Using the Health Belief Model as a Theoretical Framework to Examine Demographics Associated with the Accuracy of Sexual Risk Perception across Adulthood

By

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Abstract

Despite advancements in Sexually Transmitted Infection (STI) prevention methods, STI infections have reached an all-time high in the United States (U.S.) across demographics. STI incidents are also at an all-time high among adults in the U.S. ages 65 years and older. In the last ten years, cases have more than doubled. According to the literature, the Health Belief Model (HBM) is considered one of the most prevalent theoretical frameworks used to guide health behavior interventions (Glanz et al., 2015). For this reason, the HBM was chosen as an appropriate framework for the current study. Understanding how demographics such as age and gender influence the accuracy of sexual risk perceptions is an important step toward tailoring culturally relevant STI prevention programs throughout the course of development. This study utilized multinomial and binary logistic regression to explore the relationship between age, gender, and the interaction effect with sexual risk perception accuracy. Results indicated a significant interaction effect with null main effects. Meaning that sexual risk perception accuracy was not the same for men and women.

Keywords: Perceived Sexual Risk, Health Belief Model, Sexual Risk Accuracy, Self-Efficacy

Dedication

I would like to dedicate this dissertation to my husband, Amlan, and my two amazing children, Oliver and Sylviana Pentiah. This journey has been one of both triumphs and challenges, and it's been made possible by the sacrifices and adjustments of our entire family. I am deeply committed to supporting you, as you navigate your own paths in life, just as you've supported me on mine.

Amlan, your name holds a special meaning, “Unfading and Ever bright”. These words encapsulate the essence of who you are, and indeed, how you've been to me. Your unwavering light has been my guiding star, illuminating the path as I pursued my dreams and ambitions, and as we navigated the challenges and joys of parenthood together. Your steadfastness in the face of setbacks has been a source of strength and inspiration. Without your faith, support, and boundless love, this dissertation would not exist. Thank you for being my guiding light, an extraordinary husband, my friend, and a remarkable father to our children.

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CHAPTER ONE

OVERVIEW

Health behavior theories and models are often used to explain a lack of engagement in healthy behaviors and what can be done to improve healthy decision-making and overall public health (Glanz et al., 2015). The Health Belief Model (HBM), for example, was developed in the 1950s by social psychologists Rosenstock, Hochbaum, Kegeles, and Leventhal who theorized that decisions to engage in preventative health behaviors are not always based on objective facts alone but are influenced by personal beliefs (Hochbaum, 1958; Rosenstock, 1974). Risk perceptions, or beliefs regarding one's susceptibility to a negative outcome, are also emphasized in health behavior theories, including the HBM (e.g., Brewer et al., 2007; Janz & Becher, 1984; Sutton, 1987; Weinstein, 1993). While the constructs included in the HBM have been studied across a number of health-related behaviors and conditions, the current study focuses on the accuracy of perceptions regarding the risk of contracting a sexually transmitted infection (STI). With STIs at an all-time high across numerous age groups (CDC, 2019), there is an increased need to understand how the accuracy of risk perceptions differs based on age and gender. Understanding how age groups differ in their accuracy of sexual risk perceptions may help to improve STI prevention and early intervention strategies across multiple age groups.

Data recently published by the CDC indicates that as many as one in five individuals in the U.S. have an STI, and a total of 26 million new cases occurred in 2018 alone (CDC, 2021). While 45.5 percent of new cases occurred among individuals aged 15–24, the prevalence of STIs is increasing across various age cohorts. For example, new STI incidents among adults in the U.S. aged 65 years and older have more than doubled in the past 10 years (Smith et al., 2020). Among Americans aged 55 years and older, gonorrhea increased by 164 percent, syphilis

increased by 120 percent, and chlamydia increased by 86 percent within a five-year period (CDC, 2019). Additionally, in the United States 50% of the 1.3 million people living with HIV are 50 years old or older (Karpiak and Lunievicz, 2017), and, in 2018, every one in six new HIV diagnoses were among people aged 50 and older (CDC, 2020). While older adults (50 years old or older) are considered to be less at risk for contracting an STI compared to younger age groups, the sharp increase in STI incidents among this age group suggests a need to improve prevention and early intervention efforts.

While there are a number of biopsychosocial factors that may contribute to a decline in sexual activity as an individual ages, modern technology, medical advancements, and erectile dysfunction medication have led to individuals living longer, healthier lives and staying sexually active longer (Barclay, 2010; Schick et al., 2010). According to the United States Census Bureau (2019), the United States has an aging population, and, by 2060, one in four Americans will be 65 years and older. Additionally, research suggests that sexual activity is more likely associated with health and partner availability, but not age (Freak-Poli, 2020). As individuals are living longer, healthier lives, there is a need to improve our understanding of sexual risk research across adulthood.

Efforts to improve prevention and early intervention of STIs across the lifespan is a worthwhile task because of the significant individual health and societal costs of untreated STIs. The CDC estimates that new incidents of STIs in 2018 alone cost the U.S. healthcare system approximately 16.7 billion dollars in lifetime costs (CDC, 2018). Of all the STIs, HIV has the most significant impact on older adult health (Minkin, 2010). Early detection of HIV is crucial in order to delay the onset of AIDS, improve overall prognosis, and help prevent additional cases. However, older adults are more likely to be diagnosed late with HIV and, therefore, face worse

survival rates (Brooks et al., 2012). A recent cost-analysis found that it costs more to treat older adults with HIV than their younger counterparts due to comorbid health interactions associated with aging (Krentz & Gill, 2014).

Older people infected with HIV may be at increased risk of dementia, diabetes, osteoporosis, and some cancers (NIH, 2021). Older women infected with HIV may face additional health consequences, as HIV can exacerbate menopause symptoms such as decreased bone density, decreased cardiovascular health, and neurocognitive impairments (Minkin, 2010). STIs in general can negatively impact older adult health and sexual functioning as well as impair the immune system, thus making HIV more likely.

Furthermore, when left untreated, STIs can cause a number of general and sexual health complications (Chesson et al., 2017). In the United States, the most common STIs include bacterial vaginosis, chlamydia, gonorrhea, hepatitis, herpes, human papillomavirus (HPV) infection, syphilis, and HIV/AIDS (CDC, 2021). Syphilis, gonorrhea, bacterial vaginosis, and chlamydia can all be cured with antibiotics before serious complications develop. However, when left untreated, syphilis can lead to significant complications with heart, brain, and nervous system functioning, resulting in blindness, deafness, cognitive impairments, dementia, paralysis, and impotence (CDC, 2022). Gonorrhea can lead to pelvic inflammatory disease in women, infertility issues, arthritis, and it can be life threatening if left untreated. While chlamydia impacts women's infertility, a concern that older adult women likely do not share, untreated chlamydia can lead to chronic abdominal and pelvic pain. For STIs that cannot be cured through antibiotics, there are a number of treatment options to reduce the risk of additional complications. For example, the number one cause of cervical cancer is HPV; however, following pap smear guidelines can lead to early detection and treatment of abnormal cells.

In order to preserve limited financial resources and maximize effect, screening recommendations prioritize groups disproportionately affected by STIs, such as sexually active women under the age of twenty-five or pregnant, and men who have sex with men (MSM). The CDC also recommends screening individuals who are at increased risk for contracting an STI due to risky sexual behaviors (i.e. sexual partners, condom use, and STI testing). Taking patient sexual histories as part of routine practice is therefore a vital component in the strategic plan to reduce incidents of STIs.

Primary care providers are often the first point of contact for patients of all ages seeking health care services, and they play an important role in the prevention, screening, and treatment of STIs (Barrow et al., 2020). Primary care providers can identify and treat patients at increased risk of STIs by taking brief sexual histories, providing sexual health education, and providing appropriate screening referrals. However, many health care professionals only assess sexual histories when it seems relevant to the chief complaint, which is concerning given that many individuals with STIs are asymptomatic (Palaiodimos et al., 2020; Wimberly et al., 2006). Sexual history taking among older adults seems to be especially low (Ports et al., 2014), which may be due to biased views that only young people engage in risky sex (Gott et al., 2004). This puts the responsibility to identify and communicate sexual risk on the patient, which is troubling given that many individuals of all ages underestimate their sexual risk (Ethier et al., 2003; Syme et al., 2017). Additionally, research suggests that HIV testing among individuals aged 55–75 is cost effective (Sanders et al., 2008).

While older adults are often stereotyped as asexual (Kenny, 2013), research suggests that sex and sexuality are important to this population, and that it influences quality of life (Fisher, 2010; Lindau et al. 2007). Stereotypes regarding this population are not only held by the general

public and perpetuated in mass media (Gewirtz-Meydan et al., 2020) but have also been endorsed by health care professionals and internalized among older adults as well (Gewirtz-Meydan et al., 2018). Subsequently, health care professionals are less likely to conduct sexual histories with older adult patients (McAuliffe et al. 2007), and older adults may be less likely to perceive themselves as at risk for sexually transmitted infections (Youssef et al., 2018). Understanding how the accuracy of sexual risk perceptions differ across age groups may serve to challenge these stereotypes and provide needed information to tailor outreach intervention efforts.

This study aims to fill gaps in the literature while simultaneously addressing past methodological limitations. First, this study aims to expand the operational definition of perceived susceptibility in sexual risk research, which has typically been operationally defined in the literature as one's perception of risk towards contracting HIV/AIDS, and not STIs in general. This is an important distinction because the stigma associated with who is susceptible to HIV may influence measures of perceived sexual risk in general. For example, heterosexually active young adults generally do not perceive themselves to be susceptible to AIDS but may engage in condom use to prevent contracting other STIs (Maticka-Tyndale, 1991). Researchers suggest that since the goal of understanding sexual risk is to increase safe sex practices and not just to avoid HIV, then research questions assessing risk should inquire about perceived susceptibility to contracting an STI in general.

The current study also aims to address past methodological errors by examining the accuracy of sexual risk perceptions and not simply perceptions of risk. Results regarding the relationship between perceived susceptibility to AIDS and condom use are mixed (Champion & Skinner, 2008). One explanation for these mixed results regarding the relationship between

perception of risk and sexual behavior is that they may be due to methodological weaknesses (Brewer et al., 2004; Brewer et al., 2007; Champion & Skinner, 2008). Brewer et al. (2004) notes that a common error in measuring risk perception is failing to consider the bi-directional relationship between perceptions and behaviors. For example, if an individual perceives themselves as being at risk for contracting an STI, they may be more likely to engage in preventative behaviors; vice versa, if an individual is engaging in high-risk behaviors, they may also perceive themselves as being susceptible to contracting an STI. A meta-analysis of the relationship between risk perceptions and behaviors found that the relationship between perceptions of risk and behavior is stronger in studies that included higher quality risk measures (Brewer et al., 2007).

While accurate perceptions of risk are considered a necessary factor to motivate STI prevention behaviors, few studies have looked at what factors influence the accuracy of risk perceptions (Kershaw et al., 2003; Syme et al., 2017). The current study will explore how demographic factors such as age and gender influence the accuracy of perceived susceptibility to STIs. Since research on the HBM and AIDS-related behavior in the United States has largely focused on adolescents and young adults (Champion & Skinner, 2008), the current study fills a gap in the literature by expanding the age range of participants to include adults aged 18–92.

Literature Review

The current study seeks to understand how demographic variables such as age and gender influence the accuracy of sexual risk perception. The accuracy of sexual risk perception is based on a combination of both perceived risk and actual risk. Therefore, the current review of the literature focused on 1) the HBM in relation to HIV/AIDS-related behavior, 2) gender and age differences in perceptions of risk and common STI risk behaviors, 3) age and gender factors that

influence actual risk and perceptions of risk, and 4) the accuracy of STI risk perceptions related to age and gender.

The Health Belief Model

The modern treatment for tuberculosis, a serious respiratory disease, was released in 1952 (Daniel, 2006). Positive health outcomes are associated with early detection through asymptomatic screening after exposure and early, aggressive intervention. Despite these significant advancements in modern medicine and outreach campaigns to make screening opportunities more accessible and the importance of them well known, deaths from tuberculosis continued to rise. Haucbaum (1958) sought to create a model that would help explain why the general public failed to engage in preventative health behaviors and found that health care decisions are shaped by beliefs. Since its inception, the HBM has become one of the most prevalent theoretical frameworks used to guide health behavior interventions (Skinner et al., 2015; Sulat et al., 2018). Today, there are more prevention and early intervention options for STIs than ever before, yet the prevalence of STIs continues to rise. The HBM provides an appropriate framework for understanding how beliefs, specifically perceptions of risk, are shaped by demographic variables such as age and gender.

One of the core assumptions of the HBM states that in order for an individual to feel motivation to engage in health-related behaviors they must believe that 1) they are susceptible to negative outcomes, 2) the outcome is severe enough to warrant action, 3) the individual is capable of change, and 4) the benefits of change outweigh the perceived barriers (Skinner et al., 2015). The current study focused on how demographic variables, such as age and gender, influence the accuracy of perceived susceptibility. Perceived susceptibility, also known as risk perceptions, refer to a person’s beliefs regarding one’s susceptibility to a negative outcome

(Brewer et al., 2007; Janz & Becher, 1984; Sutton, 1987; Weinstein, 1993). The HBM postulates that perceptions of risk influence a person's decision to engage in preventative health behaviors (Skinner et al., 2015). Demographic variables are theorized to influence beliefs and, therefore, health related behaviors; however, they are rarely studied in HBM research, and this is considered to be a significant gap in the literature (Skinner et al., 2015; Sulat et al., 2018).

The effectiveness of perceived susceptibility as a predictor variable of health behaviors has been researched extensively, with mixed results. These past inconsistent findings have been investigated in subsequent research, and many have argued that the cause of these inconsistent findings is the presence of methodological limitations and unclear construct definitions (Brewer et al., 2007; Sulat et al., 2018). Pinkerton et al. (2000) recommends separating individuals into risk groups, such as low, moderate, and high-risk groups. Brewer et al. (2007) conducted a meta-analysis and found that the relationship between perceived susceptibility and health behavior across studies has been reported as negative, positive, and negligible with most previous meta-analysis studies finding a significant, yet small, relationship.

Brewer et al. (2004; 2007) note that two of the major methodological errors in research related to perceived susceptibility are failing to measure current behavior and asking conditional questions. For example, the question "Are you susceptible to STIs?" is ambiguous and does not provide insight into what factors influenced each person's risk assessment. Someone who perceives themselves as being susceptible to STIs may engage in more preventative behavior, or, vice versa, a person who engages in risky behavior may rate themselves as being more at risk for contracting an STI. The bi-directional relationship between risk perceptions and behavior implies a need to measure the accuracy of risk, and not simply behavior.

In a meta-analysis, Brewer et al. (2007) note that the relationship between perceptions of susceptibility and behavior was significant (r = .24) and that the relationship was stronger in studies with higher quality risk measures or unskewed scores for risk or behavior measures. While research supports the HBM's claim that perceptions of risk influence behavior, few studies have looked at demographic factors that influence the accuracy of risk perceptions (Kershaw et al., 2003; Symes et al., 2017). Furthermore, age and gender differences have been researched concerning risk perceptions and behavior. Still, little has been investigated regarding the influence of gender and age on the accuracy of risk perceptions.

The HBM and HIV/AIDS Behavior

Most HBM-inspired prevention programs and resources have been developed for populations considered to be at increased risk for contracting HIV, such as adolescents and young adults, men who have sex with men (MSM), sex workers, and injection drug users (Champion and Skinner, 2008; Tran et al., 2019); whereas very few prevention resources are designed for middle-aged or older adults in the general public (Altschuler & Katz, 2015; Conner et al., 2019). Most HBM-inspired interventions regarding sexual risk behaviors have focused on improving condom use and decreasing multiple partners rather than on reducing the overall level of risk (Coates et al., 2008). Numerous studies that have examined the efficacy of heightening sexual risk appraisals in condom use among adolescents and college-aged adults have found a significant effect size (Coyle et al., 1999; Joorbonyan et al., 2022; Zhang et al., 2021).

Most research examining the predictive power of the HBM in predicting HIV-related behaviors has focused on condom use, with few studies focusing on other risk behaviors, such as talking to a new partner about HIV, HIV testing, or having multiple partners. While interventions aimed at changing beliefs are effective in changing safe-sex behavior, studies investigating the

model's predictive power regarding HIV-related behaviors have been mixed. Most studies have found that perceptions of HIV risk have a small positive relationship to condom use, with the exception of gender differences (Basen-Engquist, 1992; Gielen et al., 1994; Lollis & Antoni, 1997). Lollis and Antoni (1997) surveyed 122 college students aged 17–35. They found the HBM model to be efficacious in predicting multiple partners, with perceived risks of AIDS making a significant contribution to the relationship between the HBM and various partners. The HBM was also found to be more efficacious in predicting female behavior compared to men, with the HBM explaining 22% of the variance among women regarding multiple sexual partnerships and 18% of that in the total number of risk behaviors in general. Among male participants, the HBM explained 18% of the variance in multiple sexual partnerships.

Risk Behaviors

Sexual risk behaviors constitute any behavior that increases the risk of an adverse health outcome, such as an unwanted pregnancy or contracting an STI (Senn, 2015). Sexual risk falls on a spectrum and has been assessed using several factors, such as sexual partners, STI testing, and condom use. The following section explores the gender and age differences related to sexual risk.

Gender and Age-Related Risks

Several biological factors related to aging and gender influence the risk of contracting an STI. Women, in general, are more susceptible to sexually transmitted infections and are disproportionately impacted (Aral et al., 2004). Some biological explanations include larger mucosal surface area, microlesions caused during sex, and the presence of more HIV in semen than in vaginal secretions (Aral et al., 2004).

Aging is also associated with increased biological vulnerability to STIs. Chronic illnesses that are more likely to occur as an individual enters older adulthood may impair immune

functioning and thus make a person more vulnerable to STIs (Brooks et al., 2012). At the intersection of age and gender are additional biological factors that increase vulnerability to contracting an STI. Physiological changes in older adult women, such as changes in estrogen, can lead to vaginal dryness and, therefore, more tearing during intercourse, thus increasing vulnerability to STIs (Durvasula, 2014).

Risk Behaviors

While there are a number of biopsychosocial factors that may lead to a reduction in sexual activity as an individual ages, many older adults remain sexually active and report several risky sexual behaviors. Because STIs are often spread through bodily fluids during sexual contact, sexual risk is based on both individual and relationship factors. Multiple partners and casual sexual relationships have been found to increase the risk of contracting an STI (Joffe et al., 1992; Lyons., 2017). Furthermore, the CDC recommends that new partners talk about their sexual history and take an STI test before having sex (CDC, 2022). Condom use and recommended STI testing are also considered STI prevention strategies.

Casual sexual encounters seem to differ across age groups, with one study stating that 39% percent of individuals aged 18–24 reported having a casual sexual encounter in the past two years (Lyons et al. 2013), compared to a different study that found 4.2 percent of adults over the age of 55 reported engaging in casual sex in the past year (Amin, 2016). While older adults may be less likely to engage in casual sexual relationships compared to younger adults, sex in a monogamous relationship is not without risk, as older adults are more likely to have a higher number of lifetime sexual partners and incidents of infidelity.

Risk Perceptions

In a literature review regarding older adults and HIV prevention, Sankar et al. (2011) note that few articles compare older adults to a younger age group or include subgroups for individuals over 50. Sankar et al. posit that results from these studies are overgeneralized to characterize the findings as applying to anyone over 50. While there is a growing body of research on risk perceptions and older adults and a history of risk perception research in younger adults, few studies have compared risk perceptions across age groups. While studies regarding gender differences in risk perceptions exist, they usually occur within specific age groups, and the interaction effect between gender and age on perceptions is rarely researched.

The Accuracy of Risk Perceptions

Few studies have examined the combined influence of gender and age on risk perception accuracy. Among those that have, accuracy is defined by the perception of risk to the prevalence of HIV incidence in a population. As previously discussed, perceptions of STI risk influence an individual's decision to engage in preventative health behaviors. Therefore, underestimating the risk of STIs can have detrimental effects on a person's health. Research related to the accuracy of sexual risk perceptions has also been referred to as unrealistic optimism.

College students and young adults tend to underestimate their risk of contracting sexually transmitted infections (Lopez & Leffingwell, 2020; Pinkerton et al., 2000). Lopez & Leffingwell (2020) examined the role of unrealistic optimism in sexual risk behavior among 665 undergraduate participants. The researchers measured susceptibility by asking, "What are the chances that you will become infected with HPV." Participant responses were significantly lower than the actual HPV infection rate of 42.5% among individuals 18–59. While this study suggests that college-age students underestimate their sexual risk, the study compared perceptions of individuals to a national probability instead of to each student's actual behavior. Pinkerton et al.

(2000) examined the accuracy of HIV risk perceptions among college students, including the accuracy of risk perceptions associated with a variety of sexual risk activities as well as their personal risk of contracting an STI. The accuracy of personal risk perceptions was determined based on comparing the perceived likelihood of contracting HIV to the statistical probability of someone in their cohort and gender actually contracting HIV. The study found that individuals tend to overestimate the risk associated with a single act of risk but tend to underestimate their own personal risk. While Lopez and Leffingwell's study suggests some unrealistic optimism, it does not measure the actual risk of participants, thus making it unclear if this population engages in less risk than the national average or if they are underestimating their risk.

Results regarding the accuracy of sexual risk among older adults have been mixed, which may be due to the population in which the study was conducted. For example, Syme et al. (2017) is the only study to date that has examined the accuracy of risk perceptions among older adults aged 50–92 in the general public in the United States. Their review separated older adults into three risk categories: low risk, moderate risk, and high risk, and subsequently examined risk perceptions based on actual risk. The researchers found that 93.13% of individuals who reported engaging in high-risk behavior underestimated their risk of contracting an STI, suggesting a low perception of risk and an inaccurate perception of risk.

Kershaw et al. (2003) surveyed 411 girls to assess the accuracy of risk perceptions among urban female adolescents and to identify variables related to inaccurate sexual risk perceptions. Similar to Syme et al.'s (2017) study, the researchers examined these relationships by separating participants into low-, moderate-, and high-risk groups. Then, perceptions of risk were categorized as low-, moderate-, and high-risk perceptions. About half of the participants underestimated the risk of their sexual behavior. Among those who engaged in high-risk

behavior, 65.3% underestimated their sexual risk. Compared to Syme et al.'s (2017) study, it would seem that among individuals who engage in high-risk sexual behavior, older adults tend to underestimate their sexual risk more than adolescents. Still, more research is needed to test the effects that age and gender have on the accuracy of sexual risk perceptions.

Few studies have investigated the role of age in the accuracy of HIV risk perception (Schaefer et al., 2018). Schaefer et al. (2018) investigated the relationship between HIV risk perception and actual HIV risk among 15,000 adults in East Zimbabwe aged 15–54. Their study found that accuracy improved among adults aged 25 and older. This study, however, did not explore the role of gender and age in influencing based on different levels of sexual risk behaviors.

The Current Study

The current study aims to explore how the HBM can be expanded to incorporate differential effects based on the demographic characteristics of specific groups.

Research Questions

Research Question 1: Is there a significant difference in sexual risk perception accuracy based on age cohort?

Research Question 2: Is there a significant difference in sexual risk perception accuracy based on gender cohort?

Research Question 3: Is there an interaction effect between age cohort and gender cohort on sexual risk perception accuracy?

Summary

The HBM is an appropriate framework to provide insight into how demographics, such as age and gender, influence the accuracy of risk perception. Previous research suggests that there is

an interaction effect between age and gender in accounting for variability in sexual risk perceptions as well as actual sexual risk. Studies examining the accuracy of risk perception typically compare individual perceptions of risk to the prevalence of the disease, as opposed to their overall actual risk. Furthermore, no study to date has examined the effects age and gender have on the accuracy of risk perceptions across multiple age groups and gender differences. The current study investigates the relationship between demographic variables such as age and gender and the accuracy of risk perceptions.

Method

Recruitment and Procedures

The current study utilized a pre-existing data set collected in 2016 as part of a larger study examining sexual wellness, attitudes, and experiences across adulthood (ages 18 to 92). Participants in the original study were recruited using the online crowdsourcing tool Amazon Mechanical Turk (AMT). AMT is an increasingly popular data collection platform for researchers to post tasks such as surveys for registered workers to complete for compensation. The literature supports using AMT as an efficient, reliable, and cost-effective tool for generating sample responses comparable to those collected through more traditional means (Mortensen & Hughes, 2017; Rouse, 2014). As this study aimed to explore differences across gender and age regarding sexual risk perception accuracy, AMT was an appropriate data source. AMT has also been used successfully to collect data on older adults and sexuality (Graf & Patrick, 2014; Rolison et al., 2013). Participants were reimbursed $1.00, the average reimbursement rate for questionnaires averaging 20 to 25 minutes for completion (Buhrmester et al., 2011).

Quality assurance mechanisms were utilized to increase reliability. First, parameters regarding participation were put in place. For example, only one U.S. participant per Internet

Protocol (IP) address could participate. Other quality assurance mechanisms included within the survey were reported birthdate and match in reported completion codes.

Participants

A total of (962) participants, aged 18 to 92 participated. A total of (452) identified as female, (505) identified as male, and (5) identified as other. A total of (147) identified as being aged 18–25, (191) were aged 26–35, (203) were 36–49, (336) 50–64, and (85) were 65 years of age or older.

Measures

Data were collected as part of a larger study on sexual health and wellness. Participants completed a survey that consisted of 160 items. The current study utilized data on demographics, sexual behaviors, sexual risk behavior, and perceived sexual risk.

Demographic Factors

Participants were asked to provide demographic information that included age, gender, race, marital status, education level, and sexual orientation.

Age. Participants were asked to enter their date of birth on the survey. Age was calculated based on participant's date of birth and the date on which they completed they survey.

Gender. Participants were asked to respond to a single item "What is your gender" with one of three available responses: male, female, or other.

Race & Ethnicity. Participants were asked to respond to the question "How would you described your race." Participants were given instructions to "mark all that apply." The options available from which the participant could choose included White, Hispanic/Latino, American Indian or Alaskan Native, Asian, Black or African American, Native Hawaiian or Pacific Islander, more than one race/ethnicity, and Other Please Specify.

Sexual Orientation. Participants were asked to respond to a single item "How would you describe your sexual orientation" by choosing one of the following options: primarily heterosexual, primarily homosexual, primarily bisexual.

Education. Participants were asked to respond to a single item *"*What is the highest level of education you have completed" by choosing from a list of seven pre-determined options: high school or equivalent, associate's degree or post-high school vocational degree, some college, bachelor's degree, master's degree, doctorate, or professional degree. Participants were given an option to choose "other" and asked to specify their answer in a text box.

Marital Status. Participants were asked to select one of seven options to define their marital status: married, divorced, separated, living with a significant other, significant other not living together, single, and other. Participants who selected "other" were asked to specify their answer in an additional text box.

Perceived Sexual Risk

One item was used to measure perceived risk with responses on a 6-point item response scale: "How susceptible do you feel you are to contracting an STI?" (1 = Not susceptible, 6= Very susceptible). Based on previous research (Kershaw et al., 2003; Symes et al., 2017), participants were organized into one of three perceived sexual risk categories (not susceptible, somewhat susceptible, and very susceptible). Participants that reported 5 or 6 were considered very susceptible, 2–4 was considered moderate, and 1 was considered not susceptible at all.

Sexual Risk Behavior

Sexual risk behavior was measured by seven questions derived from *The Sexual Risk Survey* (SRS) which has been deemed a psychometrically sound, comprehensive measure of sexual risk-taking behavior among college students (Turchik & Garske, 2009). The use of seven

items served to broaden the typical one-item sexual risk assessment (i.e., any condom use). Participants were asked to report the number of sexual partners in the past six months; frequency of vaginal, oral, and anal sex without a condom in the past six months; sex with a casual partner; sex with a new sexual partner without getting a sexual history; and sex with a new sex partner who was previously sexually active without him or her having an HIV/STI test.

Participants reported the frequency of each behavior by typing the number into a box. The total score was calculated by adding all of the responses together. Based on previous research (Kershaw et al., 2003; Symes et al., 2017) using stratifying frequencies, participants were categorized as falling in one of three sexual risk groups based on tertials in a normal distribution (low, moderate, or high sexual risk) based on their total sexual risk score.

Accuracy of Risk Perceptions

The dependent variable, the *accuracy of risk perceptions,* is a categorical variable computed based on a combination of actual and perceived risk groups. The level of consistency between perceived risk and actual risk resulted in a corresponding sexual risk accuracy category. For example, an individual whose sexual risk behavior is categorized as “high risk” yet perceives themselves as not being susceptible or being moderately susceptible to contracting an STI would be described as underestimating their risk. Alternatively, an individual categorized as “high risk” but perceives themselves as being very susceptible to risk would be considered to have accurate risk perceptions. The risk accuracy category assignment is presented in Figure 1.

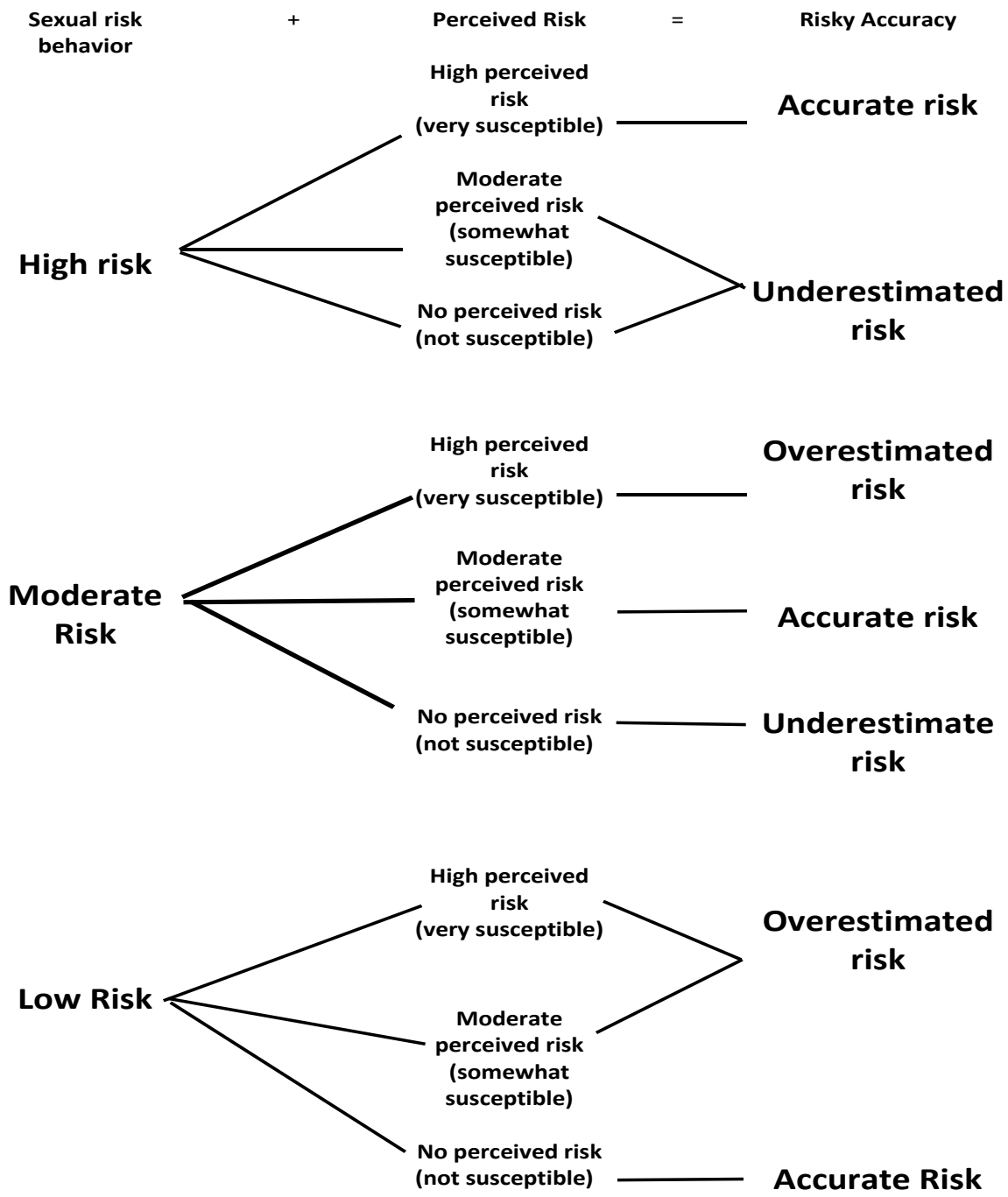

Figure 1. Sexual Risk Accuracy Groupings: Based on similar groupings from Symes et al., 2017; Kershaw et al., 2013. Participants were assigned to an accuracy group based on the consistency between their actual risk grouping and perception of risk grouping. For example, individuals who engage in high-risk behavior yet have low to moderate risk perceptions would be identified as underestimating their sexual risk. Alternatively, an individual categorized as "high risk", but perceives themselves as being very susceptible to risk would be considered to have accurate risk perceptions.

Results

The current study sought to explore gaps in the research regarding sexual risk perception accuracy related to age group and gender differences. The current researchers utilized multinomial and binary logistic regression to address the following questions: Do age cohort and/or gender significantly predict sexual risk perception accuracy, and is there an interaction effect between age cohort and gender in predicting sexual risk perception accuracy? The following sections provide descriptive statistics regarding the sample, data analyses regarding sexual risk behavior and perception, and analyses regarding the main research questions.

Sample Characteristics

The initial sample consisted of 962 participants. 52.5% (N = 452) identified as female, while the other 47% (N =505) identified as male. Five participants identified their gender as "other." Due to the low number of participants identifying their gender as "other," the researchers excluded these five participants from analyses, resulting in a final sample size of 957.

Regarding racial identity, 80.1% of the sample identified as white, .3 % identified as Native Hawaiian or Pacific Islander, 3.8% identified as more than one race, 7.3% identified as black or African American, 6.4% identified as Asian, and 2.1% identified as American Indian or Alaskan native.

Individuals in the 18–25 age group accounted for 15.3% of the sample, adults aged 26–35 accounted for 19.9% of the sample, middle-aged adults aged 36–49 accounted for 21.1% of the sample, older adults aged 50–64 accounted for 35% of the population, and elders aged 65 and older accounted for 8.8% of the population.

Regarding marital status, 43.3% of the sample identified as married, 11.9% identified as divorced, 1.4% identified as separated, 13.2% identified as living with a significant other, 6.2%

identified as having a significant other whom they do not live with, and 24.1% identified as being single. The sample consisted of 91.4% of individuals who identified as primarily heterosexual, 3.4% who identified as primarily homosexual, and 5.1% as primarily bisexual.

The sample consisted of 11.5% of individuals who completed high school, 9.5% of individuals who completed an associate's degree, 29.6% who completed some college, 34.7% who completed a bachelor's degree, 10.6% who completed a master's degree, 2.0% who completed a doctorate, and 2.2% who completed a professional degree.

Regarding income, the sample consisted of 17.7% of individuals who reported an income less than $20,000 a year, 17.9% of the sample reported an income between $20,000–$30,000, 12.5% of the sample reported an income between $31,000–$40,000, 20.3% of the sample reported an income between $41,000–$60,000, 13.8% of the sample reported an income between $61,000–$80,000, 8.4% of the sample consisted of $81,000–$100,000, 8.0% of the sample reported an income of over $100,000, and 1.5% of the sample reported that they did not know their income.

Effects of Age Group and Gender on Sexual Risk Behavior

A univariate analysis was conducted examining the main and interactive effects of Age Group and Gender on sexual risk behavior. Sexual risk behavior was a continuous variable. Both Age Group and Gender were categorical independent variables, with Age Group consisting of five levels (18–25, 26–35, 36–49, 50–64, 65+ years) and Gender of two levels (men and women). A significant age group X gender interaction effect was not observed, F (4, 911) = 0.820, p = .512, partial eta-squared = .004. A significant main effect of Age Group on Sexual Risk Behavior was observed, F (4, 911) = 6.00, p < .001, partial eta-squared = .026. A significant

main effect of gender on sexual risk behavior was not observed, F (1, 911) = 1.81, p = .179, partial eta-squared = .002.

Main Comparisons of the Effect of Age Group on Sexual Risk Behavior.

Four main comparisons were conducted, each comparing an age group to the next oldest age group. No significant differences were found between 1) the 18–25 age group and the 26–35 age group, t (321) = -0.751, p = .453, d = .070, and 2) the 26–35 age group and 36–49 age group, t (376) = -0.670, p = .503, d = .057. The mean sexual risk score for the 50–64-year-old group was significantly higher than the mean sexual risk scores for the 36–49-year-old group, t (518) = -3.34, p < .001, d = .262. The mean sexual risk score for the 65-year-old and older group was significantly higher than the mean sexual risk scores for the 50–64-year-old group, t (405) = -3.81, p < .001, d = 1.36.

Effects of Age and Gender on Risk Perception

Descriptive statistics indicated that 57.7% of the sample perceived their sexual risk as low, 36.6 percent perceived their sexual risk as moderate, and 5.7% perceived their risk as high. Further analysis indicates that 47.8 percent of the sample underestimated sexual risk, 14.8% overestimated their risk, and 37.4% accurately estimated their risk. Among those who engaged in high-risk behavior, 91.3% underestimated their risk, while only 8.1% accurately assessed their risk.

Effects of Age Group and Gender on sexual risk perception accuracy (accurate, overestimate, underestimate)

A multinomial regression analysis examined the interactive effects of Age Group and Gender on sexual risk perception accuracy. Sexual risk perception accuracy was a categorical outcome measure with three levels (accurate, overestimate, and underestimate). Both Age Group

and Gender were categorical independent variables, with Age Group consisting of five levels (18–25, 26–35, 36–49,50–64,65+ years) and Gender of two levels (men and women). A significant Age Group X Gender effect was observed, $X^2(18, N = 917) = 34.088$, $p = .012$, Cox and Snell Pseudo R-square = .036, indicating that the effect of age group was not the same for men and women in predicting sexual risk perception accuracy group. The analysis did not reveal statistically significant main effects for age group or gender: X^2 (0, N = 917) = 0. A significant main effect of Age Group was present, $X^2(18, N = 917) = 17.177$, $p = .028$, Cox and Snell Pseudo R-square = .019. The main effect of Gender was not significant, $X^2(16, N = 917) = 2.368$, $p = .306$, Cox and Snell Pseudo R-square = .003.

Simple effects of Age Group on sexual risk perception accuracy for men and women. A significant simple effect of Age Group on sexual risk perception accuracy for women was observed, $X^2(8, N = 486) = 25.98$, $p < .001$, Cox and Snell Pseudo R-square = .052. A significant simple effect of Age Group on sexual risk perception accuracy was not observed for men, $X^2(8, N = 431) = 5.74$, $p = .676$, Cox and Snell Pseudo R-square = .013.

Logistic Regression Analyses Examining Overestimation of Sexual Risk

A binary logistic regression analysis was conducted examining the interactive effects of Age Group and Gender on overestimation of sexual risk perception accuracy. Two levels of the outcome measure were used: overestimation of sexual risk and accurate perception of sexual risk. A significant Age Group X Gender effect was observed, $X^2(3, N = 917) = 8.62$, $p = .035$, Cox and Snell Pseudo R-square = .026, indicating that the effect of age group was not the same for men and women in predicting overestimation of sexual risk. The main effect of Age Group was significant, $X^2(4, N = 917) = 9.485$, $p = .050$, Cox and Snell Pseudo R-square = .026. The

main effect of Gender was not significant, $X^2(1, N = 917) = 1.618$, $p = .203$, Cox and Snell Pseudo R-square = .026.

Effects of age group on overestimation of sexual risk perception accuracy for men. A binary logistic regression model tested the effect of age group on the overestimation of sexual risk perception accuracy (overestimation vs. accurate estimation) in men. No significant effect of age group on overestimation of sexual risk perception accuracy was observed for men, $X^2(4, N = 216) = 3.10$, $p = .542$, Cox and Snell Pseudo R-square = .014.

Effects of age group on overestimation of sexual risk perception accuracy for women. A binary logistic regression model tested the effect of age group on overestimation of sexual risk perception accuracy (overestimation vs. accurate estimation) in women. The effect of age group on overestimation of sexual risk perception accuracy for women approached statistical significance at the .05 level, $X^2(4, N = 263) = 9.03$, $p = .060$, Cox and Snell Pseudo R-square = .034. Comparisons among age groups indicated the percentage of women overestimating sexual risk who were 26–35 years old (41.5%) was significantly higher than the percentage of women overestimating sexual risk between the ages of 18 and 25 (16.2%), Wald = 6.102, p = .014, odds ratio = 3.67. No other comparisons between age groups for women were significant, ps < .420. The percentage of women in each age group who overestimated the presence of sexual risk is shown in Table 1.

Table 1

Age Group Comparisons Regarding Overestimating Sexual Risk

Age Group	Overestimating Sexual Risk
18–25	16.2%

26–35	41.5%
36–49	29.7%
50–64	23.1%
65+	21.4%

Logistic Regression Analyses Examining Underestimation of Sexual Risk

A binary logistic regression analysis examined the interactive effects of Age Group and Gender on the underestimation of sexual risk perception accuracy. Two levels of the outcome measure were used: underestimation of sexual risk and accurate perception of sexual risk. The Age Group X Gender interaction effect was significant, $X^2(5, N = 957) = 16.96$, $p = .005$, Cox and Snell R-square = .021. The main effect of Age Group was significant, $X^2(4, N = 917) = 19.19$, $p < .001$, Cox and Snell Pseudo R-square = .028. The main effect of Gender was significant, $X^2(1, N = 917) = 6.210$, $p = .013$, Cox and Snell Pseudo R-square = .028.

Effects of age group on underestimation of sexual risk perception accuracy for men. A binary logistic regression model was examined, testing the effect of age group on the underestimation of sexual risk perception accuracy (underestimation vs. accurate estimation) in men. No significant effect of age group on underestimation of sexual risk perception accuracy was observed for men, $X^2(4, N = 365) = 0.96$, $p = .916$, Cox and Snell Pseudo R-square = .003.

Effects of age group on underestimation of sexual risk perception accuracy for women. A binary logistic regression model was conducted, testing the effect of age group on the underestimation of sexual risk perception accuracy (underestimation vs. accurate estimation) in women. A significant effect of age group on underestimation of sexual risk perception accuracy

was observed for women, $X^2(4, N = 416) = 19.84$, $p < .001$, Cox and Snell Pseudo R-square = .047.

Among women the age group with the highest percentage of participants underestimating sexual risk was the 36–49 years age group (68.3%). Comparisons investigating the significant simple effect of age group for women were conducted by comparing the percentage of sexual risk underestimators in each of the other four age groups to the percentage of underestimators in this 36–49 years age group. No significant difference in the percentage of sexual risk underestimators was found between women 18–25 years (53.0%) and 36–39 years groups (68.3%), p = .059. No significant difference in the percentage of sexual risk underestimators was found between women 26–35 years (63.1%) and 36–39 years, p = .481. The percentage of women underestimating sexual risk who were 36–49 years old (68.3%) was significantly higher than the percentage of women underestimating sexual risk who were 50–64 years old (44.7%), p = .003. The percentage of women underestimating sexual risk who were 36–49 years old (68.3%) was significantly higher than the percentage of women underestimating sexual risk who were 65 years and older (35.3%), p = .006. The percentage of women in each age group who underestimated the presence of sexual risk is shown in Table 2.

Table 2

Age Group Comparisons Regarding Underestimating Sexual Risk

Age Group	Underestimating Sexual Risk
18–25	53.0%
26–35	63.1%
36–49	68.3%

50–64	44.7%
65+	35.3%

Discussion

The HBM postulates that perceptions of risk influence a person's decision to engage in preventative health behaviors (Skinner et al., 2015). This theory is supported by empirical research, with a meta-analysis indicating risk perceptions significantly predict an individual's decision to engage in protective health behaviors (Brewer et al., 2004; Brewer et al., 2007). Given the importance of accurate risk perceptions in improving health prevention behaviors, the current study sought to understand better how demographic variables such as age and gender influence the accuracy of STI risk perceptions. Information from this study could be used to inform outreach materials and target specific populations at risk for underestimating their risk, subsequently delaying prevention and treatment.

The Impact of Gender and Age on Predicting Sexual Risk Behavior

Results from previous research regarding the ability of gender to predict sexual risk behavior have been contradictory, suggesting a complex interplay between gender and sexual risk behaviors (Cubbins and Tanfer, 2000; Vasilenko et al., 2015). The results from the current study are consistent with findings that suggest gender alone does not predict sexual risk behavior. However, what was unexpected in the current findings is that there was no significant interaction effect between gender and age. Previous studies suggest that a complex interplay of biopsychosocial factors influences men's and women's decision to engage in sexual risk behavior (Lindau et al., 2007) and that men and women experience an increase in STI prevalence at different ages (Paul et al., 2009).

Age group was a significant factor in predicting sexual risk behavior, with main comparisons indicating that the mean sexual risk score for the 50–64-year-old group was significantly lower than the mean sexual risk scores for the 36–49-year-old group, and the mean sexual risk score for the 65 years and older group was significantly lower than the mean sexual risk scores for the 50–64-year-old group. While few studies to date have compared sexual risk behavior differences across a sample aged 18–92, the current findings may be due to the overall decline in sexual activity (Lindau et al., 2007) and not necessarily to improvement in safe sex practices. It should be noted that physical and mental health factors associated with aging (Lindau et al., 2007; Bach et al., 2013) and social isolation (AARP, 2011; Mairs & Bullock, 2013) are sources of influence on sexual activity in adulthood but are not inevitable features of the aging process. Among those who are sexually active, previous data show that safe sex practices such as condom use decrease with age (Reece et al., 2010).

Another interesting observation regarding these data is that there were no significant differences in sexual risk behavior mean scores between the 18–25 and 26–35 groups, nor between the 26–35 groups and the 36–49 groups. While individuals between the ages of 15 and 24 account for the highest prevalence of new instances of STIs (50%), younger adults over 24 years and middle-aged adults are still significantly impacted by STIs (CDC, 2024). Previous literature suggests that a complex interplay between psychosocial factors influences sexual risk behavior among middle-aged adults, such as those having to navigate divorce, changes in relationships, re-entering the dating world after a period of monogamy or celibacy, prioritizing intimacy over sexual health, and social and cultural expectations (Dalrymple et al., 2017; Monsell and McLuskey, 2016).

Risk Perceptions of the Sample are Consistent with the Literature

Generally, people tend to view their risk as low, regardless of gender and age group, across a variety of health-related behaviors (Kim et al., 2018). This trend is consistent with sexual risk behavior as well, with multiple studies finding men and women across various age groups tend to view their risk of contracting an STI as low (Ethier et al., 2003; Syme et al., 2017). Findings from the current study examining a sample aged 18-92 are consistent with the literature, with the majority of the sample (57.7%) perceiving their risk of contracting an STI as low. Additionally, 91.3% of individuals in the current study who engaged in high-risk behavior underestimated their risk. This is consistent with literature that notes individuals who engage in high-risk sexual behavior do not typically perceive their risk as high (Cabecinha et al., 2017).

Exploring Gender and Age Effects on Sexual Risk Perception Accuracy

The current study aimed to explore the interaction and main effects of age and gender on the accuracy of sexual risk perception. The findings suggest a significant interaction effect between age and gender, indicating that the effect of age group was not the same for men and women in predicting the accuracy of sexual risk perception.

Underestimating Vs. Accurate Perceptions of Risk

The results of the current study indicate that the effect of age group is not the same for men and women in predicting the accurate perception of risk vs. underestimating risk. Specifically, the age group was not significant in predicting accurate vs. underestimating risk among men. Conversely, age group was a significant factor in predicting underestimating vs. accurate perceptions among women.

The results from the current study show a gradual increase in the percentage of women underestimating their sexual risk across age groups until reaching a high of 68.3% underestimating their risk among women aged 36–49 before a steady decline again with women

aged 50–64, and women 65 years of age and older. While women aged 36–49 had the highest percentage of people underestimating their sexual risk, they were not statistically different from women aged 26–35, of whom 63.1% underestimated sexual risk. However, women aged 36–49 underestimated their sexual risk at a statistically higher rate than women aged 50–64 and women aged 65+.

Women aged 36–49 underestimated their risk by a higher percentage than any other age group in this study. Several psychosocial factors discussed in the literature may explain this result. For example, Dalrymple et al. (2017) reported a significant proportion of their middle-aged participants associate being at risk for STIs with being irresponsible and young. Cultural expectations that they should "know better" led to participants distancing themselves from being seen as at risk, which, in turn, created barriers to seeking preventative and early treatment options for STIs.

Other reasons why women aged 36–49 may underestimate their risk may be due to a lack of representation in educational resources. The media plays a role in shaping STI-related stigma and perpetuating stereotypes (Smith, 2007). Several studies have found that individuals calculate their risk based on how similar they are to a stereotypical person with HIV (Hammer et al., 1996; Siegel, 1987; Weinstein, 1980). The belief that HIV only affects sexual minorities and young people may be one reason why individuals who do not fit into that stereotype underestimate their risk (Levy et al., 2003). Monsell & McLuskey (2016) note that there is a paucity of specific information on the sexual health needs and risks of middle-aged individuals. Like older adults, middle-aged adults are likely underrepresented in STI educational resources (Conner et al., 2019). Dalrymple et al. (2017) found that middle-aged participants viewed STI clinics as being

geared toward young people, and they feared additional judgment for being there due to their age.

Additionally, a higher percentage of women aged 36–49 in this sample reported being currently married than women in younger age groups. Being in a monogamous relationship has been shown to decrease perceptions of the risk of contracting an STI (McLaurin-Jones et al., 2017). However, being in a monogamous relationship does not necessarily protect one from contracting an STI. For example, one study reports that 16.48% of marriage partners engage in extramarital affairs, with men engaging in affairs at a higher rate compared to women (Djamba & Kimuna, 2020). Sexual risk includes not knowing your partner's sexual history or current STI results before engaging in unprotected sex.

While women in this age group were more likely to be married, they were also more likely to be divorced than younger age groups. Dalrymple et al. (2017) found that both men and women faced vulnerabilities related to relationship transitions, such as divorce, which led to reduced safe sex practices. For example, for many participants in the study, the end of a relationship was marked by a period of bereavement, leading individuals to prioritize emotional needs over safe sex practices. Additionally, men and women reported lower self-esteem regarding their aging bodies in the context of a new sexual partner, which led to less confidence in negotiating condom use. Some middle-aged adults in the study found new sexual encounters after a period of monogamy to be exciting and that it provided a sense of freedom not necessarily consistent with considering their risk or vulnerability.

Overestimation of Sexual Risk

A significant interaction effect between age and gender was observed, indicating that the effect of age group was not the same for men and women in predicting the overestimation of

sexual risk. Logistic regression analyses revealed that the effect of age group was not significant for men. Conversely, age group was significant in predicting sexual risk perception accuracy among women. Comparisons among age groups indicated the percentage of women overestimating sexual risk who were 26–35 years old (41.5%) was significantly higher than the percentage of women overestimating sexual risk who were between the ages of 18 and 25 (16.2%).

A few factors may contribute to women aged 26–35 overestimating their risk more than young adults aged 18–25. First and foremost, adults aged 26–35 may overestimate their risk more due to availability heuristics. Data show that individuals aged 18–24 account for 50 percent of new incidents of STIs (CDC, 2024), and women are more likely to experience adverse effects and symptoms related to STIs. Sunstein & Zechhauser (2008) note that recent exposures to risk can lead to an increase in fear and increased risk perceptions generally. This may mean that due to close calls or a history of STIs, women aged 26–35 may overestimate their sexual risk.

While most research aims to identify factors related to underestimating risk and ways of improving preventative health behaviors, overestimating risk is also essential to address. For example, overestimating risk can lead to a misallocation of public funds and healthcare resources (Brownlee et al., 2017). Additionally, overestimating risk can increase fear and undermine the effectiveness of public service announcements over time (Covello, 2006).

Accounting for Non-significant Main Effects

The current study found a significant interaction effect between age group and gender in predicting sexual risk perception but did not find significant main effects for age group or gender. Logistic regression analyses explained this interaction effect by showing there was an effect of age group for women but not for men. Perhaps one reason why age group is a

significant predictor for sexual risk perception accuracy in women but not in men is shifting gendered, cultural expectations and stereotypes that women experience across the lifespan. For example, gendered stereotypes have been found to influence how people perceive themselves and, subsequently, their risk (Ellemers, 2018). Stereotypes and expectations of women and their sexual behavior may shift with developmental expectations, such as young adult women being sexually objectified more frequently compared to older adult women (Sherman et al., 2024) and older adult women navigating sexual stereotypes about their asexuality (Hinchliff & Gott, 2008). While Sherman et al. (2024) compared women aged 18–27 to women 48–90, leaving a gap in understanding the stereotypes and objectification experiences of women aged 28–47, there is research suggesting how relationship status can influence perceptions of sexual functioning in women around this age. For example, Kingsberg (2002) discussed how women may perceive their sexual desire as low due to comparisons with their partner's sexual drive. This is not to say that older adult men do not experience internalized messages about asexuality (Syme et al., 2016); however, there is research to suggest that men are seen as becoming more sexually attractive with age (Åberga et al., 2020).

Limitations of the Current Study

The current results should be considered within the limitations of this study. First, the findings in this study suggest that middle-aged women may be at risk of underestimating their sexual risk more than any other age group. However, before broad generalizations can be made about middle-aged women, it is important to note that middle age is not defined consistently across the sexual risk literature (Addis et al., 2006; Dalrymple et al., 2016). The current study defined middle age as starting at 36, based on Petry's operational definition in risk research (2002), and cut off at 49 right before age 50, which is often cited as the beginning of the "older

adult" age range in sexual risk research (Syme et al., 2017). While Andrade (2017) argued that using age as a categorical variable in health research is appropriate because results are often used to allocate resources to specific populations, using age as a continuous variable would reduce the chances of biased estimates based on inconsistent cutoff points. Additionally, comparing generational differences may be more appropriate in researching age differences in the future.

Another limitation of this study is its generalizability. First, the study sample primarily consisted of white, heterosexual, cis-gendered men and women. Future research may consider examining the accuracy of sexual risk perceptions across other racial, gender, and sexual orientations. This study also utilized a pre-existing data set, which some researchers have identified as problematic due to potential issues with data quality, depth, or limited representation (Klemenjak et al., 2019).

Summary and Implications for the Field

With sexually transmitted infections at an all-time high across numerous age groups (CDC, 2019), there is an increased need to understand how the accuracy of risk perceptions differs based on age and gender. Understanding how age groups differ in their accuracy of sexual risk perceptions may help to improve STI prevention and early intervention strategies across multiple age groups. While 45.5 percent of new incidents of STIs occurred among individuals aged 15–24, the prevalence of STIs is increasing across all age cohorts (CDC, 2019), which suggests a need to understand if interventions aimed at improving the accuracy of STI risk perception would be appropriate in men and women across various age groups. The current study contributes to the field of counseling psychology's value for preventative treatment and care.

Research on STI risk is primarily focused on those disproportionately affected by STIs, such as sexually active women under the age of 25 or pregnant and men who have sex with men

(MSM). This study sought to better understand sexual risk perception accuracy across various age groups from 18–92, encompassing many age groups that are often understudied. The current study contributes to the field of counseling psychology's values regarding social justice and multiculturalism by researching age groups often excluded from sexual health research. Furthermore, this study contributed to the field's value for lifespan development by reporting findings about sexual risk behavior and perceptions of adults 18–92.

This study also highlighted that women aged 36–49 may be underestimating their risk of contracting an STI more than women in other age groups. Future studies may want to research this age group further and develop outreach to improve sexual risk perception accuracy. The contributions of the current study reflect the values of counseling psychology, such as lifespan development, preventative treatment, and social justice and multiculturalism (Gelso et al., 2014).

Chapter II: Literature Review

The current study seeks to understand how demographic variables, such as age and gender, influence the accuracy of sexual risk perception. The accuracy of sexual risk perception is based on a combination of perceived and actual risks. Therefore, this review of the literature focuses on 1) the HBM in relation to HIV/AIDS-related behavior, 2) gender and age differences in perceptions of risk and common STI risk behaviors, 3) age and gender factors that influence actual risk and perceptions of risk, and 4) the accuracy of STI risk perceptions related to age and gender.

An Overview of the Health Belief Model

The HBM (Rosenstock et al., 1974) is one of the most widely used theories in public health outreach programs (Sulat et al., 2018). In order to tailor outreach prevention efforts across the lifespan, it is important to know how demographics influence the accuracy of STI risk perceptions. Therefore, the current study utilized the HBM framework, focusing on perceived susceptibility, preventative/risk behaviors, and demographics. The current section provides a brief overview of the HBM, covering the model's origins, key components, model validity, and methodological considerations regarding perceived susceptibility.

The Origin of HBM. Early case studies on public participation in tuberculous screening provided researchers with the insight that public decisions to engage in preventative health behaviors are not always based on objective facts alone but are influenced by personal beliefs (Hochbaum, 1958). This investigation into why individuals do not participate in health prevention programs led to the development of the Health Belief Model (HBM) (Rosenstock, 1966). Since its inception, the HBM has become one of the most prevalent theoretical frameworks used to guide health behavior interventions (Skinner et al., 2015; Sulat et al., 2018).

Initially, the model was designed to provide an understanding of prevention health behaviors and guide health education and intervention programs. Eventually, the model evolved to encapsulate a focus on an individual's response to symptoms (Kirscht, 1974) and their medical treatment adherence (Becker, 1974).

Preventative health behaviors are behaviors that an individual engages in to avoid getting sick or prevent disease spread. This might include eating healthy foods and exercising regularly to avoid negative health outcomes. Another type of health behavior to which the HBM has been applied is sick role behavior, or an individual's response to symptoms. Sick role behaviors differ from preventative behaviors in that the behaviors are aimed at getting well instead of preventing disease. An example of this might be engaging in lifestyle changes following a diagnosis of diabetes to reduce symptoms. The third main health behavior often discussed in HBM research is medical treatment adherence. This type of health behavior refers to following direct advice and recommendations from a medical provider, such as attending regular check-ups and taking medication as advised.

***Key HBM Components*.** The HBM originally consisted of four main constructs: perceived susceptibility, perceived severity, perceived benefits, and perceived barriers (Rosenstock, 1966). As the model's applicability expanded into several health domains, other constructs were added to the model, such as self-efficacy (Rosenstock et al., 1988), cues to action (Rosenstock, 1974), and demographic modifying variables (Rosenstock, 1974; Salloway et al., 1978). One of the core assumptions of the HBM is that for an individual to feel motivation to engage in health-related behaviors, they must believe 1) they are susceptible to negative outcomes, 2) that the outcome is severe enough to warrant action, 3) that the individual is capable of change, and 4) that the benefits of change outweigh the perceived barriers (Skinner et

al., 2015). The HBM states that demographics likely modify the relationship between health beliefs and behaviors; however, few studies have empirically studied the relationship between demographic variables and other constructs in the model (Ferrer & Klein, 2015; Skinner et al., 2015).

The current study's focus areas include HBM constructs, demographics, and perceived susceptibility. Perceived susceptibility, or risk perceptions, refers to a person's beliefs regarding susceptibility to a negative outcome (Brewer et al., 2007; Janz & Becher, 1984; Sutton, 1987; Weinstein, 1993). The HBM postulates that perceptions of risk influence a person's decision to engage in preventative health behaviors (Skinner et al., 2015). Demographic variables are theorized to influence beliefs and, therefore, health-related behaviors; however, they are rarely studied in HBM research, which constitutes a significant gap in the literature (Skinner et al., 2015).

Empirical Support. The utility of the HBM has been critically reviewed on five separate occasions (Carpenter et al., 2010; Harrison et al., 1992; Janz & Becker, 1984; Sulat et al., 2018, Zimmerman & Vernberg, 1994). All reviews included HBM studies that examined the application of the model to various health behaviors and not to sexual risk-taking behaviors, specifically. The HBM has been utilized in correlational studies to predict behavior and experimental designs to predict changes in behavior. Since this study focuses on perceived susceptibility and demographics, the current section will discuss the validity of perceived susceptibility in both experimental and correlational research designs.

The first major review of the HBM was conducted by Janz & Beckner (1984). The researchers examined the model's predictive power across three health behaviors present in the literature between 1974 and 1984: prevention, response to symptoms, and clinic utilization. The

researchers utilized a significance ratio to measure the strength of the prediction by dividing the number of positive and statistically significant findings for an HBM dimension by the total number of findings for that dimension. Seventy-seven percent of the studies reviewed achieved significance.

Harrison et al. (1992) conducted the first meta-analysis on the HBM. The researchers reviewed 16 studies that met the criteria and reported the mean effect size in total and across specific health behaviors: screening, risk reduction, and adherence to a medical regimen. Of the four core HBM belief constructs, the strongest relationship was found between perceived susceptibility and health behaviors in longitudinal study designs ($r = 0.15$).

The subsequent meta-analysis on the HBM was conducted by Zimmerman and Vernberg (1994). In addition to examining the predictive power of core HBM constructs on behavior, the researchers compared the predictive power of the HBM as a whole to two other popular health models at the time: Theory of Reasoned Action and Social Cognitive Theory. The authors reported no significant difference between the three health theories and that perceived susceptibility was a significant predictor of behavior ($r = 0.37$).

In the three separate reviews previously discussed, perceived susceptibility was found to have a statistically significant correlation with health behavior (Harrison et al., 1992; Janz & Becker, 1984; Zimmerman & Vernberg, 1994); however, these findings were not observed by Carpenter et al. (2010), who found no significant relationship between perceived susceptibility and health behavior in a meta-analysis on 18 longitudinal studies published from 1982–2007. Carpenter et al. (2010), argued that Zimmerman and Vernberg's (1994) use of vote-counting to conduct their meta-analysis was not as accurate as Hunter and Schmidt's (2004) variance-centered meta-analysis method. Carpenter et al. (2010) also argued that the significant effect size

between perceived susceptibility and behavior found in Zimmerman and Vernberg's meta-analysis was likely a reflection of the overall predictive power of the model.

Subsequent research has investigated these past inconsistent findings, and many have argued that the cause of these inconsistent findings is a combination of methodological weaknesses and unclear construct definitions (Brewer et al., 2007; Sulat et al., 2018). Brewer et al. (2007) conducted a meta-analysis. They found that the relationship between perceived susceptibility and health behavior across studies has been negative, positive, and negligible, with most previous meta-analysis studies finding a significant yet small relationship.

Brewer et al. (2004; 2007) note that one of the major methodological errors in research related to perceived susceptibility is failing to measure current behavior and asking conditioned questions. For example, the question "Are you susceptible to STIs?" is ambiguous and does not provide insight into what factors influenced each person's risk assessment. Someone who perceives themselves as being susceptible to STIs may engage in more preventative behavior, or, vice versa, a person who engages in risky behavior may rate themselves as being more at risk for contracting an STI. The bidirectional relationship between risk perceptions and behavior implies a need to measure the accuracy of risk and not simply behavior.

In a meta-analysis, Brewer et al. (2007) notes that the relationship between perceptions of susceptibility and behavior was significant ($r = .24$) and that the relationship was stronger in studies that had higher-quality risk measures or unskewed scores for risk or behavior measures. While research supports the HBM's claim that perceptions of risk influence behavior, few studies have looked at demographic factors that influence the accuracy of risk perceptions (Kershaw et al., 2003; Symes et al., 2017).

In addition to using the HBM to predict behaviors, HBM-inspired interventions have also been shown to be effective in changing health intentions and behavior (Sheeren et al., 2014). In a meta-analysis conducted by Sheeren et al. (2014), the authors found that interventions aimed at improving the accuracy of risk perceptions led to significant changes in health behaviors (d = +.23) across multiple health domains. While there is significant support that accurate risk perceptions improve health behavior, little research has examined the role of demographics in shaping the accuracy of risk perceptions. To maximize the effect of limited outreach resources, more data focused on identifying the role of gender and age in shaping the accuracy of risk perceptions is needed.

The Health Belief Model and Sexually Transmitted Infections

While the HBM has been used as a framework for health education prevention and management for a wide range of disease states, the current study is particularly interested in the HBM in the context of sexual risk and prevention of STIs. In relation to STI prevention, the HBM states that an individual's beliefs influence their engagement in preventative health behaviors (i.e., using condoms, STI testing, and sexual partners). The theory also postulates that beliefs are modified by demographics and that cues to action may result when individuals act on their beliefs (i.e., using condoms following a campus sexual education fair).

Most of the research regarding the HBM and sexual risk has focused on adolescents and young adults in the U.S. and the general public in Africa (Champion et al., 2008). Additionally, most of the research on the HBM regarding sexual risk behavior focuses on AIDS research and not STIs in general. This is an important distinction because the stigma associated with who is susceptible to HIV may influence measures of perceived sexual risk in general. For example, heterosexually active young adults generally do not perceive themselves to be susceptible to

AIDS but may engage in condom use to prevent contracting other STIs (Maticka-Tyndale, 1991). Researchers suggest that since the goal of understanding sexual risk is to increase safe sex practices and not just avoid HIV, research questions measuring risk should inquire about perceived susceptibility to contracting an STI in general. The following section describes 1) the efficacy of the HBM as a predictive model and its role in guiding interventions related to HIV/AIDS-related behaviors, 2) age and gender differences in sexual risk behaviors and perceptions, and 3) the current literature on the accuracy of sexual risk perceptions.

The HBM and HIV/AIDS Behavior Research.

HIV and AIDS. The Human Immunodeficiency Virus (HIV) attacks CD4 cells, which weakens the body's immune system over time until a person eventually develops Acquired Immunodeficiency Syndrome (AIDS) (CDC, 2022). Individuals with AIDS have a difficult time fighting off infections and are, therefore, more vulnerable to minor illnesses. The AIDS epidemic in the U.S. was officially declared in 1981 following numerous reports of young men dying from rare diseases (CDC, 2022). Throughout the 80s and early 90s, HIV-related deaths rose exponentially, and by 1992, HIV infection was the leading cause of death among men aged 25–44 (CDC, 2022). A diagnosis of HIV was considered a death sentence until the invention of a new class of antiviral drugs called protease inhibitors—nicknamed the "miracle drug"—came out in 1995. By 1996, HIV was no longer the leading cause of death among young men (AARP, 2019).

Early detection and treatment of HIV can help delay the onset of AIDS. The antiviral drugs used to treat HIV work to suppress the viral load and, in some cases, can make the virus dormant, which decreases the chance of spreading the disease to additional partners. The acquisition of AIDS is associated with risky sexual behavior and injection drug use (Tran et al.,

2019); therefore, much of the research conducted on the HBM and AIDS/HIV focuses on sexual risk behaviors, HIV testing and treatment, and the effectiveness of HBM-inspired interventions (Tran et al., 2019).

Efficacy of HBM-inspired Programs. Most HIV/AIDS prevention programs and resources are developed for populations considered to be at increased risk for contracting HIV, such as adolescents and young adults, men who have sex with men (MSM), sex workers, and injection drug users (Champion and Skinner, 2008; Tran et al., 2019). Whereas very few prevention resources are designed for older adults in the general public (Altschuler & Katz, 2015; Conner et al., 2019), most HBM-inspired interventions regarding sexual risk behaviors have focused on improving condom use and decreasing multiple partners (Coates et al., 2008).

Numerous studies have examined the efficacy of heightening sexual risk appraisals in condom use among adolescents and college-aged adults (Coyle et al., 1999; Joorbonyan et al., 2022; Zhang et al., 2021). For example, Coyle et al. (1999) investigated the efficacy of a theory-based school program for improving condom use among 9th graders in Texas and California. The results of the study found that enhancing the accuracy of STI and pregnancy risk perceptions led to a significant increase in reported condom use three months after the intervention. Similarly, Joorbonyan et al. (2022) examined the effects of an HBM-inspired, peer-led group among adolescent girls. They found that the intervention led to significant increases in perceived susceptibility to HIV and increased condom use. Zhang et al. (2021) conducted a meta-analysis and systematic review of the efficacy of behavioral interventions and condom use in college and found that behavioral interventions, such as improving sexual risk perceptions, led to increased condom use. Marsiglia et al. (2013) examined the impact of an HIV/AIDS course on college students' health beliefs, risk behaviors, and behavioral intentions. The course was specifically

designed to target beliefs theoretically believed to influence safe sex intentions. The course had a significant impact on HIV knowledge and perceived susceptibility to HIV as well as a reduction in sexual risk attitudes, compared to a control group.

Efficacy of the HBM in Predicting AIDS/HIV Behavior

Most research examining the predictive power of the HBM in predicting HIV-related behaviors has focused on condom use, with few studies focusing on other risk behaviors, such as talking to a new partner about HIV, HIV testing, or multiple partners. While interventions aimed at changing beliefs have been shown to be effective in changing safe-sex behavior, studies investigating the model's predictive power regarding HIV-related behaviors have been mixed. One study examining psychosocial predictors of safe sex behaviors among college students found that the HBM model was successful in predicting condom use and HIV discussions with a partner (Basen-Engquist, 1992). Intention to use a condom was the strongest variable in predicting condom use, with perceived susceptibility associated with variability in condom use intention.

Another study examined the efficacy of the HBM for predicting condom use and other STI risk behaviors among university students and found mixed results, depending on the sexual risk behavior and gender of the participant (Lollis & Antoni, 1997). In their study, Lollis and Antoni (1997) surveyed 122 college students between the ages of 17 and 35. The HBM model was successful in predicting multiple partners, with perceived risks of AIDS making a significant contribution to the relationship between the HBM and multiple partners. The HBM was also found to be more efficacious in predicting female behavior compared to that of men, with the HBM explaining 22% of the variance among women in regard to multiple sexual partnerships

and 18% of the variability in the total number of risk behaviors in general. Among male participants, the HBM explained 18% of the variance in multiple sexual partnerships.

Findings were supported in a subsequent study that tested the HBM's ability to predict women's sexual risk behaviors (Gielen et al., 1994). Gielen et al. (1994) surveyed 573 heterosexual women attending Johns Hopkins Hospital Obstetrical Clinic. The researchers found that beliefs about susceptibility and barriers emerged as the strongest predictors of safe sex behavior. Participants reported that changes in sexual practices in the past year were due to factors influencing perceived susceptibility, which included fewer sexual partners (62%), talking to a sex partner about AIDS (72%), refusing sex because of concern a partner might be HIV-positive (47%), and using condoms (49%).

Changes in HBM constructs in intervention and educational programs seem to be effective despite some of the mixed results in the model's predictive ability. Some of these discrepancies may be due to the bi-directional relationship between perceptions of risk and methodological concerns (Brewer et al., 2003; 2007). While the overall effectiveness of the HBM in predicting behavior may be mixed, perceived susceptibility was found to be significant in accounting for variance in several studies. Furthermore, gender differences in the relationship between perceived susceptibility and sexual risk behaviors suggest that gender may play a role in the accuracy of risk perceptions.

Sexual Risk Behavior

Sexual risk behaviors constitute any behavior that increases the risk of an adverse health outcome, such as an unwanted pregnancy or contracting an STI (Senn, 2015). Sexual risk falls on a spectrum and is measured by several different factors, such as the number of sexual partners,

STI testing, and condom use. The following section explores the impact of sexual risk behavior on sexual health and age- and gender-related differences regarding sexual risk behavior.

Factors that Shape Actual Risk: Age and Gender Differences.

Several biological factors related to aging and gender influence the risk of contracting an STI. Women, in general, are more susceptible to sexually transmitted infections and are disproportionately impacted (Aral et al., 2004). Some biological explanations include larger mucosal surface area, microlesions caused during sex, and the presence of more HIV in semen than in vaginal secretions (Aral et al., 2004).

Aging is also associated with increased biological vulnerability to STIs. Chronic illnesses that are more likely to occur as an individual enters into older adulthood may impair immune functioning and thus make a person more vulnerable to STIs (Brooks et al., 2012). At the intersection of age and gender, there are additional biological factors that increase vulnerability to contracting an STI. Physiological changes in older adult women, such as changes in estrogen, can lead to vaginal dryness and, therefore, more tearing during intercourse, thus increasing vulnerability to STIs (Durvasula, 2014).

Sexual Partners: Age and Gender Differences

Because STIs are often spread through bodily fluids during sexual contact, sexual risk is based on both individual and relationship factors. Multiple partners and casual sexual relationships have been found to increase the risk of contracting an STI (Joffe et al., 1992; Lyons, 2017). Furthermore, the CDC recommends that new partners talk about their sexual history and take an STI test before having sex (CDC, 2022). The following section explores the role of sexual partners in STI risk as well as age and gender-related differences.

Multiple Partners and Partner Type

Multiple partners and casual sexual relationships are associated with an increased risk of contracting an STI (Joffe et al., 1992; Lyons, 2017). Casual sexual encounters seem to differ across age groups, with one study stating that 39% percent of individuals aged 18–24 reported having a casual sexual encounter in the past two years (Lyons et al. 2013), compared to a different study which found that 4.2% of adults over the age of 55 reported engaging in casual sex in the past year (Amin, 2016). Following a long period of monogamy, older adults may be at increased risk for contracting an STI following divorce or the death of a partner (Harvard Health Letter, 2018). This is supported by research finding that STI incidents increased among widowed men (Smith and Christakis, 2009). Some research suggests that casual sexual encounters may also be more common among older adults who live in popular retirement states where social isolation is not a barrier (AARP, 2011; Mairs & Bullock, 2013). Several relationship changes occur throughout the lifespan, such as dating, marriage, losing a partner through death or divorce, and re-entering the dating pool. In addition, several societal changes have influenced dating across various adult age groups for men and women.

For example, a meta-analysis and systematic review found that dating apps and online sites enable individuals to find more sexual partners in a shorter period of time and are associated with increased sexual risk behavior and incidents of STIs (Queiroz et al., 2020). One study found that 52% of users on the popular dating app Tinder engaged in casual sex with someone they met on the app (Strugo & Muise, 2019). The Pew Research Center (2020) reports that dating apps and online dating sites are more popular among young adults, with 48% of individuals aged 18–29 reporting using a site at least once compared to 38% of individuals aged 30 to 49 and 16% of individuals 50 and older. While older adults over 50 use digital tools for dating less than younger

cohorts, a literature review found that online dating sites and apps are growing in popularity among older adults (Gewirtz-Meydan et al., 2022).

Societal changes have also shaped individuals' living arrangements. More older adults are living as single individuals than ever before, a phenomenon partially explained by the gray divorce revolution, which refers to the rapid increase in divorce rates among individuals 50 years and older (Brown & Lin, 2012; Brown & Wright, 2019). Changes in relationship status through divorce or the loss of a partner may be associated with an increased risk of HIV (Smith and Christakis, 2009).

Sexual Communication with Intimate Partners

Sexual communication includes topics such as a history of STIs and sexual partners. Sexual communication is an important safe-sex practice and has been shown to correlate with safer sex behaviors and HIV prevention (Noar et al., 2006; Sheeren et al., 1999; Widman et al., 2014). For example, a meta-analysis on the role of sexual communication and condom use found that sexual history conversations were associated with increased condom use (r=.23) (Noar et al., 2006). Cornelius and Kershaw (2017) explain that sexual communication influences an individual's perception of risk and subsequent future condom use intentions. While sexual communication is an important safe sex practice, many individuals do not engage in this behavior for several reasons, such as fear of being negatively judged, fear of damage to the relationship, stigma related to sex and STIs, low-risk perceptions of STI susceptibility, and perceived power imbalances in the relationship (Donné et al., 2017).

Engaging in sex with a new sexual partner without asking about STI and sexual partner history occurs across numerous age groups. According to a national survey of individuals aged

15–25, only 16.1% of the sexually active participants reported having conversations regarding STD history with their partners (Hogben et al., 2017).

STI Testing: Age and Gender Differences

In the Harvard Health Letter, Diouf (2018) discussed prevention strategies for reducing the spread of STIs among older adults. He recommended that in addition to using condoms, sexually active older adults should receive regular STI screening. However, physicians do not frequently engage in conversations regarding sexual health with their older adult patients (Hinchliff & Gott, 2011; Lindau et al., 2007; Ports et al., 2014). Furthermore, despite reporting that they would be comfortable discussing sexual health with a medical professional (Farrell & Belza, 2012), numerous studies indicate that older adults are less likely to initiate these conversations with their healthcare provider (Hinchliff & Gott, 2011). Even in high-risk clinics where the CDC recommends that every patient be tested for HIV, older adults were forty percent less likely to have been recently tested and fifty percent less likely to have ever been tested in their lifetime (Ford et al., 2015).

Condom Use: Age and Gender Differences

Aside from abstinence, condoms are the most effective tool for preventing the spread of STIs when used consistently and correctly (Holmes et al., 2004). Adolescents and young adults are the most common age group studied regarding condom use attitudes and behavior (Champion and Skinner, 2008). This is most likely because individuals aged 15 to 24 account for half of all new incidents of STIs and have been identified as an at-risk population by the CDC (CDC, 2018). The high proportion of STIs among this population, however, is more likely a reflection of higher frequency of sexual activity and improper condom use due to inexperience, and not necessarily of lower levels of condom use.

A national survey researching condom use sampled 5,865 individuals aged 14 to 94 and found that condom use is at its highest among adolescents and steadily decreases with age (Reece et al., 2010). The decline in condom use begins as individuals enter their 20s and continues to decrease into midlife and older adulthood, with only 20 percent of men and 25 percent of women 50 and older reporting condom use (Barclay, 2010). This is supported by previous research that notes condom use is low among older adults across a number of demographic variables such as men and women (Fisher, 2010; Syme et al., 2010), relationship status such as marriage, dating, and single (Fisher, 2010), and race which has included non-Hispanic white, African American, and Hispanic (Glaude-Hosch et al., 2015). The AARP surveyed their members who are age 50 and older to learn more about their attitudes and behaviors regarding sex, romance, and relationships. Among the 1,670 members who completed the survey only 12% of men and 32% of women who were identified as active dating singles reported condom use (Fisher et al., 2010).

As discussed previously, older adults go through relationship changes throughout their lives and may be re-entering the dating pool after a long period of monogamy. While only having sex with one partner can reduce your risk for STIs, unprotected sex can still present significant risk. According to a national sample, out of all demographic variables, relationship status has one of the strongest associations with condom use (Reece et al., 2010). The results from the sample suggest that married individuals report the lowest condom use (11.1%). Condom use continues to increase with 24.1% of single individuals in relationships reporting condom use, and the rate is even higher among single adults (46.7%). Overall, only a third of unmarried individuals who participated in the survey reported using a condom during their most recent vaginal intercourse. One explanation for this may be that individuals in monogamous

relationships tend to perceive themselves as being less susceptible to contracting an STI. However, individuals in intimate relationships may be engaging in higher levels of HIV risk behavior compared to individuals in casual sexual encounters due to their lack of condom use (Misovich et al., 1996). For example, while two people in an intimate relationship may be currently monogamous, conversations about past sexual behaviors or STI testing are not frequent. Depending on a partner to know their own STI status based on symptoms instead of formal testing is an additional risk because previously contracted and untreated STIs can present as asymptomatic and be passed to a new partner (CDC, 2011). Furthermore, being married does not necessarily ensure that both partners are practicing monogamy. For example, it is estimated that 20–25% of marriages have had at least one extramarital sexual affair, and 2–4% of marriages experience an affair at least once a year in the U.S. (Fincham & May, 2017). Conley et al. (2012) also found that individuals who engage in infidelity had low rates of condom use, putting their partner at direct risk. Munsch et al. (2012) identified an interesting intersection between age and gender, noting that the lifetime incidence of infidelity increased with age among men until the age of 70. In contrast, the lifetime incidence of infidelity among women tended to peak between 30 and 50.

Risk Perceptions

While demographic variables are not regularly included in HBM research, the model theorizes that demographics indirectly affect health behaviors through their influence on beliefs (Skinner et al., 2015). Since the current study aims to understand how demographics influence the accuracy of sexual risk perceptions, it is essential to review the growing body of research on the formation of risk perceptions. According to Ferrer and Klein (2015), factors such as actual

behavior, personal experiences, media representation, and emotional state influence the development of risk perceptions.

For example, when faced with a public health concern, the government may utilize the media to issue a public service announcement (PSA). News about a health threat might be reported through traditional news outlets (newspaper, television) or social media. Several studies report a strong relationship between media exposure and perceptions of health risks (Huynh, 2020; Garfin et al., 2020; Li & Zhong, 2021). However, some experts argue that media exposure may influence general risk perception (perception of risk to the community) but may not influence the perceived risk to the individual (Wåhlberg & Sjoberg, 2000). One explanation for this may be the lack of representation in PSAs. For example, Dennis et al. (2021) found that Identity-Based Public Health Announcements increased an individual's likelihood of participating in COVID-19 prevention behaviors more effectively than general PSAs about the virus. These findings suggest that demographic variables depicted in media exposure impact the formation of perceived susceptibility. Unfortunately, older adults are often underrepresented in HIV educational resources (Conner et al., 2019). In addition to representation in educational resources, the media also plays a role in shaping STI-related stigma and perpetuating stereotypes (Smith, 2007). Several studies have found that individuals calculate their risk based on how similar they are to a stereotypical HIV victim (Hammer et al., 1996; Siegel, 1987; Weinstein, 1980). The belief that HIV only affects sexual minorities and young people may be one reason why individuals in the United States aged 50 years and older often underestimate their sexual risk (Levy et al., 2003).

One way personal experiences influence perceptions of risk is through automatic associative processes or cognitive connections between events, behavior, feelings, and thoughts

(Lavino & Neumann, 2010). For example, Karpiak & Lunievicz (2017) conducted a literature review of older adult sexual health and identified several studies that found post-menopausal women associate condom use with pregnancy prevention and associate the elimination of pregnancy risk with the elimination of STI risk as well (Andany et al., 2016; Taylor et al., 2015; Taylor et al., 2016). Personal experience, such as having a friend or family member diagnosed with a disease (Chen and Kaphingst, 2010), has been shown to influence risk perception. However, demographic variables such as age and gender likely play a role in who might share information about a disease diagnosis and with whom they share it. For example, one qualitative study found that older adults might not discuss sexual health with friends due to fear of scrutiny about being sexually active at their age (Hinchliff et al., 2020). That same study found that older adult women were more likely to discuss sex with other women, and men were more likely to discuss sex with other men. Furthermore, the stigma involved with STI may reduce the frequency with which a person discloses their STI history.

Sexual Risk Perceptions: Gender Differences

Regardless of gender, most individuals underestimate their susceptibility to disease across many health-related behaviors (Kim et al., 2018). Most studies examining gender differences in sexual risk perceptions focus on differences within specific age groups or populations, such as college students, young adults, middle-aged adults, older adults, and high-risk populations.

Stein and Nyamathi (2010) examined gender differences regarding risk perceptions and behavior among a high-risk sample seeking HIV testing. In their study, they surveyed predominately minority, impoverished, homeless, and drug-abusing women (n = 621) and men

(n = 428). The women in this survey reported higher perceptions of risk despite the fact that men reported higher actual sexual risk.

Gender differences among older adults are mixed (Maes & Louis, 2003; Prati et al., 2015). Prati et al. (2015) found that older adult women have higher perceptions of HIV risk compared to older adult males; however, this gender difference was not found among younger or middle-aged adults. Conversely, Maes & Louis (2003) did not find support for a relationship between gender and perceived susceptibility among older adults.

Sexual Risk Perceptions: Age Differences.

Generally, regardless of actual risk, people across multiple age groups tend to have low perceptions of HIV risk. Most research regarding sexual risk perceptions is focused on HIV, young adult college students in the United States, and the general population in Africa. In this section, the following topics are discussed: perceptions of risk among young adults, working-age adults, and older adults, as well as the few research articles that compare risk perceptions across age groups.

Due to the high prevalence of STIs among young adults and college students in the United States, this population has been well-studied. Fehr et al., (2014) conducted a literature review and identified several studies that found college students to have low perceptions of risk, yet engage in high-risk behaviors (Carter et al., 1999; Milhausen et al., 2013; Vail-Smith et al., 2010). Several more recent studies have explored risk perceptions among college students in specific United States sub-populations. For example, one study surveyed 256 undergraduate college students in South Carolina and found that less than 20% perceived themselves to be at risk for contracting HIV (Nkwonta & Harrison, 2021). Sutton et al. (2011) surveyed 1,051 students at historically black colleges and universities and found that 79% of students reported

that they were at low risk for contracting HIV. Haile et al. (2017) surveyed 200 college students in the Midwest and found that 81.5% of students reported that they had no risk of contracting HIV.

Generally, HIV risk perceptions are low across all age groups. One study surveyed 390 undergraduate and graduate students about their sexual behavior, substance use, and sexual risk perceptions (Adefuye et al., 2009). Adefuye et al. (2009) compared HIV risk perceptions among three age groups and found that 57.9% of college students under 20, 48.1% of students aged 20–29, and 54% of students 30 years old and older reported not having any chance of contracting HIV. Conversely, this study found that 48.5% of college students under 20, 61% of college students 20–29, and 75% of college students 30 years and older reported that they did not use a condom during their most recent sexual encounter, suggesting that low perceptions of risk are likely inaccurate.

A growing body of literature is finding that older adults have low HIV risk perceptions (Cook et al., 2010; Glaude-Hosch et al., 2015; Jackson et al., 2005; Levy et al., 2003; Savasta et al., 2014; Solomon et al., 2014) and low STI perceptions in general (Syme et al., 2017). Glaude-Horsch et al. (2015) examined data collected from a nationally representative probability survey among individuals aged 57–85. They found that while 50% of participants reported having sex at least once in the past year, and only 3% reported using a condom, less than 20% perceived themselves as having any risk of contracting HIV. Jackson et al. (2005) conducted a two-phase study in which they surveyed 155 older adult African Americans and interviewed them in a follow-up focus group. The researchers found that older adults were more likely to report low perceived risk, despite reports of high-risk behavior, especially among men.

Syme et al. (2017) is one of the few studies that explored STI risk perceptions in general instead of HIV specifically. Syme et al. (2017) surveyed individuals aged 50–92 and categorized participants into three risk categories: low, moderate, and high. Of those who engaged in high-risk STI behaviors, 65.65% said they were not susceptible to contracting an STI, which suggests that older adults tend to underestimate their sexual risk. The study also explored the accuracy of risk perception, which will be discussed in more detail in the section on sexual risk perception accuracy.

Coon et al. (2003) posit that even among at-risk groups, older adults receive fewer HIV resources than younger adults, which may contribute to lower perceptions of risk. Few studies to date have compared sexual risk perceptions among young and older adults (Ford et al., 2015; Theall et al., 2003). One study examined disparities in HIV testing among younger and older adults in a high HIV prevalence clinic and found that older adults have lower perceptions of HIV risk than younger adults (Ford et al., 2015). Some individuals may argue that the lower perceptions of risk found in this article are due to lower sexual risk activity. However, this article defined HIV risks as Injection Drug Use (IDU) and Men who have Sex with Men (MSM). In their study, they found that younger adults were more likely to report MSM status, and older adults were more likely to report IDU. While this study provides insight regarding age differences in HIV risk perceptions, there are a number of limitations that the current study will address. First, the current study will compare the accuracy of STI risk perception in general and not just HIV. Second, the current study will expand the definitions of risk to include sexual risk behaviors associated with STI prevention. Third, the current study will compare the perceptions of risk and the accuracy of risk perception.

Another study compared the perceived susceptibility to HIV among younger and older adult women (Theall et al., 2003). Theall et al. (2003) found that the difference in perceived susceptibility to HIV differed significantly among younger and older adult women, with 29% of women aged 18–29 reporting no chance of contracting HIV, compared to 55% of women 40 years old or older. While younger adults were more likely to perceive themselves at risk for contracting an STI, the study does not tell us if those perceptions were accurate based on behavior. Since it is accurate perceptions of risk that motivate safe sex behavior, more research is needed.

Prati et al. (2015) compared risk perceptions among three age groups: young adults (18–49 years), late middle-aged adults (50–59 years), and older adults (60–75 years). They found that older adults were statistically less likely to perceive themselves as at risk for HIV compared to young adults, despite non-statistically significant differences in sexual risk behavior. Prati et al. (2015) point out the importance of sub-dividing age groups to avoid over-generalization of older adult sexual risk factors to all individuals over the age of 50. However, a number of changes occur throughout the life span that may suggest the need for additional age groups.

Sankar et al. (2011) conducted a systematic critical content review regarding the current literature on older adults and HIV. In their review, they found that older adults consistently report lower perceptions of HIV risk and less knowledge compared to younger adults.

Sexual Risk Perceptions and Accuracy

It is commonly assumed that with age comes wisdom; therefore, older adults are assumed to be more adept at assessing and avoiding risk; however, research on age differences suggests that risk-taking exists across the lifespan (Bonem et al., 2015). As previously discussed, perceptions of STI risk influence an individual's decision to engage in preventative health

behaviors. Therefore, underestimating the risk of STIs can have detrimental effects on a person's health. Research related to the accuracy of sexual risk perceptions has also been referred to as unrealistic optimism. Few studies have explored the accuracy of risk perceptions or unrealistic optimism concerning STIs, and even fewer have investigated the role that demographics play in the accuracy of perceived sexual risk.

Lopez & Leffingwell (2020) examined the role of unrealistic optimism in sexual risk behavior among 665 undergraduate participants. The researchers measured susceptibility by asking, "What are the chances that you will become infected with HPV." Participant reports were significantly lower than the actual HPV infection rate of 42.5% among individuals 18–59. While this study suggests that college-age students underestimate their sexual risk, the study compared perceptions of individuals to a national probability sample instead of each student's actual behavior.

Syme et al. (2017) is the only study to date that has examined the accuracy of risk perceptions among older adults aged 50–92 in the general public in the United States. Their review separated older adults into three risk categories: low, moderate, and high. Then, the researchers examined risk perceptions based on actual risk. The researchers found that 93.13% of individuals who reportedly engaged in high-risk behavior underestimated their risk of contracting an STI, suggesting a low perception of risk and an inaccurate perception of risk.

Kershaw et al. (2003) surveyed 411 girls to assess the accuracy of risk perceptions among urban female adolescents and to identify variables related to inaccurate sexual risk perceptions. Similar to the Syme et al. (2017) study, the researchers examined these relationships by separating participants into low-, moderate-, and high-risk groups. Then perceptions of risk were categorized as low-, moderate-, and high-risk perceptions. About half of the participants

underestimated the risk of their sexual behavior. Among those who engaged in high-risk behavior, 65.3% underestimated their sexual risk. Compared to Syme et al.'s (2017) study, it would seem that among individuals who engage in high-risk behavior, older adults tend to underestimate their sexual risk more than adolescents. Still, more research is needed to test the effects that age and gender have on the accuracy of sexual risk perceptions.

Few studies have investigated the role of age in the accuracy of HIV risk perception (Schaefer et al., 2018). Schaefer et al. (2018) investigated the relationship between HIV risk perception and actual HIV risk among 15,000 adults in East Zimbabwe aged 15–54. In their study they found that the accuracy improved among adults aged 25 and older. This study, however, did not explore the role of gender and age in influencing based on different levels of sexual risk behaviors.

The Current Study

The current study aims to explore how the HBM can be expanded to incorporate differential effects based on the demographic characteristics of specific groups.

Research Questions

Research Question 1: Is there a significant difference in sexual risk perception accuracy based on age cohort? (low-, moderate-, high-risk groups).

Research Question 2: Is there a significant difference in sexual risk perception accuracy based on gender? (low-, moderate-, high-risk groups).

Research Question 3: Is there an interaction effect between age cohort and gender cohort on sexual risk perception accuracy? (low-, moderate-, high-risk groups).

Summary

The HBM is an appropriate framework to provide insight into how demographics, such as age and gender, influence the accuracy of risk perception. Previous research suggests that there is an interaction effect between age and gender in accounting for variability in sexual risk perceptions as well as actual sexual risk. Studies examining the accuracy of risk perception typically compare individual perceptions of risk to the prevalence of the disease, as opposed to their overall actual risk. Furthermore, no study to date has examined the effects age and gender have on the accuracy of risk perceptions across multiple age groups and gender differences. The current study investigated the relationship between demographic variables, such as age and gender, and the accuracy of risk perceptions. Chapter three will provide an overview of the sample, measures, and procedure used in the current study.

Chapter III: Method

Recruitment and Procedures

The current study utilized a pre-existing data set collected in 2016 as part of a larger study examining sexual wellness, attitudes, and experiences across adulthood (ages 18 to 92). Participants in the original study were recruited using the online crowdsourcing tool Amazon Mechanical Turk (AMT). AMT is an increasingly popular data collection platform for researchers to post tasks such as surveys for registered workers to complete for compensation. The literature supports using AMT as an efficient, reliable, and cost-effective tool for generating sample responses comparable to those collected through more traditional means (Mortensen & Hughes, 2017; Rouse, 2014). As the aim of this study was to explore differences across gender and age regarding sexual risk perception accuracy, AMT was an appropriate data source. AMT has also been used successfully to collect data on older adults and sexuality (Graf & Patrick, 2014; Rolison et al., 2013). Participants were reimbursed $1.00, the average reimbursement rate for questionnaires averaging 20 to 25 minutes for completion (Buhrmester et al., 2011).

Quality assurance mechanisms were utilized to increase reliability. First, parameters regarding participation were put in place. For example, only one U.S. participant per Internet Protocol (IP) address could participate. Other quality assurance mechanisms included within the survey were reported birthdate and match in reported completion codes.

Participants

A total of (962) participants, aged 18 to 92, participated. A total of (452) identified as female, (505) identified as male, and (5) identified as other. A total of (147) were identified as being aged 18–25, (191) were aged 26–35, (203) were 36–49, (336) were 50–64, and (85) were 65 years of age or older.

Measures

Data were collected as part of a larger study on sexual health and wellness. Participants completed a 160-item survey. The current study utilized data on demographics, sexual behaviors, sexual risk behavior, and perceived sexual risk.

Demographic Factors

Participants were asked to provide demographic information, including age, gender, race, marital status, education level, and sexual orientation.

Age. The survey asked participants to enter their date of birth. Age was calculated based on the date of birth and the date on which they completed the survey.

Gender. Participants were asked to respond to a single item, "What is your gender?" with one of three available responses: male, female, or other.

Race & Ethnicity. Participants were asked to respond to the question, "How would you your race." Participants were given instructions to "mark all that apply." The options available from which the participant could choose included White, Hispanic/Latino, American Indian or Alaskan Native, Asian, Black or African American, Native Hawaiian or Pacific Islander, more than one race/ethnicity, and Other Please Specify.

Sexual Orientation. Participants were asked to respond to a single item, "How would you describe your sexual orientation?" by choosing one of the following options: primarily heterosexual, primarily homosexual, or primarily bisexual.

Education. Participants were asked to respond to a single item, "What is the highest level of education you have completed?" by choosing from a list of seven pre-determined options: high school or equivalent, associate's degree or post-high school vocational degree, some

college, bachelor's degree, master's degree, doctorate, or professional degree. Participants were allowed to choose "other" and asked to specify their answer in a text box.

Marital Status. Participants were asked to select one of seven options to define their marital status: married, divorced, separated, living with a significant other, significant other not living together, single, and other. Participants who selected "other" were asked to specify their answer in an additional text box.

Perceived Sexual Risk

One item was used to measure perceived risk with responses on a 6-point item response scale: "How susceptible do you feel you are to contracting an STI?" (1 = Not susceptible, 6= Very susceptible). Based on previous research (Kershaw et al., 2003; Symes et al., 2017), participants were organized into one of three perceived sexual risk categories (not susceptible, somewhat susceptible, and very susceptible). Participants that reported 5 or 6 were considered very susceptible, 2–4 were considered moderate, and 1 was considered not susceptible at all.

Sexual Risk Behavior

Sexual risk behavior was measured by seven questions derived from *The Sexual Risk Survey* (SRS), deemed a psychometrically sound, comprehensive measure of sexual risk-taking behavior among college students (Turchik & Garske, 2009). The use of seven items served to broaden the typical one-item sexual risk assessment (i.e., any condom use). Participants were asked to report the number of sexual partners in the past six months; frequency of vaginal, oral, and anal sex without a condom in the past six months; sex with a casual partner; sex with a new sexual partner without getting a sexual history; and sex with a new sex partner who was previously sexually active without him or her having an HIV/STI test.

Participants reported the frequency of each behavior by typing the number into a box. The total score was calculated by adding all of the responses together. Based on previous research (Kershaw et al., 2003; Symes et al., 2017) using stratifying frequencies, participants were categorized as falling into one of three sexual risk groups based on tertials in a normal distribution (low, moderate, or high sexual risk) based on their total sexual risk score.

Accuracy of Risk Perceptions

The dependent variable *accuracy of risk perceptions* is a categorical variable computed based on a combination of actual risk group and perceived risk group. The level of consistency between perceived risk and actual risk resulted in a corresponding sexual risk accuracy category. For example, an individual whose sexual risk behavior is categorized as "high risk" yet perceives themselves as not being susceptible or being moderately susceptible to contracting an STI would be described as underestimating their risk. Whereas an individual categorized as "high risk", but perceives themselves as being very susceptible to risk would be considered to have accurate risk perceptions. Risk accuracy category assignment is presented in Figure 1.

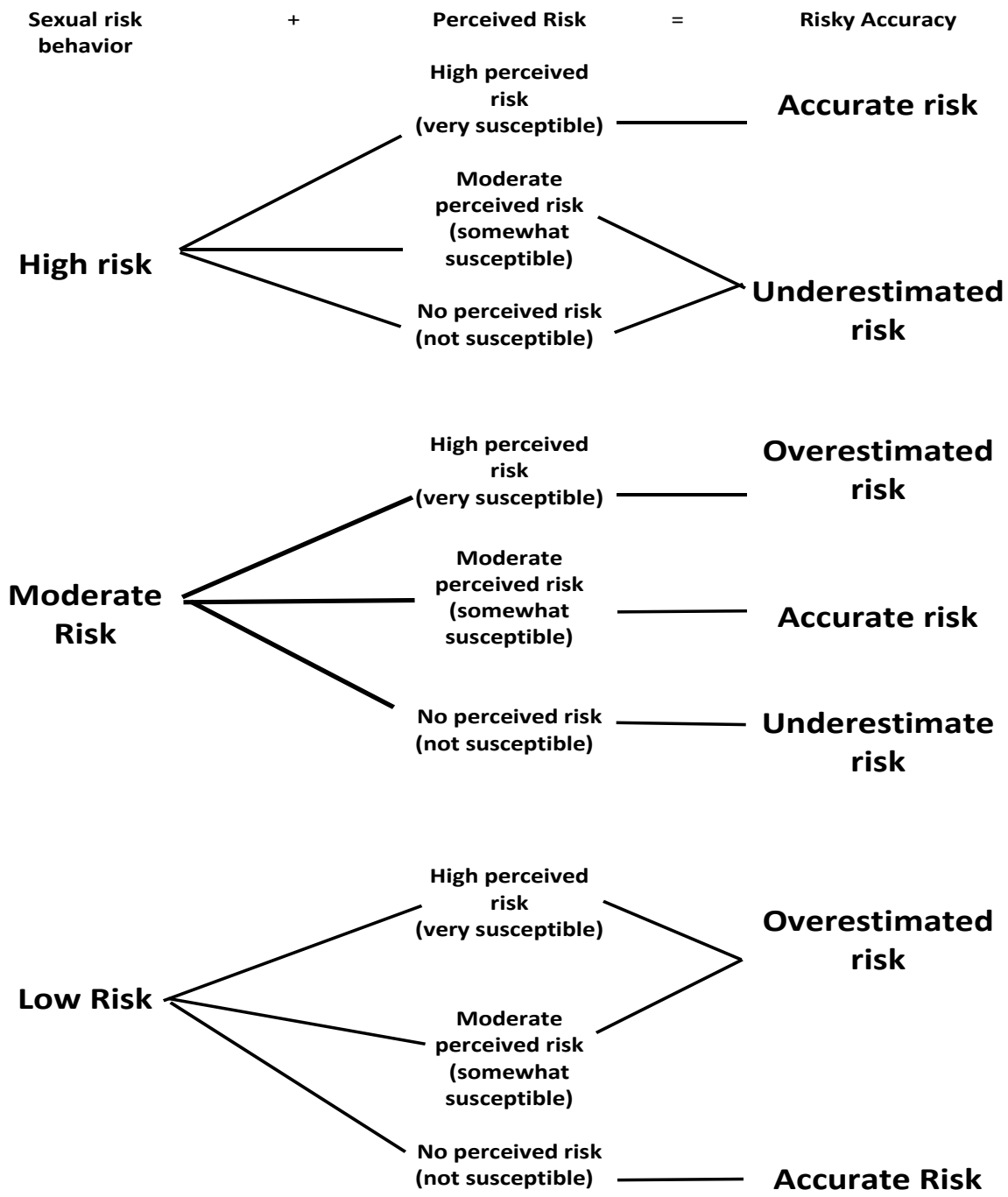

Figure 1. Sexual Risk Accuracy Groupings: Based on similar groupings from Symes et al., 2017; Kershaw et al., 2013. Participants were assigned to an accuracy group based on the consistency between their actual risk grouping and perception of risk grouping. For example, individuals who engage in high-risk behavior yet have low to moderate risk perceptions would be identified as underestimating their sexual risk. Whereas an individual is categorized as "high risk" but perceives themselves as being very susceptible to risk, they would be considered to have accurate risk perceptions.

Chapter IV: Results

The current study sought to explore gaps in the research regarding sexual risk perception accuracy related to age group and gender differences. The current researchers utilized multinomial and binary logistic regression to address the following questions: Do age cohort and/or gender significantly predict sexual risk perception accuracy, and is there an interaction effect between age cohort and gender in predicting sexual risk perception accuracy? The following sections provide descriptive statistics regarding the sample, data analyses regarding sexual risk behavior and perception, and analyses regarding the main research questions.

Sample Characteristics

The initial sample consisted of 962 participants. 52.5% (N = 452) identified as female while the other 47 percent (N =505) identified as male. Five participants identified their gender as "other." Due to the low number of participants identifying their gender as "other," the researchers excluded these five participants from analyses, resulting in a final sample size of 957 participants.

Regarding racial identity, 80.1% of the sample identified as white, .3 % identified as Native Hawaiian or Pacific Islander, 3.8% identified as more than one race, 7.3% identified as black or African American, 6.4% identified as Asian, and 2.1% identified as American Indian or Alaskan native.

Individuals in the 18–25 age group accounted for 15.3% of the sample, adults aged 26–35 accounted for 19.9% of the sample, middle-aged adults aged 36–49 accounted for 21.1% of the sample, older adults aged 50–64 accounted for 35% of the population. Elders aged 65 years of age and older accounted for 8.8% of the population.

Regarding marital status, 43.3% of the sample identified as married, 11.9% identified as divorced, 1.4% identified as separated, 13.2% identified as living with a significant other, 6.2% identified as having a significant other whom they do not live with, and 24.1% identified as being single. The sample consisted of 91.4% of individuals who identified as primarily heterosexual, 3.4% who identified as primarily homosexual, and 5.1% as primarily bisexual.

The sample consisted of 11.5% of individuals who completed high school, 9.5% of individuals who completed an associate's degree, 29.6% who completed some college, 34.7% who completed a bachelor's degree, 10.6% who completed a master's degree, 2.0% who completed a doctorate, and 2.2% who completed a professional degree.

Regarding income, the sample consisted of 17.7% of individuals who reported an income less than $20,000 a year, 17.9% of the sample reported an income between $20,000–$30,000, 12.5% of the sample reported an income between $31,000–$40,000, 20.3% of the sample reported an income between $41,000–$60,000, 13.8% of the sample reported an income between $61,000–$80,000, 8.4% of the sample consisted of $81,000–$100,000, 8.0% of the sample reported an income of over $100,000, and 1.5% of the sample reported that they did not know their income.

Effects of Age Group and Gender on Sexual Risk Behavior

A univariate analysis was conducted examining the main and interactive effects of Age Group and Gender on sexual risk behavior. Sexual risk behavior was a continuous variable. Both Age Group and Gender were categorical independent variables, with Age Group consisting of five levels (18–25, 26–35, 36–49, 50–64, 65+ years) and Gender of two levels (men and women). A significant age group X gender interaction effect was not observed, F (4, 911) = 0.820, p = .512, partial eta-squared = .004. A significant main effect of Age Group on Sexual

Risk Behavior was observed, F (4, 911) = 6.00, p < .001, partial eta-squared = .026. A significant main effect of gender on sexual risk behavior was not observed, F (1, 911) = 1.81, p = .179, partial eta-squared = .002.

Main Comparisons of the Effect of Age Group on Sexual Risk Behavior.

A set of four main comparisons was conducted, each comparing an age group to the next oldest age group. No significant differences were found between 1) the 18–25 age group and the 26–35 age group, t (321) = -0.751, p = .453, d = .070, and 2) the 26–35 age group and 36–49 age group, t (376) = -0.670, p = .503, d = .057. The mean sexual risk score for the 50–64-year-old group was significantly higher than the mean sexual risk scores for the 36–49-year-old group, t (518) = -3.34, p < .001, d = .262. The mean sexual risk score for the 65-year-old and older group was significantly higher than the mean sexual risk scores for the 50–64-year-old group, t (405) = -3.81, p < .001, d = 1.36.

Effects of Age and Gender on Risk Perception

Descriptive statistics indicated that 57.7% of the sample perceived their sexual risk as low, 36.6 percent perceived their sexual risk as moderate, and 5.7% perceived their risk as high. Further analysis indicates that 47.8 percent of the sample underestimated sexual risk, 14.8% overestimated their risk, and 37.4% accurately estimated their risk. Among those who engaged in high-risk behavior, 91.3% underestimated their risk, while only 8.1% accurately assessed their risk.

Effects of Age Group and Gender on sexual risk perception accuracy (accurate, overestimate, underestimate)

A multinomial regression analysis examined the interactive effects of Age Group and Gender on sexual risk perception accuracy. Sexual risk perception accuracy was a categorical

outcome measure with three levels (accurate, overestimate, and underestimate). Both Age Group and Gender were categorical independent variables, with Age Group consisting of five levels (18–25, 26–35, 36–49,50–64,65+ years) and Gender of two levels (men and women). A significant Age Group X Gender effect was observed, $X^2(18, N = 917) = 34.088$, $p = .012$, Cox and Snell Pseudo R-square = .036, indicating that the effect of age group was not the same for men and women in predicting sexual risk perception accuracy group. The analysis did not reveal statistically significant main effects for age group or gender: X^2 (0, N = 917) = 0. A significant main effect of Age Group was present, $X^2(18, N = 917) = 17.177$, $p = .028$, Cox and Snell Pseudo R-square = .019. The main effect of Gender was not significant, $X^2(16, N = 917) = 2.368$, $p = .306$, Cox and Snell Pseudo R-square = .003.

Simple effects of Age Group on sexual risk perception accuracy for men and women. A significant simple effect of Age Group on sexual risk perception accuracy for women was observed, $X^2(8, N = 486) = 25.98$, $p < .001$, Cox and Snell Pseudo R-square = .052. A significant simple effect of Age Group on sexual risk perception accuracy was not observed for men, $X^2(8, N = 431) = 5.74$, $p = .676$, Cox and Snell Pseudo R-square = .013.

Logistic Regression Analyses Examining Overestimation of Sexual Risk

A binary logistic regression analysis was conducted examining the interactive effects of Age Group and Gender on overestimation of sexual risk perception accuracy. Two levels of the outcome measure were used: overestimation of sexual risk and accurate perception of sexual risk. A significant Age Group X Gender effect was observed, $X^2(3, N = 917) = 8.62$, $p = .035$, Cox and Snell Pseudo R-square = .026, indicating that the effect of age group was not the same for men and women in predicting overestimation of sexual risk. The main effect of Age Group was significant, $X^2(4, N = 917) = 9.485$, $p = .050$, Cox and Snell Pseudo R-square = .026. The

main effect of Gender was not significant, $X^2(1, N = 917) = 1.618$, $p = .203$, Cox and Snell Pseudo R-square = .026.

Effects of age group on overestimation of sexual risk perception accuracy for men. A binary logistic regression model tested the effect of age group on the overestimation of sexual risk perception accuracy (overestimation vs. accurate estimation) in men. No significant effect of age group on overestimation of sexual risk perception accuracy was observed for men, $X^2(4, N = 216) = 3.10$, $p = .542$, Cox and Snell Pseudo R-square = .014.

Effects of age group on overestimation of sexual risk perception accuracy for women. A binary logistic regression model tested the effect of age group on overestimation of sexual risk perception accuracy (overestimation vs. accurate estimation) in women. The effect of age group on overestimation of sexual risk perception accuracy for women approached statistical significance at the .05 level, $X^2(4, N = 263) = 9.03$, $p = .060$, Cox and Snell Pseudo R-square = .034. Comparisons among age groups indicated the percentage of women overestimating sexual risk who were 26–35 years old (41.5%) was significantly higher than the percentage of women overestimating sexual risk between the ages of 18 and 25 (16.2%), Wald = 6.102, p = .014, odds ratio = 3.67. No other comparisons between age groups for women were significant, *p*s < .420. The percentage of women in each age group who overestimated the presence of sexual risk is shown in Table 1.

Table 1

Age Group Comparisons Regarding Overestimating Sexual Risk

Age Group	Overestimating Sexual Risk
18–25	16.2%

26–35	41.5%
36–49	29.7%
50–64	23.1%
65+	21.4%

Logistic Regression Analyses Examining Underestimation of Sexual Risk

A binary logistic regression analysis examined the interactive effects of Age Group and Gender on the underestimation of sexual risk perception accuracy. Two levels of the outcome measure were used: underestimation of sexual risk and accurate perception of sexual risk. The Age Group X Gender interaction effect was significant, $X^2(5, N = 957) = 16.96$, $p = .005$, Cox and Snell R-square = .021. The main effect of Age Group was significant, $X^2(4, N = 917) = 19.19$, $p < .001$, Cox and Snell Pseudo R-square = .028. The main effect of Gender was significant, $X^2(1, N = 917) = 6.210$, $p = .013$, Cox and Snell Pseudo R-square = .028.

Effects of age group on underestimation of sexual risk perception accuracy for men. A binary logistic regression model was examined testing the effect of age group on underestimation of sexual risk perception accuracy (underestimation vs. accurate estimation) in men. No significant effect of age group on underestimation of sexual risk perception accuracy was observed for men, $X^2(4, N = 365) = 0.96$, $p = .916$, Cox and Snell Pseudo R-square = .003.

Effects of age group on underestimation of sexual risk perception accuracy for women. A binary logistic regression model was examining testing the effect of age group on underestimation of sexual risk perception accuracy (underestimation vs. accurate estimation) in women. A significant effect of age group on underestimation of sexual risk perception accuracy

was observed for women, $X^2(4, N = 416) = 19.84$, $p < .001$, Cox and Snell Pseudo R-square = .047.

Among women, the age group with the highest percentage of participants underestimating sexual risk was the 36–49 years age group (68.3%). Comparisons investigating the significant simple effect of age group for women were conducted by comparing the percentage of sexual risk underestimators in each of the other four age groups to the percentage of underestimators in the 36–49 years age group. No significant difference in the percentage of sexual risk underestimators was found between women 18–25 years (53.0%) and 36–39 years groups (68.3%), p = .059. No significant difference in the percentage of sexual risk underestimators was found between women 26–35 years (63.1%) and 36–39 years, p = .481. The percentage of women underestimating sexual risk who were 36–49 years old (68.3%) was significantly higher than the percentage of women underestimating sexual risk who were 50–64 years old (44.7%), p = .003. The percentage of women underestimating sexual risk who were 36–49 years old (68.3%) was significantly higher than the percentage of women underestimating sexual risk who were 65 years and older (35.3%), p = .006. The percentage of women in each age group who underestimated the presence of sexual risk is shown in Table 2.

Table 2

Age Group Comparisons Regarding Underestimating Sexual Risk

Age Group	Underestimating Sexual Risk
18–25	53.0%
26–35	63.1%
36–49	68.3%

50–64	44.7%
65+	35.3%

Chapter V: Discussion

The HBM postulates that perceptions of risk influence a person's decision to engage in preventative health behaviors (Skinner et al., 2015). This theory is supported by empirical research, with results from a meta-analysis indicating risk perceptions significantly predict an individual's decision to engage in protective health behaviors (Brewer et al., 2004; Brewer et al., 2007). Given the importance of accurate risk perceptions in improving health prevention behaviors, the current study sought to understand better how demographic variables such as age and gender influence the accuracy of STI risk perceptions. Information from this study could be used to inform outreach materials and target specific populations at risk for underestimating their risk, subsequently delaying prevention and treatment.

The Impact of Gender and Age on Predicting Sexual Risk Behavior

Results from previous research regarding the ability of gender to predict sexual risk behavior have been contradictory, suggesting a complex interplay between gender and sexual risk behaviors (Cubbins and Tanfer, 2000; Vasilenko et al., 2015). The results from the current study are consistent with findings that suggest gender alone does not predict sexual risk behavior. However, what was unexpected in the current findings is that there was no significant interaction effect between gender and age. Previous studies suggest that a complex interplay of biopsychosocial factors influences men's and women's decision to engage in sexual risk behavior (Lindau et al., 2007) and that men and women experience an increase in STI prevalence at different ages (Paul et al., 2009).

Age group was a significant factor in predicting sexual risk behavior, with main comparisons indicating that the mean sexual risk score for the 50–64-year-old group was significantly lower than the mean sexual risk scores for the 36–49-year-old group, and the mean sexual risk score for the 65 years and older group was significantly lower than the mean sexual risk scores for the 50–64-year-old group. While few studies to date have compared sexual risk behavior differences across a sample aged 18–92, the current findings may be due to the overall decline in sexual activity (Lindau et al., 2007) and not necessarily to improvement in safe sex practices. It should be noted that physical and mental health factors associated with aging (Lindau et al., 2007; Bach et al., 2013) and social isolation (AARP, 2011; Mairs & Bullock, 2013) are sources of influence on sexual activity in adulthood but are not inevitable features of the aging process. Among those who are sexually active, previous data show that safe sex practices such as condom use decrease with age (Reece et al., 2010).

Another interesting observation regarding these data is that there were no significant differences in sexual risk behavior mean scores between the 18–25 and 26–35 groups, nor between the 26–35 groups and the 36–49 groups. While individuals between the ages of 15 and 24 account for the highest prevalence of new instances of STIs (50%), younger adults over 24 years and middle-aged adults are still significantly impacted by STIs (CDC, 2024). Previous literature suggests that a complex interplay between psychosocial factors influences sexual risk behavior among middle-aged adults, such as those having to navigate divorce, changes in relationships, re-entering the dating world after a period of monogamy or celibacy, prioritizing intimacy over sexual health, and social and cultural expectations (Dalrymple et al., 2017; Monsell and McLuskey, 2016).

Risk Perceptions of the Sample are Consistent with the Literature

Generally, people tend to view their risk as low, regardless of gender and age group, across a variety of health-related behaviors (Kim et al., 2018). This trend is consistent with sexual risk behavior as well, with multiple studies finding men and women across various age groups tend to view their risk of contracting an STI as low (Ethier et al., 2003; Syme et al., 2017). Findings from the current study examining a sample aged 18–92 are consistent with the literature, with the majority of the sample (57.7%) perceiving their risk of contracting an STI as low. Additionally, 91.3% of individuals in the current study who engaged in high-risk behavior underestimated their risk. This is consistent with literature that notes individuals who engage in high-risk sexual behavior do not typically perceive their risk as high (Mercer et al., 2017).

Exploring Gender and Age Effects on Sexual Risk Perception Accuracy

The current study aimed to explore the interaction and main effects of age and gender on the accuracy of sexual risk perception. The findings suggest a significant interaction effect between age and gender, indicating that the effect of age group was not the same for men and women in predicting the accuracy of sexual risk perception.

Underestimating Vs. Accurate Perceptions of Risk

The results of the current study indicate that the effect of age group is not the same for men and women in predicting the accurate perception of risk vs. underestimating risk. Specifically, the age group was not significant in predicting accurate vs. underestimating risk among men. Conversely, age group was a significant factor in predicting underestimating vs. accurate perceptions among women.

The results from the current study show a gradual increase in the percentage of women underestimating their sexual risk across age groups until reaching a high of 68.3%

underestimating their risk among women aged 36–49 before a steady decline again with women aged 50–64, and women 65 years of age and older. While women aged 36–49 had the highest percentage of people underestimating their sexual risk, they were not statistically different from women aged 26–35, of whom 63.1% underestimated sexual risk. However, women aged 36–49 underestimated their sexual risk at a statistically higher rate than women aged 50–64 and women aged 65+.

Women aged 36–49 underestimated their risk by a higher percentage than any other age group in this study. Several psychosocial factors discussed in the literature may explain this result. For example, Dalrymple et al. (2017) reported a significant proportion of their middle-aged participants associate being at risk for STIs with being irresponsible and young. Cultural expectations that they should "know better" led to participants distancing themselves from being seen as at risk, which, in turn, created barriers to seeking preventative and early treatment options for STIs.

Other reasons why women aged 36–49 may underestimate their risk may be due to a lack of representation in educational resources. The media plays a role in shaping STI-related stigma and perpetuating stereotypes (Smith, 2007). Several studies have found that individuals calculate their risk based on how similar they are to a stereotypical person with HIV (Hammer et al., 1996; Siegel, 1987; Weinstein, 1980). The belief that HIV only affects sexual minorities and young people may be one reason why individuals who do not fit into that stereotype underestimate their risk (Levy et al., 2003). Monsell & McLuskey (2016) note that there is a paucity of specific information on the sexual health needs and risks of middle-aged individuals. Like older adults, middle-aged adults are likely underrepresented in STI educational resources (Conner et al., 2019). Dalrymple et al. (2017) found that middle-aged participants viewed STI clinics as being

geared towards young people, and they feared additional judgment for being there due to their age.

Additionally, a higher percentage of women aged 36–49 in this sample reported being currently married than women in younger age groups. Being in a monogamous relationship has been shown to decrease perceptions of the risk of contracting an STI (McLaurin-Jones et al., 2017). However, being in a monogamous relationship does not necessarily protect one from contracting an STI. For example, one study reports that 16.48% of marriage partners engage in extramarital affairs, with men engaging in affairs at a higher rate compared to women (Djamba & Kimuna, 2020). Sexual risk includes not knowing your partner's sexual history or current STI results before engaging in unprotected sex.

While women in this age group were more likely to be married, they were also more likely to be divorced than younger age groups. Dalrymple et al. (2017) found that both men and women faced vulnerabilities related to relationship transitions, such as divorce, which led to reduced safe sex practices. For example, for many participants in the study, the end of a relationship was marked by a period of bereavement, leading individuals to prioritize emotional needs over safe sex practices. Additionally, men and women reported lower self-esteem regarding their aging bodies in the context of a new sexual partner which led to less confidence negotiating condom use. Some middle-aged adults in the study found new sexual encounters after a period of monogamy to be exciting and that it provided a sense of freedom not necessarily consistent with considering their risk or vulnerability.

Overestimation of Sexual Risk

A significant interaction effect between age and gender was observed, indicating that the effect of age group was not the same for men and women in predicting overestimation of sexual

risk. Logistic regression analyses indicated that for men the effect of age group was not significant. Conversely, age group was significant in predicting sexual risk perception accuracy among women. Comparisons among age groups indicated the percentage of women overestimating sexual risk who were 26–35 years old (41.5%) was significantly higher than the percentage of women overestimating sexual risk who were between the ages of 18 and 25 (16.2%).

There are a few factors that may be contributing to women aged 26–35 overestimating their risk more compared to young adults aged 18–25. First and foremost, adults aged 26–35 may be overestimating their risk more due to availability heuristics. Data show that individuals aged 18–24 account for 50 percent of new incidents of STIs (CDC, 2024), and women are more likely to experience adverse effects and symptoms related to STIs. Sunstein & Zechhauser (2008) note that recent exposures to a risk can lead to an increase in fear and increased risk perceptions generally. This may mean that due to close calls or a history with STIs, women aged 26–35 may overestimate their sexual risk.

While most research is aimed at identifying factors related to underestimating risk and ways of improving preventative health behaviors, overestimating risk is also important to address. For example, overestimating risk can misallocate public funds and healthcare resources (Brownlee et al., 2017). Additionally, overestimating risk can increase fear and undermine effectiveness of public service announcements over time (Covello, 2006).

Accounting for Non-significant Main Effects

The current study found a significant interaction effect between age group and gender in predicting sexual risk perception but did not find significant main effects for age group or gender. Logistic regression analyses explained this interaction effect by showing there was an

effect of age group for women but not for men. Perhaps one reason why age group is a significant predictor for sexual risk perception accuracy in women but not in men is shifting gendered, cultural expectations and stereotypes that women experience across the lifespan. For example, gendered stereotypes have been found to influence how people perceive themselves and, subsequently, their risk (Ellemers, 2018). Stereotypes and expectations of women and their sexual behavior may shift with developmental expectations, such as young adult women being sexually objectified more frequently compared to older adult women (Sherman et al., 2024) and older adult women navigating sexual stereotypes about their asexuality (Hinchliff & Gott, 2008). While Sherman et al. (2024) compared women aged 18–27 to women 48–90, leaving a gap in understanding the stereotypes and objectification experiences of women aged 28–47, there is research suggesting how relationship status can influence perceptions of sexual functioning in women around this age. For example, Kingsberg (2002) discussed how women may perceive their sexual desire as low due to comparisons with their partner's sexual drive. This is not to say that older adult men do not experience internalized messages about asexuality (Syme et al., 2016); however, there is research to suggest that men are seen as becoming more sexually attractive with age (Åberga et al., 2020).

Limitations of the Current Study

The current results should be considered within the limitations of this study. First, the findings in this study suggest that middle-aged women may be at risk of underestimating their sexual risk more than any other age group. However, before broad generalizations can be made about middle-aged women, it is important to note that middle age is not defined consistently across the sexual risk literature (Addis et al., 2006; Dalrymple et al., 2016). The current study defined middle age as starting at 36, based on Petry's operational definition in risk research

(2002), and cut off at 49 right before age 50, which is often cited as the beginning of the "older adult" age range in sexual risk research (Syme et al., 2017). While Andrade (2017) argued that using age as a categorical variable in health research is appropriate because results are often used to allocate resources to specific populations, using age as a continuous variable would reduce the chances of biased estimates based on inconsistent cut off points. Additionally, comparing generational differences may be more appropriate in researching age differences in the future.

Another limitation of this study is its generalizability. First, the study sample largely consisted of white, heterosexual, cis-gendered men and women. Future research may consider examining the accuracy of sexual risk perceptions across other racial, gender, and sexual orientations. This study also utilized a pre-existing data set, which some researchers have identified as problematic due to potential issues with data quality, depth, or limited representation (Klemenjak et al., 2019).

Summary and Implications for the Field

With sexually transmitted infections at an all-time high across numerous age groups (CDC, 2019), there is an increased need to understand how the accuracy of risk perceptions differs based on age and gender. Understanding how age groups differ in their accuracy of sexual risk perceptions may help to improve STI prevention and early intervention strategies across multiple age groups. While 45.5 percent of new incidents of STIs occurred among individuals aged 15–24, the prevalence of STIs is increasing across all age cohorts (CDC, 2019), which suggests a need to understand if interventions aimed at improving the accuracy of STI risk perception would be appropriate in men and women across various age groups. The current study contributes to the field of counseling psychology's value for preventative treatment and care.

Research on STI risk is primarily focused on those disproportionately affected by STIs, such as sexually active women under the age of 25 or pregnant and men who have sex with men (MSM). This study sought to better understand sexual risk perception accuracy across various age groups from 18–92, encompassing many age groups that are often understudied. The current study contributes to the field of counseling psychology's values regarding social justice and multiculturalism by researching age groups often excluded from sexual health research. Furthermore, this study contributed to the field's value for lifespan development, by reporting findings about sexual risk behavior and perceptions of adults 18–92.

This study also highlighted that women aged 36–49 may be underestimating their risk of contracting an STI more than women in other age groups. Future studies may want to further research this age group and develop outreach to improve sexual risk perception accuracy. The contributions of the current study reflect the values of counseling psychology, such as lifespan development, preventative treatment, and social justice and multiculturalism (Gelso et al., 2014).

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