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PUBLIC HEALTH | RESEARCH ARTICLE

Brief report: A health belief model approach to men's assessment of a novel long-acting contraceptive[‡]

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Abstract: We investigated predictors of men's attitudes towards and intent to use Vasalgel™, a long-acting reversible male contraceptive under development. The health belief model (HBM), with additional constructs of interpersonal factors and social norms, provided the framework. Heterosexual men ($N = 146$) living in Upstate New York (age: $M = 24$, range = 18–48) completed a survey assessing attitudes, intent, and other psychosocial characteristics. Overall men had positive attitudes towards Vasalgel™, and reported intent to use. The HBM predicted attitudes towards and intent to use Vasalgel™, and including perceived norms and interpersonal factors significantly improved the model for intent to use but not attitudes. Results indicate positive response to Vasalgel™ and the utility of theory-based models.

Subjects: Behavioral Sciences; Health Psychology; Attitudes & Persuasion; Sexual Health Education

Keywords: unplanned pregnancy; men's sexual health; contraception; sexual attitudes and behavior; reproductive health

1. Introduction

Each year an estimated 85 million unintended pregnancies occur globally, which constitute 40% of all pregnancies (Sedgh, Singh, & Hussain, 2014). The widely proposed solution to this problem is

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PUBLIC INTEREST STATEMENT

Though many contraceptive options are available for women, a dearth of reliable contraceptives are available for men. Vasalgel™ is a long-acting reversible contraceptive for men that is currently being developed. In the context of health psychology, this article describes heterosexual men's attitudes towards Vasalgel™. Survey data suggests that men have generally positive attitudes towards Vasalgel™ and that a large proportion of men would likely use Vasalgel™ if it became available. Additionally, our research supports the basis of the health belief model—that behavior is a function of the value an individual places on pregnancy avoidance and the individual's belief that a specific preventative action—getting Vasalgel™—will achieve that goal. This study indicates that a new contraceptive would be used by many men in the United States and could alter the way the world, and men in particular, view family planning.

contraception (Klima, 1998). However, most methods of contraception are developed for and used exclusively by women, which has led to a lack of birth control options for men—condoms and vasectomy remain the only contraceptives available to men. Thus, women disproportionately carry the responsibility for birth control. Vasalge™ (<http://www.parsemusfoundation.org/projects/vasalge/>), which is currently under development, is a long-acting reversible contraceptive (LARC) for men. Vasalge™ involves the injection of a polymer into the vas deferens. The polymer acts as a semi-solid plug, thereby preventing viable sperm from passing through and by extension, preventing pregnancy. Though Vasalge™ may be effective for up to ten years, the process can be reversed at any time with a second injection, which dissolves the polymer (Lohiya et al., 2009). We are unaware of any academic research on the likelihood that men would use Vasalge™. Before this method of contraception is introduced to the public, it is important to understand the psychosocial factors that affect men's attitudes towards and willingness to use male LARCs (Heinemann, Saad, Weisemes, White, & Heinemann, 2004; Keith, Keith, Bussell, & Wells, 1975; Weinstein & Goebel, 1979).

The health belief model (HBM), a psychological model often used to predict contraceptive behavior (Chernick et al., 2015; Laraque, Mclean, Brownpeterside, Ashton, & Diamond, 1997), provides a useful framework for understanding men's thoughts and feelings towards Vasalge™. The HBM is comprised of five primary constructs: perceived susceptibility, perceived severity, perceived benefits, perceived barriers, and self-efficacy (Glanz, Rimer, & Viswanath, 2008). The model posits that to be motivated to use contraception, an individual must consider himself to be susceptible to pregnancy (perceived susceptibility), believe that the pregnancy has potentially serious consequences (perceived severity), understand that the negative consequences of pregnancy are avoidable through effective use of contraception (perceived benefits), and believe that he is able to perform contraceptive behavior (self-efficacy). These factors are then weighed against the costs of using contraception (perceived barriers).

Although the HBM has had remarkable success predicting sexual health behaviors such as condom use (Zhao et al., 2012), it fails to capture two important aspects of contraceptive use. First, the HBM does not account for how behavior is influenced by social norms (Conner & Norman, 2005). Perceived social norms, which are often determined by culture and group norms, are an integral part of contraceptive behaviors (Fekadu & Kraft, 2001). Second, the model does not take into account how health behaviors may be affected by an individual's significant other or spouse (Gillam, 1991). Although the decision to use Vasalge™ could be made without regard for a partner, contraceptive behaviors and decisions can never be fully captured by characterizing the individual alone (Conner & Norman, 2005).

The current study investigated how perceptions of pregnancy and Vasalge™ influence men's attitudes and intentions towards Vasalge™ through the lens of the HBM. Moreover, we sought to build upon the existing HBM framework by accounting for social norms as well as interpersonal factors (i.e. communication with partner). We first hypothesized that the HBM would predict men's attitudes and intent to use Vasalge™. Secondly, we hypothesized that the inclusion of interpersonal factors and social norms would significantly improve the predictive ability of the HBM and therefore better capture attitude towards and intent to use Vasalge™.

2. Method

2.1. Study design and sample

A convenience sample of men at a small liberal arts college in upstate New York and surrounding area was recruited for participation. Participants were recruited via flyers posted on the college campus and in local businesses. Flyers advertised the target population (men over 18 years), link to the survey, and incentive—a chance to win one of four \$25 gift cards to Amazon.com. In the online survey, participants gave informed consent and were screened to ensure they were over 18 years old, interested in having vaginal sex with women, and biologically male. Once qualified, participants were provided with a brief description of Vasalge™, then continued on to the main survey. Upon

completion, they were debriefed and informed how to enter the gift card lottery. The protocol was approved by Bard College’s Institutional Review Board.

Our 28-item survey assessed seven independent variables: men’s perceptions of susceptibility to pregnancy, severity of pregnancy, benefits of VasalgeTM, barriers to using VasalgeTM, contraceptive self-efficacy, and social norms. Participants who were in an ongoing sexual relationship with a woman were asked a series of questions regarding interpersonal factors. Survey items used to model constructs of the HBM were adapted from Bish, Sutton, and Golombok (2000), which investigated whether the HBM could predict increased cervical smear testing in women. For a full list of survey items used in our analyses, see Table 1.

Table 1. Health belief model items grouped by construct

Construct
<i>Interpersonal factors</i>
I do not talk about birth control with my partner ^a
I often feel embarrassed when talking about birth control with my partner ^a
My partner is comfortable talking about birth control with me
<i>Susceptibility to pregnancy</i>
I cannot get a woman pregnant ^a
My physical health makes it more likely that I won’t get a woman pregnant if we have unprotected sex ^a
<i>Severity of pregnancy</i>
Getting a woman pregnant is one of the worst things that could happen at this stage in my life
I would be happy if I got a woman pregnant in the next six months ^a
Problems I would experience from getting a woman pregnant would last a long time
If I got a woman pregnant, my whole life would change
The thought of impregnating a woman scares me
If I got a woman pregnant my job opportunities and professional career would be endangered
<i>Benefits of VasalgeTM</i>
I am confident Vasalge TM is able to prevent pregnancy
Using Vasalge TM would reduce my fear of getting a woman pregnant
I have a lot to gain by using Vasalge TM
<i>Barriers to VasalgeTM Use</i>
I am afraid that if I use Vasalge TM it would affect my ability to have children later ^a
I am worried about the side effects of Vasalge TM ^a
The fact that Vasalge TM is injected into a sensitive part of my body would not deter me from using it
I am afraid that getting Vasalge TM would hurt me ^a
I am not worried that getting Vasalge TM would cause me to be permanently infertile
I am afraid that Vasalge TM would affect my sex drive ^a
<i>Self-efficacy of VasalgeTM Use</i>
It would be difficult to tell a partner that I am going to get Vasalge TM ^a
I am confident that I could go to the doctor to get Vasalge TM if it became available
I would not insist on getting Vasalge TM if a partner threatened to leave me if I got it ^a
I feel capable of discussing the importance of using Vasalge TM with a sex partner
I would get Vasalge TM even if my partner did not want me to
<i>Social norms regarding VasalgeTM</i>
My family and friends would make fun of me if I used Vasalge TM ^a
My male friends would encourage me to get Vasalge TM if it became available
As far as I know, my male friends would be interested in using Vasalge TM if it became available

Note: Response categories are six points: (1) strongly disagree to (6) strongly agree.

^aItems were reverse coded.

Our dependent variables were men's attitudes towards and intent to use Vasalgel™. Attitude towards Vasalgel™ was measured by averaging participants' responses to the following statements: "I think that Vasalgel™ is an important invention," and "Vasalgel™ should be put on the market as soon as possible" [1 = strongly disagree to 6 = strongly agree]. Participants were also asked to rate the statements: "I would use Vasalgel™ if it became available," [1 = strongly disagree to 6 = strongly agree] and "Using Vasalgel™ as a long-term contraceptive method for me would be: [1 = very awful to 6 = very nice]." Participants' responses on these items were averaged to create a composite score for intent to use.

2.2. Data analysis

For each independent variable, a composite score was calculated by averaging the participants' ratings of items in each of the HBM subscales (negatively worded items were reverse coded). Linear regressions were then used to examine the influence of demographics on HBM constructs, social norms, and interpersonal factors. Tolerance statistics indicated that the data did not violate the assumption of multicollinearity for attitude (self-efficacy = 0.56; susceptibility = 0.63; severity = 0.75; benefits, = 0.4; barriers = 0.28; social norms = 0.63; interpersonal factors = 0.93) or intent to use (self-efficacy = 0.56; susceptibility = 0.95; severity = 0.75; benefits = 0.4; barriers = 0.54; social norms = 0.63; interpersonal factors = 0.93). The data also did not violate the assumption of independence of errors (Durbin-Watson values ranged from 1.91 to 2.24).

In order to test for scale reliability, a Cronbach's α was run for each subscale of the HBM, as well as for the scales measuring perceived social norms and interpersonal factors. Items that had inter-correlations under 0.3 (of medium strength) were removed from the scales in order to improve internal consistency of subscales. Cronbach's α for perceived severity ($\alpha = 0.77$), perceived benefits ($\alpha = 0.78$), perceived barriers ($\alpha = 0.83$), and self-efficacy ($\alpha = 0.73$) were above 0.70, indicating good scale reliability (George & Mallery, 2003). Cronbach's α for perceived susceptibility ($\alpha = 0.59$), perceived social norms ($\alpha = 0.66$), and interpersonal factors ($\alpha = 0.60$) scales were below 0.7, which suggests questionable internal consistency (George & Mallery, 2003). However, given the centrality of these measures to this study, regression analyses retained these factors.

Two hierarchical multiple regressions were run to assess the relationship between the independent variables and men's attitudes towards and intent to use Vasalgel™ as well as the effect of any confounding demographic variables. Participant characteristics that significantly impacted attitudes towards Vasalgel™ (having heard of Vasalgel™ previously) and intent to use Vasalgel™ (having children and having heard of Vasalgel™ previously) were entered at step 1 of the hierarchical regressions. At step 2, scores on independent components of the HBM were entered. Social norms and interpersonal factors were entered at step 3 to explore whether these variables would improve model estimates above and beyond the HBM constructs.

3. Results

3.1. Sample characteristics

One hundred and forty-six men completed the survey (Age: $M = 24$, range = 18–48 years, see Table 2 for demographic information). All participants reported being biologically male with an interest in having vaginal sex with women. Three respondents were excluded from our analyses: two outliers who scored more than 3 standard deviations from the mean on either dependent variable and one who failed to answer any items corresponding to the dependent variables. Of participants in ongoing sexual relationships with a woman (57% of the sample), condoms (used by 48%) and oral contraception (used by 44%) were the most popular forms of contraception. The next most popular method was withdrawal (used by 20%), followed by intrauterine devices (used by 8%). No participants reported using a diaphragm.

Table 2. Participant characteristics

Characteristic	Total (N = 143)	Range
Age [mean (SD)]	24.31 (5.51)	18–48
Sexual partners this year [mean (SD)]	2.28 (8.29)	0–25
Sexual partners ever [mean (SD)]	8.29 (8.07)	0–40
Current employment status [n (%)]		
Student	73 (51)	
Employed	65 (45.5)	
Unemployed	4 (2.8)	
Ever had sex [n (%)]		
Yes	129 (90.2)	
No	13 (9.1)	
Contraception use at last sex [n (%)]		
Yes	111 (77.6)	
No	17 (11.9)	
Currently has children [n (%)]		
Yes	5 (3.5)	
No	124 (86.7)	
Currently in sexual relationship [n (%)]		
Yes	82 (57.3)	
No	46 (32.2)	
Heard of Vasalge TM previously [n (%)]		
Yes	63 (44.1)	
No	79 (55.2)	

Note: Percentages do not add up to 100 in all cases as they are calculated from the total sample, not from the number of participants who answered each question.

3.2. Attitude toward and intent to use VasalgeTM

Attitudes towards VasalgeTM were predominantly favorable ($M = 4.82$), as were intentions to use VasalgeTM ($M = 4.30$). Specifically, 41% of all participants ($n = 59$) either moderately or strongly agreed with the statement “I would use VasalgeTM if it became available” compared to 22% ($n = 31$) who either moderately or strongly disagreed. Fifty-seven percent of participants ($n = 82$) reported that using VasalgeTM would be “very nice” or “nice,” compared to only 6% ($n = 9$) who said it would be “awful” or “very awful.” Fifty-five percent ($n = 79$) moderately or strongly agreed with the statement: “VasalgeTM should be put on the market as soon as possible,” whereas 6% ($n = 9$) moderately or strongly disagreed. Additionally, 78% of participants ($n = 112$) moderately or strongly agreed that “VasalgeTM is an important invention,” compared to only 3% ($n = 4$) who moderately or strongly disagreed.

The only demographic characteristic that had a significant effect on both intent to use and attitude towards VasalgeTM was having heard of VasalgeTM prior to the present study ($n = 63$; Intent, $F(1,140) = 29.82$, $p < 0.001$; Attitudes, $F(1,140) = 32.13$, $p < 0.001$). Currently having children ($n = 5$) had a significant effect on intent to use ($F(1,127) = 5.99$, $p < 0.05$), but not attitudes ($F(1,127) = 1.19$, $n.s.$). Age, number of sexual partners in the past year or ever, ever having had sex, contraception use at last sex, current employment status, and currently being in a relationship had no significant effects (all $p > 0.05$).

3.3. Influence of demographics on HBM constructs, social norms, and interpersonal factors

Regression analysis showed that younger age was significantly associated with higher perceived severity (full model: $F(1,140) = 24.83$, $p < 0.001$; age: $t(140) = -4.983$, $p < 0.001$). Having children was

associated with lower perceived severity ($F(1,126) = 11.01, p < 0.01$) and lower perceived benefits ($F(1,125) = 4.08, p < 0.05$). Having heard of Vasalgel™ significantly increased social norms ($F(1,138) = 26.93, p < 0.001$), perceived benefits ($F(1,138) = 42.53, p < 0.001$), and perceived barriers ($F(1,139) = 29.82, p < 0.001$). There was a marginally significant effect of employment ($F(2,138) = 2.82, p = 0.06$). A Tukey *post hoc* test indicated that students had significantly higher levels of perceived severity of pregnancy than employed individuals ($t(138) = 2.37, p < 0.05$). No significant differences were found in perceived severity between unemployed and employed participants ($t(138) = -0.59, n.s.$) or between students and unemployed participants ($t(138) = -0.20, n.s.$).

3.4. Effect of HBM constructs, interpersonal factors and social norms on attitudes and intent to use

Scores on independent components of the HBM were entered at step 2. The hierarchical multiple regressions for both intent to use and attitude revealed that at step 2, the HBM constructs collectively were significant (full model for attitude at step 2: $F(6,73) = 12.61, R^2 = 0.51, p < 0.001$; full model for intent, step 2; $F(7,71) = 22.17, R^2 = 0.69, p < 0.001$) and that these constructs improved model predictions above and beyond any participant characteristics (See Tables 3 and 4). At step 2, self-efficacy ($t(78) = 2.46, p < 0.05$), perceived benefits ($t(78) = 3.25, p < 0.01$), and perceived barriers

Table 3. Hierarchical model (intent to use): Effect of having children, previous knowledge of Vasalgel™ HBM constructs, interpersonal factors, and perceived social norms on intent to use Vasalgel™

	Unstandardized estimate (SE)	Standardized estimate	t
<i>Step 1</i>			
Intercept	5.01 (1.35)		3.7**
Have children?	0.82 (0.61)	0.13	1.33
Heard of Vasalgel™ previously?	-1.41 (0.27)	-0.51	-5.25*
<i>Step 2</i>			
Intercept	0.32 (1.62)		0.2
Have children?	0.91 (0.46)	0.14	1.95
Heard of Vasalgel™ previously?	-0.22 (0.23)	-0.08	-0.094
Perceived susceptibility	-0.28 (0.21)	-0.09	-1.33
Perceived severity	-0.11 (0.09)	0.09	-1.2
Perceived benefits	0.47 (0.13)	0.37	3.54**
Perceived barriers	0.34 (0.12)	0.27	2.89**
Self-efficacy	0.39 (0.12)	0.29	3.28**
$\Delta R^2 = 0.38, \Delta F = 17.08, p = 0.01$			
<i>Step 3</i>			
Intercept	0.24 (1.67)		0.14
Have children?	0.68 (0.46)	0.11	1.48
Heard of Vasalgel™ previously?	-0.22 (0.23)	-0.08	-0.98
Perceived susceptibility	-0.24 (0.20)	-0.08	-1.17
Perceived severity	-0.08 (0.09)	-0.07	-0.91
Perceived benefits	0.42 (0.13)	0.33	3.25**
Perceived barriers	0.28 (0.11)	0.23	2.51*
Self-efficacy	0.30 (0.12)	0.22	2.46*
Perceived social norms	0.29 (0.11)	0.22	2.69**
Interpersonal factors	-0.06 (0.12)	-0.03	-0.51
$\Delta R^2 = 0.03, \Delta F = 3.70, p = 0.03$			

*Level of significance at $p < 0.05$.

**Level of significance at $p < 0.01$.

Table 4. Hierarchical model (attitude): Effect of previous knowledge of Vasalgel™, HBM constructs, interpersonal factors, and perceived social norms on attitude towards Vasalgel™

	Unstandardized estimate (SE)	Standardized estimate	t
<i>Step 1</i>			
Intercept	6.13 (0.31)		20.12**
Heard of Vasalgel™ previously?	-0.76 (0.19)	-0.41	-4.01**
<i>Step 2</i>			
Intercept	2.58 (1.23)		2.09*
Heard of Vasalgel™ previously?	-0.07 (0.19)	-0.04	-0.36
Perceived susceptibility	-0.09 (0.17)	-0.05	-0.54
Perceived severity	0.02 (0.08)	0.03	0.31
Perceived benefits	0.45 (0.11)	0.52	4.1**
Perceived barriers	0.09 (0.09)	0.11	0.97
Self-efficacy	0.12 (0.10)	0.14	1.25
$\Delta R^2 = 0.34, \Delta F = 10.05, p < 0.01$			
<i>Step 3</i>			
Intercept	2.91 (1.36)		2.14*
Heard of Vasalgel™ previously?	-0.08 (0.19)	-0.04	-0.42
Perceived susceptibility	-0.08 (0.17)	-0.04	-0.48
Perceived severity	0.01 (0.08)	0.02	0.17
Perceived benefits	0.45 (0.11)	0.54	4.07**
Perceived barriers	0.09 (0.09)	0.11	0.95
Self-efficacy	0.13 (0.11)	0.14	1.21
Perceived social norms	-0.01 (0.09)	-0.01	-0.09
Interpersonal factors	-0.62 (0.10)	-0.05	-0.62
$\Delta R^2 = 0.003, \Delta F = -0.2, p = 0.82$			

*Level of significance at $p < 0.05$.

**Level of significance at $p < 0.01$.

($t(78) = 2.52, p < 0.05$) were significant independent predictors of intent to use. Perceived benefits was the only independent predictor of attitudes ($t(79) = 0.95, p < 0.001$, See Tables 3 and 4).

At step 3, when social norms and interpersonal factors were included the full model was significant ($F(9,69) = 19.37, R^2 = 0.72, p < 0.001$). The overall model at step 3 was a significantly better predictor of intent to use than the overall model at step 2. However, the model at step 3 did not improve in predicting attitude (full model: $F(8,71) = 9.30, R^2 = 0.51, p = 0.82$; see Tables 3 and 4). Additionally, although the full model for intent to use Vasalgel™ was significant, at step 3 only the addition of social norms was independently significant ($t(78) = 2.69, p < 0.01$).

4. Discussion

Overall, men reported a high level of acceptance of Vasalgel™ as a contraceptive method. More importantly, a large proportion of men (41%) claimed that they would use Vasalgel™ if it came on the market. Supporting the primary research hypothesis, the HBM significantly predicted both attitudes towards and intent to use Vasalgel™. Within our model, intent to use Vasalgel™ was independently predicted by perceived benefits and barriers as well as by self-efficacy and social norms. Attitude towards Vasalgel™, however, was only independently predicted by perceived benefits. These findings indicate that the HBM is an appropriate lens through which men's contraceptive intentions and attitudes can be examined, but also that perceived benefits of using a LARC may be particularly instrumental in determining men's attitudes towards Vasalgel™. With regard to intent to use, the data

indicated that the addition of interpersonal-level factors and social norms significantly improved model predictions – although only the construct of social norms was independently predictive. Therefore, our second hypothesis was also supported. That social norms influence intent to use Vasalge™ is an important finding in the context of contraceptive research. Many studies examine how the HBM relates to contraceptive behavior (e.g. Petosa & Jackson, 1991) or how social factors influence contraceptive use (e.g. Albarracín, Johnson, Fishbein, & Muellerleile, 2001). Converging with a limited but growing literature (e.g. Condelli, 1986), our results suggest that using the HBM in concert with social and interpersonal factors may provide a more holistic account of this contraceptive behavior.

With regard to attitude, the second hypothesis was not supported. The addition of social norms and interpersonal factors to the model had no significant effect on attitudes towards Vasalge™. This result indicates that while the model developed for this study provides an appropriate framework for research on intent to use Vasalge™, it is likely that different constructs affect attitudes. That is, general attitudes towards Vasalge™ may be independent of social norms. While this null result was unanticipated, it may indicate that attitudes towards Vasalge™ (though not intent to use) may not be culturally bound. Thus, Vasalge™ could potentially be viewed as a viable contraceptive alternative not only in Western men, but also in men throughout the world. As contraceptive decisions in developing countries are often made by men, the development of male methods is particularly important for improving uptake and attitude towards family planning globally (e.g. Bankole & Singh, 1998). Future research should examine how cross-cultural attitudes toward male LARCs could be translated into cross-cultural behaviors.

Our study had several limitations. The majority of men who completed the survey were young ($M = 24$; $SD = 5.5$). Although we did not find that age was associated with attitudes towards or intent to use Vasalge™, contraceptive use has often been found to vary with age (Baele, Dusseldorp, & Maes, 2001). As young men in the United States are at significant risk for unanticipated pregnancy (Kann et al., 2014), our study targeted a sample most likely to benefit from a novel contraceptive method. Beyond age, this study surveyed college students and male respondents from the Hudson Valley in New York. Given that class was a significant factor in previous studies on male LARCs (Balswick, 1972) and that most of our participants had relatively high socioeconomic status due to the recruitment location, our findings may not be generalizable to all men.

Yet despite these limitations, our findings have important implications for reproductive health research and developments. This study strongly implies that young men today are ready to shoulder the contraceptive responsibility that has traditionally rested upon women. If our results generalize, a new form of contraception for men could change the global approach to reproductive health by reducing unintended pregnancies and inspiring increased inclusion of men in reproductive health services. As research into male contraception advances, findings that men would actually use a new method are critical both to encourage rapid development of products and to understand how unwillingness to use a new male contraceptive can be addressed. Furthermore, the results of this study could inform interventions aimed at encouraging men to use LARCs.

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Competing Interests

The authors declare no competing interest.

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