The role of theories in social marketing in predicting physical activity behavior among the youth

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Abstract

Purpose – The purpose of this paper is to integrate the theory of planned behavior (TBP) and the technology acceptance model (TAM) in social marketing to predict and explain technology adoption (gym equipment use) in physical activity (PA) behavior among Ghanaian youth.

Design/methodology/approach – A quantitative approach was adopted for this study. The empirical data for this paper were drawn from 314 youth who are gym equipment users. The hypothesized relationships were analyzed using structural equation modeling.

Findings – This study found that the salient beliefs, namely, attitude, subjective norm and behavioral control toward gym equipment use, do not sufficiently explain PA adoption. However, a better result emerges when these salient beliefs are combined with perceived usefulness (PU) and ease of use (TAM).

Practical implications – This paper provides evidence for issues of potential research, policy and managerial interest. The study findings showed that PA adoption, not PEOU, was directly impacted by PU. Thus, policymakers and implementers of social marketing intervention programs should promote the positive attitude toward gym equipment technology use and the perceptions of usefulness (improve cardiorespiratory fitness, feeling healthy and building muscle strength) of using gym equipment technology instead of ease of use to increase PA technology adoption behavior.

Originality/value – Considering the uniqueness of this current study in the Ghanaian context, to the best of the authors’ knowledge, this paper is the first to integrate two influential theories, namely, the TBP and TAM, to examine the effects of the TBP and TAM variables on the adoption of technology (gym equipment use) in PA among the youth.

Keywords Physical activity, Attitude, Subjective norm, Social marketing, Perceived usefulness, Perceived behavioural control

Paper type Research paper

1. Introduction

In the past decades, there has been a rapid increase in the number of studies suggesting that physical inactivity is one of the leading risk factors for non-communicable diseases (NCDs), which accounts for more premature deaths in both developed and developing worlds (World Health Organisation [WHO], 2009). In 2015, for example, statistical estimates indicate that there were about 3.2 million preventable deaths around the world owing to lack of physical activity (PA) (WHO, 2015). The estimates also project NCDs to become the number one cause of death in Africa by 2030 (WHO, 2015). In Ghana, an estimated 42 per cent accounted for all preventable NCD mortality in 2012 (WHO, 2010/2014).
In an attempt to reduce the burden and impact of NCDs in Ghana, there have been several educational and policy-related interventions by government and non-governmental institutions to increase PA among Ghanaians. Some of these institutions include Non-Communicable Disease Control Unit, National Commission for Civic Education, Ministry of Health (MOH), Ghana Health Service and Health Concerns Ghana, as well as churches. In particular, the MOH, through the Ghana Health Service, launched the “Regenerative Health and Nutrition Project” in 2007, in all the ten regional capitals as a new paradigm for healthy lifestyle (MOH, 2007, 2011). The main objective of this programme was to promote healthy lifestyle and behavior among Ghanaians.

PA adoption has been shown to have a positive impact on the human body and is effective in reducing the risks of chronic diseases (Fransen et al., 2014; Rock et al., 2012). In spite of the health-related benefits associated with PA, the literature suggests that perceived barriers, which often prevent the adoption and maintenance of PA, exist (Davison and Lawson, 2006; Haskell et al., 2007). Some of the most highly cited barriers to participation in PA include lack of time (Schutzer and Graves, 2004), perceived lack of neighborhood safety (Mason and Kearns, 2013), poor weather conditions (Tucker and Gilliland, 2007), crime and poor visibility due to unlit streets (Foster et al., 2014). These factors are likely to affect participants’ perception of safety of being outdoor and the suitability of the environment, which makes PA participation ineffective (Wagner et al., 2016). It has, therefore, become necessary to examine how the use of gym equipment technology (which is mostly performed indoors) could be promoted as an alternative to the traditional PA to encourage participation (Wagner et al., 2016) among the youth in Ghana.

Scholars have indicated the need to develop beneficial exercise strategies, using gym equipment technology to offer a feasible and attractive exercise mode for all (Wagner et al., 2016). This is evident in a study conducted by Shepherd et al. (2015), who found that using high-intensity interval training (gym equipment) improves fitness, cardiorespiratory risk factors and psychological health faster than the traditional PA. Furthermore, studies have indicated that the presence of gym equipment, such as treadmills, muscle builders, stationary bicycles, among many others, may improve exercise participation (Raynor et al., 1998; Jakicic et al., 1999). The findings of Lawton et al. (2005), in a study to ascertain the “barriers to PA in Pakistani and Indian origin with type 2 diabetes patients,” indicate that respondents preferred to use exercise machines, as opposed to outdoor PA, owing to bad weather and other environmental factors associated with traditional PA.

Notwithstanding the tremendous impact that the use of gym equipment technology has on PA fitness in developed countries (Cranney et al., 2016; Furber et al., 2014), Ahlan and Ahmad (2014) opined that its adoption in the developing countries is lagging. This could be attributed, first, to the lack of evidence to prove efficiency and effectiveness of gym equipment technology in increasing the quality of physical well-being of individuals. This is important because the value (Yarbrough and Smith, 2007) the youth places on technology adoption can influence their PA behavior. Second, poor attitude of the youth toward technology adoption is likely to serve as a barrier to the use of gym equipment technology in PA. Thus, to address this social marketing problem, it is important to look at it from a behavioral change point of view, which is the main objective of social marketing (Berkowitz et al., 2008).

The social marketing concept has effectively been used to influence behavior change toward adopting, modifying or abandoning an undesirable behavior for the benefit of the individual and the society at large (Gruneklee et al., 2016). However, the extant social marketing literature seems to suggest that majority of the research has been conducted mostly in developed countries to target a variety of behaviours including the attitude of adolescents toward alcohol (Rundle-Thiele et al., 2013), problem of alcohol use (Kubacki et al.,
healthy eating and physical activity participation (Carins and Rundle-Thiele, 2014), among others, with fairly little research from developing economy contexts (Abouchedid and Eid, 2004).

Although scanty, it is fair to point out that few studies have been performed within the Ghanaian context. However, these studies have mainly focused on HIV/AIDS testing intentions among Ghanaian university students (Tweneboah-Kodua and Owusu-Frimpong, 2013), cervical cancer screening intentions among college students in Ghana (Abotchie and Shokar, 2009) and substance use and risky sexual behaviors among sexually experienced Ghanaian youth (Doku et al., 2012), to the neglect of issues concerning the adoption of technology (gym equipment use) in PA which this study seeks to address.

The use of theory in social marketing campaigns is vital, as it provides the framework for understanding the audience and improves the effectiveness of campaigns (Edgar et al., 2015; Tapp et al., 2013). However, Luca and Suggs (2013) postulate that many social marketers fail to use theory as part of their strategies to understand the phenomenon, which is quite worrying. Among the few studies that have used theories, the health belief model (Julinawati et al., 2013), the stages of change model (Prochaska et al., 2013) and the theory of planned behavior (TPB) (Ajzen, 1991) have dominated the social marketing literature. To this end, calls have been made for additional theories to extend the current theory use in the social marketing literature to better understand and address the complex social issues (Luca et al., 2016; Lefebvre, 2012; Dibb, 2014). For example, Dibb (2014) has called for the inclusion of technology innovations (e.g. technology acceptance model [TAM]) in social marketing to improve its relevance, which, in the long run, will offer huge promise for social marketing interventions.

It is also worth noting that most of these studies mentioned above used single behavior change theories, with relatively less attention given to the integrated model (Fishbein and Cappella, 2006), especially its application of PA adoption. Meanwhile, it has been argued that using a single theory is unlikely to sufficiently explain and account for all the complexities of a given phenomenon (Buchan et al., 2012). For instance, Buchan et al. (2012) assert that owing to the high amount of unexplained variance in the TPB, scholars must include other theories in the TPB to increase its explanatory power. Building on the TPB model, the study introduced two TAM variables (perceived usefulness [PU] and perceived ease of use [PEOU]) as mediators of the relationship between the salient beliefs (attitude, subjective norms, perceived behavioral control) and actual behavior (PA by using gym equipment technology). Thus, this paper aims to integrate the TPB and TAM to predict and explain technology adoption in PA (the use of gym equipment technology in PA) among Ghanaian youth. In this current study, gym equipment technology and technology use in PA are used interchangeably.

The paper provides contributions to both theory and practice. More specifically, this study adds to the social marketing literature by drawing on the TPB and the TAM to help gain understanding into why people engage in PA using technology. As this study is the first to attempt to examine and advance the knowledge of the effect of these two theories in the social marketing context, it makes a significant contribution to theory by providing essential insights that extend our understanding toward technology adoption from a developing country perspective. Second, the paper contributes to practice, as the findings will enable implementers of social marketing programs, policymakers and social marketers aiming to promote technologically inclined PA among Ghanaian youth, to better understand the strategies they need to adopt in promoting technology use behavior.

The rest of the study is structured in the following order: Section 2 provides a review of the theory underpinning the study, which leads to model and hypotheses development; Section 3 presents the research methodology; Section 4 represents analyses and results; and
Section 5 presents discussion and conclusions as well as the implications, contributions, limitations and future research directions.

2. Literature review, theory and hypotheses

Social marketing scholars have argued that in designing interventions to change individuals’ behavior, theories and models are essential, as these can help generate change in social behaviors across a broad range of areas such as road safety, healthy eating and alcohol consumption (Luca and Suggs, 2013). For example, Noar et al. (2008) conducted a study in which he compared interventions that were developed using theories with those developed without theoretical foundation and found that interventions that are based on theories were clearly effective in changing behavior than those that were not. It is against this backdrop that this current paper uses the TAM (Davis, 1989) and the TPB (Ajzen, 1991) to explain the youth’s technology adoption behavior in PA.

Technological innovation, according to Goldsmith and Hofacker (1991), is the subjective willingness of a person to try a new system or device to improve his or her well-being or job performance. Similarly, WHO (2016) defines technology as the application of organized knowledge, skills in the form of devices, systems and procedures that help to solve a health problem and improve quality of life. In this regard, this current study defines gym equipment technology as any type of machine or system that is used to perform some form of PA/exercise to improve or maintain physical fitness, including healthy weight, building and maintaining healthy muscles, improving cardiorespiratory fitness and reducing the risk for many chronic diseases. The ensuing sections therefore discuss the theories used in this study to understand the PA technology adoption behavior.

2.1 Theory of planned behavior and technology acceptance model

TPB (Ajzen, 1991) and TAM (Davis, 1989) are used as the base models to explain the adoption of gym equipment technology use in PA. The TAM has been widely applied in examining and explaining an individual’s behavior toward technology adoption (Mun et al., 2006). The TAM predicts user acceptance based on the influence of two user beliefs PU and PEOU of the technology/system (Davis, 1989). The TPB also has three predictors (attitude, subjective norms and perceived behavioral control), which are said to influence intention, which in turn influences the actual behavior (Ajzen, 1991). The typical TPB model emphasizes intention as a predictor of behavior performance. Nevertheless, this current study did not include intention in the model, as the data were collected at a single point in time which made it difficult to include both intentions to perform the behavior and the actual behavior itself in the same model (George, 2004). This is because an intention measures future behavior and an actual behavior measures past/present behavior, so there should be a clearly stated time frame between when intention is measured and when actual behavior is measured (George, 2004). As this study is focused on persons who were already users of the proposed behavior (PA by using gym equipment technology), the authors focused on reports of actual behavior to understand the youth’s PA technology behavior instead of their intentions toward the behavior. To this end, the authors modelled direct paths from attitude, subjective norms and perceived behavioral control to actual behavior as well as indirect paths via PU and PEOU.

Scholars have argued that the acceptance of a new technology mostly depends on both technological and behavioral aspects for personal use (Wu et al., 2011). However, TAM focuses on only the design of the system (technology) and fails to account for social influence in users’ adoption of a new technology and, also, lacks the consideration of the effects of individual factors in the adoption process (Wu et al., 2011). The TPB, on the other
hand, is used to explain the technology adoption behavior by taking into consideration the social and individual factors in the adoption process (Wu et al., 2011). In the context of gym equipment technology use in PA, users might be motivated to use the system not just by their perceptions of the values and efforts associated with the use alone but also being prompted by the desire for social connections with their peers (Lee, 2009). Mathieson (1991) and Mun et al. (2006) support this assertion by arguing that individual and social factors could play a role in the adoption of technology using constructs from the TPB. Consequently, the authors propose that the TPB could be extended with variables from the TAM to include both individual and social factors that could help explain technology adoption better.

To this end, many studies have proposed the concept of integrating both TPB and TAM in a complementary manner to cater for the disparities between both theories (Mathieson, 1991; Venkatesh and Davis, 2000). In response to this, some scholars have applied the integration concept to explore the use of telemedicine technologies by healthcare professionals and some support has been given to its high predictive ability (Mun et al., 2006; Mathieson, 1991). For instance, the study of Mun et al. (2006) on understanding information technology acceptance by individual professionals recorded a higher explanatory power. Similarly, Wu et al. (2011) used the TAM and TPB to determine mobile computing acceptance factors in the healthcare industry. However, in the context of social marketing, there is yet to be a study that has integrated these two theoretical lenses into a holistic model. Thus, this study seeks to fill this gap by proposing an integrated model, using two constructs from the TAM (PU and PEOU) and three constructs from the TPB (attitude, subjective norms and perceived behavioral control) to help predict and explain the youth's gym equipment technology behavior in PA.

We, therefore, propose that, first, the individual’s attitude toward PA technology behavior would influence their actual PA technology adoption directly and indirectly through PU and PEOU. Second, the normative beliefs of the referent others toward gym equipment technology would directly lead to the adoption of PA by using gym equipment and indirectly via PU and PEOU of the technology (gym equipment). Finally, the control beliefs of the individual would have a direct influence on PA by using gym equipment and an indirect influence through PU and PEOU. The various constructs and their relationships with one another are discussed in subsequent sections.

Attitude represents the individual’s positive or negative assessment toward the behavior in question (Rex et al., 2015). Thus, in this study, the higher the positive attitudes toward technology use in PA, the higher the likelihood of technology adoption in PA. A study by Chau and Hu (2002) investigating healthcare physician’s intention to use telemedicine technology found attitude to significantly influence technology use.

Subjective norm refers to the perceived social pressure to perform or not to perform a given behavior (Norman, 2011). It usually reflects an individual’s perception of social approval for the performance of the behavior (Cooke and French, 2008). In this current study, we propose that the youth are more likely to incorporate significant others’ (friends, family and peers) expectations while making the decision whether to accept or not to accept technology use (gym equipment) in PA (Rivis and Sheeran, 2003). In this case, if the youths believe that their referent others want them to engage in the actual behavior (PA by using gym equipment), their subjective norm for the behavior will be increased (Antikainen et al., 2010).

Perceived behavioral control refers to the individual’s perception of the presence or absence of requisite resources and opportunities necessary to perform the behavior (Taylor and Todd, 1995; Plotnikoff et al., 2010). In terms of PA by using gym equipment, if the
individual is self-confident about engaging in behaviors related to PA by using gym equipment, he/she is more likely to have positive feelings of control over the behavior. It must, however, be mentioned that PBC goes beyond TAM’s ease of use variable to include other barriers to technology use (Mathieson, 1991). More specifically, PBC normally depends on the control beliefs and perceived facilitation of the resources available to achieve the outcome. These include the availability of skills, resources and opportunities. These control beliefs can be situational (e.g. having access to fitness centers) as well as personal (being able to use the system, e.g. gym equipment). In light of the ideas discussed above, the following hypotheses were proposed:

\[ H1a. \] The youths’ positive attitudes toward technology use in PA significantly influence their actual PA technology use behavior.

\[ H1b. \] The youths’ subjective norms toward technology use in PA significantly influence their actual PA technology use behavior.

\[ H1c. \] The youths’ perceived behavioral control toward technology use in PA significantly influence their actual PA technology use behavior.

2.1.1 Technology acceptance model, theory of planned behavior and actual behavior. In the original TAM, attitude toward use (system) was included as an intervening variable between the belief constructs (PU and PEOU) and behavioral intention that in turn leads to actual behavior. PU and PEOU are also influenced by some external factors. However, recent studies using the TAM suggest the exclusion of attitude from the model as a mediating variable owing to its weak role as a mediator between the belief constructs and behavioral intention (Saadé and Bahli, 2005; Venkatesh et al., 2003; Mun et al., 2006). We, therefore, decided to exclude attitude as a mediating variable from our model and replace it with PU and PEOU toward system use. The rationale for using these two belief constructs as possible mediators is in accordance with Abdekhoda et al. (2015), Chau and Hu (2002) and Seyel and Rahman (2007), who suggest that PU and PEOU should be used as mediators between the external factors and behavior. To this end, in this current study, we incorporate the TPB constructs, attitude, subjective norms and perceived behavioral control as external variables that affect PU and PEOU and then link these two variables to actual behavior (technology use in PA).

PU in this study is the “extent to which individuals” believe that using a particular system (gym equipment technology in PA) would improve their health and give them greater value (Davis, 1989, p. 340). Thus, unless a new system is perceived as useful to the user, it would not be easily adopted (Yang and Su, 2017; Chau and Hu, 2002). Chau and Hu (2002), in their study on healthcare professionals’ intention to use telemedicine technology, found PU to be the most significant determinant affecting physicians’ acceptance of telemedicine. Similarly, Holden and Karsh conducted a comprehensive critical review of studies that used TAM with respect to health IT in the healthcare context and found PU to be significant with the use of health IT in most of the studies (Holden and Karsh, 2010).

PEOU, on the other hand, represents the extent to which a person believes that using the system (e.g. gym equipment technology) will require no effort (Taylor and Todd, 1995). Thus, if the youth perceives that learning how to use the gym equipment for exercising will be easy, flexible and convenient, they are more likely to participate in the behavior (PA by using gym equipment). For instance, Tung et al. (2008) as well as Yousafzai et al. (2007) in their studies found PEOU to be significant with healthcare physicians’ use of telemedicine technology. From the ensuing discussion, we hypothesize that:
H2a. PU mediates the relationship between the youths’ attitudes toward technology use in PA and actual technology use in PA behavior.

H2b. PEOU mediates the relationship between the youths’ attitudes toward technology use in PA and actual technology use in PA behavior.

H3a. PU mediates the relationship between the youths’ subjective norm toward technology use in PA and actual technology use in PA behavior.

H3b. PEOU mediates the relationship between the youths’ subjective norm toward technology use in PA and actual technology use in PA behavior.

H4a. PU mediates the relationship between the youths’ perceived behavioral control toward technology use in PA and actual technology use in PA behavior.

H4b. PEOU mediates the relationship between the youths’ perceived behavioral control toward technology use in PA and actual technology use in PA behavior.

H5a. PU significantly influences technology use in PA behavior.

H5b. PEOU significantly influences technology use in PA behavior.

Our proposed framework in Figure 1 theorizes that the positive attitudes toward PA gym equipment technology use, subjective norm about and perceived behavioral control over the behavior will significantly influence actual behavior (PA technology use) directly and indirectly through PU and PEOU.

3. Methodology
3.1 Research design, sample and procedure
This study sought to integrate the TPB and TAM to develop a holistic model to predict and explain the PA technology adoption behavior among Ghanaian youth. A quantitative approach was used for this study using survey instruments. To establish face and content validity, the initial scales were pre-tested using 3 groups of social marketing academic
experts: 2 lecturers from management information systems and, 50 doctoral and MBA students of the University of Ghana to ensure the questions were clear, easy to understand and not ambiguous. In view of their suggestions, several changes were incorporated into the instrument to improve clarity and subsequently administered to 340 gym users between 18 and 40 years of age within a period of four weeks. The choice of this age bracket was informed by McDonough (2009) who classified young adults between the ages of 18 and 40 as youth. It could also be argued that this age range constitutes a large segment of youths who are likely to engage in sedentary lifestyles that could result in NCDs. Also, because they are the nation’s resource base, understanding their technology adoption behavior in PA is critical to help reduce morbidity and mortality (McDonough, 2009) associated with physical inactivity. Convenience sampling method was used for the selection of the participants, owing to lack of sample frame (Madden et al., 1993). The sample size was also informed by Burns and Bush (2010) and Hair et al. (2013). They assert that for a sample to be representative and acceptable for a quantitative study and a structural equation modeling (SEM) analysis, it should be preferably 100 and 300, respectively.

Regarding the measures, the items used in the questionnaire were adapted from prior research with changes made to suit the current study. All the scale items (Appendix 1) were measured on a seven-point Likert-type scale ranging from 1 (strongly disagree) to 7 (strongly agree). Attitude had four items; subjective norms had four items; perceived behavioral control had four items, and these were all adapted from Taylor and Todd (1995), and Ajzen (1991). PU and PEOU had four items each and were both adapted from Davis (1989). The dependent variable (PA using technology) was measured using self-reported actual behavior measures, which are deemed as good as objective measures (Ajzen, 2002) and were measured with three items, which were adapted from Moon and Kim (2001). Actual behavior recorded Cronbach alpha of 0.78 and composite reliability of 0.78. The questionnaire also contained demographic variables such as gender of the respondents, age of the respondents and educational level of the respondents.

Out of the 340 questionnaires distributed, 322 were returned, and of these, 8 questionnaires were rejected because of incomplete responses and missing data, leaving a final 314 data set for further analysis, representing 92 per cent. The data were analyzed using SPSS version 21 and structural equation modeling (AMOS Version 21).

3.1.1 Common method bias. As our data were collected based on self-reports, we conducted two tests to show that common method bias (CMB) was not an issue for this current study (Lu et al., 2010). First, we performed Lindell and Whitney’s (2001) test through a marker variable approach. The results showed no significant correlation between the marker variable item and self-reported behavior ($r = 0.013, p > 0.05$). The result also showed no significant correlations between the marker variable item and other constructs, ranging between 0.013 and 0.067, which suggests that CMB does not affect this study. Subsequently, Harman’s one-factor test in confirmatory factor analysis (CFA) was run; the results indicate that no single factor accounted for more than 30 per cent of the variance, which is below the 50 per cent threshold value recommended by Podsakoff and Organ (1986), indicating that common method variance was not a problem in this study.

4. Analyses and results

4.1 Profile of the respondents
The results in Table I reveals that the sample comprised 62.1 per cent men and 37.9 per cent women. Approximately, 75 per cent of the respondents were under the age of 30. Regarding educational status, most of the respondents (71.6 per cent) fell within senior high and tertiary educational level. This means that most of the respondents were educated, a
possible indication that they could have high competence and mental/cognitive capability and may comprehend the use of technology quickly with less effort as opposed to other population groups.

Following Anderson and Gerbing’s (1988) two-step approach, we first conducted a CFA using maximum likelihood estimation procedure to assess the measurement model, and then we tested the structural model in the second stage.

4.2 Confirmatory factor analyses and structural equation modeling

We evaluated the reliability of the scales to ascertain if all of them are true measures of the latent constructs by using three indices, namely, composite reliability (CR), average variance extracted (AVE) and Cronbach’s alpha (CA). As displayed in Table II, all CR and CA were above the recommended thresholds of 0.7, indicating that the items had good reliability (Bagozzi and Yi, 2012). The loadings of all items were statistically significant on each respective construct, as all the loadings of items occurred in the respective construct, with no item loading high in other constructs. For all cases, CR, AVE and CA exceeded the acceptable threshold value of 0.7, 0.5 and 0.7, respectively (Fornell and Larcker, 1981), thereby providing evidence of satisfactory item convergence for all the constructs.

<table>
<thead>
<tr>
<th>Measure</th>
<th>Category</th>
<th>Frequency</th>
<th>(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>Male</td>
<td>195</td>
<td>62.1</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>119</td>
<td>37.9</td>
</tr>
<tr>
<td>Age (years)</td>
<td>18-24</td>
<td>120</td>
<td>38.2</td>
</tr>
<tr>
<td></td>
<td>25-29</td>
<td>117</td>
<td>37.3</td>
</tr>
<tr>
<td></td>
<td>30-34</td>
<td>66</td>
<td>21.0</td>
</tr>
<tr>
<td></td>
<td>35-40</td>
<td>11</td>
<td>3.5</td>
</tr>
<tr>
<td>Education</td>
<td>Other</td>
<td>22</td>
<td>7.0</td>
</tr>
<tr>
<td></td>
<td>Junior high</td>
<td>67</td>
<td>21.3</td>
</tr>
<tr>
<td></td>
<td>Senior high</td>
<td>93</td>
<td>29.6</td>
</tr>
<tr>
<td></td>
<td>Tertiary</td>
<td>132</td>
<td>42.0</td>
</tr>
</tbody>
</table>

Table I. Demographic of respondents

<table>
<thead>
<tr>
<th>Constructs</th>
<th>Item codings</th>
<th>Factor loadings</th>
<th>CR</th>
<th>AVE</th>
<th>CA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived usefulness</td>
<td>PU2</td>
<td>0.90***</td>
<td>0.95</td>
<td>0.82</td>
<td>0.88</td>
</tr>
<tr>
<td></td>
<td>PU3</td>
<td>0.88***</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived behavioral control</td>
<td>BC3</td>
<td>0.82***</td>
<td>0.91</td>
<td>0.71</td>
<td>0.79</td>
</tr>
<tr>
<td></td>
<td>BC4</td>
<td>0.81***</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Attitude</td>
<td>ATT2</td>
<td>0.89***</td>
<td>0.91</td>
<td>0.76</td>
<td>0.86</td>
</tr>
<tr>
<td></td>
<td>ATT3</td>
<td>0.85***</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subjective norms</td>
<td>SN3</td>
<td>0.66***</td>
<td>0.85</td>
<td>0.66</td>
<td>0.74</td>
</tr>
<tr>
<td></td>
<td>SN4</td>
<td>0.89***</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived ease of use</td>
<td>PEOU2</td>
<td>0.86***</td>
<td>0.89</td>
<td>0.74</td>
<td>0.90</td>
</tr>
<tr>
<td></td>
<td>PEOU3</td>
<td>0.95***</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Behaviour</td>
<td>BEH1</td>
<td>0.70***</td>
<td>0.78</td>
<td>0.54</td>
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<tr>
<td></td>
<td>BEH2</td>
<td>0.86***</td>
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<tr>
<td></td>
<td>BEH3</td>
<td>0.63***</td>
<td></td>
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</table>

Table II. Final measurement model

Notes: RMSEA = 0.07, NFI = 0.94, TLI = 0.94, CFI = 0.96, $\chi^2$/df = 2.54
Next, the study conducted a discriminant validity test to verify if each construct was unique and captured different but theoretically connecting variables. As indicated in Table III, the study found that all the square roots of the AVEs were higher than the correlation coefficients between the respective constructs, which suggests that the constructs are distinct from one another, thus providing evidence of good discriminant validity (Hair et al., 2013).

The fit indices of the CFA model, as illustrated (Table IV) below, exhibited a good model fit on the data. All the model fit indices exceeded their respective acceptable threshold value suggested by previous research (Kline, 2015), hence, demonstrating that the measurement model exhibited an adequate fit with the data collected.

4.2.1 Test for hypothesized structural paths using structural equation modeling. A SEM approach was used for testing the hypotheses formulated earlier in this study. We estimated a partial baseline model by testing the direct paths from the predictors (attitude [ATT], subjective norms [SNORM], perceived behavioral control [PBC]) to the outcome variable (PA by using gym equipment technology), as well as the indirect paths (PU and PEOU) to the behavior. The results for the structural model (Table V) revealed that the hypothesized model fits the data reasonably ($\chi^2$/df = 2.51; RMSEA = 0.069; GFI = 0.95; NFI = 0.93; CFI = 0.95).

From Table V above, it is revealed that $H1a$, which posits that there is a positive significant relationship between the respondents’ ATT toward PA using technology and PA technology adoption behavior, was partially supported, as the results showed significant but negative relationship ($\beta = -0.71$, t-values = -6.54, $p < 0.01$). On the other hand, $H1b$ (the path from SNORM directly to PA technology adoption behavior) as well as $H1c$ (the path from perceived behavioral control to PA using technology) were both not supported in this study, as they both recorded non-significant coefficients ($\beta = -0.06$, t-values = 0.52, $p > 0.05$) and ($\beta = 0.05$, t-values = 0.65, $p > 0.05$) (Table V).

Furthermore, we examined how PU and PEOU might act as mediators in the relationships between the three predictors (ATT, SNORM, and PBC) and the outcome behavior.
The results revealed that the coefficient for the path between ATT and PU was significant ($\beta = 0.37$, $t$-values = 5.21, $p < 0.01$) as was the coefficient for the path between PU and PA gym equipment use behavior ($\beta = 0.36$, $t$-values = 3.34, $p < 0.01$). Thus, $H2a$ was supported. On the other hand, PEOU was only significant with ATT in the first path ($\beta = -0.32$, $t$-values = -4.73, $p < 0.01$) but not significant with actual behavior in the second path ($\beta = -0.08$, $t$-values = -0.68, $p = 0.50$); hence, $H2b$ was not supported.

Regarding $H3a$, the study posited that PU will mediate the relationship between SNORM and PA gym equipment use behavior. The results showed that SNORM had a significant effect on PU in the first path ($\beta = 0.42$, $t$-values = 5.86, $p < 0.01$) and a significant effect between PU and actual behavior in the second path ($\beta = 0.36$, $t$-values = 3.34, $p < 0.01$). Consequently, $H3a$ was supported. Similarly, the findings revealed a significant relationship between SNORM and PEOU in the first path ($\beta = 0.56$, $t$-values = 7.39, $p < 0.01$) but recorded a non-significant effect between PEOU and actual behavior in the second path ($\beta = -0.08$, $t$-values = -0.68, $p = 0.50$), providing no support for $H3b$.

With respect to PU mediating the relationship between PBC and PA gym equipment use behavior, the results indicate positive significant relationships between the first and second paths ($\beta = 0.29$, $t$-values = 4.66, $p < 0.01$; $\beta = 0.36$, $t$-values = 3.34, $p < 0.01$). Therefore, $H4a$ is supported. However, the findings do not provide support for $H4b$, as the paths in $H4b$ were both not statistically significant ($\beta = -0.07$, $t$-values = -1.19, $p = 0.23$; $\beta = -0.08$, $t$-values = -0.68, $p = 0.50$), (Table V). Finally, our study found support for $H5a$, as PU significantly affected the PA technology adoption behavior. However, the relationship between PEOU and PA technology behavior was not significant. Hence, $H5b$ was not supported. Notably, there was a need for comparing alternative models, as some of the hypothesized paths were statistically unsupported ($H1b$, $H1c$, $H2b$, $H3b$, $H4b$, $H5b$).

### 4.2.2 Tests for model comparison.

Going by the approach proffered by Anderson and Gerbing (1988), the study tested a series of nested models against a baseline model through a sequential chi-square tests with the focus on the constraint parameters. Notably, a significant change observed in the chi-square difference would signify the importance of the constrained path, and therefore, provide support for the baseline model (Lu et al., 2010).

Thus, in Model 1, the path linking ATT and PA technology adoption behavior was removed from the baseline model. Similarly, the paths of the other hypothesized paths were constrained to 0 in Models 2-9 one at a time, after which a full mediation model was tested in

<table>
<thead>
<tr>
<th>Hypothesized relationships</th>
<th>$\beta$-estimates</th>
<th>$t$-value</th>
<th>$p$-value</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>$H1a$ Attitude $\rightarrow$ behaviour</td>
<td>$-0.71$</td>
<td>$-6.54$</td>
<td>$***$</td>
<td>Supported</td>
</tr>
<tr>
<td>$H1b$ Subjective $\rightarrow$ behaviour</td>
<td>$-0.06$</td>
<td>$-0.52$</td>
<td>$0.60$</td>
<td>Not supported</td>
</tr>
<tr>
<td>$H1c$ Perceived behavioral control $\rightarrow$ behaviour</td>
<td>$0.05$</td>
<td>$0.65$</td>
<td>$0.52$</td>
<td>Not supported</td>
</tr>
<tr>
<td>$H2a$ Attitude $\rightarrow$ perceived usefulness</td>
<td>$0.37$</td>
<td>$5.21$</td>
<td>$***$</td>
<td>Supported</td>
</tr>
<tr>
<td>$H2b$ Attitude $\rightarrow$ perceived ease of use</td>
<td>$-0.32$</td>
<td>$-4.73$</td>
<td>$***$</td>
<td>Supported</td>
</tr>
<tr>
<td>$H3a$ Subjective norms $\rightarrow$ perceived usefulness</td>
<td>$0.42$</td>
<td>$5.86$</td>
<td>$***$</td>
<td>Supported</td>
</tr>
<tr>
<td>$H3b$ Subjective norms $\rightarrow$ perceived ease of use</td>
<td>$0.56$</td>
<td>$7.39$</td>
<td>$***$</td>
<td>Supported</td>
</tr>
<tr>
<td>$H4a$ Perceived behavioral control $\rightarrow$ perceived usefulness</td>
<td>$0.29$</td>
<td>$4.66$</td>
<td>$***$</td>
<td>Supported</td>
</tr>
<tr>
<td>$H4b$ Perceived behavioral control $\rightarrow$ perceived ease of use</td>
<td>$-0.07$</td>
<td>$-1.19$</td>
<td>$0.23$</td>
<td>Not supported</td>
</tr>
<tr>
<td>$H5a$ Perceived usefulness $\rightarrow$ behaviour</td>
<td>$0.36$</td>
<td>$3.34$</td>
<td>$***$</td>
<td>Supported</td>
</tr>
<tr>
<td>$H5b$ Perceived ease of use $\rightarrow$ behaviour</td>
<td>$-0.08$</td>
<td>$-0.68$</td>
<td>$0.50$</td>
<td>Not supported</td>
</tr>
</tbody>
</table>

Notes: $***p < 0.001$; $\chi^2$/df = 2.51; GFI = 0.95; NFI = 0.93; CFI = 0.95; RMSEA = 0.069 $R^2 = 0.77$
Model 10, where all the direct paths (ATT, SNORM and PBC) to the outcome variable were constrained, leaving only the indirect paths. The results of the model comparison test are displayed in Table VI.

The results in Table VI above indicate that all the chi-square differences were significant. This shows that the baseline model fits our data satisfactorily. It was also observed that the chi-square difference between Model 10 (full mediation model) and the baseline model (partial mediation) was significant ($\Delta \chi^2 = 11.01, \Delta df = 3, p < 0.001$). This notwithstanding, it was revealed from the fit indices that the baseline model was stronger than all the alternative models except for Models 3 and 9. Hence, the paths from PBC to behavior and PBC to PEOU were removed, resulting in the final structural model in Figure 2.

In summary, regarding the direct relationships between the three predictors (ATT, SNORM, PBC), the two mediators (PU and PEOU) and the actual behavior, $H1a$, $H2a$, $H3a$, $H4a$ and $H5a$ were supported, while $H1b$, $H1c$, $H2b$, $H3b$, $H4b$ and $H5b$ were refuted in this study.

5. Discussion and conclusions
The present study sought to understand how the salient beliefs (ATT, SNORM and PBC) influence the PA technology adoption behavior. We further examined the mediating role of PU and PEOU on these relationships via the conceptual lenses of the TPB and TAM. More specifically, the initial hypotheses posited that the youths’ positive ATT toward technology use in PA would influence their PA technology adoption behavior ($H1a$). The study found a significant but negative relationship, suggesting that, although most of the respondents

<table>
<thead>
<tr>
<th>Model</th>
<th>$\chi^2$</th>
<th>df</th>
<th>$\Delta df$</th>
<th>$\Delta \chi^2$</th>
<th>$\chi^2$/df</th>
<th>GFI</th>
<th>NFI</th>
<th>CFI</th>
<th>RMSEA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline (partial mediation)</td>
<td>100.44</td>
<td>40</td>
<td>-</td>
<td>-</td>
<td>2.51</td>
<td>0.95</td>
<td>0.93</td>
<td>0.95</td>
<td>0.069</td>
</tr>
<tr>
<td>Model 1</td>
<td>116.27</td>
<td>44</td>
<td>4</td>
<td>15.83***</td>
<td>2.64</td>
<td>0.94</td>
<td>0.91</td>
<td>0.94</td>
<td>0.072</td>
</tr>
<tr>
<td>Model 2</td>
<td>111.53</td>
<td>44</td>
<td>3</td>
<td>11.06***</td>
<td>2.54</td>
<td>0.95</td>
<td>0.92</td>
<td>0.95</td>
<td>0.070</td>
</tr>
<tr>
<td>Model 3</td>
<td>101.25</td>
<td>41</td>
<td>3</td>
<td>0.81</td>
<td>2.47</td>
<td>0.95</td>
<td>0.93</td>
<td>0.95</td>
<td>0.069</td>
</tr>
<tr>
<td>Model 4</td>
<td>126.42</td>
<td>41</td>
<td>3</td>
<td>25.98***</td>
<td>3.08</td>
<td>0.94</td>
<td>0.93</td>
<td>0.93</td>
<td>0.082</td>
</tr>
<tr>
<td>Model 5</td>
<td>144.65</td>
<td>41</td>
<td>3</td>
<td>44.21***</td>
<td>3.53</td>
<td>0.93</td>
<td>0.89</td>
<td>0.92</td>
<td>0.080</td>
</tr>
<tr>
<td>Model 6</td>
<td>120.97</td>
<td>41</td>
<td>3</td>
<td>20.53***</td>
<td>2.95</td>
<td>0.94</td>
<td>0.91</td>
<td>0.94</td>
<td>0.079</td>
</tr>
<tr>
<td>Model 7</td>
<td>119.78</td>
<td>41</td>
<td>3</td>
<td>19.34***</td>
<td>2.92</td>
<td>0.95</td>
<td>0.91</td>
<td>0.94</td>
<td>0.078</td>
</tr>
<tr>
<td>Model 8</td>
<td>160.88</td>
<td>41</td>
<td>3</td>
<td>60.44***</td>
<td>3.92</td>
<td>0.93</td>
<td>0.88</td>
<td>0.91</td>
<td>0.087</td>
</tr>
<tr>
<td>Model 9</td>
<td>101.64</td>
<td>41</td>
<td>3</td>
<td>1.20***</td>
<td>2.48</td>
<td>0.95</td>
<td>0.93</td>
<td>0.95</td>
<td>0.069</td>
</tr>
<tr>
<td>Model 10: full mediation</td>
<td>111.45</td>
<td>43</td>
<td>3</td>
<td>11.01***</td>
<td>2.59</td>
<td>0.95</td>
<td>0.92</td>
<td>0.95</td>
<td>0.071</td>
</tr>
</tbody>
</table>

Notes: *** $p < 0.001$; Baseline model: Partial mediation (with direct paths from attitude, subjective norms and perceived behavioral control to the outcome variable (PA by using gym equipment technology); Model 1: (attitude $\rightarrow$ actual behaviour) was restricted to 0; Model 2: (subjective norms $\rightarrow$ behaviour) was constrained to zero; Model 3: (perceived behavioral control $\rightarrow$ behaviour) was constrained to 0; Model 4: (attitude $\rightarrow$ perceived usefulness) was constrained to 0; Model 5: (subjective norms $\rightarrow$ perceived usefulness) was constrained to 0; Model 6: (perceived behavioral control $\rightarrow$ perceived usefulness) was constrained to 0; Model 7: (attitude $\rightarrow$ perceived ease of use) was constrained to 0; Model 8: (subjective norm $\rightarrow$ perceived ease of use) was restricted to 0; Model 9: (perceived behavioral control $\rightarrow$ perceived ease of use) was restricted to zero; Model 10: (the paths of Models 1, 2 and 3 were constrained to 0, resulting in complete or full mediation models).
have positive ATT toward technology use in PA, this does not automatically translate into their PA technology adoption behavior. This could possibly be because of external factors such as the cost involved in adopting the behavior and other contextual and environment factors that serve as barriers to the behavior adoption (Ajzen, 1991). This finding is not surprising, as it confirms Ajzen and Fishbein’s (2000) assertion that people might have positive attitude toward a particular behavior but may be unable to engage in it because of lack of sufficient motivation and sufficient opportunity to perform the behavior.

We postulated in H1b that SNORM toward technology use in PA would lead to PA technology adoption behavior. The study revealed a non-significant relationship between these variables. This finding is quite surprising, as it disconfirms the arguments of Antikainen et al. (2010) and Ajzen (1991). For example, Antikainen et al. (2010) argues that individuals will perform a behavior when they believe that their referent others want them to be part of it. However, in this current study, our findings suggest that in Ghana, the normative beliefs of the respondents toward PA by using technology do not really matter to them and as a result will not influence them to engage in PA by using technology. Thus, it is possible that the study group makes their decisions toward using technology in their PA based on their own assessments and the value they perceive to derive from engaging in the behavior rather than what their significant others think (Chau and Hu, 2002).

Similar to H1b, our study found no significant relationship between PBC toward technology use in PA and actual behavior (H1c). This finding is not consistent with the existing body of knowledge that found PBC to significantly influence actual behavior (Plotnikoff et al., 2010; Holden and Karsh, 2010). The plausible explanation for our results could be that in the Ghanaian context, even though the youth perceive some form of control over the behavior, this does not necessarily translate into behavior adoption, because they do not see it as an important consideration when they want to adopt the behavior.

Figure 2.
Final structural model

Notes: *** p < 0.001; χ²/df = 2.51; GFI = 0.95; NFI = 0.93; CFI = 0.95; RMSEA = 0.069
With respect to the mediation analysis, the results from our study revealed that PU partially mediated the relationship between ATT toward PA gym equipment use and actual behavior. On the other hand, the relationship between SNORM and PA technology adoption behavior and that between PBC and actual behavior were fully mediated by PU. The results are consistent with several studies of TAM that found PU to be an important determinant when deciding whether to use a technology or not (Chau and Hu, 2002; Mat and Sentosa, 2008). The partial mediation effect of PU on ATT and PA technology behavior implies that the youths’ positive ATT toward PA technology adoption will lead to actual PA technology adoption behavior. However, when they form positive perceptions about the usefulness of the technology toward PA, it will enhance the performance of the behavior. Thus, policymakers and implementers of social marketing programs need to formulate strategies that would increase the youths’ perception of technology as being useful in PA to decrease the barriers associated with PA technology adoption behavior.

In addition, the study revealed that PU fully mediated the relationship between SNORM and actual behavior and that between PBC and actual behavior. This finding underscores the importance of PU in the adoption of the actual behavior. Therefore, social marketers aiming to influence the youths’ SNORM and PBC toward PA technology use must strongly communicate and emphasize the technology’s usefulness in PA to promote the positive perceptions toward the behavior, as the study results suggest that the youth will engage in PA technology behavior only when they perceive it as useful to satisfy their health and physical well-being. Otherwise, they having control over the behavior or what their referent others think about the behavior will not influence them to adopt it (Mathieson, 1991). This finding is not surprising, as it confirms the findings of previous studies (Beni et al., 2017; Furber et al., 2014; Mun et al., 2006).

Contrary to the findings of previous studies (Abdekhoda et al., 2015; Tung et al., 2008), our study found that PEOU did not have a mediation effect on all the hypothesized relationships. This finding means that the positive PEOU toward PA using technology may be necessary but not enough to influence PA technology adoption. The plausible reason could be because majority of our samples are already users of the technology and may be conversant with the features of the machines (Yarborough and Smith, 2007), and as such, they may not be influenced by their ease of use. Rather, as propagated in TAM (Davis, 1989), until the youth find the technology (gym equipment) to be useful in PA to them, ease of use may not likely affect their acceptance (Holden and Karsh, 2010). In other words, the youth would first assess the value they will derive from using the system (Dibb, 2014) before adopting the behavior. We, therefore, recommend that the PU of the technology in PA must be promoted to enhance a sustainable behavior adoption instead of the ease of use of the technology.

5.1 Implications for theory and practice

Empirical insights into social marketing theory and practice can be gleaned from the results of this paper to guide future research and practice. First, in terms of social marketing theory building, to the best of the authors’ knowledge, the current study appears to be the first to integrate TPB and TAM in social marketing to understand the PA technology adoption behavior in the Ghanaian context. It is worth noting that, although, the TPB has been empirically proven for its predictive ability to explain a significant amount of variance in behavior, the inclusion of the TAM provides a better explanatory power to our model. Thus, at the conceptual level, the study has responded to calls for theory expansion in social marketing (Dibb, 2014; Luca et al., 2016; Lefebvre, 2012).
Furthermore, we have tested these theories from a developing country context in sub-Saharan Africa. It was established in earlier sections that evidence from this context on the subject area was minimal in social marketing literature. To this end, the results of this study provide profound contributions to the understanding of theories that are applicable in developing and emerging economies. The integration of the theories in a social marketing context will enable social marketers to develop a rich understanding of the behavior they seek to influence and the mechanisms underlying technology acceptance in PA.

Practically, PU toward technology use in PA has proven to be the most important variable that informs the youth’s acceptance of PA technology adoption behavior. To this end, implementers of social marketing programs and policymakers aiming to promote PA using technology behavior among the youth should focus on increasing the perceived benefits of the technology (gym equipment) in PA to enhance behavior adoption and maintenance. Russell-Bennett *et al.* (2009) assert that for consumers to exert effort to change their behavior, there must be a value proposition that incentivizes them. Consequently, Zainuddin *et al.* (2013) propose that policymakers, when designing social marketing programs, must understand what the individual perceives as value to reduce the barriers and costs to participation, as this will encourage sustainable behavior.

In addition, our findings for \( H1a \) recorded a negative significant relationship between ATT toward technology use in PA and actual behavior. This could be explained against the backdrop that the positive ATT of the respondents may be hindered by other factors that may inhibit them from patronizing the behavior. Some of these barriers may include the price of gym equipment, cost of accessing gym facilities and the absence of qualified trainers/instructors. Thus, if the respondents perceive the cost of the behavior to be high, there is no way they will use it. We, therefore, recommend that government should establish accessible free fitness centers with qualified trainers if possible, in all district capitals to help remove the barriers to PA using technology.

5.2 Limitations and further research

As with any research, this current study has limitations and future research directions that need to be pointed out. First, one of the possible setbacks was that only the youth who were users of gym equipment technology were sampled in this study. Therefore, future research should collect data from both users and non-users of gym equipment technology. This will remedy the bias and help researchers to better understand technology adoption in PA. Second, the study focused on only the respondents within 18-40 age bracket (youth). As a result, this study may not have covered all the unique characteristics among the various age groups. Analysis of variance test could have brought out the mean differences among the various age groups within the age bracket under consideration. However, this was beyond the scope of the current study. Hence, future research could expand the age bracket and test for the mean differences among the various groups, as this will provide a wider basis of comparison for the different age cohorts. Third, the findings of this study are based on cross-sectional data, which may suggest static correlations among the variables used at a single point in time. Future researchers should seek to explore longitudinal data to see the pattern of change overtime. Finally, several authors have extensively criticized the TPB and TAM for their intention–behavior gap (Echegaray and Hansstein, 2017; Halder *et al.*, 2016). The models postulate that behavior is a function of intention. However, several studies have consistently shown that although behavioral, normative and control beliefs largely influence intention, they do not always lead to behavior adoption (Echegaray and Hansstein, 2017). To address the behavior intention–gap, we recommend that future studies include other variables in the TPB–TAM model to cater for this gap.
References


**Further reading**


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