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The Next Frontier for Men's Contraceptive Choice:
College Men's Willingness to Pursue Male Hormonal Contraception

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Abstract

Unplanned pregnancy is a concern for emerging adult men, but their contraceptive options are limited. With male hormonal contraception in clinical trials in progress, it is important to investigate men's attitudes toward alternative contraception, as many social factors, such as masculine norms, may hinder their interest. This study used the Prototype-Willingness Model to investigate college men's willingness to pursue hormonal contraception. Male college students ($N = 160$; $M_{age} = 19.37$, $SD = 1.33$; 61.9% White) read a description of male contraception clinical trials and filled out a questionnaire assessing Prototype-Willingness and masculinity constructs. Multinomial logistic regression revealed that men perceiving greater male contraceptive use and more favorable prototypes of a typical user had *higher* odds of having high willingness compared to no willingness (norms OR = 29.78, 95% CI [5.79, 153.18]; prototypes OR = 3.93, 95% CI [1.96, 7.87]). Men rating higher avoidance of femininity had *lower* odds of having high willingness compared to no willingness (OR = 0.60, 95% CI [0.40, 0.92]). Perceived risk of unplanned pregnancy failed to associate with willingness to use contraception, suggesting the importance of men's social cognitions (norms and favorable images) and identity (masculinity) when promoting male hormonal contraception. Men's avoidance of femininity may hinder their willingness, but promotion of male norms and favorable male users may enhance clinical trial recruitment and eventual public health campaigns to expand men's contraceptive options. Future studies should examine diverse college and non-college samples to determine the generalizability of these results to the broader emerging adult male population.

Keywords: male hormonal contraception; Prototype-Willingness Model; masculinity; college men; norms

Public significance statement: Clinical trials are currently being conducted to prepare male hormonal birth control as a pharmaceutical option for men, but little is known about men's attitudes towards male hormonal contraception. Among a group of college men, 35% had high willingness to pursue male hormonal contraception. The men were more willing to pursue male hormonal contraception if they believed that other men would too, if their image of a man who would use contraception was positive, and if they rated themselves as less concerned about avoiding effeminate behavior.

The Next Frontier for Men's Contraceptive Choice:
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Introduction

In 2012, out of the 213.4 million worldwide pregnancies, 40% were unplanned (Sedgh, Singh, & Hussain, 2014). Unplanned pregnancy rates are somewhat higher in the United States; in 2011, 45% of pregnancies were unintended and rates were higher in the emerging adult population compared to other age groups (Finer & Zolna, 2016). Among 18-19 and 20-24 year olds, unintended pregnancy rates were 71% and 81%, respectively (Finer & Zolna, 2016). Nationally representative samples of emerging adults (18-29 years old) reveal that the majority of sexually active unmarried young adults are not trying to get pregnant (Frost, Lindberg, & Finer, 2012). Contraception access and use is inadequate; only half of American emerging adult women use a long-acting/hormonal birth control method and adherence for many is inconsistent (Frost et al., 2012). Men's expanded involvement in contraception could help mitigate this public health challenge, but men have few birth control options.

Clinical trials are being conducted to examine efficacy of hormonal contraception for men (Mahmoud & T'Sjoen, 2012), but men's acceptance of hormonal contraception is limited due to norms positioning women as contraceptive gatekeepers (Campo-Engelstein, 2011) and norms encouraging men's avoidance of femininity (Figueroa-Pera, 2003). In the present report we review the attitudinal research that has been conducted surrounding men's interest in contraception, introducing the Prototype-Willingness Model (Gibbons, Gerrard, Stock, & Finneran, 2015) as a useful framework for advancing understanding of college men's willingness to pursue male hormonal contraception. Additionally, we examine masculinity, specifically avoidance of femininity, as an additional factor that may play a role. We surveyed Prototype-

Willingness constructs and avoidance of femininity cross-sectionally in a sample of 160 college men.

Men's Involvement in Family Planning

A major barrier inhibiting men's involvement in family planning is asymmetric focus on medical interventions for women, resulting in a dearth of birth control technologies available for men (Oudshoorn, 2003). Over a dozen new contraceptive technologies have been introduced for women since World War II (Oudshoorn, 2003). In the United States, the majority of women (ages 15-44) report using some form of contraception including: the pill (25.9%), long acting reversible contraception (e.g., intra uterine devices, 11.6%), injectable birth control (e.g., Depo-Provera, 4.5%), and the contraceptive ring or patch (2.6%; Daniels, Daugherty, & Mosher, 2014).

In contrast, men's options for contraception, condoms, withdrawal (coitus interruptus or the "pull out" method), and vasectomies, have remained relatively stable for over a century (Oudshoorn, 2004). Male condoms are intended to protect against both disease and pregnancy but are used inconsistently (Copen, 2017) and have the highest failure rate compared to other forms of contraceptive technology (Sundaram et al., 2017). In the United States there are vast gender disparities in sterilization surgery, with 15.5% of adult women depending on their own sterilization surgery for contraception versus 5.1% of adult women depending on male sterilization surgery (Daniels & Jones, 2014). This disparity persists despite vasectomies being more cost efficient and having lower side effects than female sterilization (Anderson, 2017; Shih, Zhang, Bukowski & Chen, 2014). Worldwide, male condoms and vasectomies account for only around 8.9% of global contraception use (United Nations, 2009).

In the United States, the majority of men are in need of family planning (i.e., men who reported they have had vaginal sex, are fecund but not trying to become pregnant with a female partner or partners, and have female partner or partners who are fecund and not currently pregnant; Marcell et al., 2016). Of these men in need of family planning, less than 20% have received family planning services (Marcell et al., 2016). Additionally, only around a fourth consistently use condoms and less than half have partners who consistently use contraception (Marcell et al., 2016). On college campuses, reported rates of condom use in the most recent vaginal sex encounter are low (Fielder & Carey, 2010; Lewis, Granato, Blayney, Lostutter, & Kilmer, 2012) and condom use is inconsistent among college men, despite college men reporting preventing pregnancy as a motivation for condom use (Caron, Davis, Halteman, & Stickle, 1993).

With limited contraception options, a substantial proportion of men report an interest in pursuing expanded forms of male hormonal contraception, ranging from 20% (Laird, 1994) to 83% (Martin et al., 2000) across diverse samples (for a review see Glasier, 2010). In a large, multinational study, the majority of men in Scotland (n = 436), South Africa (n = 493), and China (n = 900) reported joint contraception decision-making with their female partners; and the majority of men in South Africa and China reported women bear too much of the responsibility for contraception (Martin et al., 2000). A cross-cultural study of 450 women demonstrated that the vast majority of women believe that male hormonal contraception is a good idea (71-97%), predominantly because it would enhance egalitarian approaches toward family planning (Glasier et al., 2000).

Male Hormonal Contraception Development

Pharmaceutical contraceptive development has historically focused on hormonal interventions for women, limiting men from a proactive role (Campo-Engelstein, 2011). Barriers to the development of marketable male hormonal contraception are biological, financial, and societal (Oudshoorn, 2003; Potts, 1996). Despite these challenges, since the 1970s there has been progress in development of marketable, long-acting, and reversible male hormonal contraception. Over a dozen clinical trials have been conducted targeting spermatozoa, with the goal of reducing sperm concentration while ensuring minimal side effects and reversibility to full fertility after suspending treatment (for a review of clinical trials and biological processes see Mahmoud & T'Sjoen, 2012). Most recently, the World Health Organization conducted a large, cross-cultural, phase III clinical trial of a testosterone and progestogen injection, with the intention of lowering sperm concentrations to 1 mil/mL (or oligospermia, sperm concentrations meeting general medical criteria for suppressed fertility; Behre et al., 2016).

While progress is being made on efficacy, issues of acceptability remain a concern. Some clinical trials have suggested side effect concerns that include depression and mood swings (Behre et al., 2016; Mommers et al., 2008), even leading to the suspension of the World Health Organization trial testing an intramuscular injection (Behre et al., 2016). Other research on acceptability seems promising; 66% of men involved in one clinical trial reported high acceptability for continuing the treatment at the conclusion of trial (Meriggiola et al., 2006) and in another trial men experienced little change in their health, mood, and sex life during the treatment (Sjögren & Gottlieb, 2001).

Efficacy and general acceptability aside, pharmaceutical companies have concerns regarding whether male contraception development will be financially viable given the norms of women as contraceptive gatekeepers (Campo-Engelstein, 2011). Societal standards of gender

play a role in positioning men as secondary actors to regulating fertility, including rejection of effeminate behavior and perceived threats to masculinity (Figueroa-Pera, 2003). For male hormonal contraception development and uptake to succeed, it is essential to understand men's socially-driven cognitions and attitudes surrounding male hormonal contraception and to explore the role that masculinity plays in men's willingness to pursue male hormonal contraception.

Men's Attitudes and Cognitions Surrounding Male Hormonal Contraception

Around a dozen qualitative and quantitative studies from diverse disciplines have investigated men's attitudes toward or beliefs about male hormonal contraception. Published in isolated fields, little consensus has developed around socially-driven cognitive predictors of men's interest in male hormonal contraception. Most survey-studies focus on rates of acceptability, demographic associates, and preferences for administration (for a review see Glasier, 2010). Generally, neither demographic characteristics (e.g., age, education, job prestige) nor sexual or relational characteristics (e.g., length of relationship, past sexual experience and use of contraception) have consistently associated with positive male hormonal contraceptive attitudes or interest (Brooks, 1998; Laird, 1994; O'Connor, Ferguson, & O'Connor, 2005; Walker, 2011; Weston, Schlipalius, Bhuinneain, & Vollenhoven, 2002). In contrast, a large cross-cultural study revealed that higher income and education were associated with male hormonal contraception acceptability (Heinemann, Saad, Wiesemes, White, & Heinemann, 2005) and one study demonstrated that men reporting more stable relationships reported more positive attitudes towards male hormonal contraception (Eberhardt, van Wersch, & Meikle, 2009). No studies that we are aware of have examined racial or ethnic differences in the United States.

Beyond demographic and past sexual behavior variables, survey studies have employed disparate approaches to assessing attitudinal predictors of men's male hormonal contraception interest. For example, research has demonstrated that protection from unwanted pregnancy is a motivator for taking the male pill (Walker, 2011), but no research has investigated whether men's perceived risk of unplanned pregnancy associates with their perceptions of male hormonal contraception use. The only research study examining American college men found that barriers such as perceived "bothersomeness" or believing male contraception was "against nature" were associated with lower likelihood of using male contraception (Laird, 1994). One study found that self-reported adherence to health-promoting behaviors associated with positive attitudes toward the male pill (Eberhardt et al., 2009). In sum, attitudinal research has revealed isolated findings surrounding perceived barriers and habits, but rarely includes aspects of theoretical health models or explores socially-driven cognitions related to men's hormonal contraception interest.

Only one study we are aware of used health behavior theory to investigate male hormonal contraception. O'Connor and colleagues (2005) employed the Theory of Planned Behavior to examine predictors of intentions to use male hormonal contraception among male and female college students and staff in the United Kingdom. Results indicated partial support for the theory, positing subjective norms, attitudes, and perceived behavioral control as reasoned-cognitions associated with behavioral intention. Among men, greater subjective norms (i.e., their perception of the approval of important others) of male hormonal contraception was associated with intentions to use male hormonal contraception. Perceived behavioral control was only related to intentions to use a daily pill administration (not for injections) and no significant results emerged for attitudes towards contraception. These results suggest that socially proscriptive norms may play an important role in men's rejection of hormonal contraception, but that the Theory of

Planned Behavior may not be the most applicable theoretical framework for understanding men's socially-driven motivations for pursuing hormonal contraception.

The Prototype-Willingness Model. Unlike the Theory of Planned Behavior and other expectancy-value models that highlight reasoned assessment (e.g., likelihood in Laird, 1994 and intention in O'Connor et al., 2005) as predictors of behavior, the Prototype-Willingness Model is a dual-process model that predicts behavior through a combination of a reasoned decision making process alongside a social-heuristic decision making process (Gibbons et al., 2015). While attitudes (via conditional perceived vulnerability) and norms (descriptive) are captured in the Prototype-Willingness Model, two additional constructs—behavioral willingness and prototypes—contribute to the social-heuristic path. Behavioral willingness is positioned as a proximal behavioral antecedent and is defined as an openness to engaging in a behavior given conducive circumstances (Gibbons et al., 2015). Prototypes are defined as images of a typical person who engages in the target behavior and have been found to be predictive for both health-risk and health-promotive behavior (Gibbons et al., 2015). Together, prototypes and behavioral willingness capture socially-influenced cognitions related to health behavior and have been found to predict behavior independently of reasoned cognitions (Todd, Kothe, Mullan, & Monds, 2016). The Prototype-Willingness Model is predictive of pregnancy prevention and risk behavior including undergraduate women's condom preparedness (e.g., carrying condoms; Gebhardt, Van Empelen, & Van Beurden, 2009) and pregnancy-risk behavior (e.g., engaging in vaginal sex without using birth control) among male and female college students (Gibbons, Gerrard, Blanton, & Russell, 1998).

Among college men, vaginal sex and contraception use is not always a reasoned behavior. Hookup culture is a pervasive environmental norm on college campuses, and college

men's participation in vaginal sex and contraceptive use can be heavily socially influenced (Stinson, 2010). The Prototype-Willingness Model is appropriate for examining male hormonal contraceptive use, particularly among college men, for three reasons. First, men's pursuit of hormonal contraception subverts typical gender norms, and as such, men's decisions to pursue male hormonal contraception will likely be influenced by social-heuristic processes in addition to expectancy-value beliefs surrounding pregnancy prevention. Second, men's pursuit of male hormonal contraception is a new behavior. Behavioral willingness forms prior to behavioral intention for new behaviors (Gibbons et al., 2015) and social-heuristic cognitions are generally more predictive of behaviors that individuals have less experience with (Pomery, Gibbons, Reis-Bergan, & Gerrard, 2009). Third, male hormonal contraception is a help-seeking/preventative behavior rather than a health-risk behavior, and both theory (Gibbons et al., 2015) and empirical research among college students (Hammer & Vogel, 2013) suggest that the Prototype-Willingness Model is predictive for help-seeking.

Masculinity

While we posit that social-heuristic cognitions such as men's perceptions of descriptive norms and their favorability of male user prototypes contribute to college men's hormonal contraception willingness, masculinity will likely play a distinct role in informing men's attitudes towards male hormonal contraception. Qualitative research in the United Kingdom with small samples of White working-class men (Dismore, Van Wersch, & Swainston, 2016) and men from a prosperous area (Walker, 2011), along with a study of African-American adolescent and young adult men (Marcell, Plowden, & Bowman, 2005), revealed a theme indicating that men, while expressing interest in sharing the burden of family planning with women, perceived male hormonal contraception as feminine and emasculating. One quantitative study conducted with a

large international sample indicated that, depending on method of administration and cultural context, up to 34% of men reported that using male contraception would threaten their masculinity (Martin et al., 2000). In sum, a theme of hormonal contraception as feminine has emerged from qualitative research and quantitative research indicates emasculation as a prevalent concern surrounding male hormonal contraception use.

Preliminary research suggests masculinity as a contextual factor in men's attitudes towards hormonal contraception, and there is strong theoretical precedent for exploring masculinity. Male hormonal contraception relates to central tenants of social constructions of masculinity, namely affirmative demonstration of manhood via avoidance of femininity. Masculinity may negatively associate with men's pursuit of a medical intervention related to their fertility. Early research demonstrated that among adolescent males, masculinity strongly associated with men's belief that impregnating a woman demonstrates manhood (Pleck, Sonenstein, & Ku, 1994). In the behavioral domain of vasectomy, an older and diverse group of males reported that the largest hindrance to vasectomy was loss of manhood (Shih, Dubé, Sheinbein, Borrero, & Dehlendorf, 2013). No research has empirically investigated whether masculinity associates with men's willingness to pursue male hormonal contraception, but ample evidence indicates that masculinity associates with other health-related behaviors.

Generally, masculinity is negatively associated with health-enhancing behaviors and positively associated with health-risk behaviors among men. In a sample of adult men (18-78 years old) recruited from listservs, masculinity and men's perception of male descriptive norms were related to greater levels of alcohol use and fighting, and lower levels of seatbelt use, talking to someone about problems, annual physicals, exercising, and fruit and vegetable consumption when controlling for age, race, sexual orientation, relationship status, income, and education

(Mahalik, Burns, & Syzdek, 2007). Masculinity is also associated with more negative attitudes toward psychological help (Addis & Mahalik, 2003), and less health care use. For example, among a representative sample of male adolescents, having more traditional masculine beliefs was predictive of *not* having had an annual physical 2-3 years later (Marcell, Ford, Pleck, & Sonenstein, 2007).

Masculinity is also a central factor in the health challenges of college men, especially their sexual health (Courtenay, 1998). Among college males in the United States and Kenya, masculinity was related to greater number of sex partners and alcohol consumption, and less ultraviolet skin protection, blood pressure screenings, medical appointment attendance, and annual medical exams (Mahalik, Lagan, & Morrison, 2006). In addition to greater sex partners, college men's masculine ideology is related to greater unprotected sex (Pleck, Sonenstein, & Ku, 1993; Shearer, Hosterman, Gillen, & Lefkowitz, 2005). Similar findings have emerged in younger samples; higher approval of masculine identity was associated with less condom use among heterosexual adolescent males (Noar & Morokoff, 2002).

Becoming a man is a precarious and continual process, and the transition from adolescence to young adulthood, or emerging adulthood, is a particularly crucial period for men's development of masculine attitudes (Marcell, Eftim, Sonenstein, & Pleck, 2011). Among emerging adult college men, avoidance of femininity is central to masculine identity. College men report pressure to earn "masculine capital" through engaging in traditionally masculine behavior and fear losing masculine capital when engaging in behavior considered feminine (de Visser & McDonnell, 2013). In-depth qualitative research with college males reveals that manhood is defined in contrast to womanhood, and that actively rejecting femininity is an essential aspect of proving and constructing manhood (DiMuccio, Yost, & Helweg-Larsen,

2017). Avoidance of femininity also relates to safe sex. Of various dimensions of masculinity, only rejection of femininity emerged as predictive of unprotected sex among college men (Shearer et al., 2005). Avoidance of femininity may hold particular importance for college men's willingness to pursue male hormonal contraception.

The Present Study

In the current study, we cross-sectionally investigated social-heuristic cognitions and masculinity (avoidance of femininity) to determine whether they were associated with men's willingness to pursue male hormonal contraception in a sample of 160 college men. The present study expands on the former research in two primary ways. First, the present study is the first research using the Prototype-Willingness Model to study male hormonal contraception. This adds to the literature by applying an appropriate theoretical-framework to investigate a behavior with strong social proscriptive norms. Second, the present study will extend prior research by empirically examining whether masculinity associates with men's perceptions of male hormonal contraception. We predict that social-heuristic cognitions, specifically descriptive norms and prototypes, will associate with college men's willingness to pursue male hormonal contraception. Second, we hypothesize that more masculine college men, specifically men who are higher on avoidance of femininity, will be less willing to pursue male hormonal contraception.

Method

Participants and Procedure

Participants were a convenience sample of undergraduate self-identifying men enrolled in introductory psychology courses at a mid-sized, urban, mid-Atlantic university. The study was advertised on the university's secure online sign up system as research on health-promotive

behavior for men 18 years of age and older. Individuals who selected the study were given a unique identification number to ensure confidentiality and a link to complete the secure, confidential informed consent process and subsequent online survey (SurveyMonkey; Finley, 2010). Participants received course credit for participating, and all procedures were approved by the university's institutional review board.

The health-promotive behavior and men survey covered questions on men's perception of male hormonal contraception and the human papillomavirus (HPV) vaccine. The present analysis focused on the section of the survey that assessed men's attitudes toward male hormonal contraception. First, men were provided with a brief factual overview of how male hormonal contraception would work (see Appendix). Adapting previous methods to query men's attitudes about male hormonal contraception separate from safety concerns (Martin et al., 2000), men were instructed to rate their perceptions of male hormonal contraception given that it was safe, reversible, and approved by the Food and Drug Administration (FDA). Next, the survey assessed participants' perceived vulnerability of pregnancy from unprotected vaginal sex, descriptive norms of male hormonal contraceptive use, prototype favorability of the typical male hormonal contraceptive user, and willingness to pursue male hormonal contraception. Replicating strategies used in other research on male hormonal contraception (O'Connor et al., 2005), norms, prototypes, and willingness were all presented as *future-anticipated* cognitions. The survey concluded with questions assessing avoidance of femininity and demographics.

A total of 171 men completed the survey. The goal of the present study was to examine emerging adult college men's attitudes toward pursuing male hormonal contraception, therefore participants were excluded from analyses if they identified as totally homosexual ($n = 6$), were in a sexual relationship where they were trying to get pregnant ($n = 2$), were married ($n = 1$), or

were over 25 years old ($n = 4$; $n = 11$ excluded total, categories not mutually exclusive). A total of 160 men were included in final analyses ($M_{age} = 19.37$; $SD = 1.33$; range 18-24 years old; White $n = 99$ [61.90%], Asian $n = 27$ [16.90%], Other and Multiracial $n = 12$ [7.50%], Hispanic and/or Latino $n = 11$ [6.90%], African-American and/or Black $n = 10$ [6.30%], and one participant who opted not to answer this question $n = 1$ [0.60%]).

Measures

Participants rated questions assessing four Prototype-Willingness Model constructs (Gibbons et al., 2015) including perceived vulnerability, descriptive norms, prototypes, and behavioral willingness, along with avoidance of femininity and demographic questions. All final constructs were calculated using available cases and continuous constructs were normally distributed unless otherwise noted.

Perceived vulnerability for pregnancy from unprotected sex. Perceived vulnerability measured participants' perceptions about their perceived risk of getting a female partner pregnant, conditioned on engagement in unprotected vaginal sex. The two survey items included both casual and steady partners, "Consider a steady [casual] female sex partner who is not taking birth control. If you were to have vaginal sex without a condom or male hormonal contraception, what are the chances that you would get her pregnant?" (7-point Likert scale response; 1 = *not at all likely* to 7 = *very likely*). The two items were reliable ($r = .78, p < .001$) and averaged to create one perceived vulnerability construct.

Descriptive norms of male hormonal contraceptive use. Descriptive norms measured participants' perceptions about other men's use of male hormonal contraception. The survey items included five referent groups: "If male hormonal contraception became available for men, how many male undergraduate students at (redacted) University [of your male friends; male

college students in the United States; males 18-25 in (redacted city); males 18-25 in the United States] would use male hormonal contraception?" Response options were on a 7-point Likert scale (1 = *none* to 7 = *almost all*). The five items had high reliability ($\alpha = .95$), were averaged together to create a descriptive norms index, and due to a positive skew, the descriptive norm construct was naturally-log transformed to achieve normality.

Prototype favorability of male hormonal contraception user. Prototypes measured participants' perceptions of a typical male who uses male hormonal contraception. Participants were asked to "Think about the type of guy your age who would use male hormonal contraception.... Rate this individual on the following characteristics..." There were six adjectives (smart, attractive, confident, mature, popular, and exciting), which participants rated on 7-point Likert scale (1 = *not at all* to 7 = *very*). The six items had high reliability ($\alpha = .92$) and were averaged to create a prototype favorability construct.

Behavioral willingness to pursue male hormonal contraception. Behavioral willingness measured participants' willingness to pursue male hormonal contraception conditioned on free access. Participants read the following scenario, "Suppose that there is a nurse practitioner or doctor at Student Health Services (the student health center on campus) who could provide male hormonal contraception for you at no cost, how willing would you be to..." and rated their responses on four follow up behaviors: (a) "...consider getting male hormonal contraception," (b) "...make an appointment to get male hormonal contraception," (c) "...contact the nurse practitioner or doctor to ask more information," and (d) "...get male hormonal contraception?" Participants responded on a 7-point Likert scale (1 = *not at all willing* to 7 = *very willing*). The four willingness items had high reliability ($\alpha = .97$) and were averaged to create a willingness to pursue male hormonal contraception construct.

Due to a pronounced floor effect for behavioral willingness to pursue male hormonal contraception (22.50% of respondents scored an average of 1), behavioral willingness to pursue male hormonal contraception was recoded into a 3-level ranked variable with the floor response as one category and the remaining responses split at their median (unwilling = 0 [responses of 1], low willingness = 1 [responses > 1 to 4], and high willingness = 2 [responses > 4 to 7]).

Avoidance of femininity. The Male Role Norms Inventory - Avoidance of Femininity subscale was used to assess masculinity (Levant et al., 1992). The Avoidance of Femininity subscale includes seven items such as “It is too feminine for a man to use clear nailpolish on his fingernails” and “A man should avoid holding his wife’s purse at all times.” Participants responded on a 7-point Likert scale (1 = *strongly disagree* to 7 = *strongly agree*). The seven items had high reliability ($\alpha = .89$) and were averaged.

Demographic information and past behavior. Demographic questions included age, race/ethnicity, sexual orientation, past vaginal sex behavior, and relationship status. Sexual orientation was assessed with the Kinsey Scale (1 = *totally straight*; 4 = *bisexual*; 7 = *totally homosexual*; Diamond, 1993). Past vaginal sex behavior was measured by one item that asked about the number of partners who participants had vaginal sex in three months, “How many people have you had vaginal sexual intercourse with in the last 3 months?” The fill-in-the-blank response was heavily positively skewed, and responses were re-coded into not having had or having had vaginal sex in the past 3 months (0 = 0 partners [n = 62, 38.80%]; 1 = 1 or more partners [n = 98, 61.30%]). Relationship status was measured by one item that asked participants to rate their current romantic relationship status (1 = *no relationship*; 7 = *very strong commitment*; 8 = *married*; Stock, Peterson, Molloy, & Lambert, 2017).

Results

Statistical analyses. Bivariate associations with behavioral willingness to pursue male hormonal contraception were examined for all demographic variables, Prototype-Willingness Model constructs, and avoidance of femininity using chi-square tests for categorical variables (race/ethnicity, vaginal sex in the past 3 months) and Kruskal-Wallis equality-of-populations rank tests for continuous variables (age, relationship status, perceived vulnerability, descriptive norms, prototypes, avoidance of femininity).

A multinomial logistic regression was used (proc logistic) to conduct an analysis of the primary hypothesis with “no willingness” as the reference group. The model tested all Prototype-Willingness and avoidance of femininity constructs and included all demographic variables that significantly associated with behavioral willingness in bivariate analyses ($p < .05$ level). Data cleaning and variable creation was conducted with SPSS statistical software (version 24; IBM Corp, Armonk, NY) and inferential analyses were conducted using SAS statistical software (version 9.4; SAS Institute, Cary, NC).

Sample characteristics and bivariate relationships. The majority of college men in this sample were sexually active (61.3% had recently had vaginal sex) and on average expressed low levels of commitment in relationships ($M = 2.75$, $SD = 2.30$, range 1 - 7). Of the college men, 22.50% ($n = 36$) reported no willingness to pursue male hormonal contraception, 42.50% ($n = 68$) reported low willingness, and 35.00% ($n = 56$) reported high willingness.

Vaginal sex in the past 3 months was associated with behavioral willingness such that a greater proportion of men who had had vaginal sex in the past 3 months reported high behavioral willingness to pursue male hormonal contraception ($p = .003$, see Table 1). Therefore, recent past vaginal sex was included as a covariate in the model. Age, race, and relationship status did not significantly associate with behavioral willingness at the $p < .05$ level and were not included in

the model ($ps > .06$, see Table 1). In bivariate analyses, perceived vulnerability of pregnancy did not significantly associate with behavioral willingness to pursue male hormonal contraception ($p = .47$), higher descriptive norms and prototype favorability were associated with greater behavioral willingness ($ps < .0001$), and higher avoidance of femininity was associated with lower behavioral willingness ($p = .0052$, see Table 1).

Table 1. Sample Characteristics and Bivariate Associations of Demographic, Prototype-Willingness Model, and Avoidance of Femininity Constructs with Male Hormonal Contraception Willingness (N = 160)

Variable	Categories or Scale Range	Aggregate Sample Characteristics	Behavioral Willingness to Pursue Male Hormonal Contraception			Kruskal-Wallis or Chi-Square Test***
		n (percentage) or median (IQR)	None n = 36 (22.50%)	Low n = 68 (42.50%)	High n = 56 (35.00%)	p value
Age	18-24	19 (18-20)	19 (19-20)	19 (18-20)	19 (18-20)	<i>p</i> = .45
Race / Ethnicity*	White	n = 99 (62.3%)	24 (66.7%)	38 (56.7%)	37 (66.1%)	<i>p</i> = .69
	Asian	n = 27 (17.0%)	3 (8.3%)	15 (22.4%)	9 (16.1%)	
	Other and Multiracial	n = 12 (7.5%)	3 (8.3%)	6 (9.0%)	3 (5.4%)	
	Hispanic a/o Latino	n = 11 (6.9%)	4 (11.1%)	3 (4.5%)	4 (7.1%)	
	African-American a/o Black	n = 10 (6.3%)	2 (5.6%)	5 (7.5%)	3 (5.4%)	
Relationship Commitment	1-7	1.00 (1.00-4.00)	2.00 (1.00-4.00)	1.00 (1.00-3.00)	2.50 (1.00-6.00)	<i>p</i> = .06
Vaginal Sex in the Past 3 Months	Yes (1)	n = 98 (61.3%)	23 (63.9%)	32 (47.1%)	43 (76.8%)	<i>p</i> = .003
	No (0)	n = 62 (38.8%)	13 (36.1%)	36 (52.9%)	13 (23.2%)	
Perceived Pregnancy Vulnerability	1-7	5.00 (3.75–6.00)	4.50 (3.00–5.75)	5.00 (3.50–6.00)	5.00 (4.00–5.75)	<i>p</i> = .47
Perceived Descriptive Norms of MHC Use**	1-7	3.00 (2.00–4.00)	2.00 (1.60–3.00)	2.80 (2.00–3.60)	4.30 (2.80–5.30)	<i>p</i> < .0001
Prototype Favorability of MHC User	1-7	4.50 (3.92–5.00)	3.75 (2.67– 4.17)	4.33 (4.00–5.00)	5.00 (4.67–5.75)	<i>p</i> < .0001
Avoidance of Femininity (Masculinity)	1-7	3.64 (2.71–4.57)	4.21 (3.43–5.64)	3.50 (2.50– 4.07)	3.50 (2.36–4.57)	<i>p</i> = .005

Note. Male hormonal contraception abbreviated to MHC

*one person did not report his race or ethnicity (these results, n = 159)

**descriptive norms were naturally log-transformed for analyses, but raw values are reported here to aid in interpretation

***Chi-squared tests used for categorical variables; Kruskal-Wallis equality-of-population rank tests used for continuous variables

Hypothesis testing. Multinomial logistic regression was used to examine associations between willingness groups and recent past vaginal sex (no = 0, yes = 1), Prototype-Willingness Model constructs, and avoidance of femininity entered simultaneously (see Table 2). No willingness served as the reference group.

Results indicated that past vaginal sex was not significantly associated with willingness to pursue male hormonal contraception. No significant differences in the odds of having low willingness versus no willingness (or high willingness versus no willingness) emerged comparing those who reported having vaginal in the past 3 months to those who did not (see Table 2). To further investigate the role of past vaginal sex, the model was rerun with high willingness as the reference group, which revealed differences in the odds of having low willingness versus high willingness. Specifically, those who reported having vaginal sex in the last 3 months had lower odds of having low willingness (odds ratio = 0.22, 95% CI [0.09, 0.56]) versus high willingness.

For Prototype-Willingness Model constructs, perceived vulnerability was not significantly associated with behavioral willingness (see Table 2). Compared to those with no willingness, individuals who perceived greater descriptive norms had higher odds of low willingness and high willingness. The same pattern emerged for prototypes. Those with more favorable prototypes had higher odds of having low willingness versus no willingness and high willingness versus no willingness. Individuals with higher masculinity had *lower* odds of having low willingness and high willingness compared to no willingness (see Table 2).

Table 2. Odds of Willingness to Pursue Male Hormonal Contraception According to Recent Vaginal Sex Behavior, Prototype-Willingness Model Constructs, and Avoidance of Femininity

Variable	Scale	Odds Ratio and 95% Wald Confidence Limits for Behavioral Willingness to Pursue Male Hormonal Contraception	
		Low Willingness	High Willingness
Vaginal Sex in the Past 3 Months	no = 0, yes = 1	0.72 [0.27, 1.93]	3.26 [0.95, 11.19]†
Perceived Vulnerability of Pregnancy	1-7	1.01 [0.72, 1.42]	1.10 [0.74, 1.66]
Perceived Descriptive Norms of Male Hormonal Contraception Use	1-7 ^a	3.62 [1.02, 12.81]*	29.78 [5.79, 153.18]***
Prototype Favorability of Male Hormonal Contraceptive User	1-7	2.46 [1.40, 4.31]**	3.93 [1.96, 7.87]***
Avoidance of Femininity (Masculinity)	1-7	0.70 [0.50, 0.99]*	0.60 [0.40, 0.92]*

Note. No willingness is the reference group.

^a log transformed

† $p < .10$

* $p < .05$

** $p < .01$

*** $p < .0001$

Discussion

The goal of the present study was to investigate whether Prototype-Willingness Model constructs (i.e., descriptive norms and prototypes) and masculinity (avoidance of femininity) associated with college men's willingness to pursue male hormonal contraception. Results support the hypothesis that social-heuristic cognitions are related to college men's contraceptive willingness. Men who perceived that male contraception would be normative among male referent groups and viewed the typical male user more favorably had higher odds of having high willingness to pursue contraception. Men's perceived vulnerability of a partner becoming pregnant was not significantly associated with hormonal contraception willingness. The results also support the hypothesis that avoidance of femininity would associate with lower willingness to pursue male hormonal contraception. The present results are the first to validate the Prototype-Willingness Model for the behavioral domain of male hormonal contraception and demonstrate an empirical relationship between men's masculinity, specifically avoidance of femininity, and hormonal contraception willingness.

A sizable portion of college men were interested in male hormonal contraception; 35.00% of men in the sample reported moderate to high willingness, and another 42.50% reported any level of willingness (77.50% reporting at least some willingness). These proportions fall in the range of the existing research but are substantially higher than the only other study reporting proportional interest among American college men (20%; Laird, 1994) and lower than the highest rates of interest reported among White men in Capetown, South Africa (83%; Martin et al., 2000). The results provide further evidence that a substantial portion of men are interested in male hormonal contraception.

The present results provide a theory-based perspective to understanding men's interest in hormonal contraception. Given strong social mores surrounding gender roles in sexual behavior that position women as responsible for pregnancy prevention (Campo-Engelstein, 2011), the present study provides evidence that these social-heuristic cognitions play a role in men's hormonal contraceptive interest. Only one other research study examined men's hormonal contraception attitudes using health behavior theory, and it examined the Theory of Planned Behavior, a reasoned decision-making model (O'Connor et al., 2005). Among a sample of British male college students and staff, men's *intentions* to use hormonal contraception were heavily influenced by others' approval of male hormonal contraception (i.e., *subjective norms*). The present results both parallel and expand these findings, demonstrating similar associations between norms and a behavioral cognition, but for a social-heuristic pathway. Men's *descriptive norms* of male referent groups associated with their *willingness* to pursue male hormonal contraception. These results also expand past research demonstrating that men's descriptive norms of other men's behavior strongly associated with their own health behavior (e.g., exercise, alcohol use, unprotected sex; Mahalik et al., 2007) to a new and important behavioral domain.

Beyond descriptive norms, the results for prototypes and conditional perceived vulnerability provide further support for the Prototype-Willingness Model. Prototypes, or the favorable images of the typical male contraception user, related to greater willingness to pursue male hormonal contraception. This is the first study demonstrating a relationship between prototypes and willingness for male hormonal contraception, providing further evidence for the importance of social-heuristic cognitions. Although past research demonstrates that protection from unwanted pregnancy is a motivator for taking the male pill (Walker, 2011), we did not find evidence that men's perceived risk of unplanned pregnancy was related to their willingness to

pursue male hormonal contraception. Although men may state that unplanned pregnancy is a motivation for taking the pill, their pursuit will likely be driven more by social-heuristic cognitions, rather than solely perceived risk of unplanned pregnancy.

In addition to Prototype-Willingness Model cognitions, masculinity emerged as an identity construct related to hormonal contraception willingness. As hypothesized, masculinity (avoidance of femininity) was associated with less willingness to pursue male hormonal contraception. The current results support and extend qualitative research among small samples that reported emasculation fears associated with male hormonal contraception (Dismore et al., 2016; Marcell et al., 2005; Walker, 2011) and large international survey research where around a third of men reported male contraception as a masculinity threat (Martin et al., 2000). Individual variance in masculinity, specifically avoidance of femininity, associated with decreased odds of low and high hormonal contraceptive willingness compared to no willingness.

These results illustrate a specific example of broader theory surrounding masculinity development. College is a crucial time for men's development of a masculine identity; college men report that rejection of womanhood is a central component of becoming a man and strive to sustain "masculine capital" by avoiding "feminine" behavior (de Visser & McDonnell, 2013; DiMuccio et al., 2017; Marcell et al., 2011). Highly masculine men may have greater reluctance to pursue male hormonal contraception because hormonal birth control is typified as a feminine behavior (Campo-Engelstein, 2011). Our results provide initial evidence for this idea, as higher avoidance of femininity was associated with no willingness to pursue male hormonal contraception. These results parallel former findings that rejection of femininity is related to less condom use among college men (Shearer et al., 2005).

Similar to most of the former research, relationship status and age did not emerge as associated with hormonal contraception interest (Brooks, 1998; Laird, 1994; O'Connor et al., 2005; Walker, 2011; Weston et al., 2002), although this is possibly due to restricted range. Past vaginal sex partners associated with hormonal contraception willingness in interesting ways. While differences did not emerge between men with no and low willingness, a greater proportion of men in the high willingness group had recently had vaginal sex compared to the low willingness group. These results suggest that recent engagement in vaginal sex may increase the salience of birth control, resulting in men's greater contraception interest. College men who are sexually active may be a relevant group for promoting male hormonal contraception.

Limitations

There are several limitations in the present study that future research should address. First, the study examined a hypothetical behavior. Although hypothetical examination is currently one of the only options for gaining insight to men's hormonal contraception interest (O'Connor et al., 2005), hypothetical measures allow for only a tentative understanding of social-heuristic cognitions. However, research on college men's health behavior does suggest that perceptions, particularly descriptive norms, influence men's behavior more so than actual behavioral prevalence (Prentice & Miller, 1993). The present study should be replicated after male hormonal contraception approval to see if the results are reflected in actual cognitions and subsequent behavior.

Due to the hypothetical nature of assessing willingness to pursue male hormonal contraception, the study was cross-sectional and provides limited insight to longitudinal or causal pathways predicting men's willingness to pursue male hormonal contraception. Future research could use experimental manipulation of norms or prototypes to examine causal impact on male

hormonal contraception willingness prior to FDA-approval. Longitudinal research on men's perceptions of norms and prototypes would also be valuable, as social-cognitions may vary with increased publicity of clinical trials and their results.

The purpose of the present study was to examine male hormonal contraceptive cognitions among college men. Although the sample was more racially and ethnically diverse than the only other study of American college men (73% White in Laird, 1994), the generalizability of the sample to the broader male college population is still limited. Future research should examine rural, public, religious, and community college samples in addition to private, secular, urban campuses. The sample was predominantly White, and men identifying as African-American and/or Black and Hispanic and/or Latino were underrepresented. Racial and ethnic differences did not emerge for hormonal contraception willingness, but racial and ethnic health disparities are evident in the United States population for risky contraception use among emerging adult men (Frost et al., 2012) and hormonal contraceptive use among women ages 20-29 (Dehlendorf et al., 2014). Given that recent sexual behavior played a role in men's willingness to pursue male contraception, more sensitive examination of sexual behavior and gender identity (e.g., virgin men, gender nonconforming people, transgender people) among people interested in pregnancy prevention from penile/vaginal sex would be an avenue for further inquiry. Including samples of emerging adult men living in the United States who are not enrolled in college would allow for generalizability beyond the college setting. Finally, surveying a nationally representative sample in the United States would allow for examination of race and ethnicity, age and generational factors, as well as marriage status among a greater range of men.

Future Research / Implications

This study provides a framework for applying theory-based findings to understand and enhance male hormonal contraception interest. First, research suggests that descriptive norms and favorable prototypes may increase college men's interest in male hormonal contraception. In the behavioral domain of condom use, an experimental intervention to enhance perceived condom use norms resulted in increased condom use among college men (Chernoff & Davison, 2005). Future research could examine whether men underestimate norms of male hormonal contraceptive interest among male referent groups and test whether normative feedback enhances men's acceptance. Favorable prototypes may also influence men's perceptions. If men perceive that a man who uses male contraception is smart, attractive, confident, mature, popular, and exciting, this could potentially enhance their interest. Experimental research could examine whether a vignette-based prototype manipulation impacts men's willingness. Results could have potential marketing applications for clinical trial participation, public health campaigns, and direct-to-consumer advertising of FDA-approved products.

Avoidance of femininity was associated with lack of willingness to pursue male hormonal contraception and it would be beneficial to explore potential mediators. Future research should directly examine whether men vary in their perceptions of male hormonal contraception as an effeminate object (see Dismore, Van Wersch, & Swainston, 2016 for preliminary qualitative work) and whether this belief mediates the avoidance of femininity and willingness association. This research could prove meaningful for branding male hormonal contraception, especially if the term "hormonal" is specifically perceived as feminine (e.g., examining whether an alternative such as "male medical contraception" is seen as less feminine). While results emerged for avoidance of femininity, we did not investigate other dimensions of masculinity such as sexual prowess that may associate with *greater* willingness.

Clinical trials have found that some men perceive increased muscle mass, weight, and sexual desire during efficacy stages of treatment (Sjögren & Gottlieb, 2001; Solomon, Yount, & Mbizvo, 2007). A large cross-cultural typology study revealed that a subsection of men are interested in male hormonal contraception as it relates to masculine enhancement of sexual desire, performance, satisfaction, and muscle mass (Heinemann, Saad, Wiesemes, & Heinemann, 2005). Future research should explore the sexual prowess dimension of masculinity to determine if it is related to greater willingness to pursue hormonal contraception. Men who are reluctant to take hormonal contraception because it is typified as feminine may be interested in hormonal contraception if it enhances their sexual vigor.

In addition to social-heuristic cognitions and masculinity, other factors will likely play a role in men's acceptance of male hormonal contraception. Perceptions of side-effects, safety, administration method (shot versus pill), and financial cost are all variables associated with acceptance of new medical technologies and warrant continued research (Brooks, 1998; Frost et al., 2012; Heinemann, Saad, Wiesemes, & Heinemann, 2005; O'Connor et al., 2005; Weston et al., 2002). Some research indicates that men report a low tolerance for side effects for male hormonal contraception (Brooks, 1998), but that when inaccurate assumptions about side effects are corrected, men report increased interest in using long acting birth control (Frost et al., 2012). Another drawback of male hormonal contraception is that, unlike condoms, it would not provide barrier protection against sexually transmitted infections; this is a similar concern for female hormonal contraception (Glasier, 2010).

Once male hormonal contraception is approved, women's positive attitudes, encouragement, and trust could potentially enhance men's uptake (Glasier et al., 2000; Marcell et al., 2005; O'Connor et al., 2005; Weston et al., 2002). Physicians are also positioned as potential

change agents, as many men may want to discuss male hormonal contraception options. For example, a survey of 346 men in New York City and Baltimore found that the majority were willing to talk about sexual and reproductive health topics with their physician with a preference for the physician initiating the conversation on most sexual health topics (Same, Bell, Rosenthal, & Marcell, 2014). Additionally, men who have family planning conversations with their providers are more knowledgeable about pregnancy prevention (Richards, Peters, Sheeder, & Kaul, 2016; Same et al., 2014). These results bode well for enhancing male hormonal contraception willingness. Large cross-cultural research has found that men's providers and doctors are their first choice for receiving information and advice about male hormonal contraception (Heinemann, Saad, Wiesemes, & Heinemann, 2005). Once male hormonal contraception is approved, women and physicians' perceptions may influence men's perceptions about its use in addition to social-heuristic cognitions and masculinity.

Conclusion

Male hormonal contraception innovation has remained stalled in the research and development phases for almost five decades despite men's interest in expanding their options. These results provide some of the first theoretically-informed insight on college men's hormonal contraception willingness. It is essential to consider socially-driven cognitions surrounding men's interest in hormonal contraception. In particular, men's sense of male norms, favorable user images, and endorsement of manhood via femininity avoidance play a role. Introducing male hormonal contraception will give men greater control in preventing unwanted pregnancies and promote shared responsibility with their female partners. Men's social identity will be a central theme in the next frontier of male contraception.

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Appendix

Information participants read prior to completing survey-items related to male hormonal contraception.

Reversible hormone-based male contraception will be available in the near future, with Phase II clinical trials already conducted demonstrating efficacy of male hormonal contraception (Gu et al., 2009; Nieschlag, 2010; Tulsiani & Abou-Haila, 2010). Male hormonal contraceptives are developed to lower the sperm count in ejaculate by stopping the secretion of a man's reproductive hormones in the brain and testes. When levels of testosterone in the testes are low, sperm production slows or halts.¹ The contraceptive efficacy of reduced sperm in ejaculate is comparable to the female hormonal contraception (delivered via the female pill, patch, ring, shot, skin implant, hormonal intrauterine device). Clinical trials have demonstrated that the effect of administering male hormonal contraception is reversible, and men's sperm count returns to normal levels after halting administration (Gu et al., 2009; Nieschlag, 2010).

Researchers are currently testing the effectiveness of hormonal contraception in different populations and among couples. A main research question is method and frequency of administration – most clinical trials deliver male hormonal contraception via a muscular injection. For the following survey questions regarding male hormonal contraception – assume that the Food and Drug Administration (FDA) has approved male hormonal contraception to be efficacious and safe.

¹ Explanation adapted from Male Contraceptive Coalition (malecontraceptives.org)