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Bridging the Behavioral Intention Action Gap in Reusable Menstrual Product Adoption through Digital Health Literacy and Protection Motivation Theory

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Bridging the Behavioral Intention Action Gap in Reusable Menstrual Product Adoption through Digital Health Literacy and Protection Motivation Theory

Abstract

The research utilizes Protection Motivation Theory (PMT) to explore factors influencing the adoption of reusable menstrual products and the role of digital health literacy in bridging the behavioral intention-behavior gap in sustainable menstrual health practices. A cross-sectional survey was conducted using structured questionnaires. The conceptual framework integrated digital health literacy with PMT's threat and coping appraisal components, and the data were analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM). Results reveal that perceived severity, vulnerability, and response cost positively influence behavioral intention to adopt these products, while self-efficacy and response efficacy show limited predictive power. Digital health literacy acts as an indirect enabler of behavioral intention rather than a direct influence. The significant behavioral intention-behavior link indicates a narrower gap in this context, offering theoretical and practical insights for more inclusive menstrual health solutions by demonstrating the importance of coping appraisal over threat appraisal.

Keywords

Reusable menstrual products; Protection Motivation Theory; digital health literacy; coping appraisal; behavioral intention–behavior gap; sustainable health behavior; menstrual health management.

Introduction

The management of menstrual health is essential for sustainability, gender equity, and public health. Although reusable menstrual products, such as cups and cloth pads, are becoming more popular, their use remains low in low- and middle-income countries. This discrepancy,

characterized by a behavioral intention–behavior gap (Sharma et al., 2025; Dwumfour-Asare et al., 2024; Kaur et al., 2023), necessitates effective interventions to align behavioral intentions with actual behaviors. Similar gaps are observed in various health behaviors (Sheeran & Webb; Rhodes & de Bruijn). Factors like social stigma, cultural norms, misinformation, and individual beliefs hinder the adoption of reusable products, despite favorable environmental and cost-related behavioral intentions. The challenge highlights the need for frameworks addressing cognitive and informational processes in behavior implementation rather than solely focusing on behavioral intention creation (Hennegan et al; Van Eijk et al).

Protection Motivation Theory (PMT) describes health-protective behavior through coping and threat appraisal, suggesting individuals will adopt protective actions if they see the response as effective, feel self-efficacious, perceive costs as manageable, and view health threats seriously. While PMT has been effectively applied to areas such as immunization and illness prevention (Milne, Sheeran et al., 2000; Maleki et al., 2023; Japalaghi et al., 2025), its use in promoting sustainable health products like reusable menstrual items is underexplored. Additionally, Digital Health Literacy (DHL) is vital for accessing health information, defined as the capacity to locate, understand, evaluate, and apply digital health information. Higher DHL correlates with better health decision-making and service use, while low DHL exacerbates health inequalities, notably among women and socioeconomically disadvantaged groups (Dadaczynski et al., 2021;Paakkari et al., 2020).

Recent research shows that Digital Health Literacy (DHL) significantly impacts awareness, risk perception, self-efficacy, and trust in health information sources, crucial for behavioral change (Levin-Zamir et al., 2018; Zhou et al., 2025). Higher DHL enables individuals to access reliable information and convert online knowledge into practical health behaviors, particularly in digital sexual and reproductive health contexts (Melhem et al., 2025). However, the relationship between DHL and actual health behavior is underexplored, with findings

suggesting that attitudes and DHL mediate the effects of digital information accessibility on healthcare intentions (Cho et al., 2025). Research has concentrated on knowledge and attitudes in menstrual health rather than actual behavior (Shukla and Sanjeev, 2024). The omission of DHL in health behavior theories highlights the gap in understanding how digital skills influence health practices. Although digital interventions are growing, they cannot assume behavior change without adequate DHL, which is necessary for understanding product use, evaluating hygiene risks, and dispelling myths—raising concerns about whether digital health advancements genuinely empower users or favor those with higher literacy.

The study examines the adoption of reusable menstruation products through digital health literacy (DHL) within a Protection Motivation Theory (PMT) framework. It positions DHL as crucial for improving coping appraisals, thus helping translate behavioral intentions into actions. The research addresses the gap between behavioral intention and behavior in sustainable menstrual health practices, contributing by applying PMT, highlighting the importance of DHL, and offering insights for digitally mediated interventions focused on equality and literacy. The work proposes a model for future research, emphasizing literacy's role in behavioral theories and promoting sustainable health behaviors.

Literature Review and Hypothesis Development

Protection Motivation Theory (PMT) in the Context of Reusable Menstrual Product Adoption.

Threat appraisal and coping appraisal are two parallel cognitive processes that people use to process threat information and form behavioral intentions to engage in protective or adaptive behaviors. PMT was first proposed by Rogers in 1975 and revised by Rogers in 1983. While coping assessment evaluates the effectiveness of suggested responses, one's capacity to carry them out (self-efficacy), and related expenses, threat appraisal evaluates the seriousness of a threat and one's own susceptibility to it. Protection motivation, which is usually operationalized

as behavioral behavioral intention and predicts actual conduct, is produced by these evaluations less the rewards of maladaptive behaviors (Rogers, 1983; Floyd et al., 2000). PMT has recently been applied (2020–2026) to pro-environmental and sustainable behaviors, such as resource conservation and climate adaptation, where coping appraisals frequently exhibit greater predictive power than threat appraisals (Kothe et al., 2024; Frantz et al., 2024). Protection motivation behavioral intention is positively correlated with perceived severity, vulnerability, response efficacy, and self-efficacy, according to meta-analyses; response costs have a weakly negative influence (Hedayati et al., 2023). Menstrual cups, reusable pads, and period underwear are examples of reusable menstrual products (RMPs). PMT frames environmental pollution, health risks from disposables (such as chemicals and waste), and period poverty as threats in the domain of RMP adoption, while RMPs are adaptive responses that promote sustainability, cost savings, and health equity. The framework aligns well with research employing similar models like the Health Belief Model or Theory of Planned Behavior, revealing needs for integrated testing, even though direct PMT applications to RMPs are still restricted (e.g., Negi et al., 2024 meta-analysis on menstrual cup adoption in India).

Perceived Severity and Behavioral Intention

According to Rogers (1983) and Hedayati et al. (2023), perceived severity is a person's subjective evaluation of how significant the repercussions would be if the threat materialized. These implications may be environmental, social, economic, or bodily. Its theoretical underpinnings are found in PMT's threat evaluation process, which is based on fear appeal and expectancy-value models (Rogers, 1975; Lazarus' stress and coping framework). When coping choices are available, higher severity evaluations increase motivation; meta-analyses consistently demonstrate positive associations with behavioral intentions (moderate effect sizes) (Floyd et al., 2000; Hedayati et al., 2023). It contrasts with generic risk perception by being threat-specific and consequence-oriented, and it differs from perceived vulnerability

(probability-focused) by stressing the degree and impact rather than likelihood. Severity in RMP adoption refers to perceptions of health hazards (such as chemical exposure) or environmental harm from disposable trash, which motivates behavioral intention beyond awareness. A balanced message for menstrual sustainability is suggested by critical assessments, which point out that an over-reliance on fear without effectiveness may backfire (Frantz et al., 2024). As such, the following hypothesis is proposed:

H1: Perceived severity positively influences behavioral intention.

Perceived Vulnerability and Behavioral Intention

A person's assessment of their own probability or likelihood of encountering the threatening occurrence or injury is known as perceived vulnerability (or susceptibility) (Rogers, 1983). It is based on PMT's threat appraisal, which has similarities to the Health Belief Model and encourages people to interact with severity when they see themselves in danger (Hedayati et al., 2023; Milne et al., 2000). According to recent research, there are slight but positive correlations with goals ($\beta = 0.16$) (Hedayati et al., 2023). It is different from objective risk since it is subjective and prone to biases (such as optimistic bias) and from severity because it emphasizes personal likelihood rather than harm amount. Different from societal-level environmental concern, it captures perceptions about individual contributions to plastic pollution, period poverty exposure, or health vulnerabilities from disposables in RMP situations. Its context-dependency has been criticized in the literature; regular throwaway users may be less vulnerable (Kothe et al., 2024). As such, the following hypothesis is proposed:

H2: Perceived vulnerability positively influences behavioral intention.

Response Cost and Behavioral Intention

The perceived obstacles, costs (money, time, effort, psychological, or social), or disadvantages related to carrying out the advised protective behavior are all included in response cost (Rogers,

1983). Efficacy views are negatively weighed against PMT's coping evaluation, which is derived from cost-benefit paradigms. Meta-evidence indicates a weak negative influence on motivation (Hedayati et al., 2023; Floyd et al., 2000). It is distinct from both generic barriers (like those seen in TPB) and maladaptive incentives (benefits of staying the same) by emphasizing the costs of the adaptive response. Different from throwaway convenience, RMP costs include the initial purchase price, learning curve, cleaning/maintenance, and stigma/leakage concerns. Although cultural and psychological costs still exist, recent research emphasizes affordability initiatives as mitigators (Negi et al., 2024). As such, the following hypothesis is proposed:

H3: Response cost negatively influences behavioral intention.

Response Efficacy and Behavioral Intention

The idea that the suggested course of action will successfully prevent or lessen the threat is known as response efficacy (Rogers, 1983). Efficacy views are negatively weighed against PMT's coping evaluation, which is derived from cost-benefit paradigms. Meta-evidence indicates a weak negative influence on motivation (Hedayati et al., 2023; Floyd et al., 2000). It is distinct from both generic barriers (like those seen in TPB) and maladaptive incentives (benefits of staying the same) by emphasizing the costs of the adaptive response. Different from throwaway convenience, RMP costs include the initial purchase price, learning curve, cleaning/maintenance, and stigma/leakage concerns. Although cultural and psychological costs still exist, recent research emphasizes affordability initiatives as mitigators (Negi et al., 2024). As such, the following hypothesis is proposed:

H4: Response efficacy positively influences behavioral intention.

Self-Efficacy and Behavioral Intention

Self-efficacy is the belief in one's capacity to carry out the suggested conduct, including overcoming challenges (Bandura, 1997, incorporated into PMT by Rogers, 1983). According to several meta-analyses, it is frequently the best indicator of behavioral intentions (Hedayati et al., 2023; Floyd et al., 2000). It is distinct from perceived behavioral control (TPB) by emphasizing internal confidence and from response efficacy by prioritizing human agency above action effectiveness. It provides techniques for discreet use, washing procedures, and insertion (cups) for RMPs. Tutorials and other interventions improve it by removing obstacles to adoption (Kothe et al., 2024). As such, the following hypothesis is proposed:

H5: Self-efficacy positively influences Behavioral Intention.

Behavioral Intention and Actual Behavior

The proximal result of PMT assessments is behavioral intention, which is the motivational readiness or plan to carry out a particular action (Rogers, 1983). With powerful but inaccurate behavior prediction because of volitional gaps, purpose connects cognitive appraisals and action in PMT and related theories (Sheeran, 2002; Hedayati et al., 2023). It is prospective rather than enacted, which sets it apart from real activity. : Behavioral intention predicts trial or ongoing use in RMP research, but access or maintenance problems lead to gaps. According to Negi et al. (2024), longitudinal designs emphasize translation facilitation. As such, the following hypothesis is proposed:

H6: Behavioral intention positively influences Action Behavior.

The Moderating Effect of Digital Health Literacy (DHL) on Behavioral Intention and Actual Behavior

The ability to find, comprehend, assess, and use digital health tools and information to make informed decisions is known as "digital health literacy" (DHL) (Norman & Skinner, 2006; López et al., 2023). DHL expands the model as a post-behavioral intention moderator, utilizing

eHealth literacy frameworks to improve translation through lessons, reviews, or support, even though it is not central to traditional PMT (Çetin & Gümüş, 2023; Kim et al., 2023).

Its digital specificity sets it apart from generic health literacy, and its emphasis on information navigation sets it apart from self-efficacy. High DHL moderates RMP uptake by providing access to trustworthy maintenance information or dispelling myths, which is particularly important in sustainability education for the digital age. According to recent research, DHL is a crucial facilitator of intention-behavior relationships (Qiu et al., 2025; Liu et al., 2026).

H7: Digital Health Literacy (DHL) positively moderates the relationship between Behavioral Intention and Actual behavior

Protection Motivation Theory (PMT) is useful in predicting pro-environmental and health-related actions, but its application to the adoption of reusable menstruation products (RMPs) is still somewhat limited. With little direct integration of PMT's dual appraisal processes, the majority of current research on RMPs (such as menstrual cups and reusable pads) relies on descriptive assessments of awareness, barriers, and sociodemographic factors or draws from more general frameworks like the Theory of Planned Behavior or Health Belief Model (Negi et al., 2024; Prima Citta et al., 2024). Few studies test a full PMT model in the RMP context, especially in high-burden settings like India, where period poverty, cultural stigma, and plastic waste intersect. In contrast, threat appraisals (severity and vulnerability) and coping appraisals (response efficacy, self-efficacy, response costs) are studied in analogous domains like sustainable consumption or hygiene behaviors. Moreover, menstrual literature pays little attention to the behavioral intention-behavior gap, a well-documented weakness in PMT and related theories. Studies show limited sustained adoption despite high knowledge, but they hardly ever look at post-behavioral intention moderators. It is imperative to close these gaps for a number of reasons. Scaling RMP use can help achieve global sustainability goals by drastically reducing plastic waste from disposable products. In terms of health, it reduces the

hazards associated with chemical-laden disposables and promotes menstrual fairness by reducing long-term expenses and tackling period poverty, particularly in low- and middle-income nations like India.

The concept for modern digital health contexts, where information-seeking is increasingly done online, is theoretically advanced by extending PMT with a digital moderator like DHL. Practically speaking, an understanding of behavioral intention-behavior translation can guide focused interventions (such as apps and digital tutorials) that go beyond awareness campaigns to long-term behavior change, producing advantages for the environment, public health, and the economy.

By using a thorough PMT framework specifically for RMP adoption in the Indian context, testing all fundamental dimensions, and utilizing DHL as a unique moderator between behavioral intention and actual behavior, your suggested study closes these gaps. It offers empirical information on the relative strength of threat versus coping assessments in sustainable menstruation by using a (probably quantitative or mixed-methods) approach using validated instruments. Through moderation analysis, it directly addresses the intention-behavior gap and provides useful information for digital interventions. It provides context-specific findings that expand PMT to understudied pro-environmental health behaviors, enabling high-impact Q1 publications and policy recommendations for menstrual health programs. It is conducted in a high-relevance setting, such as Delhi or larger India.

The suggested conceptual model is based on Rogers' (1983) Protection Motivation Theory, which holds that behavioral intention to adopt reusable menstrual products is predicted by threat appraisal (perceived severity and vulnerability regarding environmental/health impacts of disposables) and coping appraisal (response efficacy, self-efficacy, and response costs of RMPs). The association between behavioral intention and actual adoption behavior is

moderated by Digital Health Literacy (DHL), which strengthens the relationship at higher DHL levels by providing access to trustworthy information, tools for developing skills, and content that dispels myths. For robustness, putative mediators (like attitude) and control factors (including age, socioeconomic position, and prior experience) may be added. By incorporating a moderator from the digital age, this moderated mediation framework expands on traditional PMT. It may be tested using hierarchical regression or structural equation modeling to provide subtle insights into the translation of sustainable behavior(Figure 1).

Insert Figure 1, Conceptual research model

Research Methodology

Research design

To investigate the factors influencing the adoption of reusable menstrual products, this study used a quantitative, cross-sectional research approach. Since data were gathered from respondents at a particular point in time to capture their beliefs, behavioral intentions, and self-reported behaviors related to menstruation product use, a cross-sectional approach was deemed appropriate. The enlarged role of digital health literacy and hypothesized links developed from Protection Motivation Theory (PMT) could be statistically tested thanks to quantitative methodologies(Creswell & Creswell, 2018).

In PMT-based research, where behavioral intention and action are explained by measuring cognitive appraisals like perceived severity, vulnerability, self-efficacy, and response cost simultaneously, the approach is especially appropriate (Rogers, 1983; Floyd et al., 2000). Furthermore, because cross-sectional survey methods are practical and can effectively assess complicated behavioral models, they are frequently used in studies on sustainable consumption and digital health (Hair et al., 2019).

Sampling and data collection

The intended audience is menstruators who know about or have used menstrual hygiene products, such as disposable and reusable items like menstrual cups, cloth pads, or period underwear, made up the target population. The study concentrated on people who were of reproductive age and capable of making their own decisions about the use of menstrual products.

Method of Sampling

Data was collected using a non-probability convenience sampling technique. This approach is widely utilized in behavioral and exploratory health research, particularly when dealing with delicate subjects like menstrual health, where random sampling may be challenging to use (Etikan et al., 2016). In theory-testing research employing structural equation modeling, convenience sampling is also deemed appropriate when the goal is model estimation and explanation rather than population generalization (Saunders et al., 2019).

A self-administered online survey was used to gather data, and it was disseminated via social media and email. Given the study's emphasis on digital health literacy, the online method of data collection was suitable and guaranteed respondent confidentiality and accessibility. For data analysis, a total of 186 valid responses were employed. According to PLS-SEM requirements, which place a higher priority on prediction accuracy than large sample sizes, the sample size was judged sufficient. The "10-times rule" states that each endogenous construct should have a minimum sample size that is at least ten times the maximum number of structural routes. The concept of Behavioral intention in this study received the most input pathways, supporting the sample's adequacy.

Furthermore, previous methodological research indicates that sample sizes ranging from 50 to 150 are appropriate for PLS-SEM exploratory and theory-extension studies, especially when the model exhibits adequate indicator reliability and effect sizes.

Measurement Tools

Multi-item reflective measures that were modified from recognized and validated scales in earlier research were used to operationalize all of the study's dimensions. Perceived vulnerability, perceived severity, self-efficacy, and response cost were among the constructs of the Protection Motivation Theory. While intention and behavior represented the intention–behavior continuum, digital health literacy was considered a crucial enabling factor impacting coping appraisal mechanisms.

Perceived vulnerability and perceived severity were adapted from PMT-based health risk perception studies (Rogers, 1983; Weinstein, 2000). Self-efficacy items were based on Bandura's (1997) conceptualization of perceived capability in performing a behaviour. Response Cost items captured perceived barriers associated with reusable menstrual product adoption, adapted from PMT literature (Floyd et al., 2000). Digital Health Literacy (DHL) was measured using four items adapted from the eHealth Literacy Scale (eHEALS), capturing individuals' ability to find, understand, evaluate, and apply online health information (Norman & Skinner, 2006; van der Vaart & Drossaert, 2017). Behavioral intention was measured using items grounded in the Theory of Planned Behaviour and intention–behaviour research (Ajzen, 1991; Sheeran, 2002). Behaviour reflected self-reported adoption and consistent use of reusable menstrual products.

A five-point Likert scale, with 1 denoting "strongly disagree" and 5 denoting "strongly agree," was used to measure each item. For behavioral research, a five-point scale is advised because it strikes a compromise between responder cognitive load and enough variability for statistical analysis (Hair et al., 2019).

Method of Data Analysis

Partial Least Squares Structural Equation Modeling (PLS-SEM) was used to analyze the data. Because of its applicability for prediction-oriented research, theory extension, and complicated models with several latent constructs and mediation or moderation effects, PLS-SEM was chosen (Hair et al., 2019). The method is especially useful when the goal of the study is not to validate a well-established theory but rather to explain variance in important dependent variables, such as intention and behavior (Chin, 1998). Furthermore, PLS-SEM is suitable for the current investigation since it works well with non-normal data distributions and comparatively small sample sizes (Hair et al., 2021). SmartPLS (version 4) was used for the analysis. As advised by Hair et al. (2019), the evaluation took a two-step approach, evaluating the measurement model before looking at the structural model. Convergent validity, discriminant validity, and internal consistency reliability were all evaluated in the measurement model. Path coefficients, significance levels, coefficient of determination (R2), and predictive relevance were the main emphasis of structural model evaluation.

To assess the statistical significance of the hypothesized relationships, a bootstrapping procedure with 5,000 resamples was employed. Bootstrapping is a non-parametric resampling technique recommended in PLS-SEM to generate robust standard errors and confidence intervals for hypothesis testing (Hair et al., 2017).

The investigation was conducted with scrupulous adherence to ethical norms. Before filling out the questionnaire, participants were made aware of the goal of the study, and participation was entirely optional. At the start of the survey, informed consent was electronically sought. Respondent confidentiality and anonymity were guaranteed since no directly identifiable information was gathered. The study adhered to accepted ethical standards for social science research that uses human subjects (American Psychological Association, 2020).

Result analysis

Sample characteristics and Analytical approach

Partial Least Squares Structural Equation Modeling (PLS-SEM) with SmartPLS was used to analyze the suggested research model. PLS-SEM was chosen because of its efficacy in behavioral research contexts, robustness in managing complicated models, and suitability for prediction-oriented research. The analysis was carried out in two phases in accordance with established protocols: (1) measurement model assessment and (2) structural model evaluation. A bootstrapping process with 5,000 resamples was used to evaluate the relevance of the proposed correlations.

Before estimating the structural model, the demographic features were looked at to make sure the sample was appropriate for the study's goals. Overall, the profile shows a demographic with low actual adoption of reusable menstruation products but one that is digitally active and cognitively capable of interacting with health information. Because of this, the sample is suitable for examining how protection motivation mechanisms and digital health literacy contribute to closing the intention-behavior gap. A detailed summary of respondent demographics is presented below in Table 1.

Insert Table 1: Demographic Profile of Respondents

Young adults between the ages of 18 and 30 made up the majority of the sample's 186 responses (77.4%), which reflects the reproductive age group most pertinent to menstrual health decision-making. More than half of the participants (55.4%) had postgraduate degrees, indicating a reasonably educated group with possible exposure to online health services and digital health information. The respondents' monthly income was split reasonably evenly across all income categories, with 40.3% reporting an income between INR 25,000 and 50,000, indicating a modest level of purchasing power for goods connected to health. Disposable sanitary pads were

the most widely utilized menstrual product (75.8%), while reusable menstrual items were only used in a small percentage of cases (12.9%). This discrepancy shows that, despite increased awareness and favorable attitudes toward ecologically friendly substitutes, there is still an intention-behavior gap in the use of sustainable menstruation products. In terms of occupation, the sample comprised homemakers (19.4%), working professionals (43.0%), and students (37.6%), representing a varied set of menstruators with different lifestyle demands and resource limitations.

Measurement model assessment

The measurement model evaluation utilized the PLS-SEM approach to assess indicator reliability, internal consistency, and convergent validity. Indicator reliability revealed strong loadings, ranging from 0.752 to 0.987, confirming the adequacy of indicators representing latent constructs (Hair et al., 2022). Internal consistency was validated by Cronbach's alpha (0.840 to 0.945) and composite reliability (0.895 to 0.963), while Average Variance Extracted (AVE) values (0.742 to 0.896) exceeded the 0.50 threshold, affirming convergent validity as per PLS-SEM standards (Hair et al., 2022; Fornell & Larcker, 1981) as shown in Table 2.

Insert Table 2: Results of the measurement model

Discriminant validity was evaluated using the HTMT ratio, with values between constructs significantly below the 0.85 threshold, supporting distinct constructs and indicating no multicollinearity issues, as mentioned in Table 3. Overall, results confirm the measurement model's reliability and validity, justifying subsequent structural model assessment.

Table 3: Discriminant validity heterotrait-montrait ratio (HTMT)

Structural model results and hypothesis testing

The bootstrapping process in SmartPLS was used to assess the structural model and investigate the proposed links. Table 4 presents the findings.

H1 was supported by the considerable positive influence of perceived severity on behavioral intention ($\beta = 0.290$, $t = 5.48$, $p < 0.001$). Likewise, H2 was supported by the strong influence of perceived vulnerability on behavioral intention ($\beta = 0.271$, $t = 4.880$, $p < 0.001$). The finding supported H3 that response cost was a robust predictor of behavioral intention ($\beta = 0.375$, $t = 6.296$, $p < 0.001$). On the other hand, H4 was rejected because response efficacy and behavioral intention did not show a significant correlation ($\beta = -0.030$, $t = 0.367$, $p = 0.857$). H5 was rejected because self-efficacy also had a non-significant impact on behavioral intention ($\beta = 0.071$, $t = 0.625$, $p = 0.625$). H6 was supported by the finding that behavioral intention significantly improved action behavior ($\beta = 0.345$, $t = 6.233$, $p < 0.001$). Nevertheless, H7 was not supported since the moderating effect of digital health literacy on the association between behavioral intention and action behavior was not statistically significant ($\beta = -0.252$, $t = 0.574$, $p = 0.574$).

Three hypotheses (H4, H5, and H7) lacked empirical evidence, whereas four hypotheses (H1, H2, H3, and H6) did. These results imply that, although behavioral intention is still a major predictor of action behavior, threat appraisal variables and response cost influence behavioral intention more than coping appraisal factors. The construct labelled as Intention in the structural model refers to Behavioral Intention toward the adoption of reusable menstrual products. Results are clearly shown in Figure 2.

Figure 2, . Path coefficients for the integrated model

Overall, the structural model results emphasize the significance of psychological competence and perceived feasibility in sustaining menstrual health practices and offer empirical support for the dominance of coping appraisal processes over threat appraisal in shaping adoption behavioral intention.

The coefficient of determination was used to evaluate the structural model's explanatory ability. According to the findings, the suggested model has a moderate level of explanatory strength, explaining 32.8% of the variance in behavioral intention (R2 = 0.328; modified R2 = 0.311). Additionally, the model explains 48.0% of the variance in action behavior (R2 = 0.480; adjusted R2 = 0.472), indicating a significant capacity for behavioral outcome prediction.

Effect size (F^2) values revealed the contributions of exogenous constructs to endogenous variables. According to Hair et al. (2019), F^2 values indicate modest (0.02), medium (0.15), and large (0.35) effects. Digital health literacy showed minimal impact on behavioral intention ($F^2 = 0.000$), suggesting it does not significantly affect behavioral intention directly, though it may influence it indirectly through factors such as response cost and self-efficacy. Response cost had a small-to-moderate effect on behavioral intention ($F^2 = 0.135$), indicating that perceived costs influence adoption behavioral intentions. Overall, while some constructs significantly affect behavioral intention, they have limited capacity to drive meaningful behavioral change, underscoring the need for interventions that address practical obstacles and enhance behavioral intention realization.

The Q^2 values for behavioral intention and action behavior were positive, indicating the structural model's adequate predictive capability. The Q^2 value for behavioral intention was

0.15 and for action behavior was 0.27, demonstrating satisfactory predictive relevance and out-of-sample predictive accuracy.

Insert Table; 4 Path Coefficients and Hypothesis Testing Results Discussion

Digital health literacy was included as a moderating variable in this study, which used Protection Motivation Theory to investigate the factors that influence behavioral intention and action behavior. The results offer complex insights into how behavioral intentions and subsequent action behavior are influenced by threat appraisal and coping appraisal components.

Threat appraisal and Behavioral Intention. The findings show that behavioral intention is strongly and favorably influenced by perceived severity and perceived vulnerability. These results imply that when people understand the gravity of health-related dangers and believe they are vulnerable to them, they are more likely to have strong behavioral intentions. This is consistent with PMT, which holds that protective motivation is activated by elevated threat assessment. These structures' substantial influence on behavioral intention is further demonstrated by the noteworthy effect sizes linked to them. (Rogers, 1975; Rogers, 1983). Health behavior research has extensively documented empirical support for the importance of severity and vulnerability, especially in situations of risk-avoidance and prevention (Floyd et al., 2000; Milne et al., 2000). The current research supports the claim that perceptions of threat are strong motivators, particularly when people are faced with real and personally meaningful hazards. Furthermore, it was found that response cost was a highly significant predictor of behavioral intention. This implies that before making decisions, people carefully consider the perceived costs of various behavioral reactions. People are more likely to have

protective behavioral intentions when the costs of maladaptive behavior are high or the perceived costs of protective action are low.

This result is in line with earlier PMT-based research that highlights how important cost-benefit analyses are when making decisions about one's health (Norman et al., 2015; Plotnikoff et al., 2010).

Coping Intention and Appraisal Self-efficacy and response efficacy did not significantly affect intention, which is in contrast to PMT beliefs. Despite PMT's theory that protective behavior should be motivated by beliefs about the efficacy of suggested actions and one's capacity to carry them out (Rogers, 1983), comparable non-significant results have been documented in situations where efficacy beliefs are well-established or exhibit little variation (Milne et al., 2000; Maddux & Rogers, 1983). One reasonable argument is that the explanatory power of self-efficacy may be diminished since respondents may already have a high and comparatively consistent level of confidence in their capacity to carry out the behavior. In situations when health messaging is frequently presented and information is widely available, response effectiveness may also be assumed. These findings extend PMT by emphasizing its contextual bounds and imply that threat appraisal mechanisms influence intention more than coping appraisal processes in this situation.

Behavioral Intention and Action Behavior The results corroborate the central claim of PMT and similar behavioral theories that behavioral intention is the most proximal predictor of behavior (Rogers, 1983; Sheeran, 2002) by confirming that behavioral intention significantly predicts action behavior. Behavioral intention is crucial for converting cognitive assessments into real activity, as evidenced by the high path coefficient and significant explained variance.

This finding is in line with earlier studies that showed a strong intention-behavior relationship across a variety of health-related domains (Armitage & Conner, 2001; Floyd et al., 2000). It emphasizes how crucial it is to fortify behavioral intentions in order to accomplish significant behavioral change.

Digital Health Literacy's Moderating Function. There was no evidence to support the idea that digital health literacy moderates the link between behavioral intention and action behavior. This implies that the strength of the intention-behavior relationship is not substantially changed by digital health literacy. One possibility is that, especially in populations where digital information is regularly accessible, digital health literacy might serve as a basic skill rather than a moderator that differentiates (Norman & Skinner, 2006; van der Vaart & Drossaert, 2017). Instead of affecting how behavioral intentions are translated into actions, digital health literacy may directly impact health behaviors by influencing how people access, understand, and evaluate information. Similar questions have been raised by prior research regarding the moderating function of literacy-related factors, indicating that their impact might be more noticeable at earlier stages of cognitive development (Paakkari & Okan, 2020).

Explanatory and Predictive Power of the Model A significant percentage of the diversity in both behavioral intention and action behavior can be explained by the model, which has moderate explanatory power. The PMT-based predictors successfully capture the factors that influence behavioral outcomes, according to the R2 values. Additionally, the model's predictive significance is confirmed by the positive Q2 values, which also show that it has sufficient out-of-sample predictive power (Hair et al., 2022).

Theoretical Implications

This study adds a number of noteworthy findings to the body of knowledge regarding intention-behavior relationships in digital health settings. In the first place, the results support Protection Motivation Theory (PMT) by showing that elements of threat assessment, including perceived severity and perceived vulnerability, as well as response cost, had a greater impact on behavioral intention formulation than beliefs linked to efficacy. In technologically advanced and behaviorally familiar circumstances, behavioral intention is influenced more by risk assessment and cost-benefit analysis than by perceived ability or response effectiveness, according to the non-significant impacts of self-efficacy and response efficacy. Second, the main tenet of the Theory of Planned Behavior (TPB), which holds that behavioral intention is the most direct predictor of behavior, is supported by the strong and significant relationship between behavioral intention and action behavior. Nonetheless, TPB is improved by the notable negative moderation of digital health literacy, which shows that cognitive resources can change the degree of intention-behavior translation. influences the results of behavior. Rather, it presents digital health literacy as a context-sensitive criterion, which enhances theoretical accuracy and promotes more complex uses of well-established behavioral theories.

Managerial Implications

The results offer a number of practical insights from a managerial and policy standpoint. Since perceived severity and vulnerability are important motivators of behavioral intention, risk salience and vulnerability framing should be given top priority in health communication initiatives. Using believable, accessible storylines, messages should effectively convey personal relevance and possible repercussions. Second, the importance of response cost emphasizes the necessity of lowering perceived obstacles, such as expenses associated with effort, money, and psychological issues. It is possible to significantly improve behavioral

intention formation by streamlining processes, providing rewards, and reducing complexity. Third, rather than depending exclusively on post-intention interventions, practitioners should concentrate on enhancing behavioral intention in light of the significant intention–behavior link. Lastly, the negative moderating effect of digital health literacy suggests that highly knowledgeable users could need assistance that is clear, decisive, and action-oriented instead of being overly informational. To prevent cognitive overload in literate users, digital platforms must be designed with ease of use and efficiency in mind.

Limitations and future research scope.

This study has several drawbacks in spite of its contributions. First, causal inference is limited when cross-sectional data is used. To record changes in intention and behavior over time, future research should use experimental or longitudinal designs. Second, using self-reported measures alone could lead to social desirability effects and common method bias; objective behavioral data or mixed-method approaches could be used in future studies. Third, generalizability across cultures or demographic groupings may be limited by the study's environment. It is advised to replicate across various populations and health areas. To further improve explanatory power, future studies could incorporate affective factors such as trust, fear, or moral norms and investigate other functions of digital health literacy, such as antecedents or mediators.

Conclusion

This study contributes to our understanding of how people create intentions and carry them out in digital health settings. The results show that perceived severity, perceived vulnerability, and response cost are the main factors that influence behavioral intention formation, with efficacy-related beliefs having little impact. Although behavioral intention

remains a powerful predictor of behavior, digital health literacy negatively moderates its translation, revealing a complex and understudied dynamic. This study advances existing ideas and offers useful recommendations for managers and policymakers seeking to create inclusive, successful, and cognitively balanced digital health treatments by integrating threat-assessment and behavioral-execution perspectives. Overall, the study emphasizes the importance of focusing on evaluative and motivational factors to promote significant behavioral change in environments mediated by digital media.

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Data Availability Statement

The datasets generated and analysed during the current study are available from the corresponding author on reasonable request.

Consent for Publication:

Not Applicable, as the manuscript does not contain any identifiable individual participant data.

Ethical approval and informed consent statements

The study protocol was approved by the Institutional Ethics Committee of Galgotias Institute of Management and Technology, Greater Noida, and was conducted in accordance with the ethical guidelines and regulations of the committee.

Consent to Participate

Informed consent was obtained from all participants before participation in the study. Respondents were guaranteed privacy and secrecy, and participation was entirely voluntary.

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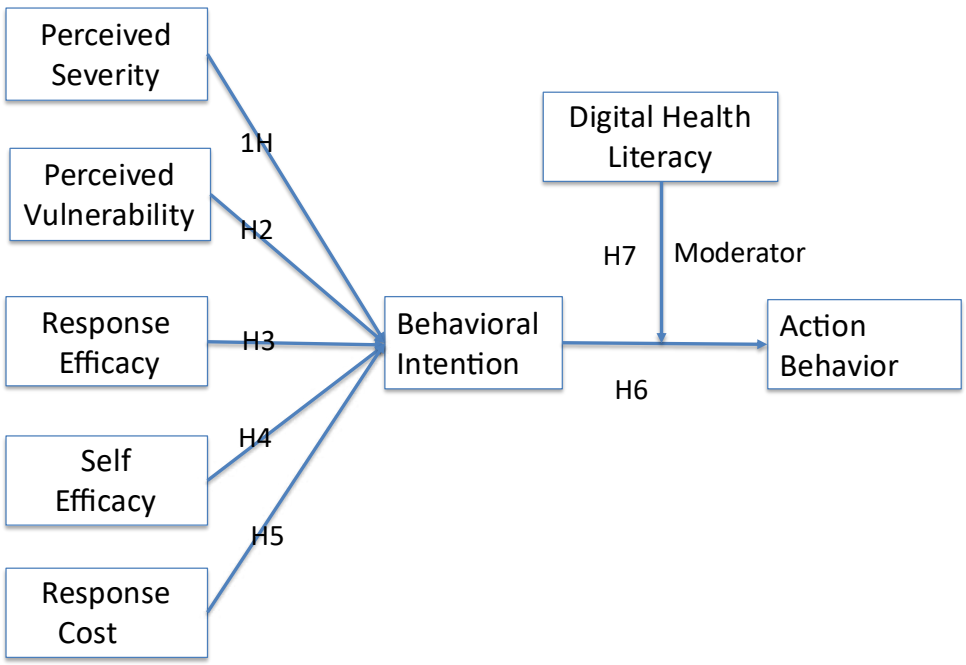


Figure 1, Conceptual research model

Source: Author's own work

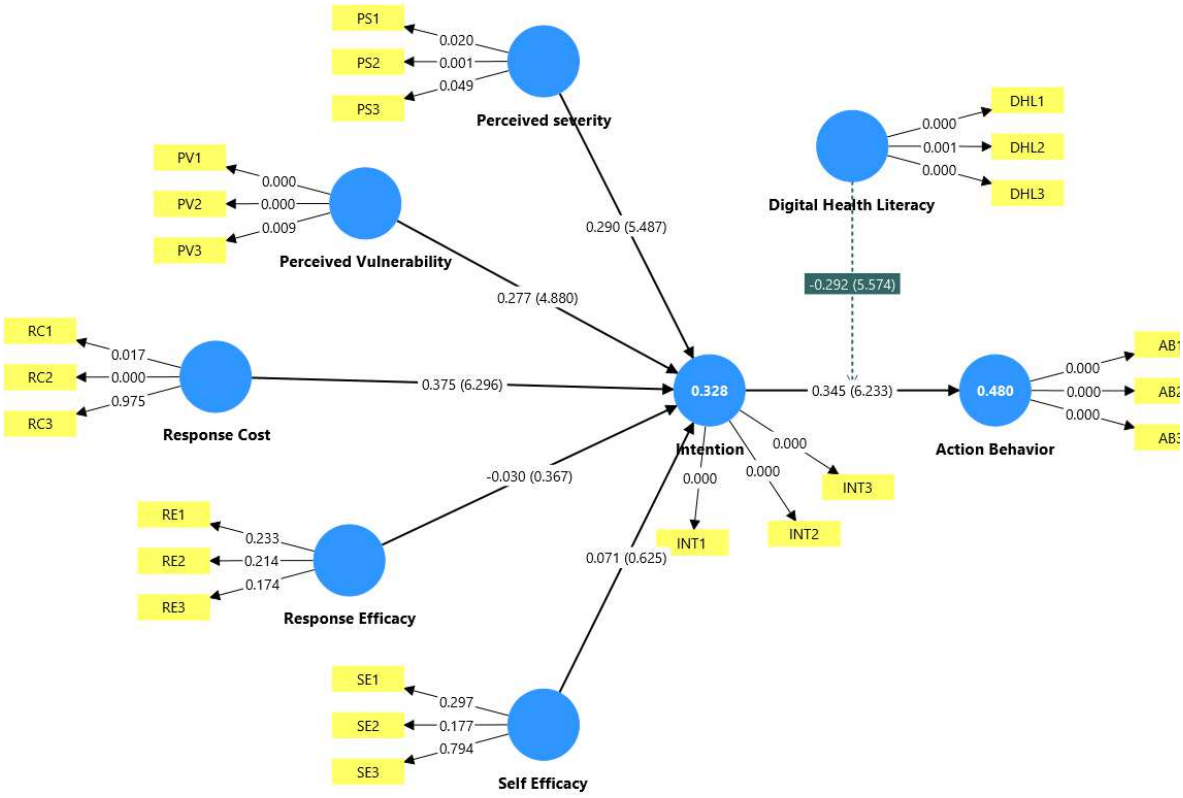


Figure 2, . Path coefficients for the integrated model

Author's own work

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