Be HeadSmart® Seniors! -- The Effectiveness of a Psychoeducational Fall and Consequential Injury Prevention Program

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Abstract

This study tested the utility of the Be HeadSmart® Seniors! fall prevention intervention, HeadSmartz, a Cranium Challenge, in the promotion of safety improvement behavior change. It employed a quasi-experimental two-group design. Of the 106 individuals included in this study, 64 received the intervention and 42 only received the safety brochure. The Cranium Challenge is an interactive, visual, and auditory program based upon the popular board game Cranium™. This game stimulated various parts of the participant's brain verbally, through trivia questions and word games, visually, or by humming, whistling, or playing charades. The presentation included trivia questions created in a PowerPoint presentation that addressed facts about prevalence, incidence, and prevention of falls that can result in traumatic brain injury. Results indicated that participants who received the fall-prevention intervention reported a higher proportion of safety improvement behavior changes when compared to individuals who only received educational safety information. Logistic regression was used to test whether the proportion of safety improvement changes (H_0: p intervention $\leq$ p comparison, $\alpha \leq .05$) was the same for intervention participants vs. persons in the comparison group. The two groups were found to have significant differences in the probability of safety improvement behavior changes ($X^2=3.877$, $df=1$, $p= 0.049$). These results support previous research that use of a multicomponent change strategy can be successful in promoting behavior change, even in areas as complex and multi-factorial as fall prevention and intervention.

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Background

The number of older adults living in the United States has grown exponentially during the 20th century. According to the Federal Interagency Forum on Aging-related statistics (2004), the number of individuals aged 65 or older grew from 3 million to 35 million (1900-2004) (http://agingstats.gov/chartbook2004/default.html). With the onset of the retirement of the Baby Boomer generation, the number of individuals aged 65 and older has been predicted to double. As the number of older individuals continues to grow, our society will encounter new challenges and face a myriad of new issues that are associated with this cohort. Morbidity and mortality associated with unintentional injury are areas of research that need to be examined and addressed. The purpose of this research study was to evaluate an intervention used to reduce risk factors associated with unintentional fall-related injuries.

The Centers for Disease Control National Center for Health Statistics (NCHS) reported that there were 161,269 deaths associated with injury during the year 2002. A total of 53, 464 of these deaths occurred in individuals aged 55 years and older. The number of nonfatal injuries was reported as 29,237,747. A total of 4,587,013 of these injuries occurred in individuals aged 55 years and older (http://webapp.cdc.gov/sasweb/ncipc/mortrate.html). According to the Centers for Disease Control National Center for Injury Prevention and Control, unintentional falls are the leading cause of unintentional injury death in individuals and unintentional injuries sustained by individuals over the age of 65 (http://www.cdc.gov/ncipc/osp/charts.htm).

There are many adverse outcomes that have been linked to falls. These include moderate to severe injuries such as bone fracture and traumatic brain injury (TBI). The most commonly reported fractures occur in the hip, forearm, leg or ankle, pelvis, underarm, and hand areas (http://www.cdc.gov/ncicp/factsheet/falls.htm). Falls are a leading cause of TBI (Thurman et al., 1999) and are a leading cause of TBI-related deaths for individuals over the age of 75 (Adekoya et al., 2002). Injuries related to falls sustained by people over the age of 65 have been increasing and more attention is being given to this major public health problem.

Fall intervention and prevention programs have been developed and implemented to promote healthy aging. Healthy or normal aging is often affected when an injury is sustained by an individual. Theory, based from behavioral and social sciences, provides a basis for understanding why people engage in health-risk or health-compromising behavior and why and how they adopt health-protective behavior. "Understanding the diverse individual, familial, social, and cultural factors that influence an individual's adoption or maintenance of health-compromising behavior can be extremely useful when applied to planning, implementing, and evaluating health promotion programs" (Crosby, Kegler & DiClemente, 2002, p. 2). A range of theoretical approaches have been applied to the promotion of health in many different disciplines. The conceptual framework for this study was based upon a combination of the model for successful aging (Rowe & Kahn, 1997) and the Transtheoretical Model of Change (Prochaska, DiClemente & Norcross, 1992).

Rowe and Kahn (1997) define successful aging as "including three main components: low probability of disease and disease-related disability, high cognitive and physical function capacity, and active engagement with life" (p. 433). These components are hierarchical, interrelated, and include subparts. The low probability of disease "refers not only to the absence or presence of disease itself, but also to absence, presence, or severity of risk factors for disease" (p. 433). Physical and cognitive capacities encompass the potential for an activity including what individuals are able to do and what they choose to do. The authors state that "successful aging goes beyond potential; it involves activity" (p. 433). In this model of successful aging, active engagement with interpersonal relations and productive activity were considered to be most important. An activity is defined as being successful if it "creates a societal value, whether or not it is reimbursed" (p. 434).

The Transtheoretical Model of Change "offers an integrative perspective on the structure of intentional change" (Prochaska, et al., 1992, p. 1102). This model consists of five stages and is organized by three constructs. These constructs are (a) stages of change, (b) processes of change, and (c) levels of change. This model is transtheoretical because "it assumes that no single theory can account for all the complexities of behavior change, and hence a synthesis on many smaller scale theories is proposed" (Glass, 2000, p. 288). Historically, the TTM has been applied to psychotherapy (Padula et al., 2003), used in smoking cessation interventions (Macnee & McCabe, 2004), and used as a method to promote and increase physical activity (Adams & White, 2003; Cardinal, Kosma & McCumbbin, 2003; Resnick & Nigg, 2003). The TTM has also been used as a model with motivational interviewing to promote health and behavior change (Shinitzky & Kub, 2001).

For the purposes of this research study, the conceptual framework focused upon the basic component of the TTM rather than the individual's stages of change. This basic component is based upon the fact that individuals vary in their level of motivation and readiness to engage in new activities and behaviors. Individuals use a variety of strategies to achieve these behaviors. Rosen (2000) states that "the TTM's most original contribution is the premise that different strategies facilitate progress at various points in the process of lifestyle change" (p. 593). The intervention implemented in this study incorporated engagement in social activities (model of successful aging) and attempted to engage individuals to make changes in their health behaviors. In sum, the model of successful aging and the premises of the TTM were chosen to facilitate the understanding of factors that motivated the adoption of a new behavior learned in a social context.

Preventative health behaviors and practices are essential for an older adult's well-being and continues to be a popular topic of interest for researchers. Preventive health practices, defined as daily routine behaviors performed to promote health and prevent illness, have been associated with decreased disability and mortality. According to Breslow and Breslow (1993), "older adults with poor health practices experienced 50% greater disability and mortality when compared to those with a pattern of good health practices" (Gallant & Dorn, 2001, p. 21). Positive health practices have been linked to better preventive health behaviors including health behavior change. For the purposes of this study health behavior change is defined as activities performed for the purpose of preventing or detecting disease or for improving health and well being (Conner & Norman, 1996).

Several factors that influence health behavior change have been identified in previous studies, but "little is known about general population prevalences of older adults' efforts to change behavior, motivations to improve behaviors, and perceived barriers to change (Newsom, Kaplan, Huguent et al., 2004, p. 193). Health behaviors have been defined as behaviors that involve any action made by individuals that have potential consequences for physical or psychological functioning (p. 194).

Reviews of behavior change interventions have reported that intensive and those specifically designed for use with high –risk populations are likely to have strong outcome effects (Emmons, 2000; Sorensen et al., 1998; Bowen et al. 1994; Bowen & Tinker 1995). Several studies suggest that older adult education and intervention programs are needed to convince older adults to change behaviors by educating them about the benefits of healthy behaviors, assisting them with tools to identifying such behaviors, and providing them with ways to perform associated safety improvement behavior changes (Newsome et al., 2004; Ferrini, Edlestein, Gallant & Dorn, 2001; Barrett-Connor,1994).

Prevention and intervention programs can be implemented to promote positive health practice and facilitate behavior change. Fall prevention and intervention programs have been implemented to reduce fall related injuries and fall-risks by promoting positive health practices and by facilitating health behavior change. According to the Healthy Aging Research Network (HARN) healthy aging is defined as "the development and maintenance of optimal physical, mental and social well-being and function in older adults" (http://depts.washington.edu/harn/). Healthy or

normal aging is often affected when an injury is sustained by an individual. The process of healthy or normal aging may be adversely affected by the occurrence of a traumatic brain injury (TBI) and this type of injury may impact of the normal aging process (Hinkebein, Martin, Callahan, & Johnstone, 2003).

Falls are a leading cause of TBI in individuals over the age of 65. Fall prevention and intervention programs have been diverse in structure, content, and delivery. There are many factors that may contribute to falling. A fall has been defined as "a symptom of multiple underlying diseases, the effects of certain medications on homeostasis, and/or environmental hazards or obstacles that interfere with safe mobility" (Guelich, 1999, p. 16). Falls may be a result of intrinsic or extrinsic factors or a combination of these factors. Intrinsic factors have been defined as "characteristics that are inherent to each individual and that are the result of changes relating to aging, disease or medication" (Tideiksaar, 2003, 201). These can include neurological, sensory, and musculoskeletal impairments. Extrinsic factors can include "environmental hazards as well as activity-related factors" (p. 201). These can include uneven and slippery floor surfaces, inadequate lighting, and cluttered walkways. There is a higher risk for falling when more of these factors are present. Previous fall prevention programs have included interventions in the areas of home assessment (Steven et al., 2001; Peel, Steinberg, & Williams, 2000; Salkeld et al., 2000), exercise regimens (Robertson et al., 2002; Tinetti, 1994; Reinsch et al., 1992), educational/group learning (Clemson et al., 2004; Deery et al., 2000), and multi-component programs (Casteel et al., 2004; Chang et al., 2004; Nikolaus & Bach, 2003; Day et al., 2002; Stevens et al., 2001; Yates & Dunnagan, 2001; Hornbrook et al., 1994; Murlow et al., 1994; Rubenstein et al., 1990) addressing both intrinsic and extrinsic factors.

Methods

Research Design

The research design incorporated in this study utilized a quasi-experimental two-group design. Changes in safety behavior were reported by the intervention and comparison groups in order to determine the efficacy of the Be HeadSmart® Seniors! intervention to promote behavior change.

Study Participants.

The population of interest for this study was individuals who are 60 years of age or older who attended presentations and social activities at local Senior Centers or other related recreational venues. The sampling frame included seniors aged 60 years and older who attended an interactive Be HeadSmart® Seniors! presentation (intervention group) or seniors who received a fall prevention safety brochure (comparison).

Intervention

Currently in Florida, an educational fall prevention and intervention program, which highlights the risk of serious brain injury for people over the age of 60, is provided under the auspices of Brain Injury Association of Florida. Falls are the leading cause of injury and death among people over the age of 60 and are the leading cause of traumatic brain injury (Brain Injury Association of America, 2005).

The Be HeadSmart® Seniors! prevention program incorporated the presentation of HeadSmartz, a Cranium Challenge. This intervention used an interactive educational component that was tailored for fall prevention and consequential traumatic brain injury. This presentation was delivered through multi-modal components that capitalized on all avenues of sensory intake.

The Cranium Challenge is an interactive, visual, and auditory program based upon the popular board game Cranium™. This game stimulated various parts of the participant's brain verbally, through trivia questions and word games, visually, or by humming, whistling, or playing charades. The presentation included trivia questions created in a PowerPoint presentation that addressed facts about prevalence, incidence, and prevention of falls that can result in traumatic brain injury. The goal of this intervention was to foster motivation to change fall risk-related behavior. Austin-Wells, Zimmerman, and McDougall (2003) stated that "PowerPoint presentations address pragmatic, sensory, and environmental concerns much more efficiently than overhead projectors or flip charts" (p. 500).

Two to four teams were formed consisting of four players on each team. Each player and audience member was given a safety brochure that included a safety checklist for fall prevention, information about traumatic brain injury, a safety improvement card that was completed by individuals who attended the presentation and information about Brain Injury Association of Florida and its role in prevention of falls and consequential traumatic brain injury. The Cranium Challenge was presented, trivia questions were asked, and points were awarded to teams who correctly answered the questions. The team with the most points was awarded a token at the conclusion of the presentation. Tokens included canvas tote bags, magnifier bookmarks, or $5 gift certificates to a local bookstore to promote brain-stimulating activity. At the end of the presentation, all of the participants and members of the audience

completed a safety improvement card, which included changes in behavior that they planned to implement in or around their homes or activities in their daily lives. Individuals were informed that follow-up telephone calls would be made within six weeks to obtain feedback about the presentation, to find out if the listed behavior changes have been implemented, and to confirm demographic information included in the surveys. Be HeadSmart ®Seniors! is a psychosocial intervention or a systematic attempt to modify a social process" (Glass, 2000, p. 268). This intervention aimed to change psychological process for the specific purpose of modifying health or function which includes primary (occurring before disease onset) and secondary (reduction in expression and severity of disease) prevention of disease (Aschengrau & Seage, 2003).

Instrumentation and Data Collection

The Be HeadSmart® Seniors! "Make a Difference" safety improvement card was one of the instruments used to collect data. This card instructed individuals to review the Be HeadSmart Safety Checklist and to list one or two things that they could do to reduce their risk of serious injury. In addition, individuals were asked to provide their names, telephone numbers, and zip codes. Individuals were also asked to check either the "60+" or "less than 60 years of age" group box. There was a brief statement at the bottom of the card that informed individuals a phone call would be made to them to follow-up with their progress in making safety improvement changes. The bottom of the safety improvement card included a space to record the date and location of the presentation. Completed cards were collected from members of the intervention group at the end of the presentation.

Individuals in the comparison group volunteered to review the safety brochure and fill out the survey card. These individuals attended recreational activities at local Senior Centers. Participants who reviewed the safety brochure had not attended the HeadSmartz presentation or previously received the safety information. Completed cards from the members of the comparison group were collected after they had reviewed the educational informational packets.

Procedures

Data for this study were collected after the conclusion of the Be HeadSmart® Seniors! presentation, after the distribution of the safety brochures, and through the collection of completed "Make a Difference" safety improvement cards. Data were also collected through follow-up telephone surveys from March 2005 through September 2005. A total of 161 individuals were recruited to participate in this study of which 106 were eligible for inclusion in this study. A total of 55 individuals were lost to follow-up. Individuals were eligible for this study if they were over the age of 60, completed the safety improvement cards, and were able to be contacted during follow-up telephone surveys. Additionally, eligible participants had not previously received the safety brochure or attended HeadSmartz, a Cranium Challenge. The response rate associated with this study was 66%.

Follow-up phone calls were made to participants in the intervention and comparison groups using a psychosocial survey between four and six weeks after receipt of the intervention or the receipt of the safety brochures. At least five telephone call attempts were made to individuals after they received the intervention or safety information. Initial phone calls were placed approximately ten to 14 days after participants received the intervention. This time allowed individuals to have an opportunity to perform their intended safety improvement changes. Individuals who were unable to be contacted was due to missing, incorrect, or disconnected telephone numbers or the individual was unable to be reached after five phone call attempts.

Data Analyses

A multiple logistic regression was conducted to determine whether the values of the groups or the independent variables affected the probability of an individual reducing his or her risks of falling through safety improvement behavior change. Specifically, this regression explored the differences in the probability of safety improvement behaviors performed between the intervention and comparison groups.

Logistic regression models the probability of change as a function of covariates and independent variables. The dependent variable was change in behavior that participants performed to reduce their risk of falling. Participants reported making a safety improvement change or not making a safety improvement change. Group membership was the primary independent variable. Participants who attended the presentation were included in the intervention group. Participants who only received the safety brochure were included in the comparison group. The covariates of gender, ethnicity, concerns about falling, history of falls, the willingness to make safety improvements, and the presence of a caregiver were evaluated. It is not common to have independent variables that are all categorical, but as with any regression analyses, they can be either continuous or categorical.

Data analysis was performed using SPSS version 13.0. Logistic regression was used to

determine which variables significantly affected the probability of a particular outcome or event occurring. All variables included in this study were binary, having only two possible outcomes. Logistic regression was used to model the probability of safety improvement behavior change, where each person had a chance to make changes to reduce fall risks and related unintentional injury, as a consequence of group membership and the potential values of the covariates.

Results

Of the 106 individuals included in this study, 42 individuals received the safety brochure. A total of 37 females and 5 males received the safety brochure. A summary of group membership and demographics is listed in Table 1.1.

Telephone follow-up calls were placed within one month to members of the intervention and comparison groups. This survey began with an introductory statement and was followed by five closed-ended questions and open-ended sub-questions. These questions addressed safety improvements that were implemented after attending the presentation or receiving the educational informational packets. Questions also addressed concerns about falling, a history of previous falls, willingness to make safety improvements to avoid a fall and related injury. Individuals were asked if they had a caregiver or someone to assist them with activities of daily living and to assist with making safety improvement changes. A summary of these questions is presented in Table 1.2

Participants in both the intervention and comparison groups were asked to review the safety brochure and list two safety improvement changes that they intended to undertake in the future. Individuals were then asked during the follow-up telephone survey if they had performed these safety improvements to reduce risk factors associated with falls and related unintentional injury. Participants reported making both changes, one change, and no change after receiving either the intervention or the safety information brochure. These results are summarized in Table 1.3.

A multiple logistic regression analysis was conducted to determine whether the values of the groups or the independent variables affected the probability of an individual reducing his or her risks of falling through safety improvement behavior change. Of the 106 participants who were eligible for inclusion into this study, seven participants did not answer every survey question. Therefore, the N for the logistic regression was 99. Specifically, this regression explored the differences in the probability of safety improvement behaviors performed between the intervention and comparison groups.

The results of this study indicated that the intervention was useful for predicting the probability of making or not making safety improvement changes. Therefore, the two groups were found to have significant differences in the probability of safety improvement behavior changes that were made by members of the intervention group when compared to individuals who only received the safety brochure (X^2=3.877, df=1, p= 0.049). Gender, ethnicity, having concerns about falling, having a history of previous falls, an individual's willingness to perform safety behavior changes were found to be non-significant covariates when predicting the probability of making or not making safety improvement changes. These results are summarized in Table 1.4.

Table 1.1 Group Membership and Demographics (N=106)

Group Membership	Female	Male	White	Other minority, non-white
Both Groups (N=106)				
n	86	20	76	30
%	81.1	18.9	71.1	28.3
Intervention (N=64)				
n	49	15	48	16
%	76.6	23.4	75	25
Brochure (N=42)				
n	37	5	28	14
%	88.1	11.9	66.7	33.3

Table 1.2 Survey Results and Gender

Survey Question	N	%	Male	%	Female	%
Do you have concerns about falling? (n=105)			(n=20)		(n=85)	
Yes	76	71.7%	12	60	64	75.3
No	29	27.4%	8	40	21	24.6
Have you fallen in the past five years? (n=105)						
Yes	70	66.0%	11	55	59	69.4
No	35	33.0%	9	45	26	30.6
Are you willing to make safety improvement changes to reduce you chances of falling? (n=104)						
Yes	99	93.4%	19	95	80	94.1
No	5	4.6%	1	5	4	4.61
Do you have someone who will help you make these safety improvement changes? (n=103)						
	75	70.8%	11	55	64	75.3
Yes	28	26.4%	8	40	20	23.5
No						

Table 1.3 Safety Improvement Changes Made

	Intervention (N=64)	Brochure (N=42)
Both Changes	46	11
One Change	8	15
No Change	9	14

Table 1.4 Summary of Logistic Regression

Variable	DF	B	S.E.	Wald Chi-Square	p-value α ≤.05	Odds Ratio [Exp(B)]
Independent Variable: Group Membership	1	-1.118	0.568	3.877	**0.049**	0.327
Covariate: Concerns	1	-0.473	0.686	0.475	0.490	0.623
Covariate: History	1	-0.168	0.663	0.064	0.800	0.845
Covariate: Willingness	1	0.968	1.316	0.541	0.462	2.631
Covariate: Help	1	-0.471	0.607	0.600	0.439	0.625
Covariate: Gender	1	20.266	9176.018	0.000	0.998	< 0.001
Covariate: Ethnicity	1	-0.467	0.483	0.620	0.431	0.627

Discussion

The results of the preceding analyses indicated that the Be HeadSmart® Seniors! fall prevention intervention was successful in promoting safety improvement behavior changes. This study supported Rowe and Kahn's (1997) model of successful aging which emphasizes active engagement with interpersonal relations and productive activity. This study also supported the basic components of DiClemente and Prochaska's (1992) Transtheoretical Model of Behavior change by motivating and engaging individuals in the intervention group to make safety improvement behavior changes.

Overall, the findings in this study supported the usefulness of the Be HeadSmart® Seniors! fall intervention in promoting safety improvement behavior change. These findings support previous research that fall prevention programs must include effective strategies to promote behavioral changes and reduce fall risks (Stevens & Olson, 2000). Gallant and Dorn (2000) stated that preventative health behaviors are crucial for older adults well being and that there is a need for a greater understanding of factors that are associated with these behaviors.

This study has several limitations that should be addressed. Participants were recruited for this study through self-selection. The type of sampling and group assignment used in this study is associated with a bias for self-selection. Convenience sampling utilized in this study incorporated the use of nonequivalent posttest-only comparison group design. This strategy facilitated static group comparison and allowed for the identification of confounding factors that were present in this study. Static comparison did allow for some measure of comparison in that it included a comparison group. Historically, this type of comparison has been viewed as being inherently weak for the illumination of causal relationships. This is a consequence of threats to internal validity, due to selection bias and attrition, and the lack of group equivalence before implementing an intervention. The sample of participants in this study consisted mostly of white females. The sample is not representative of the population.

There are a number of strengths associated with this study. Senior Community Centers provide nutritious meals, social activities, health and consumer education, and other services to senior individuals in the community. These sites were chosen to increase the likelihood that individuals attending these centers would be more diverse and representative of the senior population. An informational flyer announcing the Be HeadSmart®

Seniors! program was sent to several senior centers in northeast and central Florida. Centers were pre-selected as either only offering the presentation or only offering the safety brochure. A sign-up sheet was posted alongside the announcement at each venue.

The use of logistic regression added rigor to this study. A logistic regression analysis accompanied this study and was conducted to determine whether the values of the groups or covariates affected the probability of an individual performing a safety improvement change. The Wald chi-square test was performed and reported to indicate significance of individual independent variables.

The results of this study show that a fall prevention intervention with a unique psycho-educational approach can be successful in promoting safety improvement behavior change. There is a need to continue examination of this intervention and examine its efficacy to reduce falls and fall risk. In addition, this fall intervention is tailored to include information about Traumatic Brain Injury. Currently, the Brain Injury Association of Florida (BIAF) is providing free training to health and safety professionals throughout the State of Florida.

Conclusion

This study used logistic regression to determine whether the number of safety improvement changes that reported were the same for participants who attended HeadSmartz, a Cranium Challenge (intervention), in comparison to participants who only received safety brochure (comparison). Results of the analyses found that the Be HeadSmart®Seniors! fall intervention group had a significantly higher proportion of individuals making safety improvement behavior changes. Having concerns about falling, reporting a history of previous falls, being willing to make safety improvement changes, and having the presence of an individual to assist with making changes were not significant covariates when predicting the probability of safety improvement changes made be individuals in the intervention and comparison groups. This study supports previous research that showed that the use of a multicomponent change strategy can be successful in promoting behavior change, even in areas as complex and multi-factorial as fall prevention and intervention.

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