwarz & Hassebrauck, 2006). Again, the sex drive attaches to proximate sex/gender but has a solid biological origin (Vallone et al., 2007).

Social-cultural variables included are the gender based-stereotypes from which broader context rape myths can be assumed to originate. The masculine and feminine gender roles are hypothesized to originate in an individual's social (gender-typical) environment. Given the discussion on where to place media use in the RIMSGD, the previous pornography use should also be located in the social (gender-typical) environment. Finally, the magnitude and relative expression of sex roles is, of course, a part of psychological sex/gender.

Figure 3.3

RIMSGD Variables Addressed in the Second Study About Sex/Gender Differences and Pornography Use
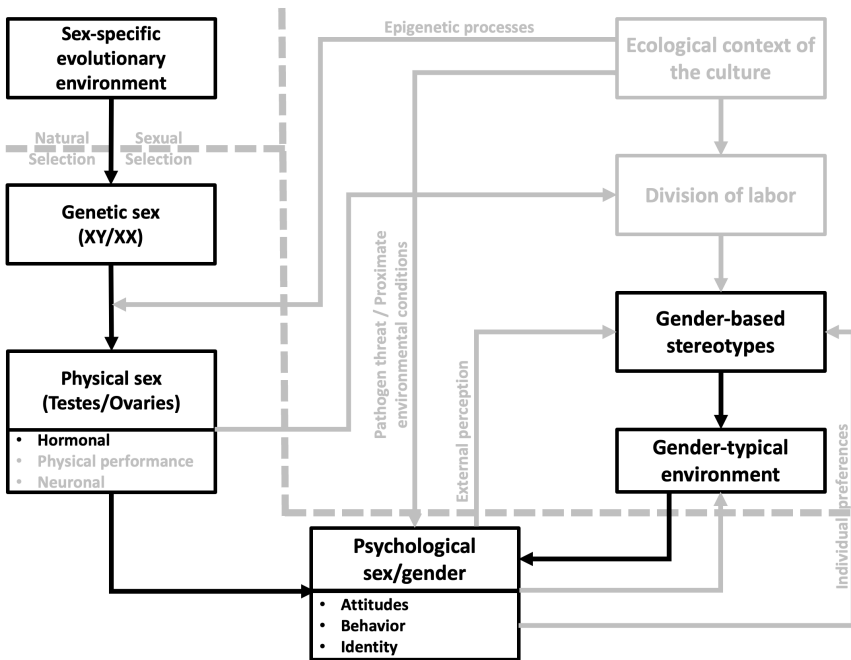
3.8.1 Limitations

The first limitation that needs to be mentioned is that, given the vast possibilities the RIMSGD offers, the study falls short again of assessing it sufficiently. However, as previously discussed in the chapter, a complete assessment is hard to achieve from a social science background.

The following limitation is that recruiting a panel sample comes with its disadvantages. Despite having a more diverse sample than the previous one, it still lacks generalizability. Furthermore, panel participants professionalize to a certain degree in participating in surveys, and it is questionable if this adds to or decreases the reliability of participants' responses. This also attaches to another limitation: the questionnaire method's vulnerability to a social desirability bias and self-selection processes within the sample population. As participants received payment, they could have been more prone to lie to complete the questionnaire. The analyses should be replicated with more objective methods of data assessment in future research (e.g., Morichetta et al., 2021; von Andrian-Werburg et al., 2023). Regarding the operationalization of pornography use, it needs to be mentioned that despite bondage & dominance can include acts of violent sex, this is not per se violent content. Qualitative analyses show that bondage in all its subform can be an expression of art and attaches in its practitioners to feelings of belongingness and care (Z. Jones, 2020). Here the quantitative approach both studies have pursued appears way too reductionistic.

3.8.2 Conclusion

The underlying research question of this chapter was to explore women's "paradox" use of pornography from a biopsychosocial perspective. The evidence gathered in the two studies points firmly toward the premier reason to use pornography at all, which is the sex drive (Burtăverde et al., 2021). The "paradox" use of pornography by women is most likely driven by women high in sexual desire. This finding will also explain the statistics published by, e.g., Pornhub.com/insights because the female audience of Pornhub.com will most likely consist in large shares of such women.

The first study showed that bondage & dominance, as well as violent sex, appear to have a unique appeal to women as they displayed even higher interest in these types compared to men. The evidence in the second study highlighted that the use of bondage & dominance pornography is predicted by the sex drive exclusively. All other assessed variables except sex in the first study showed no convincing effect on its use. Reflecting on the content of bondage & dominance, it can include components that also appear in

female erotic literature. Qualitative interviews show that practitioners of bondage report experiencing feelings of belongingness and pleasure, which would align with SST predictions (Z. Jones, 2020). Respective feelings fit perfectly to the female long-term mating strategy (Buss, 1998; Buss & Schmitt, 1993), which would explain a higher interest in women than men. Therefore, given the gathered evidence, it appears reasonable to assume that a minority of women show interest and joy in these sexual practices or by watching content that displays such behavior (Lehmiller, 2018; von Andrian-Werburg et al., 2024).

Regarding violent sex, the evidence points towards a multicausal etiology being a mix of sex drive, components of a fast life history strategy like sociosexual orientation (study 1), an earlier onset of menarche, and problematic attitudes about rape. Despite pornography being a significant leisure time behavior (Grubbs et al., 2022; Morichetta et al., 2021; von Andrian-Werburg et al., 2023) subtypes of it appear to show some problematic implications from a societal point of view that, given the evidence, should not exclusively focus on problematic implications of male pornography use. Though, more research is certainly needed regarding the etiology of potential interest in such media in men. Given the studies outlined in this chapter, mainstream pornography might not be about being hostile towards women (and men), but this might not apply to all pornographies sub-genres.

Regarding the larger aim of this dissertation, which was to consider both nature and nurture predictors in the etiology of media use, Figure 3.4 visually highlights the topics of which variables contribute to the etiology of gangbang and rough sex pornography use. Concerning the biological-evolutionary path, a faster life-history strategy and genetic and physical sex contribute to the use of respective types. Regarding social-cultural predictors, sexual socialization and the outcomes of gender-based stereotypes like rape myths contribute to the etiology of parts of the respective types.

In conclusion, the studies show that modern pornography has a market due to humans' biological-evolutionary needs (Burtăverde et al., 2021; von Andrian-Werburg et al., 2024). However, its design and narratives are driven by social-cultural factors like societal trends and the respective zeitgeist (von Andrian-Werburg et al., 2024). Though, pornography originates in an individual's social environment and the way pornography is presented is profoundly influenced by society and culture.

Figure 3.4

Identified RIMSGD Topics that Predict (Parts of) the Use of Gangbang and Rough Sex Pornography
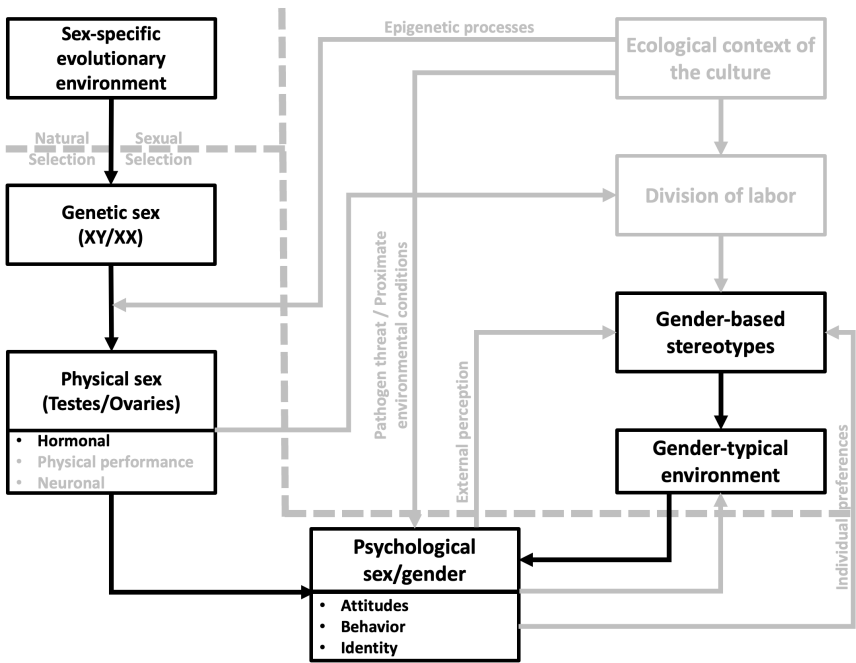
Chapter 4

The Impact of Sex/Gender on the Enjoyment of and Preferences for Sad Films

The previous chapter presented empirical evidence that both nature and nurture variables influence the preferences for and use of rough sex and gangbang pornography. This chapter will outline research on, in the mode of action, antithetical media content. Sad films "prominently feature the suffering of agreeable or liked characters. Furthermore, these portrayals are likely designed to evoke (and are likely successful in evoking) sad emotional responses on the part of the viewer" (Oliver et al., 2000, p. 284). Different from pornography, sad films, and the non-hedonistic paradox (Oliver, 1993) of their use have not been the focus of partisan groups (e.g., Dworkin, 1981) and were not in the same manner subject to moral judgments (e.g., K. M. Nelson & Rothman, 2020). The reception of sad films does not cause hedonistic pleasures—like sexual arousal and its satisfaction certainly does—but rather feelings of sadness. However, sad films catch the audience's interest despite depicting a tragic story. *Titanic* and *Gone with the Wind* are some of the most commercially successful films of all times (Oliver & Bartsch, 2010, p. 54).

Comparable to mainstream pornography, the preference for sad films yields a significant sex/gender difference. However, opposite to pornography, on average, women prefer sad films more compared to men (e.g., Oliver, 1993; Oliver et al., 2000). This sex/gender difference makes the content worthwhile to research for the aim of this thesis. Given the state of research gathered in chapter 2, potentially pioneering contributions can be made by using the RIMSGD to identify potential variables that might explain the higher preference of women for sad films.

4.1 The Complex Psychological Process of Appreciating Sad Films

Reasoning about the appeal of sad films has a long scientific tradition and sparked research from different theoretical perspectives (Gleich & Vogel, 2016; Oliver, 1993; Oliver et al., 2000; Vogel, 2007). The beauty and art of tragedy has already caught the attention of ancient philosophers like Aristotle. In his understanding of its appeal, Aristotle assumed that the reception of drama and tragedy would purge a recipient's pity and fear (Butcher, 1895). Modern-day scholars have researched this idea. However, the catharsis assumption has received mixed evidence, does most probably not work out in the original sense of Aristotle, and is recently not the focus of research (Gleich & Vogel, 2016; Khoo & Oliver, 2013; Vogel, 2007).

Instead, sad films have been prominently researched from a more modern viewpoint. The Mood Management Theory (MMT) (Zillmann, 1988a, 1988b) is a central paradigm in media research and proposes that humans use media content to regulate their moods and emotions. MMT implies that media selection does not have to be a conscious process because participants operantly learn through previous media use which media stimuli match their respective mood best (Zillmann, 1988a). The core assumption of MMT is that respective mood and emotion regulatory processes aim at a hedonistic outcome in which recipients minimize unpleasant feelings and enhance positive ones (Zillmann, 1988a, 1988b).

From a plain MMT perspective, viewing sad films is a paradox. However, different authors advanced MMT to explain the appeal of non-hedonistic content (Oliver, 1993; Oliver et al., 2000; Zillmann, 2000). Zillmann (2000) argued that viewing non-hedonistic content like sad films or news (which most often broadcast negative topics (Grabe & Kamhawi, 2006)) might be based on a concept he calls telic hedonism, which means that an individual delays gratification to achieve a desired outcome in the future. Furthermore, Zillmann (2000) advised that one must avoid the mistake of understanding MMT in a way that would assume that media use merely satisfies proximate needs. The author argued that media use can have a planned and strategic component to delay proximate gratitude and to aim for a desired outcome in the future. For instance, strategic media use occurs when one watches the news to prepare for a potential threat in the future. Applying the concept of telic hedonism to sad films, for instance, one could watch a sad film to value and contrast one's positive life experiences.

Another approach—and probably the most prominent explanation approach for the appeal of sad films—focuses on psychological processes that have been labeled meta-moods (Mayer & Gaschke, 1988), meta-emotions (Bartsch et al., 2008; Oliver, 1993) or meta-appraisals (Schramm & Wirth, 2010). Various concepts and definitions exist about the phenomenon reflecting the ambiguous use of terms like mood and emotions in scientific publications but also the different perspectives being applied to and the complexity of the underlying phenomenon (Bartsch et al., 2008; Beedie et al., 2005). In the original definition, meta-moods are defined as "the product of a mood regulatory process that monitors, evaluates, and at times changes mood" (Mayer & Gaschke, 1988, p. 102). Bartsch et al. (2008) define "meta-emotion as a process that monitors and appraises emotions and recruits affective responses toward them, which results in a motivation to maintain and approach emotions, or to control and avoid them" (p. 7). Exemplarily, one can be aware of her/his emotions but can feel shame about them. For instance, this would be the case if someone was happy about witnessing a disliked person's misfortune but started to feel ashamed as it violates her/his moral standards. Subsequently, the schadenfreude can be suppressed.

In line with the concept, Oliver (1993) showed that a sad film's reception indeed causes sad feelings. However, she supposed such feelings can be evaluated on a cognitive meta-layer to yield a pleasant outcome. For this process to take place, Schramm and Wirth (2010, p. 320) describe the content of a sad film to be a situational reference that, at first, needs to be appraised by a recipient to lead to an emotional response. Applied to the example above, the person must recognize his opponent's misfortune and also appraise the situation as a misfortune for the primary emotion (Ekman, 1992a, 1992b) of happiness to take place (for an elaborate discussion of appraisals and emotions see: Scherer, 1984, 2001). More theoretically, the emotional response to a sad film can be described as the output of an interaction between the film's characteristics (e.g., following a communal or agentic storyline, cultural background of the film) and a recipient's traits and states (e.g., empathy readiness, a recipients cultural background) (Oliver & Raney, 2011; Oliver et al., 2000; Scherer, 1984, 2001; Schramm & Wirth, 2010).

If and how strongly the emotion of sadness occurs during the reception of a sad film affects how a recipient will (meta-)evaluate the feeling (Schramm & Wirth, 2010, p. 321). These meta-appraisals are, in their primary process, comparable to the processes that lead to an emotional response in the first place (Scherer, 1984, 2001; Schramm & Wirth, 2010,

p. 322). Given the example, the person's schadenfreude becomes a new reference for evaluation. The now meta-evaluation of happiness ultimately leads to a desire to suppress the emotion. However, for the sadness caused by films, findings suggest that so-called *eudaimonic* gratitudes as the feeling of being moved or having one's thoughts provoked can result from respective meta-appraisals (Hanich et al., 2014; Oliver & Bartsch, 2010; Oliver & Raney, 2011). Such eudaimonic gratitudes positively mediate the relationship between the sadness a film causes and its appreciation. Finally, apart from ultimately appreciating sadness, recipients achieve other forms of gratitude by watching sad films like experiencing suspense (Oliver & Bartsch, 2010).

Because this chapter aims to understand better sex/gender's role in the etiology of the appreciation of sad films, it appears most promising to emphasize individual differences, which are a crucial variable of both the initial as well as the meta-appraisals as outlined above. Of these individual differences, a critical variable is gender (Oliver, 1993; Oliver & Raney, 2011; Oliver et al., 2000; Schramm & Wirth, 2010).

4.2 Previous Results for Sex/Gender's Influence on the Enjoyment of and Preference for Sad Films

To better understand which personal characteristics affect the enjoyment of sad films, Oliver (1993) conducted three studies to research individual differences she supposed to be relevant for enjoying sad films. Furthermore, the author developed a scale to measure the general preference for such films, the Sad Film Scale (SFS). Her results pointed towards the socializing influence of gender stereotypes on gender roles being a critical factor in enjoying sad films. Gender stereotypes affect the expression and evaluation of sadness (Oliver et al., 2000). As outlined in the previous section, variation in empathy can contribute to a greater appreciation of the film as it affects the meta-appraisal processes. In Oliver's (1993) study, women reported, as hypothesized, greater enjoyment of sad films and a more significant number of such films previously used. Furthermore, apart from the female sex, the feminine gender role, which also partially consists of traits associated with empathy readiness, was a significant predictor of the SFS (Oliver, 1993, p. 332). Variation in trait empathy affects the enjoyment of sad films because recipients high in the trait should connect easier and feel

with a sad film's protagonist (de Wied et al., 1995; Oliver, 1993; Oliver et al., 2000; Schramm & Wirth, 2010). Subsequently, participants with higher empathy can experience more sadness during the plot.

Another study about individual differences affecting the preference for sad films was conducted by Oliver et al. (2000). Oliver et al. (2000, p.282) recognized that the preference for sad films yields a vast sex/gender difference. Based on previous results of Oliver (1993), the authors supposed that socialized gender roles impact the meta-appraisals, which ultimately cause the appreciation of a sad film. A recipient's beliefs about how women and men should behave and feel in society will affect her/his evaluation of her/his emotions. Boys and men are stereotypically supposed to hide feelings of sadness and will learn that sadness is not a socially desirable emotion to show or experience for men (Bussey & Bandura, 1999; Oliver et al., 2000). Girls and women, on the contrary, are, on average, socially less inhibited in their expression of sadness, and their appraisal of experiencing such emotions should be much more favorable compared to men. Furthermore, regarding film characteristics Oliver et al. (2000) argued that many sad films deal with communal topics that are especially appealing to women.

To test these assumptions Oliver et al. (2000) conducted three studies. In the first two, the authors displayed either a sad or neutral film scene (first study) or a sad or neutral full-length film (second study) to samples of approximately 100 undergraduate student participants each and surveyed their enjoyment. The third study was based on questionnaires, assessing different variables (e.g., BSRI and SFS) of 187 participants (89 females) with a background questionnaire. In a separate step, approximately one week later, participants were randomly presented with six film descriptions, two about sad films with a communal or agentic storyline, and reported their anticipated enjoyment (Oliver et al., 2000, p. 290). The authors computed a single variable from both BSRI scales and separated participants high on one trait into a communal, undifferentiated, or agentic group.
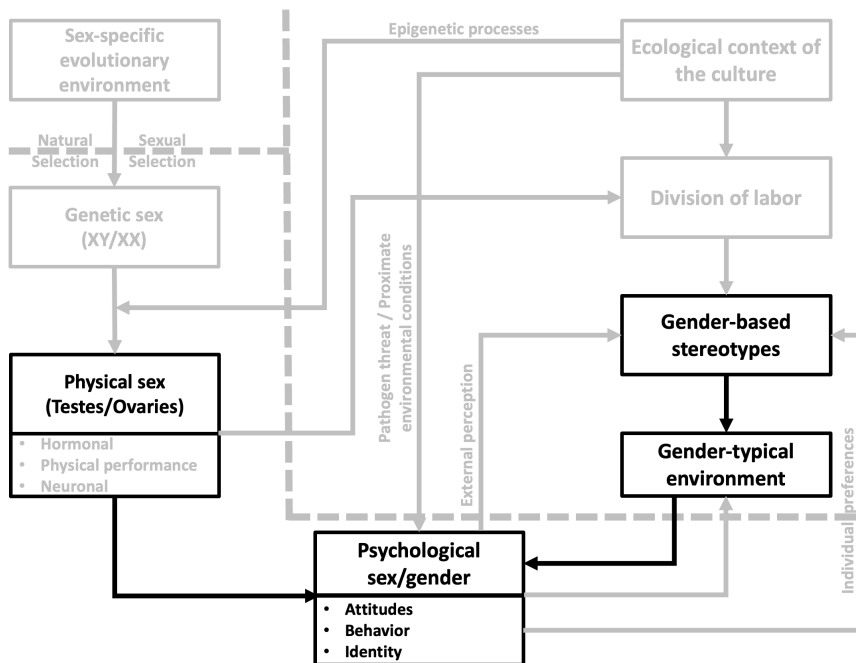
Results yielded a significant sex difference regarding the tragic film in the first study, where women liked the sad scene more than men, but not in the second study. In the third study, women reported higher values of enjoyment regarding all dependent variables (e.g., enjoyment of the film descriptions, number of sad films seen, higher values in the SFS) compared to men. This was also true for the participants of the communal group compared to the agentic group, except for SFS, where no significant

difference was found. Apart from other results, a significant sex-by-film-theme interaction occurred, with the communal-themed film appealing especially strongly to women.

Despite considering sex, the study of Oliver et al. (2000) remains in its theoretical reasoning in the social-cultural realm. However, the basic assumptions of the study are very much in line with the fundamental argumentation of the RIMSGD, which can be used as a template to identify potential variables affecting sex/gender differences. To pursue an integrative approach, the study of this chapter builds on the findings of Oliver et al. (2000) and tries to advance these from a more integrative perspective. Figure 4.1 visually highlights variables considered so far in the RIMSGD.

Figure 4.1

RIMSGD Variables Addressed in Previous Research About the Preference for and the Enjoyment of Sad Films

4.3   An Integrative Approach for the Preference and Enjoyment of Sad Films

As outlined above and visually displayed in Figure 4.1, previous results yielded evidence that the feminine gender role and female sex are significant predictors of the enjoyment of sad films (Oliver, 1993; Oliver et al., 2000). Looking at the RIMSGD and the left-out variables as displayed in Figure 4.1, the discovered sex/gender difference in the enjoyment of and preferences for sad films might not only be caused by social-cultural influences but also could be affected more strongly by biological-evolutionary variables. The most apparent biological-evolutionary predictors to consider would be sex differences in proximate hormonal levels, physical performance, and probably behavior differences based on the sex differentiation of the brain (e.g., Del Giudice, 2022). Given the results of the literature review outlined in Chapter 2, no journal-published research has been conducted to apply evolutionary-biological predictors to the sad film paradox. This nature-blindness in research about sad films leaves a blank slate for integrative research.

Regarding hormonal differences potentially affecting the preference for sad films, testosterone, as discussed in section 1.1.3, is the most prominent representative of androgens in humans (Barry & Owens, 2019; Kopera, 2015; R. J. Nelson & Kriegsfeld, 2017). Testosterone could affect the preference in multiple ways. It is the ultimate source of brain masculinization (R. J. Nelson & Kriegsfeld, 2017) and, therefore, responsible for a critical component of the organic bases of masculinity. Related to this, variation in testosterone levels is supposed to be in an inverse relationship with empathy, an essential trait for feeling sadness during the reception of sad films (Hermans et al., 2006; Procyshyn et al., 2020; van Honk et al., 2011). Therefore, testosterone appears as a reasonable representation of hormonal influences that could affect the preference for and enjoyment of sad films. Especially testosterone might contribute to the sex/gender difference as men show higher levels compared to women (R. J. Nelson & Kriegsfeld, 2017).

Regarding physical differences, various studies pointed out that physical strength is a crucial component of masculinity (Steinfeldt et al., 2011). Traits signaling physical strength highly predict the male mate value (Sell et al., 2017). Furthermore, as outlined in Chapter 1, the, on average, greater male strength appears to be partially related to an adaptation for intrasexual competition (Puts et al., 2023). From a phylogenetic point of

view, the male intrasexual competition consisted of a large share of physical competition (Puts et al., 2023). It is reasonable to argue that showing too much empathy would diminish the male's ability to compete. Furthermore, empathy can reduce physical performance (e.g., by being empathetic with a tired opponent) as one's cognitive processes centering around fatigue can be activated (Behm & Carter, 2021). Therefore, strength might affect the preference for sad films in two theoretical ways. First, it contributes to masculinity, which might cause a less positive evaluation of sadness. Second, strength could be in an inverse relationship with empathy, decreasing the sadness felt. Both ways would decrease the ultimate appreciation of sad films as described by Oliver et al. (2000). Thus, it is reasonable to assume that humans higher in strength would, on average, show less interest in sad films and do not appreciate these films to the same grade compared to less potent participants.

Finally, another biological-evolutionary variable to consider are neuronal differences related to the ontogenetic masculinization of the brain (Bischof-Köhler, 2022). Brain masculinization had been associated with digit ratio (2D/4D) (Manning, 2002). Though the construct has received considerable criticism (e.g., Neyer & Asendorpf, 2018) it has been previously applied to journal-published research about media use and effects and has led to significant findings (e.g., Huh, 2011; Millet & Dewitte, 2007). A complete overview of discovered studies regarding the topic is outlined in Section 2.2.3.1. It appears reasonable to assume that a higher grade of brain masculinization, represented in theory by a lower digit ratio (Manning, 2002), could also decrease empathy-readiness as there is robust empirical support for brain masculinization leading to a higher amount of systemizing and a reduced amount of empathy (Greenberg et al., 2018). Summarizing these paragraphs, hypothesis 1 aims at potential biological-evolutionary predictors for the appreciation of sad films and assumes:

H1: Biological-evolutionary variables influence the enjoyment of and preferences for sad films.

H1$_a$: The female compared to the male sex predicts the enjoyment of and preferences for sad films.

H1$_b$: A higher testosterone level will decrease the enjoyment of and preferences for sad films.

H1$_c$: A higher level of body strength will decrease the enjoyment of and preferences for sad films.

H1$_d$: A lower digit ratio will decrease the enjoyment of and preferences for sad films.

The following hypothesis aims to advance the findings regarding social-cultural predictors for the enjoyment and preferences for sad films. Different from the empirically discovered effect of BSRI, Oliver et al. (2000) assumed that conformity to gender norms is ultimately responsible for causing a less favorable outcome of the meta-appraisal regarding experienced sadness for men. However, the authors did not measure actual norm conformity, which differs from an individual's gender roles (Smiler & Epstein, 2010). As introduced in Chapter 1, Mahalik et al. (2005) developed an inventory that aims at feminine and Mahalik et al. (2003) an inventory that aims at conformity to masculine norms. These will be used to assess if norm conformity contributes to the enjoyment of and preferences for sad films. Hypothesis 2 assumes:

H2: The conformity to gender norms influences the enjoyment of and preferences for sad films.

H2$_a$: A higher conformity to feminine norms will increase the enjoyment of and preferences for sad films.

H2$_b$: A higher conformity to masculine norms will decrease the enjoyment of and preferences for sad films.

4.4 Method

The data of this project is intended to be analyzed in a different research project preregistered by von Andrian-Werburg et al. (2021). The project was evaluated and approved by the Ethics Committee of the Institute Human-Computer-Media. The analysis outlined below is the first publication based on the data. However, this chapter must be correctly denominated as a reanalysis because of the existing pre-registration. As outlined, meaningfully reanalyzing data is no issue from a Bayesian perspective (Dienes, 2011). Still, it must be disclosed that H1$_a$ of this analysis overlaps with a preregistered hypothesis (Study-part 3: H1) of von Andrian-Werburg et al. (2021). Both hypotheses suppose that women report greater enjoyment of and preferences for sad films. However, different from the analysis outlined below, the preregistered hypothesis will be evaluated in an analysis consisting of a different set of predictors and with different filters regarding

the sample composition applied than the ones used in the analysis of this chapter and, therefore, is not redundant or preemptive to the analysis of the preregistered hypothesis.

4.4.1 Sample Size Determination

The target sample size for the original analysis was determined with a power analysis using G*Power (Faul et al., 2007, 2009) and aimed at a Frequentist linear multiple regression. The target sample size was determined to detect an effect size below a medium effect ($f^2 = .11$) for a single regression coefficient with a power of .95 ($\alpha = .05$) and yielded a target N of 187 participants. As discussed, this and much smaller sample sizes should be sufficient for a Bayesian analysis equivalent to a multiple regression (Wagenmakers et al., 2008).

The study was planned to consist of two parts: an online questionnaire and a laboratory assessment requiring data matching between the steps. Because previous experiences in data matching showed that some participants misspell their identifiers, which makes matching impossible, it was decided to aim to recruit 200 participants in the laboratory and that this would be the determining value to obtain for ending recruitment.

4.4.2 Study Procedure and Data Matching

As described, the study was conducted in two steps. In the first step, participants completed an online questionnaire. The questionnaire was advocated in the Institute Human-Computer-Media (SONA) student participant management system, and participants were granted 0.5 subject hours for completion. Furthermore, the questionnaire was advertised in different social media groups with a local attachment to Würzburg, as the laboratory assessment took place in the city.

After finishing the online questionnaire, participants were asked to schedule a meeting for laboratory assessment. The laboratory consisted of a single room at a university building originally intended for teaching. Due to the ravaging corona pandemic, however, teaching was suspended. A hygiene concept was applied to avoid any spread of the coronavirus. Neither the researcher nor any participants were infected due to the study's procedures. After arrival, participants were greeted by the researcher and guided to different stations where different biological-evolutionary variables were assessed. The exact procedure to assess the variables of relevance for this thesis will be described in the measures section below.

Non-student participants received 10 euros if they attended the laboratory session (step two) following the online questionnaire. Student participants were granted additional 0.75 subject hours if they participated in the laboratory session. Participating in the questionnaire was advertised until the laboratory's target sample size of 200 participants was reached.

The two steps were matched with an anonymous code, as the German Society for Psychology initially recommended anonymizing results while still providing participants control of their questionnaire responses.

4.4.3 Sample Size

The online questionnaire of step 1 was finished by 332 participants (204 female, M_{age} = 23.68 years, SD_{age} = 7.05 years). Of these, 200 participants attended the laboratory session. Dropout occurred during data-matching because participants misspelled their code or used different codes compared to the online questionnaire. The most significant dropout occurred at an especially critical variable, the assessment of hair samples. Because hair testosterone is a crucial variable, its availability will be the determining factor for the final sample size. N = 147 participants were able to provide a code that allowed reliable matching between the results of their hair samples and the questionnaire responses. Of these, 96 were female, and 51 were male, with an average age of 22.63 years (*SD* = 6.08). One participant reported still attending school, one held a secondary school certificate, 132 had a high school, and 12 had a university/college degree. One participant reported holding a different (and unspecified) kind of degree.

The sample is smaller, as had been determined for the frequentist analysis. However, decreasing the power to the by Cohen (1988) advised minimum threshold of .80 would yield a sample size of 59 participants, which yields ample room for the given sample size to appear not underpowered for the analysis to be pursued.

4.4.4 Instruments and Measures

The following section outlines the measures and procedures regarding the analysis. Scales and film descriptions were translated for research projects unaffiliated with this thesis (see: Bierhalter, 2019; Vogel, 2007).

4.4.4.1 The Enjoyment and Preferences for Sad Films

The SFS (Oliver, 1993) was used to measure the general preference for sad films. The scale consists of 15 items (e.g., "I like sad films because they allow me to become part of another world.") and is rated on a seven-point scale ranging from 1 = *not at all* to 7 = *very much*. The items were averaged to create a single index as advised by Oliver (1993).

Because a film's storyline is also a significant characteristic for enjoying sad films, Oliver et al. (2000, p. 292) developed film descriptions with two alternating storylines about communal and agentic topics. Furthermore, protagonist names were changed in the film descriptions, so that female participants read the descriptions with female actors and male participants with male actors.

Different from Oliver et al. (2000), in this study, the agentic stimulus consisted only of male and the communal only of female actors. This was done to present the same stimulus to every participant, allowing for a more accurate comparison between the sexes. The stimuli consist of film descriptions comparable to the back of a Blu-ray or DVD or, as can be seen in the introduction of a stream. The stimuli had been developed and pretested in a student research project under the supervision of the author of this thesis (see: Bierhalter, 2019).

Participants were instructed to imagine having an evening off and looking for a good stream. The stimuli were presented with six other stimuli, like done by Oliver et al. (2000) to hide the aim of the study. The potential enjoyment of the communal and agentic stimulus was measured by asking participants to report their supposed enjoyment on eight attributes (e.g., "interesting"), as was done by Oliver et al. (2000, p. 291). Participants rated the attributes on a 7-point scale ranging from 1 = *not at all* to 7 = *very much*. The rating of the attributes was averaged to yield a single index for the communal and agentic stimuli.

4.4.4.2 Sex

Sex was assessed with an item asking if respondents were either female, male, or had miscellaneous sex (divers). Comparable to previous chapters (e.g., Chapter 3), it is supposed that participants reported their actual sex, which appears to be utmostly reasonable given the low prevalence of, of sex deviating gender identities (see the discussion in section 1.1.2).

4.4.4.3 Testosterone

At the beginning of the online questionnaire, participants were informed that donating a strain of hair would be a part of the study. Hair samples are easier to assess and store than salivary or blood samples, and their gathering yields less problematic ethical implications. Testosterone residuals in the hair can provide a retrospective reflection of bioactive testosterone in participants' plasma (Slezak et al., 2017).

In the laboratory, participants were instructed to sit on a chair with a small mirror in front of them, from which they could watch and control the procedure. They were asked to write their code on a storage bag in front of them determined for the storage of their hair sample. A small strand of hair, in thickness less than a pencil, was separated from the rest of the hair approximately 2 cm below the cranial bone. After participants gave oral consent, the strand was cut as close to the scalp as possible and put in the storage bag. After completion, samples were repackaged in aluminum foil to match the requirements of the laboratory responsible for the assessment.

All samples (185 in sum) were shipped to Clemens Kirschbaum Laboratory in Dresden, Germany, where the most recently grown 3 cm of hair were analyzed for testosterone residuals (pg per mg hair). The length of the strands was determined by scalp hair growth is about 0.35 mm a day (Vogt et al., 2008, p. 15) to approximate the past three months. Fifteen participants refused to donate hair samples, or their hair strain was too short to be analyzed, which was caused by the general short hair of participants.

Because the testosterone values of participants yielded a high number of outliers, exemplarily caused by 32 participants whose hair samples yielded not enough testosterone residual to be detectable and, exemplarily, one participant personally admitting to using testosterone for doping (with a resulting 720 pg/mg testosterone residual in his hair) the scale was 90% trimmed based on unpublished standard reference values of Clemens Kirschbaum Laboratory. Values below the 5% percentile and above the 95% percentile were adjusted to respective percentiles of the reference values depending on sex and age group.

4.4.4.4 Strength

A precalibrated handheld dynamometer (Saehan DHD-1) measuring the maximal grip strength between 0 and 90 kg was used to assess strength. Grip strength was chosen to approximate total muscle strength because both traits are highly correlated (Wind et al., 2010). Furthermore, grip strength can be easily assessed in a laboratory setting.

Grip strength assessment was conducted as described by Beenakker et al. (2001): Participants were instructed to remain seated after their hair sample had been taken. However, they were asked to move the chair about 90 degrees facing the experimenter and to slide away from the table to allow for a free movement of their arms. Finally, participants were given the dynamometer and asked to adduct and flex their shoulders at an approximately 70-degree angle.

Using the so-called *brake technique*, participants were instructed to apply their maximum force on the dynamometer and were told to stop when their peak strength gave way.

Grip strength was assessed three times for every hand. As was done in previous research (e.g., Beenakker et al., 2001), all measures were averaged into a single index.

4.4.4.5 2D:4D

Digit Ratio was measured by computer-assisted analysis as recommended by Allaway et al. (2009). Participants were asked to remove any jewelry or rings interfering with the measurement. Furthermore, they were asked if they had ever suffered broken or injured fingers that could have affected the measure. All participants denied the question. The left and right hand was scanned with a resolution of 600 DPI using a Hewlett Packard Laserjet scanner. Gimp in Version 2.10 was used to measure the distance between the midline of the basal crease to the tip of the index and ring finger. The resulting finger lengths of the right hand (index finger(2D)/ring finger(4D)) were divided to calculate respective digit ratios (Manning, 2002).

4.4.4.6 Conformity to Feminine and Masculine Norms

The conformity to feminine and masculine norms was assessed with the short forms (Parent & Moradi, 2010, 2011) of CFNI and CMNI (Mahalik et al., 2003, 2005) which are briefly introduced in Section 1.2.4. The CFNI-45 consists of 45 instead of the original 84 items, yielding a better model fit than the original inventory version (Parent & Moradi, 2010). It assesses nine subdimensions of feminine norm conformity (e.g., being relational or sweet and nice). However, it can also be averaged into a global index that best suits the hypothesis about general norm conformity (Parent & Moradi, 2010).

The short form of the CMNI-46 uses 46 items instead of the original 94 (Parent & Moradi, 2011). Like the CFNI-45, it assesses nine subdimensions. However, these aim at masculine norm conformity (e.g., being focused

on winning or presenting oneself as heterosexual). Again the index was averaged across all items to compute a single measure for masculine norm conformity, which best aligns with the abovementioned hypotheses.

Responses to both inventories were assessed on a four-point scale with value labels of 1 = *Strongly disagree*, 2 = *Disagree*, 3 = *Agree*, to 4 = *Strongly agree* with higher values indicating more substantial conformity to respective norms.

4.4.4.7   Control Variables

Despite not being mentioned in the hypotheses, the analysis requires the consideration of two crucial variables to test the effects of testosterone on human behavior reliably. Lefevre et al. (2013) showed that age and BMI (kg/m^2) should be controlled for if, otherwise, inflation in the relationships between testosterone-associated variables can occur. Furthermore, when physical strength is assessed, it is crucial to control for BMI as people with a high or low BMI tend to show less grip strength caused by an, on average, decreased muscle tissue quality (Lad et al., 2013).

Participants' height and weight were assessed as the final step in the laboratory assessment. Before the weight and height assessment, participants were instructed to remove their shoes and heavy clothing. Height was measured by participants being instructed to lean against a wall and subsequently have their height measured by the researcher with a tape measure in centimeters. Weight was measured on a calibrated medical scale ranging up to 250 kg. Age was assessed with a single item asking for their age in years in the online questionnaire of step one.

4.4.5   Data Analysis

The data analysis followed the same procedures as described in chapter 3. The Bayesian multiple linear regression was computed with the package *brms* in version 2.18.0 (*R* version 4.2.2). Missing values were imputed using a non-parametric random forest imputation (Stekhoven & Buhlmann, 2012). Again, weakly informative Cauchy priors were used (Gelman et al., 2008).

General model fit was computed with Bayesian McKelvey-Zavoina R^2 (Gelman et al., 2019). BF_{10} were computed and interpreted as outlined in chapter 3. Again, all analyses were also assessed with a Frequentist linear-multiple regression. No substantial deviations were found regarding the regression coefficients. Again, no concerns regarding multicollinearity

arose (Field, 2017). The average VIF was 1.55 for all analyses, which yielded the same VIFs for each predictor. The variable with the highest VIF was Sex, with a VIF of 2.50. Again, the Bayesian regressions proved stable, the chains converged, and no concerns regarding autocorrelation arose.

4.5 Results

The descriptive statistics relevant to the analyses are displayed in Table 4.1. All variables were visually inspected and showed proper normal distributions.

Table 4.1
Descriptive Statistics of the Response and Explanatory Variables (N = 147)

Variables	$M(SD)$	$Min./Max.$
Response variables		
Sad Film Scale	4.48 (1.19)	1.47/6.73
Communal film stimulus	4.40 (1.06)	1.50/6.75
Agentic film stimulus	4.52 (1.10)	1.75/6.50
Explanatory variables		
Testosterone (pg/mg)	0.78 (0.69)	0.03/3.34
Grip strength (kg)	31.27 (8.07)	13.58/59.07
2D/4D	0.96 (0.04)	0.85/1.09
Feminine norm conformity	2.65 (0.26)	1.67/3.24
Masculine norm conformity	2.04 (0.32)	1.35/3.07
BMI	23.20 (3.88)	15.58/42.49
Age	22.63 (6.08)	18.00/63.00

4.5.1 An Integrative Approach for the Preference of Sad Films

Table 4.2 displays the Bayesian multiple-linear regression results regarding the SFS.

The results of Table 4.2 show a null effect for all variables of hypothesis 1. The data for digit ratio ($H1_d$) was relatively indecisive, with only anecdotal evidence favoring the null hypothesis. However, the other variables received strong evidence favoring the null hypothesis.

For hypothesis 2, anecdotal evidence points towards the masculine gender role of decreasing the preference for sad films ($H2_b$). $H2_a$ received moderate evidence in favor of the null hypothesis. Conformity to feminine norms appears not to affect the preference for sad films.

Table 4.2

Bayesian Multiple-Linear Regression Regarding the Sad Film Scale

Explanatory variables	B	$Est.\ Error\ B^1$	BF_{01}	$95\%\ CI^2$
Hypothesis 1				
Sex[3]	0.06	0.32	11.29	[-0.58,0.70]
Testosterone (pg/mg)	-0.03	0.16	22.83	[-0.34,0.28]
Grip strength (kg)	0	0.02	199.17	[-0.03,0.04]
2D/4D	-0.94	2.01	1.83	[-5.26,2.72]
Hypothesis 2				
Feminine norm conformity	0.35	0.44	5.93	[-0.50,1.19]
Masculine norm conformity	-0.76	0.33	0.83	[-1.40,-0.12]
Control variables				
BMI	0	0.03	120.76	[-0.07,0.06]
Age	-0.01	0.02	137.94	[-0.05,0.02]

Note. R^2 = .10, $95\%\ CI^2$ = [0.04,0.18], [1]Bayesian approximation to $SE\ B$, [2]Bayesian credibility interval, [3]Dummy-coded (women = 0).

4.5.2 An Integrative Approach for the Potential Enjoyment of Communal Sad Films

The Bayesian multiple-linear regression's results regarding the potential enjoyment of the communal film description can be seen in Table 4.3.

Comparable to the previous analysis, the results of Table 4.3 show a null effect for the utmost majority of hypothesis 1. The data was almost utterly indecisive regarding the effect of sex ($H1_a$), with practically no evidence regarding the existence or non-existence of an effect.

For hypothesis 2, very strong on the brink to extreme evidence points towards an effect of feminine norm conformity ($H2_a$) on the potential enjoyment of the film described in the communal stimulus. The masculine gender showed no effect, however, only with anecdotal evidence.

4.5.3 An Integrative Approach for the Potential Enjoyment of Agentic Sad Films

The results of the Bayesian multiple-linear regression's results regarding the potential enjoyment of the agentic film description can be seen in Table 4.4.

Regarding hypothesis 1, the results of Table 4.4 show a null effect with moderate ($H1_a$), strong ($H1_b$), and very strong ($H1_c$) evidence for the utmost majority of supposed variables except for digit ratio where there is

Table 4.3

Bayesian Multiple-Linear Regression Regarding the Potential Enjoyment of Communal Sad Films

Explanatory variables	B	Est. Error B^1	BF_{01}	95% CI^2
Hypothesis 1				
Sex[3]	-0.53	0.25	1.09	[-1.01,-0.01]
Testosterone (pg/mg)	0.03	0.12	15.22	[-0.19,0.27]
Grip strength (kg)	0	0.01	120.2	[-0.02,0.03]
2D/4D	-0.03	1.64	1.23	[-3.36,3.26]
Hypothesis 2				
Feminine norm conformity	1.23	0.35	0.01	[0.54,1.90]
Masculine norm conformity	-0.38	0.26	2.84	[-0.88,0.14]
Control variables				
BMI	-0.01	0.02	73.47	[-0.06,0.04]
Age	-0.02	0.01	72.71	[-0.04,0.01]

Note. R^2 = .28, 95% CI^2 = [0.18,0.38], [1]Bayesian approximation to SE B, [2]Bayesian credibility interval, [3]Dummy-coded (women = 0).

Table 4.4

Bayesian Multiple-Linear Regression Regarding the Potential Enjoyment of Agentic Sad Films

Explanatory variables	B	Est. Error B^1	BF_{01}	95% CI^2
Hypothesis 1				
Sex[3]	0.01	0.29	5.31	[-0.57,0.58]
Testosterone (pg/mg)	-0.03	0.14	11.22	[-0.29,0.25]
Grip strength (kg)	0.02	0.02	52.86	[-0.01,0.05]
2D/4D	-2.11	2.13	0.53	[-6.72,1.63]
Hypothesis 2				
Feminine norm conformity	1.46	0.39	< 0.01	[0.54,1.90]
Masculine norm conformity	0.38	0.29	2.27	[-0.02,0.97]
Control variables				
BMI	-0.01	0.03	52.14	[-0.06,0.05]
Age	-0.01	0.02	60.37	[-0.05,0.02]

Note. R^2 = .15, 95% CI^2 = [0.06,0.24], [1]Bayesian approximation to SE B, [2]Bayesian credibility interval, [3]Dummy-coded (women = 0).

anecdotal evidence for an effect in the assumed direction (H1$_d$). The lower the digit ratio was the higher was the aniticipated enjoyment of the agentic sad film.

Again extreme evidence points towards an effect of feminine norm conformity (H2$_a$) in this analysis on the potential enjoyment of the film described in the agentic stimulus. Again, masculine norm conformity had no effect with anecdotal evidence in this analysis.

4.6   Discussion

This chapter aimed to advance previous findings of Oliver et al. (2000) from a biopsychosocial perspective. In general, the most biological-evolutionary variables subsumed by hypothesis 1 did not affect the preference or enjoyment of sad films. Unlike previous studies of Oliver (1993) and Oliver et al. (2000), it was found with strong evidence regarding the SFS and moderate evidence regarding the agentic stimulus that sex was not a predictor for the response variables. Simultaneously, the data needed to be more decisive concerning the communal stimulus. Only 2D/4D (H1$_d$) received anecdotal evidence for a negative effect on the potential enjoyment of the agentic stimulus. However, that there is an effect is only about twice as likely compared to a null effect. Neither variation in plasma Testosterone (H1$_b$) nor strength (H1$_c$) were meaningfully associated with the response variables with apparently decisive evidence. Regarding hypothesis 2, the masculine norm conformity had a comparable indecisive effect on the SFS. In contrast, feminine norm conformity does not affect the general preference towards sad films (SFS) with moderate evidence. However, feminine norm conformity strongly predicted the potential enjoyment of the communal and agentic-themed movie descriptions with strong up to extreme evidence.

Summarizing both hypotheses, it appears evident that a substantial social-cultural influence affects the preferences for and enjoyment of sad films. This effect is a plausible explanation for the null effects regarding hypothesis 1. Given that the sexes have become more gender equal, for instance, as can be assessed with traits of the BSRI where no meaningful difference can be found anymore if the original items developed in the 1970s are used (Troche & Rammsayer, 2011), it appears reasonable that any variation that was caused by the reporting of sex, possibly, has now faded away by cultural change.

Indeed, the socially learned content of gender stereotypes (Bussey & Bandura, 1999) impact the outcome of the meta-appraisals (Oliver et al., 2000; Schramm & Wirth, 2010) and emphasize the substantial social-cultural influence on the evaluation of media content. It appears that Oliver et al. (2000) was correct with the assumption that gender stereotypes contribute to the gender difference in the preference for and enjoyment of sad films.

4.6.1 Limitations

As with the previous chapter, the first limitation is that the study does not entirely assess the RIMSGD but relies on an available set of predictors. However, one must be clear that this is the first study (see Chapter 2) to assess biological-evolutionary variables, and it is reasonable to test simple assumptions before assessing more complex one (Vollmer, 2002).

Comparable to the previous previous studies, the analysis presented here is part of a multi-purpose research project. Such projects are research-economically sound and allow researching multiple topics with comparable few subjects. However, compromises need to be made regarding the assessed variables and tested stimuli. For instance, if this project had been a stand-alone study, it would have been reasonable and especially more valid to test for the enjoyment of actual movies compared to mere descriptions.

Another limitation is that the sample is not generalizable to the German population. The sample consists primarily of students living in or close to Würzburg. However, this was a laboratory sample gathered through a pandemic. Many assumptions about biological-evolutionary variables should be generalizable beyond the population within the "borders" of the University of Würzburg. Though, the sample might have biased the influence of social-cultural predictors. Studies have been published that show that men deciding to study a subject in the social science branch show, on average, a greater amount of gender nonconformity (Diekman et al., 2011; Su et al., 2009). The University of Würzburg has a focus on communal subjects, and the male participants could be, on average, more feminine and less masculine compared to the general (student) population. Furthermore, a large dropout of male participants occured during the hair sampling which certainly has lead to a bias for participants that are conscious and do not wear short hair.

A final limitation is that BSRI was not tested with the other predictors to see if gender stereotype conformity was responsible for the significant effect regarding gender roles as assessed by Oliver et al. (2000). However, it can

be supposed that both constructs (BSRI, norm conformity) are strongly associated, and it remains questionable if a regression (multicollinearity) would be suitable for a similar assessment.

4.6.2 Conclusion

Given the argument outlined in the first few sentences of this chapter that sad films are antithetical media content compared to pornography, the argument appears true from a sex/gender perspective. While pornography use is strongly affected by variables from the biological-evolutionary pathway, like the sex drive, the preference for and enjoyment of sad films is strongly influenced by variables originating in the social-cultural realm. Though, both studies also showed that at least anecdotal evidence exists for an impact of social-cultural or biological-evolutionary variables on the usage and preferences for each content. Figure 4.2 highlights the variables of the RIMSGD that have been identified in this chapter to account for variation in the usage of and preferences for sad films. Digit ratio is supposed to be related to brain masculinization and, therefore, neuronal sex differences (Manning, 2002). However, these are based on androgenic action in early brain development and, therefore, a human's ontogeny. Based on this, the hormonal bullet point must be emphasized. Finally, the most decisive influence on the sex/gender differences in the preference for and the enjoyment of sad films originates from conformity to feminine norms and, to a smaller extent, from masculine norms. This influence is highlighted by the variables concerning gender-based stereotypes and the gender-typical environment of the RIMSGD.

Figure 4.2

RIMSGD Variables Shown to Predict the Preference for and the Enjoyment of Sad Films
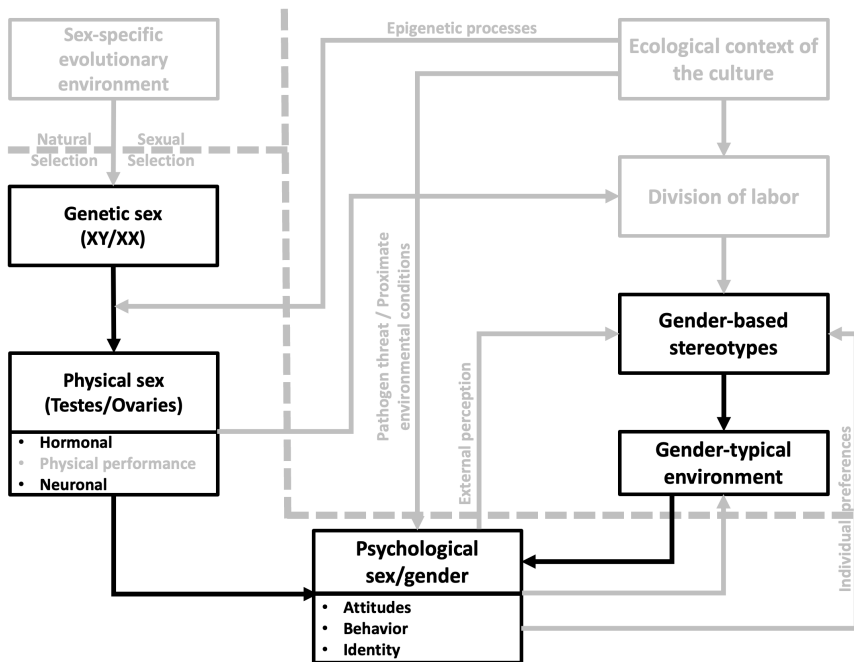
Chapter 5

General Discussion

This dissertation aimed to advance the state of research about sex/gender from both a biological-evolutionary and a social-cultural, or, in the terminology of this thesis, an integrative perspective. In the first chapter, the IMSGD (Neyer & Asendorpf, 2018), displayed in Figure 1.1, was thoroughly discussed and subsequently revised, leading to the RIMSGD (Figure 1.5).

The RIMSGD introduced sexual selection as the second force of evolution (Darwin, 1871; Hiraiwa-Hasegawa, 2000) which Neyer and Asendorpf (2018) did not even mention despite its detrimental impact on, for instance, human brain development (G. Miller, 2001). In defense of Neyer and Asendorpf (2018), it needs to be mentioned that the authors summarize the previous state of knowledge and the ways of thinking in differential psychology. However, as the IMSGD had been published in at least a couple of volumes of a standard textbook for teaching differential psychology without anybody recognizing how flawed the biological-evolutionary pathway was, it does not shed a good light on diverse student and lecturer generations. Another part of the revision was that hormonal sex was classified as a subcategory of physical sex instead of preceding it. The RIMSGD acknowledges the existence of epigenetic processes and introduces pathogen threat as a proximate environmental condition to affect psychological sex/gender directly. In its ultimate aim, it should emphasize that biological-evolutionary and social-cultural predictors need to be considered if sex/gender differences are researched, and it offers a potential preselection of variables and topics, including their interaction, that might contribute to the etiology of individual sex/gender differences.

A literature review followed the introduction of the RIMSGD (Chapter 2). It used the biological-evolutionary path of the RIMSGD to focus on studies that somehow considered biological-evolutionary influences, as described in the RIMSGD, to explain any sex/gender difference in media selection, use, and effects. The review's results showed that studies considered at least one of each topic of the biological-evolutionary pathway. In summary, thirty-nine studies met the inclusion criteria for the literature review. The largest block of studies centered around mating advertisements

used to assess PIT and SST. However, the most noteworthy block from a media psychologist's perspective centered around the studies conducted primarily by Marie Elisabeth Grabe about sex/gender differences in news processing. Her and her co-authors' research yield an excellent example of integrative media research. Apart from her studies and a few other exceptions Wright and Vangeel (e.g., 2019), research had been sparse and was in large shares not conducted by native media psychologists but rather evolutionary psychologists. This scarcity of previous work yielded—and still yields—a blank slate to research.

The first quantitative-empirical chapter (Chapter 3) focused on sex/-gender differences in pornography use and pornography content preferences (e.g., Morichetta et al., 2021; von Andrian-Werburg et al., 2023, 2024). Specifically, the chapter aimed to advance the state of journal-published knowledge about the predictors of both female and male pornography usage regarding gangbang and rough sex pornography. Surprisingly, women are more interested in some of the contents, which can be labeled a paradox (Salmon et al., 2019). The results of the chapter replicated that the primary reason to watch pornography is the satisfaction of one's sex drive (Burtăverde et al., 2021) with other biological-evolutionary predictors being sex, sociosexual orientation, and age for specific pornographic content preferences assessed. From the social-cultural realm, the social influence of sexually loose peers was found to predict the use of gangbang pornography, and anecdotal evidence was discovered for verbal abuse in childhood to predict the use of sadomasochistic pornography. A follow-up study yielded the replication of sex drive being the premier predictor for bondage & dominance and violent sex pornography. Only these types of pornography were further analyzed because they yielded an effect of sex related to women reporting to use more such content compared to men. The use of violent sex pornography was subsequently predicted by an earlier onset of menarche (anecdotal evidence) and with very strong evidence by women's belief in rape myths. Furthermore, the replication study showed that although only a minority of women use the outlined contents, these phenomena are of empirical relevance, with approximately ten % of the not self-selected sample (Chapter 3, study 2) using bondage & dominance and about five % of women using violent sex pornography. In summary, integrative research showed that pornography is a media content deeply driven by hedonism, with minor social implications regarding its subtypes. Rape myths consist of a society's problematic beliefs regarding sexual assault and can be used to facilitate victim blaming or downplay

sexual assault (Schwendinger & Schwendinger, 1974). That these are in a relationship with pornography use yields a topic of concern, and more emphasis should be put on the matter in future research.

The second quantitative-empirical chapter (Chapter 4) pursued an integrative approach toward sad films. Unintended, but in a remarkable plot twist, the evaluation of sad films relies much stronger on social-cultural predictors than pornography. The predictors of sad films almost mirror the biological-evolutionary predictor variables of pornography use on the social-cultural pathway of the RIMSGD. Especially conformity to feminine norms and, to a weaker extent, masculine norms appear to affect the preferences for and enjoyment of sad films. Different, in theory reasonable, biological-evolutionary predictor variables had been tested but showed no effect on the response variables in their utmost majority. Only anecdotal evidence was found regarding the digit ratio. A construct that is supposed to be related to an individual's degree of brain masculinization (Manning, 2002). In summary, the data of the chapter yield strong evidence that a substantial social-cultural influence in the processes regarding sad films meta-appraisals take place and that cultural stereotypes and norms significantly affect sex/gender differences for the preference for and enjoyment of sad films.

Translating the evidence gathered in both empirical chapters onto the RIMSGD Figure 5.1 summarizes all topics and variables on the model that somehow predicted the use of assessed types of pornography or sad films.

Beginning in the upper left corner of Figure 5.1, an earlier onset of menarche and older age predicted the use of different types of pornography. Both variables had been theorized to be related to the "speed" of an individual's life-history strategy, which is supposed to have evolved in the environment of evolutionary adaptedness (Stearns, 1992). From the theoretical background of this thesis (see Section 1.1.2), genetic sex is the determining factor of sex. Therefore, all sex-related effects are attributed to physical (participant self-description) and genetic sex. The digit ratio, which possibly influences the enjoyment of sad films and the menarche, is associated apart from any ultimate origin to physical sex and accounts for neuronal (digit ratio) and hormonal sex differences (menarche, digit ratio).

Variables of the social-cultural realm that predicted media selection and use are, as outlined in Figure Figure 5.1, the conformity to gender norms regarding the preference for and enjoyment of sad films originating from gender-based stereotypes and societal norms. Rape myths that predicted the use of violent sex pornography most likely share the general etiology of

gender norm conformity. Further social-cultural predictors were sexually loose peers that facilitated the use of gangbang pornography. Such peers can be accounted for the social environment of which the gender-typical environment is a subset. Suffered verbal abuse in childhood, with anecdotal evidence as a predictor for sadomasochistic pornography, can also be attributed best to an influencing factor in the social environment.

Finally, a human's sex drive and her/his sociosexual orientation are individual psychological and behavioral traits that are at best attributed to psychological sex/gender.

Figure 5.1

Empirically to Sex/Gender Differences in Media Selection and Use Associated RIMSGD Variables
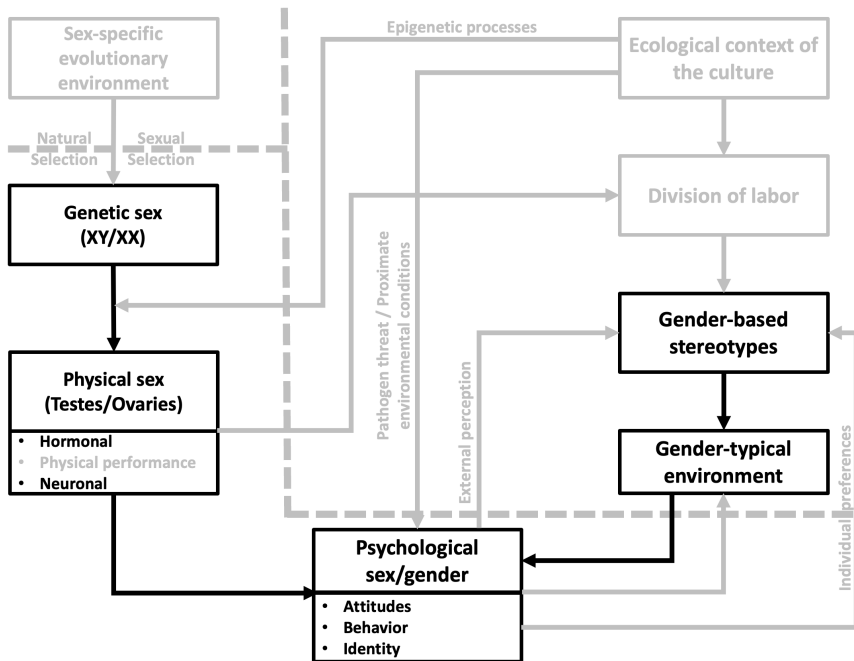
5.1   General Limitations

Specific limitations of the literature review and the quantitative-empirical chapters were addressed in the discussions of the respective chapters. However, general limitations regarding the conception of this thesis and its underlying structure need to be further discussed.

Looking at Figure 5.1, it is apparent that many of the model's assumptions have not been tested or even been theoretically considered beyond Chapter 1. This is, for example, the case for pathogen threat, the ecological context of the culture, or the historical division of labor. If this thesis were a journal article, it would certainly be desk-rejected for outlining a theory that is not put to the empirical test in the later parts of the manuscript. Related to this, a concept from playwriting was recently applied to social science texts called Chekhov's gun (Lund, 2021). Chekhov, a Russian dramaturgist, stated that any elements in a story should somehow be a meaningful part of the story or, more literally, that if a loaded gun is put on the stage, someone is better there to shoot it (Lund, 2021, p. 54).

However, this thesis is better understood as a series of theoretical and empirical arguments that, on the one hand, interact and build on each other but, on the other hand, aim to stand alone with a unique scientific contribution for each chapter. Research on the pathogen prevalence and media use or the epigenetic impact on sex differentiation and how this applies to media selection, use, and effects would be very worthwhile to research however, such research is at the current state of knowledge, not economically sound, given alone that so much more research can be conducted within the borders of media psychology itself keeping the Occam's razor in mind (Vollmer, 2002). Nonetheless, the possibility that, exemplarily, epigenetic differences might influence certain kinds of media selection and use or possibly predict media effects should not be left unnoticed. Ultimately, Chapter 1 aims to spark new research despite allowing the possibility to be interpreted as a conceptual weakness.

Another topic that needs discussion regarding this thesis is that only content preferences about pornography and sad films were assessed. Neither media effects, which the literature review of chapter 2 also searched for, nor other media preferences were part of the analysis. It appears certain that more media contents exist where an integrative perspective could yield a significantly better understanding of sex/gender differences associated with the phenomena. These could be, for instance, romantic films, online dating, social media use, or specific genres of computer games, as Chapter 2 highlighted. The research outline here focussed on pornography and sad

films because almost no prior research existed. It appeared best (based on Occam's Razor) to test at first the media contents, probably yielding the most considerable sex/gender differences in the field (Oliver et al., 2000; von Andrian-Werburg et al., 2023). However, this can only be the tip of the iceberg about further integrative research on media selection use and effects.

Concerning general methodological concerns, this dissertation focused on regressions. Given the previous state of research about the assessed phenomena, it appeared reasonable to use such a standard method in psychology to analyze the hypotheses outlined. At the current state of research recapped in this thesis, new knowledge is created if further predictors responsible for the sex/gender difference are identified and tested. Looking at the results of chapter 4, effects that had previously been labeled to yield the most significant sex/gender difference in media research (Oliver et al., 2000) can, in parts, apparently be explained by social-cultural variables like the impact of gendered norms only, eliminating any effect of sex for certain subtypes of sad films. Again, Occam's razor has to be called upon to justify this approach, and it certainly has advanced previous research. However, such an approach can not be considered the gold standard for evaluating this dissertation's basic assumptions, and more sophisticated analyses should be used in future investigations. As outlined in chapter 1, the whole might not be more than the sum of its parts, but it contains different properties (Lewin, 1936, 1939). If one looks at Figure 5.2, the actual paths of statistical inference the regressions have drawn visualize and highlight how limited the analysis was regarding evaluating the integrative model. Probably more interactive approaches like structural equation modeling or network approaches could provide a more interactive statistical perspective (e.g., Borsboom & Cramer, 2013; Wolf et al., 2013). However, these require large sample sizes and, given the assumptions made by the RIMSGD longitudinal data for a long time frame. Such an approach might only be feasible if more human resources are accessible than for a "mere" dissertation.

5.2   Conclusion and Outlook

Ultimately this thesis showed that integrative research about media selection, use, and effects has been scarce. Traditionally, social science focused on variables attached to the social-cultural realm (Eagly, 2018; Pinker, 2003; Sherry, 2004). Therefore, sex/gender differences have primarily

Figure 5.2

Assumed Statistical Pathways in the Analyses Impacting The Response Variables (Without Interactions Between Explanatory Variables displayed)
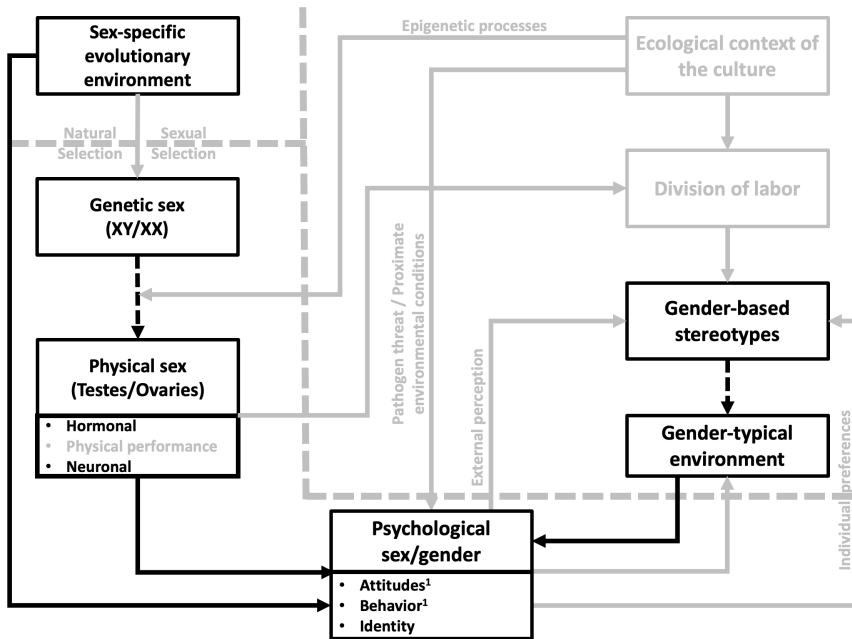
Note. [1]Media selection and use and associated sex/gender differences are a part of sexed/gendered attitudes and behavior. The figure illustrates the statistical inference pathways but no interactions among the explanatory variables. The dotted arrows emphasize that the constructs they originate from are theoretically meaningful only for the variable they point to, but they have not been evaluated practically.

been attributed to social-cultural influences. Only a few studies research before this thesis have dealt with biological-evolutionary influences regarding media selection, use, and effects. However, sex/gender differences originate from a complex biopsychosocial etiology, and changing variables affect a human's media preferences depending on the media content with varying intensity.

The fact that sex/gender differences exist is based on solid empirical evidence. Independent if specific sex/gender differences are rooted more strongly in the social-cultural or evolutionary-biological realm. They can lead, even if they appear tiny from a univariate perspective (e.g., Petersen & Hyde, 2010), to completely different outcomes when a multivariate picture is considered (von Andrian-Werburg et al., 2024). Von Andrian-Werburg et al. (2024) showed that the sex/gender differences in human sexual behavior account for a thoroughly different, though complementary, structure of human sexual behavior. Therefore, it appears detrimental in line with this thesis's aim that more research should be put into variables that cause and uphold sexed/gendered attitudes, behaviors, and identity, including their interaction.

The conclusion of chapter 2 yielded two potential scenarios for the future of integrative research on sex/gender differences. In the pessimistic one, integrative research was supposed to remain in the niche it currently is, only now and then to be recognized by a scholar pointing towards the largely blank slate the field remains (e.g., Sherry, 2004). The optimistic scenario assumes that social science will (have to) react to recent calls, not only made within evolutionary psychology (Buss, 2020) but by well-renowned scholars of mainstream social science (e.g., Eagly, 2018). The reconsideration of biological sex differences as factum has not only been called for social science, but also other disciplines like medicine take sex/gender differences increasingly into account (e.g., Baggio et al., 2013).

This thesis provides a model and empirical evidence that a biological-evolutionary influence on human behavior exists and points to future research directions. Ultimately, one needs to be clear that there will always remain an elephant of unexplained variance in the room if the biopsychosocial etiology of media selection, use, and effects is not adequately reflected in research. Reinterpreting Chekhov's gun, merely focusing on social-cultural predictors to explain sex/gender differences, is like having two loaded guns on stage but only discharging one during the play. The other remains looming at the back of the protagonist with an uncertain outcome.

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Few topics have been the subject of more controversy than those encapsulated by the terms "sex" and "gender". Social-cultural and biological-evolutionary argumentation patterns frequently clash and especially the public debate appears to be stuck in a stalemate between the two competing parties. From a psychological perspective both topics appear deeply intertwined and are not easy to be separated. This study pursues an integrative approach to better understand the roots of differences best subsumed under the term sex/gender. It will become apparent that both nature and nurture variables interact and form the complex system of human behavior and experience.

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