Journal of Science and Medicine in Sport 22 (2019) 544–549

Contents lists available at ScienceDirect

Journal of Science and Medicine in Sport

journal homepage: www.elsevier.com/locate/jsams

Original research

Health Belief Model Scale and Theory of Planned Behavior Scale to assess attitudes and perceptions of injury prevention program participation: An exploratory factor analysis

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ARTICLE INFO

Article history:
Received 30 April 2018
Received in revised form 1 November 2018
Accepted 6 November 2018
Available online 16 November 2018

Keywords:
Sport
Exercise
Compliance
Implementation
Lower extremity injury
Theory

ABSTRACT

Objectives: To examine the psychometric properties of the Health Belief Model Scale (HBMS) and Theory of Planned Behavior Scale (TPBS), and determine construct validity by evaluating which subscales were most associated with intention to participate in an Exercise-related Injury Prevention Program (ERIPP) within physically active adults.
Design: Cross-sectional.
Methods: Two hundred and eighty-four physically active individuals volunteered to participate in this study and completed the HBMS and TPBS on one occasion. The HBMS consisted of 39 items and the TPBS consisted of 22 items. Both scales aimed to assess attitudes and perceptions of ERIPP participation. Exploratory factor analysis evaluated the loading factors of the HBMS and TPBS. Linear regression determined if the HBMS and TPBS subscales were predictors of intention to participate in an ERIPP.
Results: Nine factors were identified within the HBMS and five factors were identified within the TPBS. The subscales of the HBMS and TPBS had acceptable internal consistencies. Perceived benefits, social norms, and social influence from the TPBS and perceived benefits, individual self-efficacy, and general health cues from the HBMS were positively and significantly associated with intention to participate while perceived barriers had a negative association.
Conclusions: The HBMS and TPBS demonstrated strong psychometric properties to assess behavioral determinants of ERIPP participation within physically active adults. The social influence, social norm, and individual self-efficacy subscales were the best predictors of intention to participate followed by benefits, general health cues, and barriers.

Practical implications

- The HBMS and TPBS can be used to assess attitudes towards ERIPPs within physically active adults.
- Social influence was the subscale most associated with intention to participate in an ERIPP.
- Interventions aimed to improve compliance should focus on social influence by providing group settings and information regarding the effectiveness of ERIPPs to improve athletic performance.

1. Introduction

Lower extremity musculoskeletal injuries are common within physically active individuals who participate in sport and recreation.[1,2] Musculoskeletal injuries; such as ankle sprains and anterior cruciate ligament tears, are a public health concern due to their short and long term negative consequences and the associated costs incurred over the lifespan. These injuries cause short-term deficits such as loss of range of motion, loss of strength, postural control insufficiencies, joint laxity and kinesiophobia.[3–5] Additionally, these injuries lead to long-term concerns such as the early development of post-traumatic osteoarthritis and decreased health-related quality of life.[6,7] The overall treatment costs for these injuries generate a large economic burden for both the patient and healthcare system.[8,9] The functional deficits, psychological concerns, and economic burden associated with these injuries sup-

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https://doi.org/10.1016/j.jsams.2018.11.004
1440-2440/

ports the need to develop injury prevention efforts rather than focus on treating musculoskeletal conditions.

Exercise-related Injury Prevention Programs (ERIPPs) were developed primarily to reduce the occurrence of lower extremity musculoskeletal injuries. ERIPPs are often composed of neuromuscular based exercises that aim to improve balance, range of motion, strength, and agility. Several studies have suggested that these programs effectively mitigate the risk of musculoskeletal injury occurrence.[10] However, the effectiveness of these programs is limited by the users' adoption and compliance to complete the recommended exercises throughout the recommended duration.[11] The potential reasons that young, physically active individuals fail to adopt and adhere to ERIPPs is unclear and presents a barrier to more consistent utilization of these programs in clinical practice.

Many healthcare fields have utilized social and behavioral science models or frameworks to better understand compliance with preventative health behaviors.[12,13] Two of the most commonly used theoretical models were the Health Belief Model and Theory of Planned Behavior.[14] Both models utilize perceptions and attitudes towards the preventative health behavior to predict participation in the behavior.[15,16] However, there is a lack of use of these theories within ERIPP related research.[14] A few studies have utilized the Health Belief Model and Theory of Planned Behavior to investigate attitudes towards ERIPP participation.[17,18] Within these studies, there was still a lack of scale design directly based on the theoretical model or framework used. Utilizing these theoretical models or frameworks to design the scale could provide insight into the reasons for poor ERIPP compliance in physically active individuals.

Due to the lack of use of theoretical models within ERIPP-related research, there are very few scales that have been validated to assess behavioral determinants. A previous study developed a Health Belief Model Scale (HBMS) and Theory of Planned Behavior Scale (TPBS) to assess behavioral determinants of ERIPP participation.[19] The scales were preliminary investigated within a small population of physically active adults. Most of the subscales showed acceptable internal consistency (>0.70) with the exception of HBMS perceived severity, TPBS attitudes, and intention to participate. Due to the low internal consistency of a few subscales and the limited sample population, further psychometric testing of the scales' ability to assess the behavioral determinants of ERIPP participation is warranted. Therefore, the purposes of this study were to examine the psychometric properties of the HBMS and TPBS, and determine construct validity by evaluating which subscales were most associated with intention to participate in an ERIPP within physically active adults.

2. Methods

The overall design of this study was cross-sectional. Participants were administered a demographic questionnaire, the modified Disablement in the Physically Active Scale (mDPA), HBMS, and TPBS on one occasion. The demographic questionnaire assessed information related to gender, previous history of injury, type of participation in physical activity, and previous experience with ERIPPs. The study was approved by the institutional review board.

Two hundred and eighty-four (Females = 150; Males = 134; Age = 21.17 ± 2.78 years; Height: 172.37 ± 18.98 cm; Mass: 75.00 ± 14.99 kg; Previous exposure to ERIPPs: 159; Previous history of injury: 225) physically active adults volunteered to participate in this study. Participants were considered physically active if they participated in a moderate level of exercise for a minimum of 90 min per week. Participants were recruited from a large public university and small liberal arts college using flyers on campus, club sport and collegiate athletic team meetings, and classroom recruitment.

The mDPA is a generic patient-reported outcome measure that was designed to assess quality of life in physically activity people.[20] The mDPA contained two subscales including the 12-item physical summary component (DPA-PSC) and the 4-item mental summary component (DPA-MSC). Each item was scored on a Likert scale ranging from no problem (0) to severe (4). The responses for each item were summed to create a total score for each subscale. Higher scores on both subscales are associated with increased physical and mental health-related quality of life impairments. The subscales of the mDPA have been previously validated and have demonstrated excellent internal consistencies measured using Cronbach's alpha ranging from 0.88 to 0.94.[20]

The HBMS was adapted from Champion's Health Belief Model Scale originally aimed to assess perceptions and attitudes regarding preventative mammography screenings.[21] The scale was altered by inserting language consistent with lower extremity injuries and injury prevention programs. The HBMS contained 39 items to assess the six constructs of the Health Belief Model (perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action, self-efficacy) in relation to ERIPP participation.[19] The original HBMS contained response choices along a 5-point Likert Scale. The response choices were expanded within this study to a 7-point Likert scale from strongly agree (3) to strongly disagree (−3). The internal consistencies measured using Cronbach's alpha of the subscales have been previously reported as acceptable (0.70–0.90) with the exception of the perceived severity subscale (0.68).

The TPBS was created using Ajzen's guidelines to assess the constructs of the Theory of Planned Behavior (attitudes, perceived subjective norm, perceived behavioral control) in relation to ERIPP participation.[22] The scale also included an assessment of the participant's intent to participate in an ERIPP. The original scale contained 22 items with response choices ranging along a 5-point Likert scale.[19] The response choices were expanded for this study to a 7-point Likert scale ranging from strongly agree (3) to strongly disagree (−3). Preliminary assessment of the TPBS subscales identified acceptable internal consistencies (0.72–0.90) with the exception of the perceived attitudes and intention subscales (0.60–0.68).

Packets were distributed to potential participants containing a cover letter and all of the scales. The cover letter explained the purpose of the study and voluntary nature of the study. Consent was gained by the participant continuing to complete the survey after reading the cover letter. All questionnaires were completed using pen and paper format and returned to the researchers.

Participants who were missing more than 10% of the scale data (HBMS and TPBS) were excluded from analysis. In instances where participants were missing less than 10% of scale data, multiple imputation (SPSS version 24) was used to estimate missing data points. Exploratory factor analysis was used to evaluate the intercorrelations between items on the HBMS and TPBS to identify groups of variables that strongly correlated around an underlying construct called a 'factor'.[23] The goal of this analysis was to identify grouping of variables (i.e. factors) to represent unique subscales within the HBMS and TPBS. Using principle component analysis, factors associated with eigenvalues greater than 1 were retained based on Kaiser's criterion and further examined as potential subscales within the instruments. Scree plots were also examined to confirm the factors that were retained.[24] The factor loading patterns and meaningful relationships for the grouped items were used to determine the ideal factor structure. A factor loading cutoff score of 0.40[23] was used for item retention. The Kaiser–Meyer–Olkin measure was used to verify sampling adequacy. Values >0.5 would indicate acceptable sampling. If items failed to load with a factor, they were dropped from the respective scale. Cronbach's alpha was used to determine the internal consistency of the subscales created by each factor. Acceptable internal consistency was interpreted

Table 1
Factor loading for Health Belief Model Scale and Theory of Planned Behavior Scale.

Factor	Number of items	Loading range	Eigenvalue	Percent of variance	Internal consistency
Health Belief Model Scale					
1.Perceived susceptibility	5	0.79–0.91	6.91	17.72%	0.95
2.Perceived benefits	5	0.41–0.90	6.43	16.48%	0.86
3.General health cues	6	0.48–0.91	2.94	7.54%	0.80
4.Perceived barriers	5	0.42–0.86	2.57	6.59%	0.81
5.Perceived consequences	5	0.61–0.80	2.58	6.59%	0.85
6.Fear of injury	3	0.64–0.93	2.15	5.52%	0.85
7.Community led self-efficacy	3	0.64–0.89	1.64	4.20%	0.82
8.Individual self-efficacy	3	0.73–0.84	1.32	3.39%	0.81
9.External health cues	3	0.43–0.85	1.16	2.96%	0.84
Theory of Planned Behavior Scale					
1.Perceived benefits	5	0.72–0.86	7.78	35.36%	0.87
2.Perceived social norms	6	0.48–0.93	2.27	10.29%	0.84
3.Intention to participate	4	0.56–0.78	1.57	7.12%	0.78
4.Perceived barriers	3	0.53–0.95	1.29	5.85%	0.81
5.Perceived social influence	3	0.73–0.74	1.16	5.27%	0.77

as Cronbach alpha values >0.70.[24] Once factors were identified through the exploratory factor analysis, they were considered subscales within the overall scale and total scores for each subscale were calculated based on the included items. A series of Spearman correlations were performed between the HBMS subscales and TPBS subscales to assess redundancy between the two scales. Redundancy was evaluated to determine if both scales were measuring similar qualities or if each scale examined unique perspectives about attitudes towards ERIPPs. Additionally, correlations were evaluated and interpreted (very weak: $r < 0.3$, weak: $0.3 < r < 0.5$, moderate: $0.5 < r < 0.7$, or strong: $r > 0.7$) for the HBMS and TPBS with the DPA-MSC and DPA-PSC to determine convergent reliability.

A combination of t-tests and one-way ANOVAs were used to determine whether differences in intention existed between individuals with different demographic variables. An independent t-test was used to compare intention within gender (Males/Females), those with and without a previous history of injury, and those with and without previous exposure to an ERIPP. An ANOVA was used to compare intention between individuals of different levels of participation in physical activity (Recreation, Club sport, Collegiate). In instances where intention was different within the individuals of differing demographic variables, the variable was used within the regression model. A multiple linear regression was used to determine if the subscales of the HBMS and TPBS could predict intention to participate in an ERIPP. Partial eta squared was calculated for each significant variable to determine the strength of the prediction (small: $0.06 > \eta^2 \geq 0.01$, moderate: $0.14 > \eta^2 \geq 0.07$, or large: $\eta^2 \geq 0.15$).[25] Alpha was set a $P \leq 0.05$ for all analyses.

3. Results

The Kaiser–Meyer–Olkin Measure verified sampling adequacy for the HBMS (0.83). The exploratory factor analysis for the HBMS revealed 9 factors were present within the scale accounting for a total of 70.12% of the variance (Table 1). The Kaiser–Meyer–Olkin verified sampling adequacy was acceptable for the TPBS (0.88). The exploratory factor analysis for the TPBS revealed 5 factors were present within the scale and accounted for a total of 63.89% of the variance (Table 1). The internal consistencies for the subscales of the HBMS and TPBS were all acceptable and can be found in Table 2. The finalized version of the HBMS can be found in Appendix A while the finalized TPBS can be found in Appendix B. Most of the subscales of the HBMS and TPBS had small correlations with a few falling within the moderate range and a few having no significant correlation. However, the correlation coefficients between the scales were <0.80 indicating a lack of redundancy between the two scales.[26] The DPA-PSC and DPA-MSC were positively and significantly correlated with HBMS perceived susceptibility, HBMS fear of injury, and HBMS perceived consequences. Additionally, the DPA-MSC was negatively and significantly correlated with the TPBS perceived benefits. The correlations between the HBMS subscales, TPBS subscales, and DPA subscales can be found in Table 2.

Individuals with previous experience with an ERIPP (9.03 ± 4.06) had a higher intention to participate measured by the intention subscale of the TPBS than those with no previous experience (7.94 ± 4.84) with an ERIPP ($t(280) = -2.05$, $p = 0.04$). There were no other significant differences in intention between demographic variables. Therefore, previous experience with an ERIPP, DPA-PSC, DPA-MSC, HBMS subscales, and TPBS subscales were included within the model as the potential predictors while the outcome was intention to participate in an ERIPP. The linear regression (Table 3) revealed a significant relationship between the TPBS perceived benefits, TPBS Perceived Social Norms, TPBS Perceived Social Influence, HBMS Perceived Benefits, HBMS Individual Self-Efficacy, HBMS General Health Cues, HBMS Perceived Barriers, and intention to participate in an ERIPP ($F(16, 255) = 22.53$, $R^2 = 0.59$, $p < 0.001$). The strongest association was the positive and moderate association between the TPBS social influence and intention to participate in an ERIPP. There was a small and positive association between the TPBS perceived benefits, TPBS perceived social norms, HBMS perceived benefits, HBMS individual self-efficacy, and HBMS general health cues with intention to participate in an ERIPP. An additional small and negative association between the HBMS perceived barriers with intention to participate in an ERIPP existed.

4. Discussion

The main findings of this study were the strong psychometric properties of the HBMS and TPBS within physically active adults. Nine factors were identified within the HBMS including perceived susceptibility, perceived consequences, fear of injury, perceived benefits, perceived barriers, individual self-efficacy, community led self-efficacy, general health cues, and external health cues. Five factors were identified within the TPBS including perceived benefits, perceived barriers, perceived social norms, perceived social influence, and intention. The nine factors of the HBMS demonstrated acceptable internal consistencies and the five factors of the TPBS also demonstrated acceptable internal consistencies. Additionally, the behavioral determinants which were associated with intention to participate were identified. Perceived social influence, perceived social norm, and individual-self efficacy were the behavioral deter-

Table 2
Correlations between the Subscales of the Health Belief Model Scale, Theory of Planned Behavior Scale, and Disablement in the Physically Active Scale.

	DPA-MSC	TPBS BEN	TPBS BARR	TPBS SN	TPBS SI	TPBS ITP	HBMS SUS	HBMS FOI	HBMS CON	HBMS BEN	HBMS BARR	HBMS ISE	HBMS CLSE	HBMS GHC	HBMS EHC
DPA-PSC	0.428*	−0.014	0.020	0.060	0.007	−0.055	0.390*	0.160*	0.150*	0.019	0.010	0.065	−0.070	0.100	0.104
DPA-MSC	–	−0.123*	0.076	−0.076	−0.045	−0.110	0.169*	0.119*	0.169*	−0.048	0.059	0.119	−0.050	-0.030	−0.041
TPBS BEN		–	0.157*	0.635*	0.439*	0.602*	−0.049	0.046	−0.063	0.593*	−0.297*	0.152*	0.392*	0.348*	0.251*
TPBS BARR			–	−0.180*	−0.038	−0.184*	0.142*	0.085	0.150*	−0.154*	0.427*	0.152*	−0.121*	0.006	−0.121*
TPBS SN				–	0.463*	0.626*	0.007	0.085	−0.036	0.539*	−0.321*	0.180*	0.446*	0.381*	0.359*
TPBS SI					–	0.564*	0.035	0.044	−0.043	0.360*	−0.177*	0.028	0.405*	0.323*	0.173*
TPBS ITP						–	−0.034	0.111	−0.023	0.535*	−0.344*	0.261*	0.468*	0.413*	0.391*
HBMS SUS							–	0.269*	0.386*	0.011	0.205*	0.048	−0.072	−0.072	0.219*
HBMS FOI								–	0.575*	0.159*	0.181*	0.120*	0.022	0.044	0.206*
HBMS CON									–	0.085	0.374*	0.031	−0.009	0.112	0.196*
HBMS BEN										–	0.213*	0.206*	0.507*	0.370*	0.304*
HBMS BARR											–	−0.053	−0.173*	−0.205*	−0.032
HBMS ISE												–	0.187*	0.168*	0.408*
HBMS CLSE													–	0.409*	0.261*
HBMS GHC														–	0.243*

DPA-PSC = disablement in the physically active scale-physical summary component, DPA-MSC = disablement in the physically active scale-mental summary component, HBMS = Health Belief Model Scale, TPBS = Theory of Planned Behavior Scale, BEN = perceived benefits, BARR = perceived barriers, SN = perceived social norms, SI = social influence, ITP = intention to participate, SUS = perceived susceptibility, FOI = fear of injury, CON = perceived consequences, ISE = individual self-efficacy, CLSE = community led self-efficacy, GHC = general health cues, EHC = external health cues.
* Indicates significance at $P < 0.05$.

Table 3
Linear regression results for association with intention to participate.

Variable	B	Standard error	p-Value	Partial eta squared
Previous history of ERIPP	0.75	0.42	0.08	0.01
DPA-PSC	−0.09	0.22	0.69	0.00
DPA-MSC	−0.27	0.20	0.19	0.01
TPBS perceived benefits	0.74	0.25	0.003	0.03
TPBS perceived barriers	−0.12	0.21	0.58	0.00
TPBS perceived social norm	0.89	0.25	0.001	0.05
TPBS perceived social influence	1.15	0.21	0.000	0.10
HBMS perceived susceptibility	−0.15	0.22	0.51	0.00
HBMS fear of injury	0.22	0.23	0.33	0.004
HBMS perceived consequences	0.04	0.25	0.88	0.00
HBMS perceived benefits	0.51	0.25	0.04	0.02
HBMS perceived barriers	−0.52	0.22	0.02	0.02
HBMS individual self-efficacy	0.73	0.22	0.001	0.04
HBMS community led self-efficacy	0.12	0.22	0.03	0.02
HBMS general health cues	0.46	0.21	0.03	0.02
HBMS external health cues	0.38	0.22	0.09	0.01

DPA-PSC = disablement in the physically active scale-physical summary component; DPA-MSC = disablement in the physically active scale-mental summary component; HBMS = health belief model scale; TPBS = Theory of Planned Behavior Scale.

minants most strongly associated with intention to participate followed by benefits, general health cues, and barriers.

There were nine factors identified within the HBMS. Most of these factors directly aligned to one of the Health Belief Model constructs, however some were slightly different. Three of the factors directly aligned with a construct of the Health Belief Model: perceived susceptibility, perceived benefits, and perceived barriers. The perceived severity construct split into two factors containing fear of injury and perceived consequences. The self-efficacy construct split into two specific types of self-efficacy including individual self-efficacy and community led self-efficacy. This distinction is important and may lead to further understanding of reasons for low implementation amongst physically active individuals. Some users of ERIPPs may need to complete the program as an individual while others would prefer to participate in a group or team setting. The construct of cues to action split into general health cues and external health cues. The general health cues assess whether the individual participates in general preventative health behaviors such as annual physicals and check-ups with a physician. The external health cues assessed whether the individual has been told by a coach or healthcare provider to participate in an ERIPP. The factors identified within the HBMS have allowed for more distinction of some of the constructs of the Health Belief Model which may lead to better understanding of the reasons why implementation and compliance rates are lacking.

Five factors were identified within the TPBS. Most of these factors aligned well with the constructs of the Theory of Planned Behavior while a few factors were unique. Perceived subjective norms and intention were directly aligned with constructs of the Theory of Planned Behavior. The attitudes construct split into two types of attitudes which were better described as the benefits of participating in and ERIPP and the barriers to participating in an ERIPP. The perceived behavioral control construct was not represented by any of the factors identified. Most of the original questions created for this construct fell into the intention to participate factor. This alignment seems appropriate as confidence in participating in an ERIPP should transform to intention to participate in such a program. The last factor that was identified was social influence. This factor assessed the influence a team or group setting would have on the individual as well as evidence regarding the effectiveness of the ERIPP to improve athletic performance. This new factor sheds light on the importance of the team/community aspect of participating in injury prevention strategies, as well as information that would be gained through the community on the effectiveness of the ERIPP. The factors identified within the TPBS provided a representation of the Theory of Planned Behavior with the inclusion of a new factor that assessed the role of social influences on participating in an ERIPP.

Overall, a majority of the subscales from the HBMS and TPBS had weak to moderate correlations with each other. Perceived susceptibility, fear of injury, and perceived severity were the only subscales which were not significantly correlated to intention to participate. Additionally, those subscales lacked significant correlation to perceived benefits, perceived social norms, and perceived social influence. These results indicate these areas of the HBMS may be assessing a unique aspect of behavioral determinants of ERIPP participation. Therefore, it is recommended that clinicians and researchers utilize both scales to examine all aspects related to attitudes towards ERIPPs. The DPA-PSC had a positive and weak correlation with perceived susceptibility, positive and very weak correlation with fear of injury, and positive and very weak correlation with perceived consequences. Additionally, the DPA-MSC had a positive and very weak correlation with perceived susceptibility, positive and very weak correlation with fear of injury, positive and very weak correlation with perceived consequences, and negative and very weak correlation with perceived benefits. Individuals with physical or psychosocial impairments associated with participation in physical activity may have greater fear of injury, understand the susceptibility to injury, and perceive greater consequences associated with injury. These individuals may have suffered a recent injury which increased their awareness for susceptibility to injury and the negative consequences of injury. Individuals with psychosocial or behavioral limitations were more likely to not report perceived benefits of participating in an ERIPP. Potentially, these individuals did not associate the ability to overcome psychosocial impairments with ERIPP participation. Neither the DPA-PSC nor DPA-MSC were significantly correlated with intention to participate indicating physical or psychosocial impairments may not directly influence intention to participate in an ERIPP.

The results of the study indicated social influence was most associated with intention to participate followed by social norms, individual self-efficacy, benefits, general health cues, and barriers. Social influence and social norms indicate that most users rely on the community and value their opinion regarding whether they should participate in an ERIPP. This information indicates implementing an ERIPP within a team or group setting would most likely be more beneficial than an individual setting. Additionally, the social influence subscale evaluates the importance of available data to support the effectiveness of the ERIPP to improve athletic performance. There are studies that show improvements in athletic performance due to participation in an ERIPP.[27,28] Interventions to improve the uptake of ERIPPs may want to focus on providing supportive data for ERIPPs regarding improvements in athletic performance and create group environments for the ERIPP to be completed within. The importance of individual self-efficacy indicates the individual must feel confident completing the program as an individual. Potentially one-on-one meetings to instruct the ERIPP and practice the exercises may improve participation rates. The benefits of participating in an ERIPP and barriers to implementing the program were also associated with intention to participate. Therefore, there is a potential for an educational intervention to include the benefits of the program, barriers to implementing the program, and strategies to overcome the barriers. Information regarding the subscales which are most associated with intention to participate can be used to transform implementation strategies which may be more effective at improving participation rates.

The effectiveness of ERIPPs is largely based on the adoption and continued compliance of the user to complete the recommended exercises.[11,29] Clinicians must better understand the reasons why the users are choosing to not participate in ERIPPs as one component of a likely multifaceted strategy to improve compliance rates. The HBMS and TPBS can be used by clinicians to evaluate the potential reasons users are not participating in ERIPPs. The information gained can then be used to develop intervention strategies to improve attitudes towards ERIPPs which is thought to lead to improved compliance. For example, a club soccer team that reports low scores on the perceived benefits and perceived susceptibility of injury subscales may require education to inform the users of the multiple benefits that can come from participating in an ERIPP. The clinician can also educate the user on the susceptibility or risk of sustaining specific injuries within their sport or activity (for this example soccer). The clinician would provide this information to the user when presenting the ERIPP to the user.

There were several limitations associated with this study. Participants within the study only included physically active individuals between the ages of 18 and 35 who were enrolled in academic programs on a college campus. Therefore, the psychometric properties of the HBMS and TPBS have only been validated within this population. Future research should investigate the psychometric properties of the scales within other populations. There were some additional variables that may play a role in compliance of ERIPPs that were not included within this study. One potential variable would be the attitudes of coaches' towards ERIPP participation. In many cases, coaches will play a vital role in the user's decision to participate in an ERIPP, however in other cases; a coach may play a lesser role in the user's decision to participate in an ERIPP. Future research should consider this variable when attempting to better understand user compliance and uptake of ERIPPs. Also, participants self-reported responses on the HBMS, TPBS, DPA-PSC, and DPA-MSC which could have led to response bias or the participants responding how they believed the researchers would want them to respond. Additionally, current ERIPP participation rates were not measured in this study and intention to participate was used for the linear regression. There is a potential that users' intention to participate does not align with actual participation as has been found within coaches.[30] However, intention has been significantly associated with behavior within users when evaluating other preventative health behaviors.[12,13] Therefore, future research should further investigate the relationship between intention and participation within users of ERIPPs.

5. Conclusion

The results of this study indicate the HBMS and TPBS have sound psychometric properties and can be used to assess behavioral determinants of ERIPP participation. The focus on social influence indicated that ERIPPs should be implemented within group settings where the effectiveness of the ERIPP is thoroughly presented to the users. Future research should assess behavioral determinants of ERIPP participation using these scales within diverse populations of differing physical activity level and demographic variables. The information gained from these studies could be used to inform the development of implementation strategies to improve adoption and participation in ERIPPs.

Acknowledgments

The authors would like to thank Ariana Moran and Abrianna D'Onofrio for their assistance with data collection. There was no external financial assistance for the completion of this study.

Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at https://doi.org/10.1016/j.jsams.2018.11.004.

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