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Article *in* Health Education Journal · June 2011

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Health Education Journal 2011 70: 184 originally published online 2 July 2010
DOI: 10.1177/0017896910373171

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Article

Health Education Journal
70(2) 184–191

DOI: 10.1177/0017896910373171
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Stories to communicate risks about tobacco: Development of a brief scale to measure transportation into a video story – The ACCE Project

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Abstract

Objective: To evaluate the construct and criterion validity of the Video Transportation Scale (VTS).
Setting: Inpatient service of a safety net hospital in Birmingham, Alabama, USA.
Method: We administered the VTS in the context of a randomized controlled trial of a DVD-delivered narrative-based intervention (stories) designed to encourage smoking cessation among hospitalized patients.
Results: Factor analysis yielded a two-factor solution relating to engagement and attentional focus. Patients receiving the stories-based intervention had a higher score for engagement than control but stories patients and controls did not differ in reported attentional focus. The engagement factor demonstrated predictive validity in that patients with higher scores were more likely to report quitting smoking at two weeks.
Conclusion: The VTS provides a rapid assessment of transportation that can be used in applied settings using video-based narratives.

Keywords

narrative, smoking, transportation, video intervention

Introduction

Narratives, also known as stories or testimonials, are a basic mode of human interaction and a promising tool for behavioral interventions[1–3]. In health-promotion interventions, narrative communication can be used to augment or replace more traditional didactic health educational messages designed to induce behavior change[2]. Narrative communication may be especially helpful in reducing counter-arguing and in reducing resistance to behaviors and messages[2,4].

One property of narrative communication that mediates the persuasive impact of storytelling is the feeling of being transported into the story. Transportation in the context of narrative communication

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is defined as absorption into a story, including cognitive and emotional engagement and attentional focus[4,5]. Increased narrative transportation is associated with attitude change in the direction of story conclusions[5] and may be associated with stronger motivation to action. Individuals who are transported into a narrative world are less observant of their surroundings because of their intense focus into the narrative world. Theoretically, transportation may occur when interacting with written, spoken, or enacted narratives.

A transportation scale for measuring engagement and attentional focus in written narratives has been developed and validated[4]. Although it has been informally used for video presentations[6], the scale has not been fully evaluated for use with video-based interventions. We created an adapted version, the Video Transportation Scale, to measure narrative transportation in the context of a DVD-delivered intervention to promote smoking cessation. The purpose of this study is to evaluate the Video Transportation Scale, including an assessment of construct and criterion validity.

Methods

Study design

We conducted a psychometric evaluation of the Video Transportation Scale using cross-sectional and prospective data. This evaluation was conducted within the context of a randomized controlled trial of a culturally-sensitive DVD-delivered narrative-based intervention ('Stories to Communicate Risks about Tobacco') designed to encourage smoking cessation among hospitalized patients. In the parent study, we first collected narratives. We recruited 50 patients from a local safety net hospital in Birmingham, Alabama. The majority of these storytellers were African American. In-depth, open-ended, video-taped interviews were conducted with smokers by asking them to tell us their stories about smoking and quitting and by using prompts to assess smoking history, physical symptoms from smoking, perceived long-term and environmental risks from smoking, and rewards of and roadblocks to quitting. Research assistants scored the stories based on constructs from the Social Cognitive Theory (outcome expectancies, reciprocal determinism)[7] and an Expert Panel selected the four most compelling stories for inclusion in the intervention. After editing, each individual story was less than five minutes in duration. The resulting stories intervention was compared with an attention control activity, a DVD with a series of health-related mini-lectures (non-culturally tailored, non-narrative, non-tobacco-related). The goal of the present psychometric evaluation was to assess factors related to the construct [8] and criterion validity of the Video Transportation Scale. We evaluated construct validity using both a factor analysis and by assessing group differences in transportation among those exposed to stories or control. For criterion validity, we assessed the ability of the scale to predict the stories' interventions influence on plans to quit smoking, and subsequent two-week self-reported smoking cessation.

Setting and sample

After developing the stories intervention, we recruited a second cohort of African American patients who were current smokers and randomly assigned them to the stories intervention or the attention-control condition. Patients were recruited through physician referral from the inpatient service of the same safety net hospital used to collect stories. Once referred, we approached patients during their hospitalization on the inpatient service. Patients were admitted on cardiovascular, pulmonary, cancer and other non-drug abuse-related admission diagnoses (the hospital provides surgical and medical surgical services and patients are charged on a sliding fee scale). Exclusion criteria for the study included non-smokers, previous participation in the development of stories,

plans to move to another state within one month of discharge, failure to consent to three follow-up calls, or difficulties in hearing, vision or comprehension. All eligible participants signed informed consent to participate in the study. The study protocol, consent procedure, and instrument were approved by the University of Alabama at Birmingham Institutional Review Board.

Adaptation of the transportation scale

Based on the 15-item self-report scale validated by Green & Brock[4] to measure cognitive, affective, and imagery involvement, we adapted and evaluated a five-item Video Transportation Scale for use with video-based narrative interventions. Items specifically relating to written narratives, such as mental imagery, were dropped and we replaced statements that included the wording 'reading the narrative' with statements that included the wording 'watching the story.' The scale included five items related to the respondents' favorite 'story' within the video. For each item, respondents were asked to respond using a 7-point Likert scale ranging from 1 (not at all) to 7 (very much). Three items measured engagement, 'I was mentally involved in the STORY while watching it'; 'The STORY affected me emotionally'; and 'The events in the STORY are relevant to my everyday life'; while two items measured attentional focus: 'I found my mind wandering while watching the STORY'; and 'While I was watching the STORY, activity going on in the room around me was on my mind.' The measures of attentional focus were reverse coded, so a higher score on each item would represent higher level of attention, consistent with the engagement items.

Data collection

Demographics were collected at baseline. The Video Transportation Scale was administered to participants immediately after viewing the stories intervention or control video. To assess criterion validity and the influence of the video on behavioral intentions to quit smoking, we asked a single item, 'How much did the video influence you to quit smoking?' which was assessed on a 100-point scale with anchors of not at all influenced (0) to very much influenced (100). Follow-up phone interviews were conducted at two weeks post-discharge from the hospital to assess self-reported cessation, and cessation data were used in the evaluation of criterion validity.

Statistical analyses

We conducted a series of analyses that contribute support to the construct validity of the Video Transportation Scale. The scale is designed to measure the underlying constructs of transportation: level of engagement and attentional focus. First, we conducted a principal component factor analysis with varimax rotation. Based on the factor analysis, we identified underlying constructs, created subscales, and assessed frequency distributions of these subscales. We then evaluated the stability of the subscales by examining the variation in responses by participant characteristics (demographics, smoking status, health status, and diagnosis codes) among those exposed to stories. Next, we examined the differences in transportation reported by the intervention and attention control groups. We assessed group differences by comparing the subscales for intervention and control groups using both a non-parametric Mann-Whitney test, and a *t*-test.

We then evaluated criterion validity. Among intervention group smokers, we assessed the association of transportation and the stories' influence on plans to quit smoking using Spearman's Rho. We then assessed the ability of the VTS to predict self-reported quitting at two weeks post-discharge. Rates of smoking cessation were compared across tertiles of the transportation

scale factors using a non-parametric test for trend. We analyzed the data using STATA version 9; a two-sided p-value of 0.05 was used for all statistical tests.

Results

Of the 82 participants randomized to the stories intervention, the majority was female, over the age of 46, and had a high school or greater education (Table 1). Most participants were either not thinking of quitting smoking (precontemplation) or were thinking of quitting within the next 30 days (contemplation or preparation). Over half were admitted for tobacco-related diagnoses. In the stories randomized trial, there were no significant differences in stage of change or patient gender, median age, education level, health status, or diagnostic codes comparing the 82 intervention participants and the 81 control participants (data not shown).

Construct validity: Factor analysis and differences by stories exposure

Our factor analysis of VTS items from 82 Stories participants resulted in a two-factor solution (Table 2). Three items loaded onto the first factor, which we termed engagement (eigenvalue 1.80; all factor loadings > 0.65), and two items loaded onto a second factor, which we called attentional

Table 1. Characteristics of 82 inpatient smokers randomized to the stories intervention*

	n/N	Percent
Age		
Age 20–45	13/82	16%
Age 46–55	44/82	54%
Age 56–76	25/82	30%
Gender		
Female	46/82	56%
Education		
High school education or greater	59/82	72%
Less than high school education	23/82	28%
Smoking status (stage of change)		
Precontemplators	5/82	6%
Contemplators	17/82	21%
Preparation	60/82	73%
Self-reported health status†		
Fair or Poor	47/74	64%
Good or Very Good	27/74	36%
Diagnosis codes		
Tobacco-related admission diagnosis‡	46/82	56%
Non-tobacco-related admission diagnosis	36/82	44%

*There were no statistically significant differences in these measured characteristics comparing the 82 participants randomized to stories and the 81 randomized to the attention control.

†Denominator varies because data missing for eight participants on this measure.

‡Tobacco-related admission diagnoses included including Cardiovascular/Acute Coronary Syndrome, Cardiovascular/Non-Acute Coronary Syndrome, Transient Ischemic Attack or Stroke, or Pulmonary conditions (COPD, lung cancer).

Table 2. Exploratory factor analysis* for the five items of the Video Transportation Scale ($N = 82$)

Item # from the Video Transportation Scale	Mean score *(SD)* for item‡	Factor loadings and Eigenvalue†	
		Factor 1 (engagement)	Factor 2 (attentional focus)
1. 'While I was watching the STORY, activity going on in the room around me was on my mind'.	5.0 (*SD* 1.9)	–0.03	**0.83**
2. 'I was mentally involved in the STORY while watching it'.	6.3 (*SD* 1.2)	**0.65**	0.02
3. 'The STORY affected me emotionally'.	6.0 (*SD* 1.4)	**0.77**	0.19
4. 'I found my mind wandering while watching the STORY'.	4.5 (*SD* 2.4)	–0.23	**0.80**
5. 'The events in the STORY are relevant to my everyday life'.	6.3 (*SD* 1.3)	**0.81**	0.06
Eigenvalue		1.8	1.4

* Factor Loadings and Eigenvalues for two-factor solution from exploratory factor analysis using principal component factor analysis with varimax rotation.
† Bolded are factor loadings > 0.65 that were included in the subsequent two-factor solution.
‡ Mean Score for each item measured on 7-point Likert scale ranging from 1 = not at all to 7 = very much, with items 1 and 4 reverse coded.

focus (eigenvalue 1.40; all factor loadings > 0.80). For each factor, we calculated a mean subscale scores (engagement and attentional focus).

When assessing stability, we found that scores on the VTS subscales differed by gender and education for the 82 stories participants (Table 3). Women had higher scores compared with men for engagement ($p = 0.07$). Those with a high school education or greater experienced greater engagement than those with less than a high school education in the engagement subscale ($p = 0.06$). There were no significant differences for the attentional focus subscale.

When examining differences by experimental group, we found that those randomly assigned to receive the narrative-based stories intervention had a higher score for engagement ($M = 6.2$, $SD = 0.2$), compared with the control participants ($M = 5.5$, $SD = 0.1$), (Mann-Whitney $z = 3.6$, $p = 0.003$) who viewed the attention control, non-narrative video. There was no difference in the attentional focus subscale between the two groups, with a mean score of 4.7 ($SD = 2.0$) for intervention versus 4.8 ($SD = 2.1$) for control, respectively (Mann-Whitney $z = 0.23$, $p = 0.80$). Results were unchanged when using a *t*-test to assess differences in means.

Criterion validity: Predicting influence on quitting and two week smoking cessation

Among the 82 participants exposed to the stories intervention, the mean score on the 100-point scale of the video's influence on quitting was 85 ($SD = 21$). Increasing score on the engagement factor was moderately and positively correlated with report of influence of the video on plans to quit smoking, Spearman's Rho = 0.42 ($p = 0.0001$). Increasing score on the attentional focus subscale was associated with increasing influence of the video on plans to quit smoking, Spearman's Rho = 0.31, $p = 0.005$.

In preliminary analysis of two-week cessation ($N = 70$ intervention participants with data available), we found a trend towards higher self-reported cessation among those who had reported

Table 3. Video Transportation Scale results by participant characteristics among 82 inpatient smokers exposed to the stories intervention

	N	Engagement subscale			Attentional focus subscale		
		Mean	*SD*	test*, (*p*)	Mean	*SD*	test, (p)
Age				F = 1.1 (0.3)			F = 1.3 (0.3)
Age 20–45	13	5.8	1.17		4.2	2.1	
Age 46–55	44	6.3	1.01		5.0	1.9	
Age 56–76	25	6.3	0.86		4.5	1.7	
Gender				t = −1.8 (0.07)			t = 0.3 (0.7)
Male	36	6.0	1.25		4.8	1.9	
Female	46	6.4	0.72		4.7	1.9	
Education				t = −2.0 (0.04)			t = −1.5 (0.1)
High school Education or greater	59	6.4	0.91		4.2	1.9	
Less than high School education	23	5.9	1.14		5.0	1.9	
Smoking status				F =1.6 (0.2)			F = 0.6 (0.5)
Precontemplators	5	5.9	0.59		5.7	1.3	
Contemplators	17	5.9	0.95		4.7	1.8	
Preparation	60	6.3	1.0		4.7	1.9	
Self-reported health status				F = 0.6 (0.5)			t = 0.2 (0.8)
Fair or poor health	47	6.20	0.98		4.8	1.9	
Good or very good health	27	6.38	0.99		4.7	1.9	
Diagnosis codes†				1.3 (0.2)			t = 0.5 (0.6)
Tobacco-related admission diagnosis	46	6.09	1.06		4.8	1.7	
Non-tobacco-related admission diagnosis	36	6.39	0.89		4.6	2.1	

* Statistical significance assessed using *t*-tests (t) or ANOVA (F).

† Tobacco-related admission diagnoses included including Cardiovascular/Acute Coronary Syndrome, Cardiovascular/Non-Acute Coronary Syndrome, Transient Ischemic Attack or Stroke, or Pulmonary conditions (COPD, lung cancer).

higher engagement (Table 4). There were no significant differences in cessation by score on the attentional focus subscale.

Discussion

Narrative is becoming an increasingly valuable tool in health promotion interventions. Accordingly, it is important to understand the mechanism through which the effects of such interventions on behavior are mediated. Transportation is a potentially critical mechanism through which narratives support behavior change. Building on previous work from Green and Brock (2000)[4], we assessed the psychometric properties of a Video Transportation Scale. Our analyses contribute support for the construct and criterion validity of the scale.

As technology to deliver multimedia tailored interventions through the internet and mobile phones increases, the future of narrative communication will frequently involve video-based stories. However, the underlying constructs of transportation, including engagement and attentional focus, have only been fully validated for use with written narratives. Thus, the VTS is particularly useful because it is adapted for use with video-based narrative interventions, and is based on the prior work of Green to define the underlying constructs of transportation.

Table 4. Criterion validity: Predicting two-week self-reported cessation among inpatient smokers exposed to the stories intervention ($N = 70$)* with the Video Transportation Scale

Engagement	Quit smoking		Attentional focus	Quit smoking	
Tertiles of engagement Subscale	*n/N**	%	*Tertiles of attentional focus subscale*	*n/N**	%
Lowest tertile (score <6)	8/20	40%	Lowest tertile (score <4)	11/22	50%
Middle tertile (score 6-6.99)	15/24	62%	Middle tertile (score 4–6)	16/28	57%
Highest tertile (score = 7)	16/26	62%	Highest tertile (score > 6)	12/20	60%
chi-square = 2.8, p = 0.09 when comparing lowest quartile to others			chi-square = 0.42, p = 0.5 when comparing lowest quartile to others		

* Lower N loss to follow-up for 12 patients.

An additional advantage of the Video Transportation Scale is its brevity. The VTS consists of a five-item scale while the original transportation scale consisted of eleven general items as well as additional items assessing specific imagery (the extent to which an individual had vivid mental images of particular characters in a story). We removed items relevant only to written narratives and those that were specific to the narratives of interest. We used the VTS in an applied setting and it was feasible to deploy readily.

Our analysis indicated differences by gender in only one of the subscales. It is important to note that storytellers in the intervention DVD were both male and female. Previous research has not found a consistent gender difference in transportation, but suggests that some stories are more appealing to men and others are more appealing to women[9]. Furthermore, because the stories in the current intervention deal with families, they may be more appealing to women.

We went beyond Green and Brock by examining the stability of the VTS subscales across other demographics (age and education) as well as other behavioral and health-related factors (smoking status, self-reported health status, and hospital admission diagnosis). We were also able to support criterion validity through predictive associations.

While we found convincing results for the engagement subscale, similar findings did not emerge for the attentional focus subscale. Transportation theory outlines conditions that influence enjoyment and asserts that situations which distract individuals and prevent engagement tend to hinder enjoyment[10]. In this inpatient hospital setting, attentional focus was likely highly influenced by the external environment. It is important to note that distracting noises, such as those experienced in a hospital setting, may make transportation into narrative worlds more difficult[10, 11]. Thus, the lack of group differences and criterion validity for the attentional focus may be as much a result of our setting as the scale itself. In addition, a two-item scale is not robust enough to perform well in many of these psychometric analyses and this could also account for why differences were not seen as they were in the engagement subscale.

This study is limited by its small sample size and geographical concentration. It is possible that the DVD-delivered intervention may have a lower impact in patients with different demographics or from non-southern areas. Because the Video Transportation Scale only consists of five items, three items loaded onto the engagement factor while only two items loaded onto the attentional focus subscale; typically, at least three items must load onto each factor to produce a reliable subscale. In addition, self-report bias may have affected outcomes in that people who watched stories about smoking may feel pressure to report that they have tried to quit.

Narrative-based interventions may be particularly valuable for minority populations. Creating an intervention based on the stories of others in the community may enhance cultural relevance. In narrative-based, culturally-targeted interventions, assessing transportation may be of particular value. Though our study was among African Americans, future studies should compare head-to-head the value of scales and constructs in different populations.

Conclusions

Additional research on the effect of transportation in video-based narrative interventions is needed. Few studies have evaluated the impact of narrative communication delivered in ways other than written form. However, because of narrative's ability to transport the individual, thereby creating stronger connections with characters, reducing counter-arguing, and making narrative events seem more real[9], narratives hold great potential for behavioral interventions. Future studies are needed to examine the effect of narrative-based interventions in different patient populations and in different geographical areas. The Video Transportation Scale is a brief, easily-used tool for evaluating such interventions.

Acknowledgment

This study was funded by the NIH/NHLBI Alabama Collaboration for Cardiovascular Equality (ACCE) project (UO1 HL079171).

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