

Benefits and Barriers Associated with Intention to Participate in Injury Prevention Programs in ROTC Cadets

Emily Gabriel (✉ Gabriel_eh@mercero.edu)

Mercer University <https://orcid.org/0000-0002-1274-0634>

Cameron Powden

University of Indianapolis

Research

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Abstract

Background: There is a lack of participation in Exercise-Related Injury Prevention Programs (ERIPPs) within Reserve Officer Training Corps (ROTC) which limits the effectiveness. Identification of factors which may influence participation in ERIPPs within ROTC cadets is an important first step in improving adoption and adherence rates. Therefore, the purpose of the study was to identify factors associated with intention to participate in an ERIPP within ROTC cadets.

Methods: The study design was cross-sectional where a paper survey was distributed in spring 2019. Twenty-eight (M/F=23/5; Age=20.68±2.02years; Height=175.78±8.95cm; Mass=75.30±11.10kg) ROTC cadets volunteered to participate in this study. Participants completed the Health Belief Model Scale (HBMS) and Theory of Planned Behavior Scale (TPBS) to assess attitudes towards participation in ERIPPs. A backwards multiple linear regression was used to determine if associations between attitudes towards ERIPP participation and intention to participate existed. Partial eta squared was calculated for each significant variable to determine the strength of the association and alpha was set at $P \leq 0.05$ for all analyses.

Results: Perceived benefits ($B=4.364$, $\eta^2=0.68$, $p<0.001$) had a positive and large association with intention to participate while perceived barriers ($B=-2.43$, $\eta^2=0.40$, $p<0.001$) had a negative and large association with intention to participate. There were no other statistically significant associations ($p>0.05$).

Conclusion: Perceived benefits and barriers were significantly associated with intention to participate in ERIPPs within ROTC cadets. Implementation strategies for ERIPPs may need to focus on the benefits and barriers of participating in an ERIPP to increase adoption and adherence.

Background

Lower extremity injuries are common in the physically active population including those participating in the military (1–3). Military personnel suffer musculoskeletal injuries in the knee and ankle very similarly to individuals who participate in physical and sporting activities (4). From 1998 to 2006, over 423,000 service members sustained an ankle sprain injury at a rate of 34.95 per 1,000 person-years (1). In comparison, from 1998–2004, 27,117 ankle sprains occurred within collegiate athletes at a rate of 0.83 per 1,000 exposures (5). Additionally, from 1998–2003 over 70,000 members of the military sustained an injury to the anterior cruciate ligament of the knee (2) while 4,800 injuries occurred within collegiate athletes at a rate of 0.15 per 1,000 exposures between 1998–2004 (5). The consequences of these injuries are significant in the short- and long-term. Some of the short-term consequences include pain, loss of function, and missed duty (6). In the long-term, there is an increased likelihood for the early development of osteoarthritis (7) and decreased health-related quality of life (8). Focus has been shifted to prevention of these injuries to avoid the negative consequences associated with them.

In 2003, a military based group was established to investigate different methods of injury prevention and make recommendations for military personnel (9). They determined the four critical components to effective injury prevention were education, leader support, surveillance, and research to support the effectiveness. Furthermore, six methods of injury prevention were found that met all criteria and were recommended to all portions of the military. One of the six methods was exercise-related injury prevention programs (ERIPPs) (9). ERIPPs are designed to prevent musculoskeletal injuries using balance, strength, range of motion, and agility exercises. Several ERIPPs have demonstrated efficacy to reduce the risk of lower extremity injuries and improve functional performance of participants in sporting and military populations (10–12). However, one of the major limitations of the effectiveness of these programs is the adoption and subsequent adherence to completing the exercises as prescribed by users (13, 14).

One major step in starting to improve adherence rates is to gain a better understanding of the reasons behind the lack of adoption and adherence. Several studies have begun to use social and behavioral theoretical models and frameworks to better understand the uptake of preventative health behaviors (15–18). The two most commonly used theories are the Health Belief Model (HBM) and Theory of Planned Behavior (TPB). The HBM contains six theoretical constructs (perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action, self-efficacy) that are thought to directly predict participation in a preventative health behavior (19). The TPB contains three theoretical constructs (attitudes, perceived subjective norms, perceived behavioral control) which are thought to indirectly predict participation in a preventative health behavior through intention to participate (20). There is a lack of current literature investigating attitudes towards participating in ERIPPs within military personnel and specifically ROTC cadets. Identification of the most influential factors could enhance the development of implementation strategies for ERIPPs within this population. Therefore, the purpose of this study was to identify factors associated with intention to participate in an ERIPP within Reserve Officer Training Corps (ROTC) cadets.

Methods

A cross-sectional research design was implemented which involved participants completing paper surveys on one occasion in spring 2018. Participants completed a demographic questionnaire, Health Belief Model Scale (HBMS) (21) and Theory of Planned Behavior Scale (TPBS) (21). This study was approved by the Institutional Review Board.

Participants were recruited during ROTC courses at a single university. Twenty-eight ROTC cadets volunteered to participate in this study during the spring semester (Table 1). Participants were included if they were over the age of 18 and reported being physically active. Physically active was defined as participating in a moderate level of physical activity for at least 90 minutes per week. The primary investigator explained the study and went over the consent forms with the participants. Once the participant provided written informed consent, survey packets were distributed.

Table 1
Participant Demographics

Variable	Mean \pm SD
Gender (M/F)	23/5
Age (years)	20.68 \pm 2.02
Height (cm)	175.78 \pm 8.95
Mass (kg)	75.30 \pm 11.10
Previous Exposure to ERIPP (Y/N)	16/12
Previous History of Injury (Y/N)	25/2

The HBMS was developed in a prior study (22) and an exploratory factor analysis confirmed the psychometric properties of the HBMS with all nine subscales having acceptable internal consistency values (Cronbach's alpha > 0.80) (21). The finalized version of the HBMS contained nine subscales (perceived susceptibility, perceived benefits, general health cues, perceived barriers, perceived consequences, fear of injury, community led self-efficacy, individual self-efficacy, and external health cues) comprised of a total of 39 items to assess attitudes towards ERIPP participation. The response choices ranged along a 7-point Likert scale from strongly agree to strongly disagree. Positive scores indicated positive attitudes for all subscales except for perceived barriers where a positive score meant they perceived more barriers.

The TPBS was developed in another study (22) to assess attitudes towards participation in ERIPPs. An exploratory factor analysis confirmed the psychometric properties of the TPBS with all five subscales having acceptable internal consistency values (Cronbach's alpha > 0.77) (21). The finalized version of the TPBS contained five subscales (perceived benefits, perceived social norms, perceived barriers, and perceived social influence, intention to participate) derived from a total of 19 items used to assess attitudes towards ERIPP participation. The response choices ranged along a 7-point Likert scale from strongly agree to strongly disagree. Positive scores indicated positive attitudes for all subscales except perceived barriers where a positive score would mean they perceived more barriers.

Scale data was scanned using Remark Office OMR (Gravic Inc, Version 10.3; Malvern, PA) and entered into a spreadsheet. Participants who were missing more than 10% of the scale data were excluded from analysis. When participants were missing less than 10% of scale data, multiple imputation was used to estimate missing data points (SPSS Version 25). The independent variables were the subscales of the HBMS and TPBS and the dependent variable was intention to participate in an ERIPP. The intention to participate variable was calculated using total scores of the intention subscale of the TPBS. Total scores and associated median and interquartile ranges were calculated for each of the HBMS and TPBS subscales. Mann-Whitney U tests were used to detect differences in intention to participate in ERIPPs based on gender (Male/Female), previous exposure to ERIPP, and previous history of injury. In instances

where intention was different based on a particular demographic variable, the variable was included within the regression model. A backwards multiple linear regression was used to determine if significant associations between the subscales of the TPBS and intention to participate in an ERIPP existed. Partial eta squared was calculated for each significant variable to determine the strength of the association (small = $0.06 < \eta^2 \leq 0.01$, moderate = $0.14 < \eta^2 \leq 0.07$, or large = $\eta^2 \geq 0.15$) (23). Alpha was set at $P \leq 0.05$ for all analyses which were completed in fall 2019.

Results

There were no statistically significant differences in intention to participate in an ERIPP (median = 7.50, IQR = 6.75) based on demographic variables ($P > 0.05$). There was a statistically significant association between the subscales of the TPBS and intention to participate in an ERIPP ($R^2(4, 27) = 0.80$, $p < 0.001$). Perceived benefits ($B = 4.364$, $\eta^2 = 0.68$, $p < 0.001$) had a positive and large association with intention to participate while perceived barriers ($B = -2.43$, $\eta^2 = 0.40$, $p < 0.001$) had a negative and large association with intention to participate (Table 2). There were no other statistically significant associations ($p > 0.05$).

Table 2
Associations Between Subscales of HBMS, TPBS, and Intention

Subscale	Median (IQR)	Beta	P-Value	Partial Eta Squared
HBMS Barriers	-1.00 (7.00)	1.10	0.18	0.15
HBMS Benefits	5.00 (11.00)	-1.27	0.31	0.09
HBMS Perceived Consequences	1.00 (6.00)	1.03	0.34	0.08
HBMS Community Led Self-Efficacy	6.00 (5.00)	-1.34	0.12	0.19
HBMS External Health Cues	0.00 (4.00)	-0.27	0.77	0.01
HBMS Fear of Injury	0.00 (3.00)	-0.89	0.32	0.08
HBMS General Health Cues	11.00 (8.00)	1.60	0.14	0.18
HBMS Individual Self-Efficacy	-1.00 (6.00)	-0.94	0.26	0.11
HBMS Perceived Susceptibility	4.00 (4.00)	-0.17	0.84	0.004
TPBS Barriers	0.00 (4.00)	-3.51	0.003	0.54
TPBS Benefits	7.00 (11.00)	5.17	0.003	0.53
TPBS Social Influence	7.00 (6.00)	2.22	0.08	0.23
TPBS Social Norms	8.00 (7.00)	-1.60	0.23	0.12
HBMS = Health Belief Model Scale; TPBS = Theory of Planned Behavior Scale				

Discussion

The primary findings of this study were the significant associations between perceived benefits and barriers and intention to participate in an ERIPP in ROTC cadets. Additionally, it is important to note that social influence was trending towards statistical significance and had a large association with intention to participate in an ERIPP ($B = 2.22$, $\eta^2 = 0.23$, $p = 0.08$). These results indicate ROTC cadets value benefits of ERIPP participation, barriers to participate in ERIPPs, and social influences.

The two factors most associated with intention to participate in ERIPPs were perceived benefits of participation and perceived barriers to participation. Perceived benefits of participation include anything that an individual sees as gaining from their participation in an ERIPP such as reducing lower extremity injury rate, improving functional performance, and increasing knowledge of lower extremity injuries and ERIPPs. Perceived barriers include anything the individual sees as a barrier to their participation in an ERIPP. As cadets indicated that they perceived more benefits of participation and reduced challenges to their participation they were more likely to indicate enhanced levels of intention to participate in an ERIPP. These results align well with the results of a study (15) which investigated attitudes towards participation in ERIPPs within female netball players. There was a significant association between the attitudes subscale, comprised of questions related to barriers and benefits of participation, and intention to participate (15). There are multiple benefits to participating in ERIPPs within military personnel including reduction in the risk of lower extremity injury (24) and improvements in functional performance (11, 25). Some of the proposed barriers to participation in ERIPPs have been time, availability of equipment, location of the program, and knowledge on how to perform the exercises (17, 26). Benefits to participation and strategies to overcome barriers may be influential to ROTC cadets when choosing to adopt ERIPPs.

The association between social influence and intention to participate was trending towards significance and was associated with a large partial eta squared effect size. The social influence subscale focuses on the influence of peer participation in an ERIPP and the importance of data to support the effectiveness of the ERIPP to improve athletic performance. Some literature has suggested that ERIPPs can not only reduce the risk of injury, but also lead to improvements in functional performance (11, 25). Specifically, one study indicated improvements following participation in the Dynamic Integrated Movement Enhancement program in jump landing technique (11) while another found improvements in the Army Physical Fitness Test including the 2 mile run, push-up, and sit-up performance (25). However, it is unlikely that ERIPP participants are aware of the benefits of participation specific to improvements in performance. These specific benefits could be highly motivating as ROTC cadets have requirements to pass the Army Physical Fitness Test, which requires a significant amount of physical performance. Additionally, the importance of group setting is already a factor that is instrumental in most military activities (27). The information gained in this study further supports the need for the ERIPP to be a part of normal physical fitness that is completed as a group rather than something the cadet is expected to do individually. The introduction of the specific data that shows improvements in physical performance after

participation in an ERIPP and including the ERIPP in regularly scheduled group physical fitness sessions may encourage ROTC cadets to participate.

There were several subscales from the HBMS and TPBS that were not significantly associated with intention to participate. A few of the subscales with a lack of association with intention were HBMS perceived susceptibility, HBMS fear of injury, and HBMS perceived consequences. The participants in this study were young, healthy individuals and therefore may have not perceived susceptibility to injury, fear of injury, and consequences because most of them had probably not suffered a significant injury in the past. Although most of the participants had experienced an injury in the past, only 14% had an injury they classified as "severe". This assortment is supported by the literature that indicates that this population reports relatively low levels of perceived probability and worry/concern of injury as well as confidence in their ability to avoid injury (28). Additionally, soldiers have indicated that there is a lack of injury education in the military which could lead to a lack of realization of susceptibility and consequences of injury (29). There is a need to further investigate these variables and their importance in relation to participation in ERIPPs in other populations.

The results of this study indicate implementation plans for ERIPPs within ROTC cadets should place a focus on benefits, barriers, and social influence. Participants could be educated on the benefits of participating in ERIPPs including the reduction in lower extremity injuries and improvements in functional performance. Additionally, educational information could be provided on common barriers to participating and strategies to overcome those barriers. Lastly, social influence could be targeted by providing a group setting for the cadets to participate in. Including focus on these factors within the implementation plan for ERIPPs may lead to increased adoption and adherence of these programs. Therefore, future research is needed to determine the effectiveness of an intervention which targets these factors to improve adherence rates of ERIPPs.

There were several limitations associated with this study. Intention to participate in an ERIPP was used as the dependent variable for the regression analysis. There is currently a lack of data to suggest whether intention to participate is directly related to actual participation within users of the program. There is some evidence to suggest that intention to implement ERIPPs is not associated with actual implementation in coaches (30). The sample size for the study was limited and only contained ROTC cadets from one university. As a result, the findings of this study may not be generalized to other military personnel. Participation in an ERIPP is a multifactorial issue. For the purposes of this study, only the attitudes of the user were taken into consideration. It is likely the attitudes towards injury prevention of the leaders are an important factor and must be investigated through future research.

Conclusion

Benefits and barriers were significantly associated with intention to participate in ERIPPs within ROTC cadets. Implementation strategies should focus on presenting the benefits and barriers of ERIPP

participation to the users. Future research is necessary to determine if interventions focused on benefits and barriers will lead to actual improvements in participation.

Abbreviations

ERIPP= Exercise-Related Injury Prevention Program

HBM= Health Belief Model

HBMS= Health Belief Model Scale

ROTC= Reserve Officer Training Corps

TPB= Theory of Planned Behavior

TPBS= Theory of Planned Behavior Scale

Declarations

Ethics approval and consent to participate

Approval for this study was provided by the Mercer University Institutional Review Board. Participants provided written informed consent prior to participation.

Consent for publication

Not applicable

Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

Both authors developed the idea behind the study and developed the design of the study. EG analyzed all of the data associated with this study. Both authors contributed to the writing of this manuscript and

approved the finalized version.

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