Journal of Social, Behavioral, and Health Sciences
2019, Volume 13, Issue 1, Pages 149–165
DOI:10.5590/JSBHS.2019.13.1.09

Public Service Announcements to Promote Physical Activity

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The World Health Organization promotes physical activity (PA) as important for successful maintenance of health, but many individuals are inactive. Despite the potential for public service announcements (PSAs) to communicate health information and promote behavior change, no previous research on developing video PSAs to promote PA was found. The purpose of this quasi-experimental study was to examine how video PSAs designed for public health campaigns affect future levels of intention to engage in PA. The PSAs assessed perceived effectiveness of message foci and the impact of stage of change readiness. They were developed specifically for this study using the model of goal directed behavior as the foundation. Participants were recruited via SurveyMonkey, an Internet-based survey research platform that included an option for referral sampling to view PSAs with the message foci of empathy, fear, information, and combination to determine which focus area was perceived as most persuasive for promoting PA. The present study examined moderating effects of current PA habits, stage of change readiness, and affect at time of viewing PSA. Differences in perceived effectiveness between the different message foci were found with participants perceiving the empathy video as most effective, followed by combination videos, with fear and information being perceived least effective. For participants who met the World Health Organization recommendations for PA, the PSA based on fear was most effective. Many participants (61%) had a positive affect while watching the four PSA videos. Stages of change indicated over 28% of participants were in precontemplation and 11% were in action. Social implications are based on improving public health communication to promote healthy behavior and physical exercise.

Keywords: *physical activity, public service announcement, behavior change, model of goal directed behavior, health communication*

Introduction

The World Health Organization (WHO) promotes physical activity (PA) as one of the primary ways to maintain a healthy body. It is recommended that all individuals engage in exercise to reduce risks of injury and noncommunicable diseases like cardiovascular disease, ischemic stroke, Type 2 diabetes, and different types of cancers. Additionally, PA is associated with improvements in mental health, with reduced injuries and falls, and with weight management (WHO, 2017).

PA should entail at least 150 min of moderate to vigorous intensity each week (WHO, 2017). However, many individuals do not participate in this health-promoting behavior. Across the world, many populations do not meet the minimum guidelines and, in fact, live a sedentary lifestyle, resulting in physical inactivity being the fourth leading cause of death worldwide (Friederichs et al., 2014). Within the United States, the Centers for Disease Control and Prevention (CDC, 2016) reported that in 2014, fewer than 24% of American adults engaged in PA. Because of the health risks

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associated with physical inactivity, there is a need to develop effective methods for communicating public health information in a way that is both informative and motivating.

There is a lack of research into the best approach for U.S. public health officials to develop and communicate public health information in a way that is both informative, motivational, and that will lead to health behavior change. Furthermore, the WHO (Rimal & Lapinski, 2009) has recognized the need for health communications to relay the importance of health behavior change.

Video public service announcements (PSAs) have been found to be an effective tool for communicating information in a persuasive way. The Ad Council (2017) reported several significant and measurable changes to society because of video "commercial" public health ad campaigns. Some notable changes have been in the areas of autism awareness, children's oral health, and gay and lesbian bullying prevention.

Video PSAs are an effective communication platform because they are typically less than 1 min in duration, are aimed at real audiences, and can reach persons of many educational levels (Selfe & Selfe, 2008). To realize PSAs' communicative potential, it is essential that PSA developers understand the role message development, including the message's focus and delivery, plays in viewer response (Epton et al., 2015).

Past research on the effects of inactivity on health (e.g., Hogan, Mata, & Carstensen, 2013; Koeneman, Verheijden, Chinapaw, & Hopman-Rock, 2011; Schutte, Bartels, & de Geus, 2014) supported the significance of the present research in aiding health communicators to improve the effectiveness of PSAs in promoting health behavior change as it relates to PA. Although previous literature has elucidated the role PA plays in a person's health, for the research data to extend to change in society, effective dissemination of the data is significant. Public health information is important, but it is not beneficial if it does not lead to behavior change.

Efficacy of Public Service Announcements

PSAs have been found to be effective at communicating information, and research has confirmed that their effectiveness can be measured through perceived effectiveness (PE; Bigsby, Cappella, & Seitz, 2013). PE is the ability of a person to become aware of something and make a change based on that new information (Bigsby et al., 2013). Furthering the understanding, researchers have been able to determine the link between PE and actual effectiveness (AE), with specific focus on emotional response (Bigsby et al., 2013).

Shen (2010) examined the message frame in video PSAs and how it affected individuals' cognitions and attitudes. Shen's targeted behavioral change was smoking cessation. Participants in the study viewed four randomized videos for three different PSAs, each with a different message frame: health consequences, secondhand smoke, and industry manipulation. Message frame was identified as a central organizing idea or story line that provides meaning or context to the information.

Behavior Change Influencing Physical Activity

Behavioral intention, defined by the National Institutes of Health (n.d.), is a "person's perceived likelihood or subjective probability that he or she will engage in a given behavior" (para. 1). Behavioral intention is a thought process people engage in to decide if an actual behavior change is going to occur. Considerations such as "Do I intend to engage in this new behavior?" are rooted in personal concepts such as desire, motivation, and accountability in what may or may not occur if the behavior change is not implemented. In areas such as marketing, medical care, and research, behavioral intention is the most proximate predictor of behavior, and behavior is the variable most people are trying to influence.

Understanding the relationship between intention and behavior is paramount to being able to promote a positive health change. Researchers continue to review behavioral intention as it relates to PA. Rhodes and Dickau (2013) completed a review of articles with the focus on the moderators that increase intention to engage in PA.

Through their research, Rhodes and Dickau (2013) were able to determine that 38 different moderators are in the PA domain. The primary moderator that affected behavioral intention was intention stability. Intention stability, defined by Rhodes and Dickau, is a person maintaining the same motivational flux or strength over a period of time. The results demonstrated a positive correlation between intention stability and PA. The strength of their research helped confirm the ability to measure behavioral intention and that PA promotion could be more effective if behavioral intention were used to design public health information campaigns targeting a promotion to engage in PA (Rhodes & Dickau, 2013).

Conner, McEachan, Lawton, and Gardner (2016) furthered the understanding about behavioral intention within health psychology. The goal of their research was to examine the intention–behavior gap within a broad scope of health-related issues and determine how the intention–behavior gap relates to motivation as a predictor of intention. Prior understanding was that intention is based on different cognitive beliefs, which then impact the intention of a behavior change, where the focus is on attitudinal and normative motivational factors, controlling for perceived behavior control/self-efficacy (Conner et al., 2016)

Choi, Chung, and Park (2013) focused their research on the transtheoretical model, which they used to understand behavior in relation to the stages of change theories. The stages of change consist of precontemplation, contemplation, preparation, action, and maintenance. The concept is that people have to move through the progressive stages to implement and sustain a behavior change. Additionally, some people may stay at the precontemplation stage, not realizing that they truly need to make a change. It is through understanding the stages of change that practitioners can help people progress and make change.

The growth of behavior-change theories led to the theory of planned behavior (TPB), used by Hobbs, Dixon, Johnston, and Howie (2013) in their research on PA. TPB focuses on cognitions that predict different behavior beliefs. TPB is considered a parsimonious theory using two proximal predictors of behavior: intention and perceived behavioral control. Research has found that intention is affected by beliefs and attitudes regarding a particular behavior, subjective beliefs, and behavior control. The research conducted by Hobbs et al. targeted PA intention with results indicating that TPB can predict behavioral intention within individuals; however, TPB has limitations in that predictions are more accurate the closer in time the intention is to the event. Owing to perceived strengths and limitations of behavior change theories in predicting behavioral intention, research continued with a new model.

The model of goal-directed behavior (MGDB) developed from the TPB and includes the emotion of desire (Esposito, van Bavel, Baranowski, & Duch-Brown, 2016). The inclusion of desire in behavior change theory incorporates people's wish to do something rather than just their feeling of obligation to do something (Esposito et al., 2016). The MGDB includes subjective norms (perceived social pressure), positive anticipated emotions (positive consequences), and negative anticipated emotions (negative consequences), which can influence behavioral intention (the likelihood that a person will engage in a specific behavior change), allowing PE to be measured (Esposito et al., 2016).

Promoting a Behavior Change via Video PSAs

Santa and Cochran (2008) researched the use of video PSAs with the goal of informing future video PSA developers on best practices to create behavior change. The purpose of their study was to determine if differing message foci had differing influences on viewers that could lead to behavior change. Message focus was considered to be the character of the emotional response viewers would have to the PSA, influencing viewers' decision making. Santa and Cochran used PSAs with an empathy focus to the message, a fear focus to the message, and a basic information focus to the message. As a comparison against the independent variables, negative affect, positive affect, and PE of message were all used as dependent variables. In the end, they found that PSAs with an empathy focus evoked the most negative affect, creating the most significant intention to engage in behavior change.

Bigsby et al. (2013) suggested that being able to measure message effectiveness of the PSA would be useful for creators of public health campaigns as well as for researchers wanting to evaluate message effectiveness. Bigsby et al. focused on the importance of message effectiveness, suggesting longitudinal testing would be the most informative approach to confirm message effectiveness; however, the reality of longitudinal testing would be prohibitive to confirming AE.

With the recognition that longitudinal testing is prohibitive, Bigsby et al. (2013) focused on the concept of PE of persuasive PSA messages. Using smoking cessation as their target behavior change, the researchers were able to determine that PE is an indicator of AE. The study focused on emotions as variables (fear, pride, hope, guilt, and anger) and included readiness to quit (motivation) to derive an aggregate PE score. Additionally, the researchers found that messages that were perceived as more effective by viewers influenced those viewers with an intention to engage in the new behavior that was consistent with the message, even when the message was considered difficult, such as in the area of smoking cessation.

The purpose of the present study is to evaluate how different message foci within a video PSA may have different PE when promoting PA. Specifically, this study will compare the PE of four different message focus areas (empathy, fear, combination, and informational). At the present time there is minimal research available focused on video PSAs creating a behavioral intention to engage in PA. Additionally, the present study will compare previous research results determining which emotion creates the strongest behavioral intention to engage in behavior change.

This quasi-experimental research study was based on the overall research question of whether video PSAs with different message foci elicit a behavioral intention to engage in PA. The research questions follow.

> *Research Question 1:* Which video PSAs with different message foci (empathy, fear, information, and combination) elicits the strongest relationship between affective response (positive or negative) and PE to engage in PA?
>
> *Research Question 2:* Which video PSAs message foci (empathy, fear, information, and combination) elicits the greatest difference in PE for intention to engage in PA?
>
> *Research Question 3:* Does having higher amounts of time spent exercising per week effectively moderate the relationship between PE of video PSAs with different message foci (empathy, fear, information, and combination) and behavioral intention to engage in PA?
>
> *Research Question 4:* Do people in different levels of stage of change have differences in PE of video PSAs with different message foci (empathy, fear, information, and combination) to engage in PA?

Research Question 5: Does being in the contemplation stage of change effectively moderate the relationship between PE of video PSAs with different message foci (empathy, fear, information, and combination) and behavioral intention to engage in PA?

Research Question 6: Does being in the action stage of change effectively moderate the relationship between PE of video PSAs with different message foci (empathy, fear, information, and combination) and behavioral intention to engage in PA?

Methodology

The video PSAs, developed specifically for this study using the MGDB as the framework, allowed for parallel reliability between the PSAs themselves. Each dialogue included the feeling of desire by the main actor. This assured that not only was each message foci distinct but conveyed the wish to engage in PA. To increase consistency in testing, the same actors and setting were used to ensure the only difference between PSAs was the message foci area (empathy, fear, information, or combination). This allows for future researchers to retest results without having to locate the same or new PSAs that were developed by different sources.

During the online survey, participants completed a demographic questionnaire and the University of Rhode Island Change Assessment (URICA) prior to viewing PSAs. Participants then viewed one of the video PSAs and completed an attention question. They then completed the Perceived Effectiveness Rating Scale (PERS), rating the participant's opinion of the effectiveness of the PSA. They repeated this for all four video PSAs (in random order). After completing all four video PSAs, they then completed the Positive and Negative Affect Schedule (PANAS).

All four message foci were measured to determine if a video PSA can influence the dependent variable of viewers' intention to engage in PA as measured by levels of PE of the PSAs. The message foci of empathy, fear, and information were selected due to prior PSA research conducted by Santa and Cochran (2008). The message focus of combination was added due to research on cognition and affect being important factors is changing exercising beliefs and habits (Conner, Rhodes, Morris, McEachan, & Lawton, 2011).

A moderating factor considered was the current amount of time a person spends exercising per week. Bussmann and van den Berg-Emons (2013) suggested that there are many factors that influence amounts of PA and sedentary lifestyle. Looking at the amount of time a person is currently engaged in PA prior to viewing PSAs may show a moderating factor is the persuasiveness of the videos. As a covariate to the research questions, the current behavior "stage of change" that someone is in is also being considered in potentially influencing the PE of the PSA videos.

Participants and Sample Size

Based on a sample size calculation for an anticipated medium effect size of .25, power of .8, and probability level of .05, and based on a minimum of four predictors or independent variables, the minimum sample size required for analysis of variance would be 180. Using the same factors for multivariate analysis of variance, the minimum sample size would be 129, and for analysis of covariance, the minimum sample size would be 125.

To ensure all analysis met correct sample size with a small to medium effect size, 200 participants were recruited (100 men and 100 women) via SurveyMonkey, an online survey research platform with an option for referral sampling. Additionally, using 100 men and 100 women resulted in generalizable data specific to gender based on prior research (Bhui & Fletcher, 2000, Santa & Cochran, 2008). SurveyMonkey Audience reported that Internet users may skew the participant pool

toward those people who have access to the Internet and computers, who are more highly educated, who have higher incomes, and who are younger than the overall general population (SurveyMonkey, 2018).

Procedure

Adult participants were recruited using SurveyMonkey Audience via anonymous online survey with a link at the end of the survey for referral sampling. There were no exclusion factors. All completed a demographic questionnaire and the URICA prior to viewing randomized PSAs. Participants then completed an attention question, the PERS, rating the participant's opinion of the effectiveness of the PSA, and then the PANAS. The empathy, fear, informational and combination foci were measured to determine if the video PSA can influence the dependent variable of viewers' intention to engage in PA as measured by levels of PE of the PSAs.

Instrumentation

The URICA is a self-reported measure that was developed at the University of Rhode Island Cancer Prevention Research Center (1991) and has been adapted and validated for exercise and was available for use for researchers without written permission. This URICA was used to understand participants' readiness for change based on a 5-point Likert-type scale from 1 (*strongly agree*) to 5 (*strongly disagree*). Questions were focused around exercise. An "attention question" was used to confirm participant viewing of video PSA. This was a question specific to each video, that could only be answered correctly if viewed. This process was This process was used by Santa and Cochran (2008). The question specific for this research study matched each video and was developed by the researcher (e.g., informational: "Was Matt sharing information about the benefits of PA?"; combination: "Did the two friends offer to bike with Matt some time?"; empathy: "Does Matt make comments about missing his dad?"; and fear: "Did Matt state he was scared about what could happen to him?").

The PANAS, which was developed and validated for brief measures of positive and negative affect (Watson, Clark, & Tellegen, 1988), was available for researchers without permission. It was used to measure PE of each message focus using a 5-point Likert-type scale from 1 (*very slightly or not at all*) to 5 (*extremely*). The PANAS was also used in prior video PSA research by Santa and Cochran (2008). In the present study, it was used to measure participant affect.

The PERS, used by Santa and Cochran (2008), was adapted to measure PE of PSA promoting PA and was provided to use in this study. It is a 5-point Likert-type scale from 1 (*strongly agree*) to 5 (*strongly disagree*).

Independent Variables

The independent variable of message focus (i.e., information, empathy, fear, and combination approach) within a video PSA was hypothesized to influence the dependent variable of viewers' intention to engage in PA. This was measured using the PANAS scores and PSA rating questionnaire.

Dependent Variables

For this study, the dependent variable was the viewers' intention to engage in PA as measured by the PE of each PSA. Additionally, within this study, the moderating variable of current PA engagement measured in minutes was captured to see if current levels of PA influenced the PE of each PSA. Finally, the covariate of the participants' current stage of change readiness at the time of the study was measured by focusing specifically on the contemplation and action stage of change.

Results

The participants ranged in ages from 18 to 74 years old, with ages being divided into seven age categories: 18–24 (n = 25, 12.5%), 25–34 (n = 84, 42%), 35–44 (n = 33, 16.5%), 45–54 (n = 34, 17%), 55–64 (n = 20, 10%), 65–74 (n = 4, 2%), and 75–99 (n = 0, 0%). Two hundred participants participated in the survey, 100 men (50%) and 100 women (50%). Participants resided in 37 states, with Virginia (18.5%), Florida (1.0%), and California (0.7%) being the top for participation. Total education ranged from none at all to completed graduate school; 99% of participants said they completed 2 or more years of college, with 43% of participants graduating college (i.e., 4 years) and 16% completing graduate school. Participants rated their approximate household income as \$0–\$24,999 (n = 38, 19%), \$25,000–\$49,999 (n = 52, 26%), \$50,000–\$74,999 (n = 54, 27%), \$75,000–\$99,999(n = 19, 9.5%), \$100,000–\$124,999 (n = 6, 3%), \$125,000–\$149,999 (n = 2, 1%), \$150,000–\$174,999 (n = 8, 4%), \$175,000–\$199,999 (n = 7, 3.5%), and ≥\$$n$,000 ($n$ = 14, 7%). Thirty-four percent of participants said they had children under 18 years of age living at home. Finally, the covariate, number of minutes of PA engaged in each week over the past 2 weeks, ranged from 1 min to more than 150 min. Results showed 49% of participants reported no more than 60 min of PA each week.

Research Question 1 focused on the implications of affect on PE of PSA message foci. Affect consisted of two levels (positive and negative) and message foci consisted of four levels (fear, empathy, information, and combination). The main effect for positive affect type yielded $F(37, 57) = 15.35$, $p < .001$, indicating a significant difference between message foci. Negative affect type yielded $F(32, 57) = 23.97$, $p < .001$, indicating a significant difference between message foci with fear ($M = 2.93$, $SD = .464$), empathy ($M = 2.97$, $SD = .413$), information ($M = 2.85$, $SD = .466$), and combination ($M = 2.93$, $SD = .396$). The results, shown in Table 1, indicate participants with a positive affect perceive fear, empathy, and information videos more negatively, whereas a combination video was better received. However, participants with negative affect viewed fear, empathy, and information videos more positively, with a negative view of the combination video.

Table 1. *Positive and Negative Affect Schedule (Participant Affect at Time of Study)*

Variable	*N*	*M*	*SD*	Kurtosis *SE*
Positive	200	30.62	8.764	.342
Negative	200	19.37	9.124	.342

Kendall's W was run for Research Question 2 to determine if there was agreement between the PE of the four PSA message foci. The participants moderately agreed in their assessments of PE, $W = .419$, $p < .001$, as illustrated in Table 2 and 3, with the empathy PSA perceived as most effective, with combination being the least effective.

Table 2. *Interpretation of Kendall's* W

Variable	Mean rank
Information	2.65
Fear	2.99
Combination	3.05
Empathy	1.31

Note. The higher the mean rank score, the stronger the disagreement between rankers.

A Pearson correlation was conducted to determine the relationship between the different PSA foci. There was a strong, positive correlation between information and combination, which was

statistically significant, $r(200) = .716$, $p < .001$. There was a strong, positive correlation between information and empathy, which was statistically significant, $r(200) = .757$, $p < .001$. There was a strong, positive correlation between information and fear, which was statistically significant, $r(200) = .796$, $p < .001$.

Table 3. *Perceived Effectiveness of Video Public Service Announcement via Results of Perceived Effectiveness Rating Scale*

Variable	*N*	*M*	*SD*	Kurtosis *SE*
Information	200	2.85	.466	.342
Combination	200	2.92	.395	.342
Empathy	200	2.97	.413	.342
Fear	200	2.93	.464	.342

To see the moderating effect of exercise, for Research Question 3, an analysis was conducted on the influence of PE of PSA message foci moderated by the amount of exercise a participant currently exercises as illustrated in Table 5. Current level of exercise was categorized as 1–30 min, 31–60 min, 61–90 min, 91–120 min, 121–150 min, and >150 min; message foci consisted of four levels (fear, empathy, information, and combination). All effects were statistically significant at the .05 level. Results showed that 49 participants (24.5%) exercised 1–30 mins per week, 49 participants (24.5%) exercised 31–60 min per week, 29 participants (14.5%) exercised 61–90 min per week, 28 participants (14%) exercised 91–120 min per week, 18 participants (9%) exercised 121–150 min per week, and 27 participants (13.5%) exercised more than 150 min per week. These results reveal that of the 200 participants, 86.5% exercise less than the WHO recommendation for required PA. The results indicate participants who currently engage in PA have a 23% certainty to associate PE needs with fear, 21% with information, 18% with empathy, and 18% with combination. For the moderating effect of exercise on the influence of PE, the null hypothesis has been rejected.

For Research Question 4, an analysis was conducted on the influence of readiness to change, as measured by the URICA and the PE of PSA message foci. There was a statistically significant difference in "readiness to change" score for the PSA message foci of fear, $F(34, 199) = 5.604$, $p < .005$; empathy, $F(34, 199) = 4.426$, $p < .005$; information, $F(34, 199) = 5.296$, $p < .005$; and combination, $F(34, 199) = 3.385$, $p < .005$. Therefore, the null hypothesis is not supported. Overall, these results demonstrate that people who have an overall readiness to change their belief in PA may view the fear PSA as most effective (Table 4).

Table 4. *University of Rhode Island Change Assessment: Exercise – Stage of Change Readiness*

Variable	*N*	*M*	*SD*	Kurtosis *SE*
Precontemplation				
No belief in exercise	200	13.19	2.695	.342
Belief in exercise	200	14.63	2.543	.342
Contemplation	200	13.75	2.120	.342
Action	200	11.51	2.189	.342
Overall readiness	200	26.41	3.739	

Additional Findings

The results indicated there was a positive, although minimal difference in the scores for females as compared to males for all message foci area, as seen in Table 5. This is important because PSAs can be designed based on message and not gender. In previous research, Santa and Cochran (2008) found that women had a higher response to PSAs that effect the greater social good rather than individualism. The results of this study indicated both men and woman were more influenced by the empathy PSA, with woman having a slightly higher response.

Table 5. *Mean (Standard Deviation) of Public Service Announcement Message Foci by Gender*

	Female		Male	
Variable	*N*	*M* (*SD*)	*N*	*M* (*SD*)
Information	100	2.89 (0.539)	100	2.81 (0.378)
Combination	100	2.94 (0.442)	100	2.91 (0.346)
Empathy	100	3.02 (0.486)	100	2.93 (0.414)
Fear	100	2.95 (0.656)	100	2.92 (0.368)

Discussion

Rather than using preexisting video PSAs for the current research study, new ones were designed specifically for this study. To continue the research in the message focus area, this study included the areas of empathy, fear, and information messages. The combination focus area is included to determine any correlations between fear, empathy, or information approaches.

The premise for the research was that when informing the public about the importance of PA, if video PSA message focus resonates with viewers; developers and public health officials could predict an increase in PA. Four video PSAs with difference message foci (fear, empathy, information and combination), had different results in PE of the message.

Overall results indicated that 86% of participants did not meet the minimum PA requirements recommended by the WHO. Those participants who exercised at least 150 min perceived the combination PSA as most effective, with empathy and fear close behind, and information least effective. For participants reporting no current amount of exercise, empathy was perceived as most effective, fear and combination close behind, and information least effective. There was no statistically significant difference in "readiness to change" score for each message foci.

The results of this study indicate differences in PE between the different message foci (fear, empathy, information, and combination). Overall, participants perceived the empathy video as more effective, followed by combination, with fear and information being perceived as least effective. These

results are similar to the Santa and Cochran (2008) study, in which empathy was perceived as most effective, followed by fear and information. The results indicate consistency in participant response, even with different foundational structure of PSAs and PSA message.

The results of the present study also correlate with current research on PSAs examining the relationship between message affective reactions and attitude. Crozier, Berry, and Faulkner (2018) determined that if parents perceived that the PSA message was personally relevant, that it provided good information, and that the sponsoring organization of the message was positive, then they were more likely to encourage their children to be more physically active. These findings support the results of this study that media campaigns designed to elicit affective response can result in relatable and positive attitudes.

Hogan et al. (2013) explored age differences in cognitive performance and affective experience after a single event of moderate exercise. The results demonstrated that a single event of exercise does have a positive effect on both affective experience and cognitive performance, regardless of participant age. Results from the present study also indicated via the PANAS that 61% of participants had a positive affect while watching the four PSA videos. The latest research on promoting PA included predictors of intention, focusing on the conscious process of self-efficacy (St Quinton, 2017). The results in the present study, as well as other studies, indicate that PE can be measured and has aspects that promote intention.

A moderating effect in viewing the PSAs as effective was the current amount of PA engagement of the participant. Overall, the higher level of current exercise engagement, the higher the PE of each PSA. For participants who met WHO recommendations, the fear PSA was most effective, with fear being most effective for those participants right below that level, and empathy being most effective for all other levels.

In reviewing the results of the present study for the impact of education on PA engagement, 99% of participants in the study had completed at least 2 years of college. This was not a surprise due to the use of an online survey. SurveyMonkey Audience reported that Internet users may skew the participant pool toward those who have access to the Internet and computers, who are more highly educated, have higher incomes, and are younger than the overall general population (SurveyMonkey, 2018).

It was significant that 26% of the participants had an income level of ≤$25,000. This could be a result of our population, 42% of whom were in the 25–34 age range. This would make sense, as younger people tend to be in the lower income brackets, being new in their career fields or having less work experience.

The results of the present research study indicated that 27% of participants' household income was >$50,000. This was expected, given that participants who use an online survey would have a higher income based on prior research. Shuval, Li, Gabriel, and Tchernis (2017) found in their study that participants in the higher income levels were 1.6% and 1.9% more likely to meet PA guidelines.

The CDC's Division of Nutrition, Physical Activity, and Obesity continues to monitor the health of Americans with a goal of improving the public's health (CDC, 2017). The reason for the continued monitoring of Americans is the rise in obesity, which has been reported to cost the United States health care system $147 billion annually (CDC, 2017). Secondary to obesity is the continued rise in preventable conditions or diseases—such as high blood pressure, high cholesterol, Type 2 diabetes, heart disease, and certain cancers—that also increase the burden on the U.S. health care system. Thus, it is vital that the public be made aware of factors related to inactivity and be persuaded to take action.

PSAs have been found to be effective at communicating information, and research has confirmed that their effectiveness can be measured (Bigsby et al., 2013). PSAs are currently used to promote topics such as smoking cessation, abstinence from drugs, and drunk-driving education. Research has been able to measure PE, which is the ability of a person to become aware of something and make new choices based on that new information, when information is through PSAs.

A recent study of PA variables resulted in new information that could help in the development of PSAs. Downs (2016) found that environmental variables can impede PA engagement, even for people who are highly engaged in PA. This may suggest that PSAs should not only take an empathetic approach but should also promote environmental factors that also increase (or, at least, do not decrease) PA engagement and work–life balance.

Stage of change results indicate over 28% of participants were in precontemplation (unaware that a change is needed), with 13% having no thoughts regarding exercise. Only 11% of participants were in the action stage of change. Additional previous research also focused on precontemplation, recognizing that analysis of precontemplation can benefit from refinement, because the current assessment of people in precontemplation could still meet WHO guidelines. Walker, Tullar, Taylor, Roman, and Amick (2017) reported that stage of change for PA was more predictive for the action and maintenance stages of change, possibly because people were already in the planning stage when the PA events occurred.

The newer, more concise model of the stages of change has been found to measure precontemplation to better predict people who know their behavior is unhealthy but are apathetic to it (Lacey & Street, 2017). This is important because participants tested under the traditional model of stages of change could meet WHO recommendations even in the precontemplation stage. Continued understanding in stages of change, especially precontemplation, can help promoters of public health information tailor information dissemination in a way that is more effective.

Zhang and Yen (2015) found that PA reduces depressive symptoms for both men and women. More specifically, depressive symptoms affected men differently than women. It was found that PA ameliorates moderate depressive symptoms in men, whereas it ameliorates mild, moderate, and moderately severe depressive symptoms in women. This supports existing research that regular moderate PA can benefit both men's and women's overall mental health.

Bhui and Fletcher (2000) reviewed general mood and anxiety states between men and women when PA was a moderating factor. It was found that although men benefit more from longer periods of daily activity, both genders benefit from long periods of low-intensity exercise, which brings a reduction in morbidity rate. It was noted that although women have lower response rates, they also had a high prevalence of anxiety and depressive states, which could reflect a hormonal or physiological factor.

The results of the present study confirm minimal difference in results from women to men; this is significant because PSAs can be designed based on message and not gender. In previous research, Santa and Cochran (2008) found that women had a higher response to PSAs that effect the greater social good rather than individualism. The results of this study showed both men and woman being more influenced by the empathy PSA, with woman having a slightly higher response, consistent with prior research. Another recent study found no significant change in PA measures when comparing genders and age groups (Gorzelitz et al., 2018) strengthening the assumption that age and gender in PA discussions have minimal impact, noting that other differentiating factors may need to be studied.

Limitations of the Study

A number of limitations should be considered when interpreting the findings presented in this study, such as the single-sample design, convenience sample, data collection process, age, ethnicity and socioeconomic makeup, use of self-report questionnaires, and length of the study. Many of these limitations are a product of the constraints present when conducting research in the field of psychology or in applied settings.

All measures were self-reports and therefore suffer from common research problems such as those associated with response distortion (social desirability), response bias, introspective ability, and understanding of the question (Allen, Magee, Vella, & Laborde, 2017). New research also shows that participant self-report measures for PA may underestimate actual activity, especially based on education and marital status, but not based on obesity status (Gorzelitz et al., 2018). Additionally, the use of rating scales can create problems as people interpret scales differently, leading to measurement bias (Austin, Gibson, Deary, McGregor, & Dent, 1998). All assessments used 5-point Likert-type scales ranging from *strongly agree* to *strongly disagree*.

The limitation of self-reported measures is an important factor because researchers have been able to determine the link between PE and AE, with specific focus on emotional response (Bigsby et al., 2013). Research has found that exercise climate (the feelings people have related to comfort and feeling accepted) could affect motivation and how that can be applied to the creation of PSAs (Brown, Fry, & Little, 2013). This means that future research may benefit from replacing some self-report measures with real-time or longitudinal measures to determine PE. This would benefit determinations of AE.

The single-sample design and use of a convenience sample for the study could have had a limiting influence. The sample used in the study was a medium size ($N = 200$), with 42% of participants falling in the 25–34 age category. Although participants resided in 37 different states, Virginia had by far the most (18.5%). Ninety-nine percent of participants were in the category of 2 years of college or higher. Educational activity may play a factor in belief systems or time availability for PA. For household income, there was no standout income level. Taking the limitations into account, the results may not generalize to any one population.

The single-sample design and convenience sampling could be a limiting factor in video PSA development throughout the United States if the PSAs are not able to generalize to large populations. Within the United States, the CDC (2018) reported that in 2015, only 15 states and the District of Columbia indicated 50% of the adult populations who participated in their survey reported engaging in PA at the WHO standards. These states were primarily in the Midwest. The Central and Eastern United States reported ranges between 35% and 55%. Although the percentages of people reporting to be more physically active did increase over a 2-year reporting period, the results from this study demonstrate that on average, more than 50% of the U.S. population remains inactive. These results indicate there is still a need to improve public health communication methods in a way that can increase public understanding of the need for regular PA.

The length of the present study may have also been a limitation. This study involved taking two assessments, watching four videos, and then taking an additional assessment after each video, for a total of 139 questions and a survey length of 17 min. SurveyMonkey reports that participants may begin speeding through a long survey, sacrificing quality results (SurveyMonkey, 2018). Future studies using multiple videos or assessments should consider keeping survey length to 50 questions and survey time to less than 15 min (SurveyMonkey, 2018) for stronger results.

Video PSAs have been found to be effective at communicating information, and research has confirmed that their effectiveness can be measured (Bigsby et al., 2013). Research has shown that video PSAs are an effective communication platform because they are typically less than 1 min long, they are aimed at real audiences, and they can reach persons of many educational levels (Selfe & Selfe, 2008). To realize PSAs' communicative potential, it is essential that PSA developers understand the role message development, including the message's focus and delivery, plays in viewer response (Epton et al., 2015). Because this study included four PSAs and over 100 questions, the survey itself may have been contradictory to good effectiveness levels based on prior research.

Implications for Social Change

This research may be significant in its benefit to those who disseminate public health information through PSAs, and to the public who view the PSAs. Past research on the effects of inactivity on health (e.g., Hogan et al., 2013; Koeneman et al., 2011; Schutte et al., 2014) supports the goal of aiding health communicators as they improve the effectiveness of PSAs in promoting PA and health behavior change. The overall results of this study, in combination with previous PSA research, support the need for PSAs to be developed in a way that resonates with viewers to facilitate behavior change and promote PA and exercise.

Additionally, the results from using the MGDB as the framework for the four PSAs extend research knowledge in behavior change understanding. The inclusion of desire in this behavior change theory incorporates people's wish to do something rather than just feel obligated to do it (Esposito et al., 2016). New research also supports the significant role of desire in a person's decision-making process that ultimately influences behavioral intention (Park, Lee, & Peters, 2017). The results of this study, combined with prior research, confirm that behavior change is a process and inclusion of the essential element of desire when trying to implement or influence a behavior change is necessary.

Although previous literature has elucidated the role PA plays in a person's health, for the research data to extend to change in society, effective dissemination of research data is important. New public health information is important, but it is not beneficial if it does not lead to behavior change. This study's findings revealed that 86% of participants did not meet the minimum PA requirements recommended by the WHO, signifying current public health communication may not be effective. Providing empirical evidence that promotes health behavior change to PSA developers will result in a significant benefit to society and individual health and well-being.

Recommendations for Further Study

This study is particularly important due to its design, which considered both PSA development and behavior change process. Repeating this formula to confirm its effectiveness would benefit future PSA development. Additionally, future research would be beneficial if a longitudinal study was completed. Although Bigsby et al. (2013) has already provide empirical results to confirm PE can lead to AE, updated testing with this new research could benefit researchers and PSA developers.

Additionally, confirming the impact of PSAs that promote PA by age, culture, and population would also be beneficial. The goal of PSAs is to promote a public health concern, and the message is only beneficial if it resonates with the audience. This study evaluated the different household demographic of overall household income and households with children under 18: 72% of the participants made $75,000 or less, and 66% had no children under 18. This suggests that overall income and responsibilities and cost associated with children may not be a factor in a person's desire to engage in PA. If this is the case, then it is important to continue to promote PA based on fact rather than life situation; again, this information is beneficial to PSA development.

Future research on PA could also benefit from an in-depth view into the role of income and age. Although it was not surprising that 99% of participants in this study had at least 2 years of college or more, due to the online survey platform, it was significant that the results still showed that 86% of participants did not meet the WHO recommendations. A future question may be whether income really does play a factor in a person's desire to be physically activity. Although income does aid in giving people options, in many areas, if there are enough free options to engage in PA, then what is preventing people from action?

An unexpected outcome in our study was that 26% of our participants had an income level of <$25,000. This could be a result of our population, 42% of whom were in the 25–34 age range. A future research area may include looking into the best motivation age to start promoting PA. Many studies show that getting children engaged early in PA has a significant effect on executive function, attention, and academic performance (de Greeff, Visscher, Hartman, Bosker, & Oosterlaan, 2018).

The results of the present research study found that 27% of participants' household income was >$50,000. Shuval et al. (2017) found in their study that participants in the higher income levels were 1.6% (during 2-day period) and 1.9% (during 7-day period) more likely to meet PA guidelines.

Conclusion

With overall results indicating that 86% of participants did not meet the minimum PA requirements recommended by the WHO, results from this study support the continued need for public health information to be presented in a way that resonates with the audience. Results from stage of change scores indicate over 28% of participants were in precontemplation (unaware that a change is needed), with 13% reporting having no thoughts regarding exercise, again indicating a potential need to change how public health information regarding the need for PA is disseminated.

The results of this study confirm minimal difference in results when comparing female and male participants. This is important because PSAs can be designed based on message and not gender; however, gender-specific PSAs may be useful in reaching specific audiences. Additionally, designing PSA for specific ages will be useful to promote PA in children, adolescents, and young and older adults. It is recommended that future research into video PSA development to promote PA continue to promote increases in PA for everyone.

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