

Testing a Practitioner-Friendly Behavior Model in Pakistan, India, and Nigeria

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Research Article

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Abstract

Background: There is increasing interest in using social and behavior change (SBC) for Health Systems Strengthening (HSS) in low-and-middle income countries (LMICs) but few good examples of how behavioral insights could inform the design, implementation, and evaluation of HSS interventions. Practitioners would benefit from a practical behavior model that may be applied across behaviors, in multiple social contexts. We test the Fogg Behavior Model (FBM), which has this potential, in 3 different social and economic contexts: Pakistan, India, and Nigeria.

Methods: The study uses data from surveys of men married to women ages 15-49 in Pakistan, women ages 18-49 in India, and women ages 14-24 in Nigeria on condom use, iron folate use, and modern contraceptive use, respectively. The FBM states that behavior happens when motivation, ability and a prompt occur in the same moment. In other words, both motivation and ability must be present for behavior to occur. We tested the hypotheses that both respondents with a) high motivation AND high ability and b) high motivation OR high ability were more likely to adopt a behavior than respondents with low motivation AND low ability. Multivariate logistic regression was used to test these hypotheses.

Results: In all 3 contexts, compared to respondents with low motivation AND low ability, both respondents with high motivation AND high ability and respondents with high motivation OR high ability were significantly more likely to adopt the behavior examined. Statistically significant differences remained after adjusting for a range of socio-economic and demographic variables.

Conclusions: These findings provide empirical support for the FBM. The study demonstrates the utility of the FBM as a practitioner-friendly behavior model that may be applied across different social and behavioral contexts and assist in the design, implementation, and evaluation of HSS interventions.

Background

Strategies to improve maternal and child health primarily through extending the supply of health services are no longer considered sufficient [1]. To reduce global maternal and child mortality and morbidity, for example, research that identifies barriers to the utilization of health services is a high priority [2]. Effective health services utilization can only occur when individuals seek appropriate care and when the health system has the capacity to provide that care [3]. Lack of optimal care-seeking and care-provision are most likely to occur in low-resource settings and amongst the poorest care-seekers - those least able to demand quality health services [4].

There is increasing recognition of the need to take on the challenge of changing behavior related to women's seeking of maternal and child health services, in conjunction with strategies to improve the quality of services [2]. A key theme that emerges from systematic reviews is the inconsistent effectiveness of clinical behavior change efforts. Yet, it remains rare for barriers to provider behavior change to be explicitly considered in Health Systems Strengthening (HSS) interventions. Some experts

have expressed the concern that while much empirical work has been done, the extent to which this has translated into insights is less clear [5].

An important reason for taking behavior into account when designing care-seeking and care-provision interventions is the complexity surrounding behavior change theories. While more than 80 theories of behavior are available in the social and behavioral sciences [6], there is no agreement on whether a specific theory is more appropriate than another for a particular behavior or context. The proliferation of theories of behavior has not helped increase clarity among practitioners regarding which behaviors are better understood or which constructs are more influential [7]. As a result, despite evidence that the most effective interventions are grounded in theory, most interventions that aim to increase the utilization of health services in low-and-middle income countries (LMICs) do not use a behavior change framework to guide intervention design, implementation, and evaluation [6, 8].

One early and influential framework used to study access to health care in high-income countries (HICs), Andersen's *Behavior Model of Families' Use of Health Services* [9], is noteworthy. This model was developed to examine families' annual use of health care services in the context of a) predisposing demographic and socio-economic factors, b) enabling community and individual resources, and c) individuals' perceived need for services. After multiple iterations over 3 decades, Andersen's model took health behavior explicitly into account [10]. While the model has been used in LMICs to look at outcomes such as antenatal care and contraceptive use, and studies have shown the effects of demographic and socio-economic factors, enabling factors, and perceived need on health services utilization [11, 12], the insights offered in terms of behavioral processes themselves have been limited. Moreover, the extent to which this model has contributed to the incorporation of social and behavior change (SBC) in the design, implementation, and evaluation of health systems interventions is not obvious.

We believe that there is a need for a behavior model that helps generate insights to guide the design, implementation, and evaluation of health systems interventions. Practitioners stand to benefit greatly from a model that sheds light on how different segments of a population adopt preventive health products and services. In this study, we test the applicability of a model of behavior used by practitioners in the United States [13] to 3 very different social and behavioral contexts in low-and-middle-income countries (LMICs). The Fogg Behavior Model (FBM) states that behavior happens when motivation, ability and a prompt occur in the same moment. In other words, both motivation and ability must be present for behavior to occur. Several other practitioner-friendly models of behavior also consider motivation and ability to be necessary for behavior to occur, although motivation and ability are defined somewhat differently in those models [14, 15].

The FBM can be visualized in two dimensions, with motivation on the y-axis and ability on the x-axis, as shown in Fig. 1. For a specific behavior, motivation can range from high to low. Ability can also range from high to low for a particular behavior. For simplicity we say a behavior is easy to do or hard to do. The FBM proposes that a behavior happens when a person with high motivation and high ability is prompted. By contrast, a person with low motivation and low ability is not likely to adopt a behavior when

prompted. Fogg considers a threshold (the “action line”) above which a person with sufficient motivation and ability will adopt a behavior when prompted. The FBM is precise in defining the components of motivation and ability. Motivation comprises of anticipation (i.e. hope or fear), sensation (i.e. pleasure or pain) and belonging (i.e. social acceptance or rejection). Ability comprises of time, money, physical effort, mental effort, and routine [16]. We test the FBM for 3 different behaviors in the widely varying social and economic contexts of Pakistan, India, and Nigeria.

Methods

Survey Data

Pakistan

In 2009, a household panel survey of men married to women 15–49 was conducted in urban Pakistan to assess the effects of a social marketing condom promotion campaign. The survey was conducted in four provinces of Pakistan: Sindh, Punjab, Khyber-Pakhtunkhwa, and Baluchistan. The instrument used for the survey included questions on the socio-economic and demographic characteristics of respondents, their attitudes towards condoms and family planning, and their exposure to a condom advertising campaign.

The campaign was implemented in two phases. Phase 1 of the campaign was implemented in February-March 2009. In total, 2,156 advertisements were aired on television during Phase 1. The first wave of data was collected in March-April 2009 to monitor the campaign’s effects. Phase 2 of the campaign was implemented in April-May 2009 and 2,311 advertisements were aired. The second wave of data was collected in August 2009. A multistage, cluster, random sampling strategy was used to collect the data. Details of the sample design are provided elsewhere [17]. A total of 806 men were interviewed in the first survey wave and 617 were re-interviewed in the second wave. We use the panel of 617 married men to test the applicability of the FBM to the behavior of interest - a man’s use of a condom in last sex with his wife.

India

In 2020, a 3-minute online survey was conducted among women 18–49 in the states of Uttar Pradesh and Madhya Pradesh in India. The survey was conducted using a combination of the Typeform survey tool and Facebook advertisements. It asked women about their age, education, iron folate use, exposure to Facebook posts on anemia and iron folate, and their motivation and ability to use iron folate. Details of the survey methodology are provided elsewhere [18, 19]. In 2019, the year before the survey, two online advertising campaigns were conducted on Facebook to raise awareness of anemia and increase the use of iron folate use among women of reproductive ages in India [18]. Of the 1,365 women interviewed, 1,136 provided responses to all 7 questions asked in the survey and were included in the analysis. The behavior of interest was a woman’s recent use of iron folate.

Nigeria

A household survey of women ages 14–24 was conducted in Lagos, Kaduna and Kano states in Nigeria. The survey provided baseline data on attitudes, beliefs, practices, and socio-economic and demographic characteristics of women. Data was collected in February-March 2018. A multistage, cluster, random sample was used to collect the data. Details of the sample design are provided elsewhere [20]. In total 2,890 women were interviewed in the three states. We tested the FBM using data on 618 Nigerian women who reported ever having had sex. The behavior of interest was current use of a modern contraceptive method.

Operationalization of the Fogg Behavior Model

Table 1 shows the survey questions used to operationalize the motivation and ability constructs using the Pakistan survey. Variables were coded in a positive direction in relation to the behavioral outcome of interest. Each survey question with a positive response that reflected motivation or ability was given a score of 1. In Pakistan, 14 questions were available to operationalize motivation and 15 to operationalize ability. This meant that motivation had a maximum score of 14 while ability had a maximum score of 15. The upper quartile of each variable was used to define “high motivation” and “high ability”. A cross tabulation was done between high motivation and high ability, with 4 categories emerging: high motivation AND high ability, high motivation AND low ability, low motivation AND high ability, and low motivation AND low ability. For simplicity, the categories of high motivation AND low ability and low motivation AND high ability were collapsed into one: high motivation OR high ability. The three final categories of the motivation-ability variable used in the analysis were: high motivation AND high ability, high motivation OR high ability, and low motivation AND low ability.

In India, two questions asked on the online survey were used to operationalize the motivation and ability constructs. Responses to the first question, “How important is it for you, personally, to take iron supplements?” were recorded on a Likert scale which went from very important to not at all important. A binary variable was created for motivation with respondents who reported that it was very important for them to take iron supplements coded as 1 and other respondents coded as 0. Responses to the second question, “If you decided to take iron supplements how difficult would it be for you to obtain iron tablets in the next week?”, went from very easy to very difficult. A binary variable was created for ability, with respondents who felt that it would be very easy for them to obtain an iron supplement coded as 1 and other respondents coded as 0. A cross tabulation between the two binary variables, provided 4 possible combinations of motivation and ability. After combining the category of high motivation AND low ability with the category of low motivation AND high ability, 3 categories of the motivation-ability variable remained: high motivation AND high ability, high motivation OR high ability, and low motivation AND low ability.

Table 2 shows the survey questions used to operationalize motivation and ability in Nigeria. As in the case of Pakistan, variables were coded in a positive direction in relation to the behavioral outcome of interest. Each survey question that reflected motivation or ability was given a score of 1. In Nigeria, 23 questions were used to operationalize motivation and 18 to operationalize ability. As a result, in Nigeria, motivation had a maximum score of 23 while ability had a maximum score of 18. The upper quartiles of

each variable were used to define the binary variables of “high motivation” and “high ability”. A cross tabulation between these two binary variables provided 4 possible combinations of motivation and ability. After combining the categories of high motivation AND low ability with low motivation AND high ability, a 3-category motivation-ability variable remained: high motivation AND high ability, high motivation OR high ability and low motivation AND low ability.

Statistical Analysis

Frequency distributions of the socio-economic and demographic characteristics of respondents, their motivation and ability, and their exposure to advertising campaigns (in the case of Pakistan and India) are shown in Tables 3, 5 and 7. Crosstabulations between respondent characteristics and behaviors of interest are also shown in these tables. The following hypotheses were tested:

Hypotheses: 1) Respondents with high motivation AND high ability are more likely to adopt behavioral outcomes of interest than respondents with low motivation AND low ability. 2) Respondents with high motivation OR high ability are more likely to adopt behavioral outcomes of interest than respondents with low motivation AND low ability.

Multivariate analysis was used to test the hypothesis. For the Pakistan panel, we used a multi-level mixed effects logistic regression [21] to take the clustering of observations within cities and individuals into account. In Nigeria and India, multivariate logistic regression analysis was used to test the hypotheses. The clustering of observations (i.e. the clustering of respondents in sampling units) was taken into account by using the STATA cluster command [21]. For each country, variables were introduced in two stages. The 3-category motivation-ability variable was introduced in Model 1 and socio-economic and demographic characteristics were introduced in Model 2.

Study Limitations

A limitation of this study is the use of existing data from surveys in Pakistan and Nigeria which were not specifically designed to collect data on constructs articulated by the FBM. As a result, several important elements which comprise ability in the FBM are not measured in the Pakistan (i.e. time, routine) and Nigeria (i.e. time, money, physical effort) surveys. Another limitation of this study is the reliance on self-reported behavior, which may be influenced by social desirability or recall bias [22]. Finally, because we use cross sectional survey data in India and Nigeria, no causal inferences can be drawn from the analysis.

Ethics Review

All protocols were carried out in accordance with relevant guidelines and regulations. Informed consent was obtained from study participants. For Pakistan and Nigeria, Tulane University Biomedical IRB approval was received. The IRB reference number for the Pakistan study is 09-141661. The IRB reference number for the Nigeria study is 2017–6388. Local IRB approvals were obtained from the Pakistan Medical Association and the Nigerian National Health Research Committee. The IRB approval for India was obtained from the University of California San Francisco IRB - IRB reference number 18-27024.

Results

Table 3 shows frequency distributions of characteristics of married Pakistan men from Wave 1 of the survey (Column 1). About 48% of the men in the sample were ages 40 and above and nearly half had four or more children. About 43% of men did not want additional children. Slightly more than half the men had matriculate (grade 10) or higher education. About 15% of men had been exposed to a condom social marketing campaign. About 56% of married men had low motivation AND low ability, 25% had high motivation OR high ability, and 19% had high motivation AND high ability to use a condom with their wives.

Table 3 also shows cross tabulations between men's characteristics and condom use (Column 2). There was a powerful bivariate relationship between motivation and ability categories and condom use at Wave 1: 44% of men with high motivation AND high ability used a condom at last sex, compared with 25% of men with high motivation OR high ability, and 7% of men with low motivation AND low ability ($p < 0.001$). This relationship remained strong at Wave 2: 46% of men with high motivation AND high ability used a condom at last sex, compared with 26% of men with high motivation OR high ability, and 9% of men with low motivation AND low ability.

Relationships between other variables and condom use were as expected. Condom use increased with the number of children a man had. It was higher for men who wanted no additional children. Wealthier men were more likely to use condoms: men in the fifth/richest quintile were more likely to use condoms than men in the first four quintiles. Exposure to condom advertising was associated with higher condom use. Overall, condom use increased from 18.5–22% between Wave 1 and Wave 2.

Table 4 shows the odds of condom use among Pakistani men. Model 1 in Table 4 shows the unadjusted odds of condom use. Model 1 shows that there was a strong relationship between motivation and ability categories and condom use before adjusting for other factors. This relationship remained strong after adjustment for socio-economic and demographic characteristics. A man with high motivation AND high ability was more likely to use a condom with his wife than a man with low motivation AND low ability (aOR = 35.33, $p < 0.001$). A man with high motivation OR high ability was also more likely to use a condom with his wife than a man with low motivation AND low ability (aOR = 6.36, $p < 0.001$). And

Using high motivation OR high ability as the reference category, we found that a man with high motivation AND high ability was also more likely to use a condom than a man with high motivation OR high ability (aOR = 5.56, $p < 0.001$) (not shown in Table 4). The latter finding demonstrated that the effect of having high levels of both motivation and ability is also significantly greater than the effect of having high levels of either motivation or ability.

Table 5 shows frequency distributions of sample characteristics of Indian women. Column 1 shows that about 55% of women in the sample were less than 26 years of age. About one-fifth of women in the sample had less than 5 years of schooling and 16% had been exposed to an advertising campaign on

anemia prevention. About 53% of women in the sample had low motivation AND low ability to use iron folate, 31% had high motivation OR high ability, and 16% had high motivation AND high ability.

Table 5 also shows cross tabulations of women's characteristics with iron folate use. Column 2 shows that, at the bivariate level, there is a powerful relationship between motivation and ability categories and the use of iron folate: 64% of Indian women with high motivation AND high ability reported use of iron folate, compared with 28% of women with high motivation OR high ability, and 13% of women with low motivation AND low ability. In terms of relationships between other characteristics of women and iron folate use, women ages 26 and older were more likely to use iron folate, as were women exposed to an advertising campaign on anemia prevention. Somewhat surprisingly, women with less than 5 years of education were more likely to use iron folate compared with women who had more than 5 years of education.

Table 6 shows the odds of iron folate use among Indian women. Model 1 in Table 6 shows the unadjusted odds of iron folate use. There is a strong relationship between motivation and ability categories and iron folate use. Model 2 in Table 6 shows that this relationship remains strong after adjusting for age, schooling, and exposure to the anemia advertising campaign. Women with high motivation AND high ability were more likely to use iron folate than women with low motivation AND low ability (aOR = 9.41, $p < 0.001$). Women with high motivation OR high ability were also more likely to use iron folate than women with low motivation AND low ability (aOR = 2.23, $p < 0.001$).

Using high motivation OR high ability as a reference category, we found that women with high motivation AND high ability were also significantly more likely to use iron folate than women with high motivation OR high ability (aOR = 4.22, $p < 0.001$) (not shown in Table 6).

Table 7 shows frequency distributions of characteristics of Nigerian women. Column 1 show that two-thirds of the survey sample was from Northern Nigeria. Nearly three fourths of women were ages 20–24 and 64% were married. More than half the women in the sample had at least one child. Two-thirds of women had secondary and 14% had higher than secondary education. About 64% of women had low motivation AND low ability to use modern contraception, 23% had high motivation OR high ability, and 13% had high motivation AND high ability.

Table 7 also shows cross tabulations of women's characteristics with the use of modern contraception. Column 2 shows that there was a powerful bivariate relationship between motivation and ability categories and current use of modern contraception: 61% of women with high motivation AND high ability were using a modern contraceptive, compared with 44% of women with high motivation OR high ability, and 14% of women with low motivation AND low ability. Modern contraceptive use was higher among women in the South, those who had a boyfriend, those with no children, and those with higher than secondary education. Women in the first/poorest quintile were less likely than women in the second to fifth quintiles to use contraception.

Table 8 shows the odds of modern contraception use among Nigerian women. Model 1 in Table 8 shows the unadjusted odds of modern contraceptive use. There is a strong relationship between motivation and ability categories and modern contraceptive use. Model 2 shows that, after adjusting for socio-economic and demographic variables, women with high motivation AND high ability were more likely to use modern contraception than women with low motivation AND low ability (aOR = 7.91, $p < 0.001$). Women with high motivation OR high ability were also more likely to use modern contraception than women with low motivation AND low ability (aOR = 3.93, $p < 0.001$).

Using high motivation OR high ability as the reference category, we found that women with high motivation AND high ability were significantly more likely to use modern contraception than women with high motivation OR high ability (aOR = 2.01, $p < 0.05$) (not shown in Table 8). Overall, Nigerian data shows a similar pattern to what was observed in Pakistan and India in terms of the relationships of the motivation and ability constructs with behavior.

Discussion

It is not yet common in health services research to explicitly use a behavior model to understand how health services are utilized. This represents a missed opportunity. The lack of training opportunities in behavior change for practitioners in LMICs compounds this problem. While there is a proliferation of theories of health behavior change in high-income countries (HICs), there is a need for curation of existing theories of behavior in order for them to become accessible to practitioners in LMICs who seek to increase efficiencies in health services utilization.

The need for a systematic approach to testing models of behavior against one another to determine whether a specific model is better for a particular behavior or context remains high. In this paper, we identified a behavior model used by practitioners in the United States and tested this model in 3 different social and economic contexts: Pakistan, India, and Nigeria.

In all 3 contexts studied, the Fogg Behavior Model's (FBM) constructs of motivation and ability were important in explaining the behavior of interest. In Pakistan, we used the FBM to understand the use of condoms by married men. In India, we applied the FBM to the use of iron folate. In Nigeria, the FBM helped explain modern contraceptive use among young women. In each instance, respondents with high motivation AND high ability were more likely to use a preventive health product than those with low motivation AND low ability. Respondents with high motivation OR high ability were also more likely to adopt a preventive behavior than those with low motivation AND low ability. Finally, we found that respondents with high motivation AND high ability were more likely to adopt a preventive health behavior than respondents with high motivation OR high ability. The effects of motivation and ability on behavior remained powerful even after adjusting for socio-economic and demographic variables. These findings suggest that the FBM may be able to fill the current void in terms of the lack of use of SBC for health

services utilization by providing a behavior model that is easy to understand and implement by practitioners in LMICs.

In our analysis, we combined high motivation AND low ability with low motivation AND high ability to obtain the “high motivation OR high ability” category. For practitioners, the distinction between these two categories is important for the design of interventions. For those in the high motivation AND low ability category, interventions that increase ability would be needed and, depending upon the ability component that is lacking (e.g. time, money, physical effort, mental effort and routine), interventions would need to be tailored to increase that specific component. For those in the low motivation AND high ability category, interventions would need to be tailored to increase the specific component of motivation that was lacking.

That the FBM provides a segmentation of the population and a measurement of the size of each segment, offers an immediate advantage to practitioners. In each of our study contexts, the behaviors of interest were practiced by a minority of respondents. In urban Pakistan, condom use was between 18–22% among married men. In India, iron folate use was 25% among women using an online platform. In Nigeria, modern contraceptive use was 27% among young women. Across the 3 contexts, about 13–19% of respondents had high motivation AND high ability for the specific behavior examined. About 23–31% of respondents had high motivation OR high ability. More than 50% of respondents across these 3 contexts had low motivation AND low ability. These findings suggest the sort of interventions that might be needed. For those in the high motivation AND high ability segment, well-designed prompts would be needed. For segments that have high motivation but low ability, intervention design would focus on increasing ability by lowering the time required, or increasing convenience, or reducing the physical or mental effort required, or by changing the norms around that behavior. For segments that have high ability but low motivation, intervention design would focus on increasing motivation.

Use of the FBM can help practitioners determine which segment to give priority to and in what order. Fogg suggests that it can be useful to start with two segments at one time: those with high motivation AND high ability (by developing effective prompts), and those with high motivation AND low ability (by increasing their ability). Fogg believes that motivation is more difficult to change than ability. Hence, the segment with low motivation and high ability should be tackled next (Fogg, 2020). The segment, comprising people with low motivation AND low ability, is likely to require the greatest resources, especially time, for behavior change to occur. Overall, our findings suggest that considerable work remains to be done on both motivation and ability in each country studied for there to be substantial increase in the preventive behaviors examined.

Our analysis suggests that the FBM may be used across a range of behaviors and LMIC contexts. The findings also suggest that while the motivation and ability constructs may be based on a large number of variables (29 in Pakistan and 41 in Nigeria), they may also be based on just 2 variables (one for motivation and one for ability, as in India). This could be extremely useful for practitioners in LMICs who may be interested in behavioral segmentation but may not have the resources to conduct surveys that

have lengthy questionnaires. The 7-item questionnaire used in the India survey is the type of instrument that may be more feasible for some practitioners in LMICs. A short behavioral instrument would also be extremely useful for researchers conducting online surveys. Being able to conduct a behavioral segmentation based on two questions may enhance the ability to measure the behavioral impact of social media interventions - a nascent area of interest in public health. It would also allow real-time segmentation to be done in the field, by community health workers during household visits, or by healthcare providers when they interact with patients.

USAID's Vision for Health Systems Strengthening 2030 highlights the need to explicitly incorporate social and social and behavior change approaches to develop integrated health interventions. It underlines the importance of addressing the behaviors of providers at both the clinical and managerial levels [23]. This requires a clear enunciation of a behavior model that generates insights and serves as a basis for the design, implementation, and evaluation of HSS interventions. As a practitioner-friendly model that may explain behaviors in very different contexts, the FBM appears to have the potential to be used widely in health services research.

It is important to note that the FBM is not *per se* a model of health behavior. It is a model of human behavior that we have applied to health behavior. An additional benefit of using the FBM may be its applicability in providing comparable data on the effectiveness of behavioral interventions in health and non-health areas. As interest grows in applying behavioral insights to policy and advocacy interventions, to the provision of financial and agricultural services, to increasing women's empowerment, to integrated SBC interventions, a model that is applicable to a range of behaviors and contexts may prove to be extremely useful.

Conclusions

The proliferation of theories of health behavior in HICs coupled with their lack of use in most health services interventions implemented in LMICs suggests that existing theories do not meet the needs of practitioners in low-resource settings. There is a need for social and behavioral scientists to determine which theories are more applicable to specific behaviors and which constructs have the greatest explanatory power. We tested a model of behavior, the Fogg Behavior Model (FBM), that is used by practitioners in the United States in 3 LMICs. The motivation and ability constructs in the FBM were powerful drivers of behavior in all 3 contexts. The findings suggest that the FBM may be used for health services research in a broad range of social and economic contexts.

Declarations

Ethics approval and consent to participate

Informed consent was obtained from all study participants. All protocols were carried out in accordance with relevant guidelines and regulations. For Pakistan and Nigeria, Tulane University Biomedical IRB

approval was received. The IRB reference number for the Pakistan study is 09-141661. The IRB reference number for the Nigeria study is 2017-6388. Local IRB approvals were obtained from the Pakistan Medical Association and the Nigerian National Health Research Committee. The IRB approval for India was obtained from the University of California San Francisco IRB - IRB reference number 18-27024.

Consent for publication

Not applicable

Availability of data and materials

The datasets used for the current study are available from the corresponding author on reasonable request.

Competing Interests

The author declares that he has no competing interests.

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Author's contributions

S.A. conceptualized the study, conducted the data analyses, and wrote the main manuscript.

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Tables

Table 1. Pakistan survey questions related to the Fogg Behavior Model

Questions	
Motivation	
Anticipation	<p><i>On a scale from strongly agree to strongly disagree, how do you respond to the following:</i></p> <ol style="list-style-type: none"> 1. Family Planning can help improve one's standard of living
Pleasure	<p><i>On a scale from strongly agree to strongly disagree, how do you respond to the following:</i></p> <ol style="list-style-type: none"> 2. Condom use reduces sexual satisfaction 3. Condom use reduces sexual desire 4. Use of condoms interrupts sex 5. I do not enjoy using condoms 6. Condoms cause skin irritation after sex 7. Condoms cause itching 8. Condoms have a bad smell
Belonging	<p><i>On a scale from approve to disapprove, how do you respond to the following:</i></p> <ol style="list-style-type: none"> 9. Would you say that you approve or disapprove of couples using a contraceptive method to avoid getting pregnant? 10. Would you say that <i>your wife</i> approves or disapproves of couples using a contraceptive method to avoid getting pregnant? <p><i>On a scale from strongly agree to strongly disagree, how do you respond to the following:</i></p> <ol style="list-style-type: none"> 11. Religion finds family planning acceptable 12. Men should share the responsibility for family planning 13. Child spacing protects the health of mothers 14. Spouses who care for one another will use family planning
Ability	
Time	None available
Money	<ol style="list-style-type: none"> 1. Do you think the price for condoms is inexpensive, just affordable, or too expensive?
Physical effort	<p><i>On a scale from strongly agree to strongly disagree, how do you respond to the following:</i></p> <ol style="list-style-type: none"> 2. I know a place nearby where I can obtain condoms 3. Many different brands of condoms are available in this area

	<ol style="list-style-type: none"> 4. There is a general store in this neighborhood where I could obtain condoms 5. I can easily obtain condoms 6. There is a pharmacy nearby which sells condoms
Mental Effort	<p><i>On a scale from strongly agree to strongly disagree, how do you respond to the following:</i></p> <ol style="list-style-type: none"> 7. When I suggest using a condom, I am almost always embarrassed 8. It is really hard to bring up the issue of using condoms to my wife 9. I never know what to say when my wife and I need to talk about condoms or other protection 10. I am not comfortable talking about condoms with my wife 11. It is very embarrassing to buy condoms 12. When I need condoms, I often dread having to get them 13. It would be embarrassing to be seen buying condoms in a store 14. I always feel really uncomfortable when I buy condoms 15. Due to religious beliefs, a person feels guilty about using condoms
Routine	None available

Table 2. Nigeria survey questions related to the Fogg Behavior Model

Questions	
Motivation	
Anticipation	<p><i>Please tell me if you strongly agree, somewhat agree, somewhat disagree, strongly disagree, or DK:</i></p> <ol style="list-style-type: none"> 1. Condoms prevent pregnancy 2. Condoms have holes that allow HIV to pass through them 3. Contraceptives can cause cancer 4. Contraceptives are dangerous to your health 5. How motivated or unmotivated are you to use condoms with your partner? Very motivated, somewhat motivated, unmotivated, very unmotivated or don't know 6. How motivated or unmotivated are you to discuss contraception with your partner? Very motivated, somewhat motivated, unmotivated, very unmotivated or don't know 7. How motivated or unmotivated are you to discuss contraception with your partner? Very motivated, somewhat motivated, unmotivated, very unmotivated or don't know 8. Do you intend to talk to your partner about contraception in the next three months?
Pleasure	<p><i>Please tell me if you strongly agree, somewhat agree, somewhat disagree, strongly disagree, or DK:</i></p> <ol style="list-style-type: none"> 9. Sex is unnatural with condoms 10. Condoms ruin the mood 11. Contraceptives reduce a woman's sexual urge 12. Contraceptives reduce a man's sexual urge
Belonging	<p><i>Please tell me if you strongly agree, somewhat agree, somewhat disagree, strongly disagree, or DK:</i></p> <ol style="list-style-type: none"> 13. It is against your values to have sexual intercourse before marriage 14. Adolescent girls who get pregnant before marriage should feel ashamed? 15. Adolescents should have sex before marriage to see if they are suited to each other 16. Condom use means that a person is promiscuous 17. Women who use contraceptives may become promiscuous s 18. Use of some contraceptives can make a woman permanently infertile 19. The husband should be the one to decide whether the couple should use a method of contraception

20. On a scale of 1-7 please tell me how having sex makes a person cool. 1 is not cool and 7 is cool.
21. On a scale of 1-7 please tell me how having sex makes a person sexy. 1 is not sexy and 7 is sexy
22. On a scale of 1-7 please tell me how having sex makes a person respected. 1 is not respected and 7 is respected
23. Have you and your partner ever discussed the number of children you would like to have?

Ability	
Time	None available
Money	None available
Physical effort	None available
Mental Effort	<p><i>Please tell me if you strongly agree, somewhat agree, somewhat disagree, strongly disagree, or DK:</i></p> <ol style="list-style-type: none"> Using condoms during sexual intercourse is wise Using condoms during sexual intercourse is embarrassing <p><i>Please tell me how easy or difficult it would be to do each of the following</i></p> <ol style="list-style-type: none"> How easy or difficult would it be for you to use condoms with a sexual partner? How easy or difficult would it be for you to discuss condoms with a sexual partner? How easy or difficult would it be for you to discuss condoms with your parents? How easy or difficult is it for you to use contraception? <p><i>Please tell me how confident you would feel, extremely confident, somewhat confident, somewhat uncertain, extremely uncertain or DK:</i></p> <ol style="list-style-type: none"> How confident are you that you could get a condom if you wanted one? How confident are you that you could have a condom with you when you needed it, that is if you decided to have sex? How confident are you that you could use a condom correctly? Imagine that you are having sex with someone you just met, and you feel it is important to use condoms. How confident are you that you could tell that person you want to use condoms? Imagine that your partner uses birth control pills to prevent pregnancy. You want to use condoms to avoid getting an STD or HIV. How confident are you that you could convince your partner to also use condoms? How confident are you that you could convince your partner to use a method of contraception?

13. How confident are you that you could use a method of contraception even if your partner doesn't want to?

Now I am going to ask you about the likelihood of some events. Please tell me if you would be extremely unlikely, somewhat unlikely, somewhat likely, extremely likely or don't know.

14. How likely is it that your partner would like it if you had a condom with you?

15. During the next 3 months, how likely is it that you will try to persuade your partner to use condoms every time you have sex?

16. During the next 3 months, how likely is it that you will always have a condom with you?

17. Do you know of a place where you can obtain a method of contraception?

Routine

18. Do you carry condoms with you?

Table 3. Frequency distributions and condom use by characteristics of Pakistani men

	(1) Frequency distribution of sample characteristics	Condom use at last sex		(4) Number of men in the sample
		(2) Baseline	(3) Follow- up	
Age				
<30	15.2%	13.8%	26.6%	94
30-39	37.0%	24.6%	22.9%	228
40+	47.8%	15.2%*	19.9%	295
Number of children				
0-1	20.7%	9.4%	12.2%	128
2-3	31.8%	23.0%	28.0%	196
4+	47.5%	19.4%**	22.3%**	293
Desire for additional children				
Want additional children	57.2%	13.0%	14.7%	353
Want no additional children	42.8%	25.8%***	31.4%***	264
Education				
None or primary (Classes 0-5)	29.7%	13.1%	16.9%	183
Middle (Classes 5-9)	16.9%	16.4%	25.4%	104
Matriculate or higher (Classes 10 +)	53.5%	22.1%*	23.9%	330
Wealth				
First to fourth quintile	80.4%	16.9%	19.8%	496
Fifth quintile/richest	19.6%	24.8%*	30.7%**	121
Advertising exposure				
No exposure to <i>Touch</i> condom advertising	84.8%	16.8%	19.3%	523
Exposure to <i>Touch</i> condom advertising	15.2%	27.7%*	32.5%***	94
Motivation and ability				

Low motivation AND low ability	55.9%	6.7%	8.5%	345
High motivation OR high ability	25.1%	25.2%	25.7%	155
High motivation AND high ability	19.0%	44.4%***	46.3%***	117
	100%	18.5%	22.0%	617

*p<0.05, **p<0.01, ***p<0.001

Table 4. Multilevel mixed effects logistic regression showing the adjusted odds of condom use among Pakistani men

	Model 1	Model 2
	aOR (95% CI)	aOR (95% CI)
Time		
Baseline	1.00	1.00
Follow-up	1.33 (0.87,2.03)	1.32 (0.85,2.05)
Motivation and ability		
Low motivation AND low ability	1.00	1.00
High motivation OR high ability	8.10*** (4.18,15.68)	6.36*** (3.24,12.48)
High motivation AND high ability	44.05*** (18.84,102.94)	35.33*** (15.01,83.16)
Age		
<30	<i>Not included</i>	1.00
30-39	<i>Not included</i>	1.37 (0.63,2.98)
40+	<i>Not included</i>	0.77 (0.35,1.70)
Number of children		
0-1	<i>Not included</i>	1.00
2-3	<i>Not included</i>	3.46* (1.25, 9.56)
4+	<i>Not included</i>	2.17 (0.76,6.15)
Desire for additional children		
Want additional children	<i>Not included</i>	1.00
Want no additional children	<i>Not included</i>	3.32*** (1.74,6.33)
Education		
None or primary	<i>Not included</i>	1.00
Middle	<i>Not included</i>	1.37 (0.55,3.43)
Matriculate or higher	<i>Not included</i>	1.31 (0.59,2.87)
Wealth		
First four quintiles	<i>Not included</i>	1.00
Richest/fifth quintile	<i>Not included</i>	2.35* (1.19,4.63)
Advertising exposure		
No exposure	<i>Not included</i>	1.00

Exposure to <i>Touch</i> condom advertising	<i>Not included</i>	1.99* (1.02,3.87)
Number of men	617	617

*p<0.05, **p<0.01, ***p<0.001 aOR = Adjusted Odds Ratios; 95%CI = 95% Confidence Interval

Table 5. Frequency distributions and use of iron folate by characteristics of Indian women

	(1) Frequency distribution of sample characteristics	(2) Use of iron folate	(3) Number of women in the sample
Age			
Up to 25 years	54.7%	22.7%	621
26 and older	45.3%	28.7%*	515
Years of schooling completed			
5 or more years	78.8%	23.5%	895
Less than 5 years	21.2%	32.8%**	241
Exposure to advertising			
Not exposed	83.7%	20.7%	951
Exposed	16.3%	49.7***	185
Motivation and ability			
Low motivation AND low ability	53.3%	12.5%	606
High motivation OR high ability	30.5%	27.7%	346
High motivation AND high ability	16.2%	63.6%***	184
	100%	25.4%	1,136

*p<0.05 **p<0.01 ***p<0.001

Table 6. Logistic regression showing the adjusted odds of iron folate use among Indian women

	Model 1	Model 2
	aOR (95% CI)	aOR (95% CI)
Motivation and ability		
Low motivation AND low ability	1.00	1.00
High motivation OR high ability	2.68*** (1.91,3.75)	2.23*** (1.57,3.15)
High motivation AND high ability	12.18*** (8.29,17.89)	9.41*** (6.31,14.03)
Age		
Up to 25 years	<i>Not included</i>	1.00
26 and older	<i>Not included</i>	1.70*** (1.22,2.38)
Years of schooling completed		
5 or more years	<i>Not included</i>	1.00
Less than 5 years	<i>Not included</i>	1.61* (1.08, 2.39)
Exposure to advertising		
Not exposed	<i>Not included</i>	1.00
Exposed	<i>Not included</i>	2.25*** (1.55,3.28)
Pseudo R-squared		
	14.04%	16.31%
Number of women		
	1,136	1,136

*p<0.05, **p<0.01, ***p<0.001 aOR = Adjusted Odds Ratios; 95%CI = 95% Confidence Interval

Table 7. Frequency distributions and modern contraceptive use by characteristics of Nigerian women

	(1) Frequency distribution of sample characteristics	(2) Current use of modern contraception	(3) Number of women in the sample
Region			
South	34.1%	34.1%	211
North	65.9%	23.6%**	407
Age			
14-19	26.2%	22.2%	162
20-24	73.4%	28.9%	456
Marital status			
Married	64.1%	18.9%	396
Boyfriend	35.9%	41.9%***	222
Number of children			
1-3	52.1%	21.4%	322
None	47.9%	33.4%**	296
Education			
None or primary	19.4%	20.0%	120
Secondary	66.7%	25.0%	412
Higher than secondary	13.9%	47.7%***	86
Wealth			
Second to fifth quintiles	79.9%	30.2%	494
First quintile/Poorest	20.1%	15.3%**	124
Motivation and ability			
Low motivation AND low ability	63.6	14.0	393
High motivation OR high ability	23.0	43.7	142
High motivation AND high ability	13.4	61.4***	83

100%

27.2%

618

*p<0.05 **p<0.01 ***p<0.001

Table 8. Logistic regression showing the adjusted odds of modern contraceptive use among Nigerian women

	Model 1	Model 2
	aOR (95% CI)	aOR (95% CI)
Motivation and ability		
Low motivation AND low ability	1.00	1.00
High motivation OR high ability	4.76*** (2.85,7.96)	3.93*** (2.49,6.23)
High motivation AND high ability	9.79*** (5.56,17.25)	7.91*** (4.38,14.26)
Region		
South	<i>Not included</i>	1.00
North	<i>Not included</i>	1.21 (0.80, 1.84)
Age		
14-19	<i>Not included</i>	1.00
20-24	<i>Not included</i>	1.25 (0.78,2.02)
Marital status		
Married	<i>Not included</i>	1.00
Boyfriend	<i>Not included</i>	2.42**(1.40,4.20)
Number of children		
1-3	<i>Not included</i>	1.00
None	<i>Not included</i>	1.04 (0.61,1.79)
Education		
None or primary	<i>Not included</i>	1.00
Secondary	<i>Not included</i>	0.71 (0.43,1.15)
Higher than secondary	<i>Not included</i>	1.23 (0.57,2.64)
Wealth		
Second to fifth quintiles	<i>Not included</i>	1.00
First quintile/Poorest	<i>Not included</i>	0.45** (0.26,0.80)
Pseudo R ²	13.79%	17.90%
Number of women	618	618

*p<0.05 **p<0.01 ***p<0.001 aOR = Adjusted Odds Ratios; 95%CI = 95% Confidence Interval

Figures

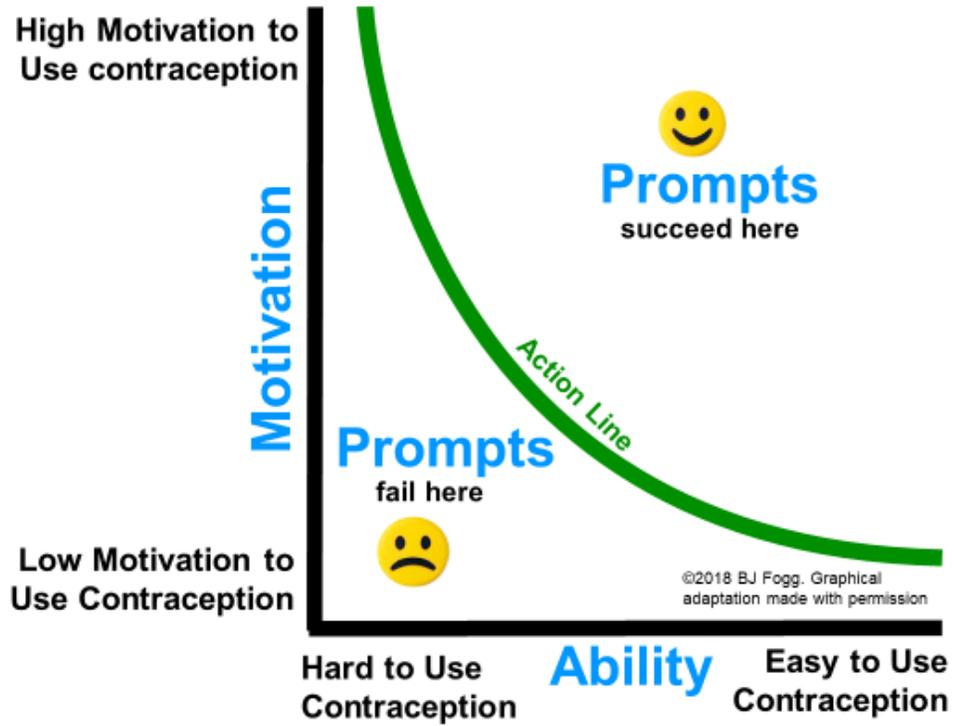


Figure 1

Fogg Behavior Model in the Context of Contraceptive Use