Comparing Normative, Anecdotal, and Statistical Risk Evidence to Discourage Tanning Bed Use

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This study compared the efficacy of normative messages to other traditional persuasive messages using anecdotal or statistical risk evidence. Messages were compared regarding their impact on beliefs, attitudes, and normative perceptions regarding tanning bed use. Undergraduate students (N = 744) at a large Northeastern university were randomly assigned to 1 of 4 message conditions: normative, anecdotal, statistical risk, or no-message control. Results from this study indicate that, although evidence types do not directly influence behavioral intention, some do impact message perceptions, normative perceptions, severity, and health beliefs about the safety of tanning beds and their negative consequences. Normative evidence was superior to other evidence types in influencing normative perceptions of other college students' and friends' beliefs that tanning beds are safe, some messages ratings, and beliefs about health protection and consequences of tanning beds. Anecdotal messages were best at altering severity and amount of invested mental effort, but statistical messages overall performed the worst. Skin color effects and gender differences were also found.

Keywords: Evidence; Persuasive Messages; Skin Cancer; Social Norms; Sun; Tanning Beds

Social norms campaigns on college campuses have proliferated. Nearly 50% of college campuses have adopted them to combat excessive drinking (Wechsler, Seibring, Liu, & Ahl, 2004). They are also being applied to other health topics, such as seatbelt

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and tobacco use (Montana State University–Bozeman, 2005). Despite their popularity, their efficacy remains in question (Keeling, 2000). To date, there has also been no study comparing the efficacy of normative evidence messages to persuasive messages using anecdotal or statistical risk evidence. This study tested the effects of social norms messages compared with anecdotal and statistical risk messages on beliefs, attitudes, and normative perceptions regarding tanning bed use.

Skin Cancer and Tanning Beds

Skin cancer is the most common form of cancer, and its prevalence is increasing. Skin cancer is largely preventable through practices such as avoiding sun exposure (both sunlight and tanning beds), wearing sunscreen, and wearing protective clothing such as long-sleeved garments and hats (Glanz, Saraiya, & Wechsler, 2002). Nearly one in 10 adolescents use tanning beds (Geller et al., 2002), despite it being a major risk factor in both melanoma and non-melanoma skin cancers (see Cokkinides, Weinstock, O'Connell, & Thun, 2002; Geller et al., 2002; National Cancer Institute, 2005). Tanning bed use is particularly prominent among teenagers and young adults (Swerdlow & Weinstock, 1998), with older teens more likely to use tanning beds than younger teens (Cokkinides et al., 2002). Children, teens, and young adults are particularly important targets for prevention messages because nearly 80% of a person's lifetime ultraviolet (UV) light exposure occurs during childhood and adolescence (Environmental Protection Agency, 2005).

As early as 1994, the World Health Organization (WHO) warned that there were adverse health effects associated with suntan bed use. By 2005, the WHO warned that no person under 18 should use a tanning bed (WHO, 2005). Although long-term exposure to tanning beds increases the risk of developing skin cancer (National Cancer Institute, 2005), even short-term exposure causes molecular alterations that are believed to be crucial in the development of skin cancer (Whitmore, Morison, Potten, & Chadwick, 2001). Tanning bed use is a voluntary behavior, although many states require parental consent for minors to engage in this behavior (the age varies, as does enforcement of this requirement). Although some factors leading to skin cancer are hereditary or uncontrollable, exposure to UV rays in the form of tanning bed use is highly controllable and, thus, a good target for health promotion message designers.

Anecdotal and Statistical Risk Messages

Studies have found that evidence is important in the persuasion process (e.g., O'Keefe, 2003; Reinard, 1988). Anecdotal (also called story, narrative, case, or exemplar) evidence messages typically present the history or experience of a particular person or case, and usually focus on elaborating one compelling case that provides details that allow the message recipient to create a picture of the person and situation. The use of anecdotal evidence is believed to be effective because the reader can relate

to the person in the story. Slater and Rouner (2002), using the elaboration likelihood model, suggested that anecdotes, at least in the form of entertainment education, may work best if the content is counter-attitudinal. They suggested that anecdotes are more involving than statistical messages and may help to increase the likelihood of central processing.

Statistical evidence messages (also called base rate and scientific) most often contain information regarding someone's relative risk for a particular condition or negative consequence, or the likelihood of a protective effect if they follow the advice in the particular message. Typically, this includes information such as "the risk of getting this particular disease is eight times higher if someone does not perform a particular behavior," or "75% of people who perform a particular behavior avoid getting a particular disease." These messages generally focus on scientific facts about the likelihood of risk and how to protect oneself against the threat. The most recent meta-analysis includes comparison of narrative, statistical evidence, and base rate fallacy (see Allen, Preiss, & Gayle, 2006).

Comparing Statistical and Anecdotal Messages

Kazoleas (1993) compared statistical evidence to no-evidence messages and suggested that exposure to statistical evidence is more persuasive than not being given a message. Both anecdotal and statistical evidence have been found to be persuasive, but it is unclear how they function and under what circumstances. Allen et al. (2000) found that both types of evidence were viewed as equally credible, but that a combination of statistical and narrative evidence was more persuasive than either form of evidence alone or a no-evidence message condition. However, when only one form was given, statistical evidence was slightly more persuasive than narrative evidence.

There have been a number of studies touting the superiority of anecdotal or statistical evidence over the other. Anecdotes have been found to be superior in several studies (e.g., Brosius & Bathelt, 1994; Cody & Lee, 1990; Taylor & Thompson, 1982; for a narrative review, see Reinard 1988). Others have found statistical evidence to be more persuasive (for meta-analysis, see Allen & Preiss, 1997; cf. Baesler & Burgoon, 1994). The superiority of the evidence type may depend on the topic, message quality, or individual characteristics. Lindsey and Ah Yun (2003) later found that for statistical messages to be effective, sample size, verifiability of evidence, and message credibility mediate the relationship between message inducement and attitudes. Slater and Rouner (1996) suggested that whether statistical or narrative evidence is more persuasive depends on whether the message is congruent with the person's values, which suggests that it is important to control for past behavior. If the message was value-congruent, statistical messages were more persuasive. However, among those where the message was counter-attitudinal, anecdotes were superior. Moreover, they suggest that when messages are value-discrepant, peripheral processing is used; but when messages are value-congruent, central processing occurs.

Kopfman, Smith, Ah Yun, and Hodges (1998) reported statistical evidence messages enhanced both systematic and heuristic processing. Kopfman et al. compared statistical and narrative messages regarding organ donation and found that statistical messages produced more cognitive reactions, although narrative messages led to greater affective reactions. Finally, Greene and Brinn (2003) compared statistical, narrative, and a no-message control regarding tanning bed use among college women. They found that the statistical and narrative messages function differently, but that both have effects on tanning intentions and behaviors. Statistical messages were slightly better at reducing use of tanning beds, but both messages worked better than a control condition. In terms of message perceptions, narrative messages were more highly rated on realism, and statistical messages were more highly rated on informational value.

Normative Evidence

In recent years, there has been a proliferation of social norms evidence messages on college campuses, particularly around alcohol use (Cameron & Campo, 2006). By 2003, nearly one half of universities in the United States had adopted social norms campaigns (Wechsler et al., 2004). In addition, the notion is spreading to include use by state health departments (Frauenfelder, 2001), and social norms campaigns have recently been used to address topics such as tobacco use, bullying, homophobia, sexual assault, prayer, eating disorders, and gambling (Berkowitz, 2005).

Normative messages are a particular type of evidence in which normative information about others' attitudes or behaviors is provided. Normative messages typically provide students with a normative statistic regarding a behavior (i.e., the average; e.g., ''85% of drivers wear their seatbelts''). Providing social norms evidence is based on pluralistic ignorance or the notion that individuals are unable to accurately judge the social norm (see Campo, Cameron, Brossard, & Frazer, 2004; Prentice & Miller, 1993). Social norms campaigns assume that once the perceived norm is altered (by providing normative evidence), individuals will alter their behavior to match the norm (see Campo et al., 2004; Perkins & Berkowitz, 1986).

Boster et al. (2000) found that statistical evidence effects are mediated by judgments regarding whether one's beliefs were congruent with the message (in this case, the percentage of students satisfied with cafeteria food). This is one of the rare cases in which normative statistical information was tested. In a radio story, Boster et al. provided students with evidence regarding the percentage of students who are satisfied with cafeteria food and anecdotes in which testimonials reflected four out of five students liking the cafeteria food. In this study, statistical evidence was presented in a way in which it was consistent with the anecdotal evidence, inconsistent with anecdotal evidence, or the no-statistical evidence condition. However, this study did not directly compare normative statistical evidence to traditional statistical evidence, anecdotal evidence, or a no-message condition.

The efficacy of normative campaigns has been controversial (Keeling, 2000), with some finding them highly effective (e.g., Glider, Midyett, Mills-Novoa, Johannessen, & Collins, 2001; Haines & Spear, 1996; Perkins, 2002; Perkins, Meilman, Leichlier, Cashin, & Presley, 1999; Pollard, Freeman, Ziegler, Hersman, & Gross, 2000) and others questioning their efficacy (e.g., Campo et al., 2003; Campo et al., 2004; Rimal & Real, 2005; Wechsler et al., 2003). Campo and Cameron (2006) also found that heavy drinkers may have negative reactance to normative evidence, and that normative messages work best on those that drink the least. Part of the inconsistencies with results may stem from variations in how the campaigns are conducted. In nearly all cases where social norms campaigns have been deemed successful, multiple interventions have been used simultaneously. In a study of 734 college presidents, Wechsler, Kelley, Weitzman, Giovanni, and Seibring (2000) found those presidents who perceived greater alcohol use put more resources toward educational efforts, campaigns, counseling services, and task forces. Others have implemented variations of social norms campaigns that included greater levels of student participation (e.g., Lederman & Stewart, 2005). Some students or some campus environments may respond better to normative evidence than others. Although this form of persuasive message has been tested most frequently as a pretest or posttest design, it has not been compared to other evidence types, and rarely to a control group. Differences in message perceptions seem likely because previous research has shown differences in message ratings, such as credibility, when comparing anecdotal to statistical evidence. Therefore, we ask the following:

RQ1: How do statistical risk, anecdotal, and normative evidence messages compare in terms of their effects on message perceptions?

Normative evidence is designed to affect normative perceptions of other community members, typically other college students. Therefore, it is reasonable to assume the following:

H1: Normative evidence will reduce normative perceptions of other college students' tanning bed use further than other evidence types.

Although normative evidence messages should be more persuasive in affecting the perception of other college students, because this is the explicit intent of the messages, it would seem likely that they may not be any more or less effective in altering normative perceptions of friends. Therefore, we offer the following research question:

RQ2: How do statistical risk, anecdotal, and normative evidence messages compare in terms of their persuasive effects on normative perceptions of friends?

Beyond message perceptions, exploration of how evidence formats influence behavior (and variables influencing behavior) increases understanding of how message evidence formats function.

Theoretical Perspective

The Health Belief Model (HBM; Becker, 1974) has previously been used to address evidence format and persuasive effect (Greene & Brinn, 2003). The HBM includes several key variables that influence behavior (Strecher, Champion, & Rosenstock, 1997). Perceived susceptibility addresses how likely people feel they are to develop negative outcomes of a condition. Perceived severity is the perception of the seriousness of the outcomes. Perceived benefits include the advantages of avoiding a health risk. Perceived barriers are factors that one believes prevent action. Benefits address the advantages of avoiding a threat. The effectiveness of each of the predictors depends on the nature of the threat and personal characteristics (Greene & Brinn, 2003). Some of these variables are also common to other theories of health behavior and persuasion.

The HBM also suggests relevant modifying factors must be accounted for influencing behavior (Strecher et al., 1997). Identifying pathways to the differential influence of evidence types needs to be examined, in addition to traditional behavior effects, to better understand the process (O'Keefe, 2003). Past research indicates that women are three times more likely to use tanning beds than are men (Robinson, Rigel, & Amonette, 1997). Moreover, we know that past behavior is a significant predictor of future behavior (Ajzen, 1991; Hale, Householder, & Greene, 2002). Therefore, we include these variables in the analytical models. Based on the HBM, we propose the following research question:

RQ3: *How do statistical risk, anecdotal, and normative evidence messages compare in terms of their persuasive effects on variables in the HBM (severity, susceptibility, beliefs, benefits, and barriers) when including gender and prior behavior in the models?*

Ascertaining how evidence types affect behavioral intention, a precursor to behavior (Ajzen, 1991; Hale et al., 2002; Kim & Hunter, 1993), is also an important component of this study. Few studies have included a no-message condition in testing evidence types (for exceptions, see Greene & Brinn, 2003; Kazoleas, 1993), which is helpful in understanding how message evidence functions. We suggest that all message evidence types will be preferable to a no-message condition. However, the relative effects of the other message evidence types are not known. Therefore, we suggest the following:

H2: *Statistical risk, anecdotal, and normative evidence messages will positively influence intention to use a tanning bed, and will be superior to a no-message condition.*

Method

Participants and Procedure

Participants in this study were 898 college students, ranging in age from 19 to 25 ($M = 21.04$, $SD = 1.16$), recruited from undergraduate courses at a large Northeastern

university in the United States. Students participated in the study outside of class time and received extra credit for participation. Of the original 898 participants, students older than 25 were removed for these analyses ($n = 24$) to retain homogeneity, as were those who had darker natural skin color ($n = 130$),[1] resulting in 744 participants retained in the analyses. The sample was 62% women, with reported ethnicity predominantly Caucasian (63%), 16% Asian or Pacific Islander, 5% African American, 4% Hispanic or Latino, and 4% bi- or multiracial, with other groups less than 2% each.

After providing written consent, participants entered a room to fill out an anonymous survey (approximately 20 min) as part of a larger project on tanning attitudes and behaviors.[2] Upon completion of the survey, all participants were debriefed.

Message Manipulation

Surveys were identical, with the exception of the presence or absence of the types of evidence format (normative, statistical, narrative, or no message).[3] There were three message evidence conditions (plus a fourth control) focusing on problems associated with tanning and tanning beds. The condition was randomized, with message perceptions collected after the stimulus message, and no order effects were detected. These stimulus messages were selected from prior studies of tanning bed use with previously validated messages. The scientific risk message provided statistical proof or evidence about the risk of use of tanning beds and information about skin cancer. Consistent with health education practice, the normative message provided a particular type of statistical evidence: the normative evidence regarding the percentage of students who avoid tanning beds (those performing the healthy choice). The narrative format told the history of a young woman who used tanning beds and later developed facial skin cancer. The messages contained identical arguments (quality and number) and sources, but they were presented in different evidence formats. The messages were shortened to less than one half of a printed page to minimize length effects.[4] Participants in the control condition received no message (and no corresponding message perception ratings).

Measurement Instruments

The survey consisted of scales adapted from Greene and Brinn (2003) to measure several variables including message perceptions, use of and attitudes toward tanning beds (and HBM components), and demographics (e.g., reported skin color).

Message perceptions. Perceptions of the message were measured by 13 Likert-type items, with 5-point responses ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). The factor analysis (varimax rotation), reliabilities, and scree plot indicated the presence of three factors. The first factor (eigenvalue = 4.13, 31.8% variance, and loadings above .6) was labeled *realism* ($M = 2.53$, $SD = 0.71$) and consisted of four items such as, "This message was realistic." The second factor (eigenvalue = 1.78, 14.3% variance, and loadings above .7) was labeled *reflectiveness* ($M = 2.97$, $SD = 0.73$)

and consisted of three items such as, ''This message made me think about my own risk for skin cancer.'' The third factor (eigenvalue = 1.18, 9.1% variance, and loadings above .7) was labeled *believability* ($M = 2.94$, $SD = 0.78$) and consisted of three items such as, ''This message was convincing.'' The scores were summed and averaged for the three subscales, with higher scores indicating more positive perceptions of the message. The reliabilities were good ($\alpha s = .81$, .70, and .74, respectively).

One additional measure of message perceptions was a shortened form of the amount of invested mental effort (AIME; Salomon, 1981, 1984). It consisted of two Likert-type items (e.g., ''How hard did you try to understand the message you read?''). Scores on the AIME were summed and averaged ($\alpha = .83$), with a higher score indicating more effort ($M = 2.42$, $SD = 0.66$).

Perceived susceptibility. Perceived susceptibility to skin cancer and sun damage was measured using four Likert-type items, with 5-point responses ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). One item included, ''I am worried about developing skin cancer because of too much sun exposure.'' Reliability was good ($\alpha = .86$), and the factor analysis indicated a single factor solution (eigenvalue = 2.87 and 71.6% variance), with all items loading above .8 on the single factor. Scores were summed and averaged ($M = 2.98$, $SD = 1.01$), with a higher score indicating greater perceived susceptibility.

Perceived severity. Perceived severity of skin cancer and sun damage was measured using three Likert-type items, with 5-point responses ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). One item included, ''Skin cancer is almost always curable'' (R). Reliability was moderate ($\alpha = .64$), and the factor analysis indicated a single factor solution (eigenvalue = 1.70 and 56.7% variance), with all items loading above .7 on the single factor. Scores were summed and averaged ($M = 2.12$, $SD = 0.64$), with a higher score indicating greater perceived severity.

Beliefs. Beliefs about tanning bed risks were measured using two Likert-type items, with 5-point responses ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). Items included, ''Indoor tanning is safer than natural sunlight'' (R), and ''Tanning indoors first protects skin from burning'' (R). Reliability was moderate ($\alpha = .61$). Scores were summed and averaged ($M = 3.69$, $SD = 0.79$), with a higher score indicating greater belief in risks.

Beliefs about consequences. Beliefs about consequences of tanning bed use was measured using five Likert-type items adapted from Slovic (2000), with 5-point responses ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). Instructions stated, ''Consider the following statements about the effects of a person's tanning bed use once or twice a week starting at age 16.'' Sample items included, ''There is really no risk at all for the first few years,'' and ''Using a tanning bed at the rate of once or twice per week will eventually harm this person's health.'' Reliability was good ($\alpha = .76$), and the factor analysis indicated a single factor solution (eigenvalue = 2.49 and 49.8% variance), with all items loading above .6 on the single factor. Scores were summed and averaged ($M = 3.77$, $SD = 0.63$), with a higher score indicating greater perceived consequences.

Benefits of skin protection. Benefits of avoiding tanning beds was measured using two Likert-type items, with 5-point responses ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). Items included, ''Avoiding tanning beds is a good way to protect my skin,'' and ''Use of sunscreen reduces the risk of skin cancer.'' Reliability was moderate ($\alpha = .64$), and scores were summed and averaged ($M = 4.12$, $SD = 0.63$), with a higher score indicating greater perceived benefits.

Barriers. Barriers to tanning bed use was measured using two Likert-type items, with 5-point responses ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). One item included, ''Tanning beds are too expensive.'' Reliability was moderate ($\alpha = .62$). Scores were summed and averaged ($M = 3.41$, $SD = 0.84$), with a higher score indicating greater perceived barriers.

Norms. Perceived norms were measured by two items, with responses ranging from 0% to 100%. The items included, ''In your best estimate, what percent of *undergrads* think tanning beds are safe?'' ($M = 35.9\%$, $SD = 24.1\%$), and ''In your best estimate, what percent of your *friends* think tanning beds are safe?'' ($M = 25.2\%$, $SD = 27.8\%$). For all items, a higher score indicated greater perceived norms for the behavior.

Behavioral intention. Intention to use tanning beds ($M = 3.80$, $SD = 1.38$) was composed of one 5-point Likert-type item: ''I am likely to use a tanning bed next semester,'' with a higher score indicating less intention to use tanning beds. The target time was specified as the next semester, when spring break would occur (data were collected in early December).

Prior tanning bed use. Tanning bed use ($M = 4.42$, $SD = 10.90$; range $= 0$–100) was measured by the following item: ''How many times have you used a tanning bed in the past year?''; and 63% of the sample reported no use in the past year (users $= 1$ and non-users $= 0$).

Results

The zero order correlation matrix for all variables is presented in Table 1. Data were analyzed by a series of $4 \times 2 \times 2$ multivariate analyses of variance (MANOVAs; utilizing Tukey's honestly significant difference test for *post hoc*), with independent variables message format (normative, narrative, statistical, or none), gender (male or female), and skin color (lighter or darker) and dependent variables grouped according to message perceptions, normative perceptions, and HBM components.[5] The level of significance was set at $p \leq .05$ for all tests except for correlations, where .01 was utilized to protect against Type 1 error based on the number of correlations. Table 2 summarizes main and two-way interaction effects, and Table 3 provides means and standard deviations for different evidence types. Main effects are reported in the results, and interaction effects were fewer than could be expected by chance.

Table 1 Bivariate Zero-Order Correlation Matrix for Variables

Variable	1	2	3	4	5	6	7	8	9	10	11	12
1. Reflectiveness	1.00											
	($n=564$)											
2. Believability	0.38**	1.00										
	($n=561$)	($n=562$)										
3. Realism	0.27**	0.36**	1.00									
	($n=558$)	($n=556$)	($n=559$)									
4. AIME	−0.19**	−0.18**	−0.10	1.00								
	($n=560$)	($n=558$)	($n=555$)	($n=561$)								
5. Intent	0.17**	−0.04	0.01	−0.11*	1.00							
	($n=563$)	($n=561$)	($n=558$)	($n=560$)	($n=742$)							
6. Susceptibility	−0.33**	−0.09	−0.11*	0.20**	−0.33**	1.00						
	($n=558$)	($n=556$)	($n=553$)	($n=555$)	($n=737$)	($n=737$)						
7. Severity	−0.00	0.05	0.07	−0.05	−0.16**	0.03	1.00					
	($n=561$)	($n=559$)	($n=556$)	($n=558$)	($n=739$)	($n=735$)	($n=739$)					
8. Beliefs	0.06	−0.03	−0.08	−0.01	0.32**	−0.10*	−0.23**	1.00				
	($n=563$)	($n=561$)	($n=558$)	($n=560$)	($n=739$)	($n=737$)	($n=739$)	($n=742$)				
9. Beliefs about consequences	0.06	−0.01	−0.11*	0.08	0.29**	0.11*	−0.24**	0.34**	1.00			
	($n=563$)	($n=560$)	($n=557$)	($n=559$)	($n=740$)	($n=735$)	($n=738$)	($n=740$)	($n=742$)			
10. Benefits	−0.08	−0.10	−0.17**	0.10	0.04	0.14**	−0.18**	0.17**	0.28**	1.00		
	($n=563$)	($n=561$)	($n=558$)	($n=560$)	($n=742$)	($n=737$)	($n=739$)	($n=742$)	($n=740$)	($n=742$)		
11. Barriers	0.02	−0.05	−0.05	0.03	0.33**	−0.06	−0.13**	0.14**	0.15**	0.08	1.00	
	($n=563$)	($n=561$)	($n=558$)	($n=560$)	($n=742$)	($n=737$)	($n=739$)	($n=742$)	($n=740$)	($n=742$)	($n=742$)	
12. Age	−0.04	0.01	0.01	0.03	0.03	0.00	0.03	0.02	−0.06	−0.01	0.03	1.00
	($n=564$)	($n=562$)	($n=559$)	($n=561$)	($n=742$)	($n=737$)	($n=739$)	($n=742$)	($n=742$)	($n=742$)	($n=742$)	($n=744$)

Note. AIME = amount of invested mental effort.
*$p < .01$. **$p < .001$.

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Table 2 Analyses of Variance for Main and Two-Way Interaction Effects

| | Main effects | | | | | | Two-way interaction effects[a] | | | | | |
| | Message | | Gender | | Skin color | | Message × Gender | | Message × Skin color | | Gender × Skin color | |
Variable	F	η^2	F	η^2	F	η^2	F	η^2	F	η^2	F	η^2
Message factors	2.90**	.02	3.99**	.03	0.46	.00	1.04	.01	1.90*	.01	0.54	.00
Reflectiveness	1.72	.01	14.36***	.03	0.16	.00	0.24	.00	1.16	.01	1.20	.00
Believability	3.53*	.01	1.32	.00	1.67	.00	0.60	.00	0.41	.00	0.17	.00
Realism	2.78	.01	3.48	.01	1.75	.00	0.90	.00	1.38	.01	1.18	.00
AIME	4.84**	.02	0.86	.00	0.38	.00	2.24	.01	3.94*	.01	0.07	.00
HBM factors	1.85**	.02	19.60***	.17	2.16*	.02	0.82	.01	1.41	.02	1.15	.01
Beliefs	4.97**	.02	0.87	.00	2.26	.00	0.62	.00	0.49	.00	3.86*	.01
Beliefs about consequences	3.17*	.01	12.55***	.02	1.69	.00	1.81	.01	0.79	.00	1.14	.00
Severity	2.13	.01	0.07	.00	4.43*	.01	0.66	.00	2.14	.01	0.41	.00
Susceptibility	0.36	.00	117.20***	.14	2.65	.00	0.34	.00	2.71*	.01	0.01	.00
Barriers	1.98	.01	2.81	.00	1.28	.00	1.65	.01	0.57	.00	1.95	.00
Benefits	0.27	.00	16.20***	.02	0.01	.00	0.09	.00	1.19	.01	0.51	.00
Behavior intention	1.04	.00	48.31***	.06	1.88	.00	0.47	.00	1.64	.01	0.25	.00
Norms	2.94**	.01	10.97***	.03	1.93	.01	1.51	.01	1.48	.01	0.05	.00
Undergrad norms	3.51*	.02	18.00***	.03	0.36	.01	1.66	.01	2.04	.00	0.00	.00
Friend norms	4.75**	.02	23.86***	.02	4.18*	.00	2.92*	.01	0.25	.01	0.05	.00

Note. AIME = amount of invested mental effort; HBM = Health Belief Model.
[a]Three-way interaction effects were not significant, and are available from the authors.
*$p \leq .05$. **$p \leq .01$. ***$p \leq .001$.

Message Evidence Format and Message Perceptions

MANOVAs were examined first to reduce error rate: message evidence format, $F(8, 1{,}072) = 2.90$, $p < .01$ (Wilks's $\Lambda = .96$; $\eta^2 = .02$); gender, $F(4, 536) = 3.99$, $p < .01$ (Wilks's $\Lambda = .97$; $\eta^2 = .03$); skin color, $F(4, 536) = 0.46$, $p = .76$ (Wilks's $\Lambda = .97$; $\eta^2 = .00$); then follow-up univariate analyses were conducted. Follow-up analyses on evidence type (3 versions) and message perceptions indicated several significant effects. For believability—$F(2, 560) = 3.53$, $p < .05$ ($\eta^2 = .01$)—normative ($M = 3.09$, $SD = 0.73$) messages were rated higher than statistical ($M = 2.91$, $SD = 0.71$) but not anecdotal ($M = 2.93$, $SD = 0.74$) messages. (Statistical messages were not significantly different from anecdotal messages.) For realism—$F(2, 557) = 2.78$, $p < .06$ ($\eta^2 = .01$)—normative ($M = 2.62$, $SD = 0.66$) messages were rated higher than statistical ($M = 2.45$, $SD = 0.72$) but not anecdotal ($M = 2.54$, $SD = 0.74$) messages. (Statistical messages were not significantly different from anecdotal messages.) For AIME—$F(2, 559) = 4.84$, $p < .01$ ($\eta^2 = .02$)—anecdotal ($M = 2.54$, $SD = 0.65$) messages were rated higher than both normative ($M = 2.36$,

Table 3 Means and Standard Deviations for Different Evidence Types

| | Evidence types | | | | | | | |
| | Normative | | Anecdotal | | Statistical | | Control | |
Variable	M	SD	M	SD	M	SD	M	SD
Message factors								
Reflectiveness	3.03_a	0.77	2.91_a	0.80	2.89_a	0.78	—	—
Believability	3.09_a	0.73	$2.93_{a,b}$	0.74	2.91_b	0.71	—	—
Realism	2.62_a	0.66	$2.54_{a,b}$	0.74	2.45_b	0.72	—	—
AIME	2.36_b	0.65	2.54_a	0.65	2.34_b	0.67	—	—
HBM factors								
Beliefs	3.86_a	0.75	3.58_b	0.75	$3.72_{a,b}$	0.80	3.60_b	0.80
Beliefs about consequences	3.86_a	0.63	$3.72_{a,b}$	0.62	$3.79_{a,b}$	0.65	3.66_b	0.62
Severity	2.07_a	0.63	2.22_a	0.67	2.08_a	0.67	2.13_a	0.61
Susceptibility	3.06_a	0.97	2.98_a	0.96	3.00_a	1.03	2.95_a	1.04
Barriers	3.56_a	0.86	3.42_a	0.83	3.35_a	0.88	3.40_a	0.89
Benefits	4.19_a	0.64	4.21_a	0.65	4.23_a	0.59	4.25_a	0.55
Behavior intention	3.79_a	1.32	3.84_a	1.41	3.64_a	1.39	3.62_a	1.46
Norms								
Undergrad norms	30.82_a	23.73	37.12_b	24.84	37.25_b	24.38	38.38_b	22.62
Friend norms	19.60_a	25.20	29.87_b	30.33	$23.83_{a,b}$	26.80	27.81_b	28.35

Note. Means that do not share the same subscript are significantly different at $p \leq .05$. AIME = amount of invested mental effort; HBM = Health Belief Model.

$SD = 0.65$) and statistical ($M = 2.34$, $SD = 0.67$) messages. (Normative messages were not significantly different from statistical messages.) There were no significant differences for message reflectiveness by evidence type, $F(2, 562) = 1.72$—that is, normative ($M = 3.03$, $SD = 0.77$), anecdotal ($M = 2.91$, $SD = 0.80$), and statistical ($M = 2.89$, $SD = 0.78$) did not differ in perceived reflectiveness.

Message Evidence Format and Normative Perceptions

To test *H1* and *RQ2*, MANOVAs were examined first to reduce error rate: message evidence format, $F(6, 1,368) = 2.94$, $p < .01$ (Wilks's $\Lambda = .98$; $\eta^2 = .01$); gender, $F(2, 684) = 10.97$, $p < .001$ (Wilks's $\Lambda = .97$; $\eta^2 = .03$); skin color, $F(2, 684) = 1.93$, $p = .18$ (Wilks's $\Lambda = .99$; $\eta^2 = .01$); then follow-up univariate analyses were conducted. Analyses of evidence type effects on normative perceptions of tanning revealed two significant effects. *H1* was supported, $F(3, 698) = 3.51$, $p < .05$ ($\eta^2 = .02$); with normative messages ($M = 30.80$, $SD = 23.70$) producing lower ratings of normative perceptions of college students about tanning than anecdotal ($M = 37.10$, $SD = 24.80$), statistical ($M = 37.30$, $SD = 24.40$), and control group ($M = 38.40$, $SD = 22.60$) messages. For *RQ2*—$F(3, 698) = 4.75$, $p < .01$ ($\eta^2 = .02$)—normative

messages ($M = 19.60$, $SD = 25.20$) produced lower ratings of normative perceptions of friends about tanning than anecdotal messages ($M = 29.90$, $SD = 30.320$) and control group ($M = 27.80$, $SD = 28.40$), but not statistical messages ($M = 23.80$, $SD = 26.80$). (Anecdotal and statistical messages were not significantly different from the control group.)

Message Evidence Format and HBM Components

To test *RQ3*, MANOVAs were examined first to reduce error rate: message evidence format, $F(21, 1,927) = 1.85$, $p < .01$ (Wilks's $\Lambda = .94$; $\eta^2 = .02$); gender, $F(7, 671) = 19.60$, $p < .001$ (Wilks's $\Lambda = .83$; $\eta^2 = .17$); skin color, $F(7, 671) = 2.16$, $p < .05$ (Wilks's $\Lambda = .98$; $\eta^2 = .02$); then follow-up univariate analyses were conducted. Analyses of evidence type and message perceptions indicated several significant effects for *RQ3*. For beliefs—$F(3, 697) = 4.97$, $p < .01$ ($\eta^2 = .02$)—normative ($M = 3.86$, $SD = 0.75$) messages produced more health protective beliefs than anecdotal ($M = 3.58$, $SD = 0.75$) and control ($M = 3.60$, $SD = 0.80$) messages, but not statistical messages ($M = 3.72$, $SD = 0.80$). (Anecdotal and statistical messages were not significantly different from the control group.) For beliefs about consequences of tanning beds—$F(3, 697) = 3.17$, $p < .05$ ($\eta^2 = .01$)—normative ($M = 3.86$, $SD = 0.63$) messages produced greater beliefs than control ($M = 3.66$, $SD = 0.62$) messages, but not statistical ($M = 3.79$, $SD = 0.64$) or anecdotal ($M = 3.72$, $SD = 0.62$) messages. (Anecdotal and statistical messages were not significantly different from the control group.) Inconsistent with *H2*, there were no significant differences by message evidence format, however, in intention to use tanning beds, $F(3, 697) = 1.04$; with no difference by anecdotal ($M = 3.84$, $SD = 1.41$), normative ($M = 3.79$, $SD = 1.32$), statistical ($M = 3.64$, $SD = 1.39$), and control ($M = 3.62$, $SD = 1.46$) messages.

Skin Color Effects

There were very few significant effects for self-reported skin color. For normative perceptions of friends—$F(1, 742) = 4.18$, $p < .05$ ($\eta^2 = .01$)—light skin-colored people ($M = 23.66$, $SD = 26.80$) had lower perceptions about tanning than dark skin-colored people ($M = 27.96$, $SD = 29.35$). For severity—$F(1, 738) = 4.43$, $p < .05$ ($\eta^2 = .01$)—light-skinned people ($M = 2.16$, $SD = 0.66$) perceived greater severity than dark-skinned people ($M = 2.06$, $SD = 0.61$). Overall, there were few differences between light-skinned and dark-skinned people on variables of interest.

Gender Effects

There were a number of significant effects for gender (only 1 for message perceptions). For reflectiveness—$F(1, 562) = 14.36$, $p < .001$ ($\eta^2 = .03$)—men ($M = 3.11$, $SD = 0.83$) reflected more on the messages than women ($M = 2.85$, $SD = 0.75$).

For normative perceptions of college students—$F(1, 741) = 18.00$, $p < .001$ ($\eta^2 = .02$)—women ($M = 33.27$, $SD = 23.40$) reported lower normative perceptions than men ($M = 41.01$, $SD = 24.40$). For normative perceptions of friends—$F(1, 741) = 23.86$, $p < .001$ ($\eta^2 = .03$)—women ($M = 21.67$, $SD = 26.13$) reported lower normative perceptions than men ($M = 31.96$, $SD = 29.67$). For intent to use tanning beds—$F(1, 740) = 48.31$, $p < .001$ ($\eta^2 = .06$)—women ($M = 3.48$, $SD = 1.45$) reported more intent to use tanning beds than men ($M = 4.20$, $SD = 1.16$).

For perceived consequences—$F(1, 740) = 12.55$, $p < .001$ ($\eta^2 = .02$)—women ($M = 3.82$, $SD = 0.62$) reported greater consequences than men ($M = 3.65$, $SD = 0.63$). For perceived susceptibility—$F(1, 735) = 117.20$, $p < .001$ ($\eta^2 = .14$)—women ($M = 3.25$, $SD = 0.91$) reported more susceptibility than men ($M = 2.46$, $SD = 1.00$). For perceived benefits—$F(1, 740) = 16.20$, $p < .001$ ($\eta^2 = .02$)—women ($M = 4.27$, $SD = 0.58$) reported more benefits than men ($M = 4.07$, $SD = 0.71$).

Discussion

This study examined the impact of normative, statistical, and anecdotal evidence types, as well as a no-message control condition on a variety of message perceptions and behavioral intentions to use a tanning bed, as well as common predictors of health behavior based on the HBM. Previous studies have focused on testing traditional scientific risk evidence messages versus anecdotal ones (e.g., Allen & Preiss, 1997; Baesler & Burgoon, 1994; Brosius & Bathelt, 1994; Cody & Lee, 1990; Reinard, 1988; Taylor & Thompson, 1982). Results from this study indicate that, although evidence types do not directly influence behavioral intention, some do affect message perceptions, normative perceptions, severity, health beliefs about the safety of tanning beds, and their negative consequences. Given one single message exposure, this is not surprising. Longer-term impact of messages should be studied. However, it is also possible that intention and behavior will be indirectly influenced via health beliefs or severity. The lack of findings for behavioral intention are important because behavioral intention was measured using a specific period of time (next semester). Kim and Hunter (1993) noted that specificity in behavioral intent is a better predictor of behavior than general intentions. Although the messages were not specific for time (and the measure of behavioral intention was), there was a match on target and behavior. These results have implications for evidence type selection in health persuasive messages.

Findings for Message Evidence Type

Normative evidence had the most influence on perceptions of normative behaviors of other college students—the measure that is the target goal of normative messages. Although this finding has been well-documented in the literature (e.g., Haines & Spear, 1996; Perkins, 2002; Perkins et al., 1999; Pollard et al., 2000) and this variable is commonly employed as an outcome message in norms message studies, it was

surprising that normative evidence was, in addition, the most effective in influencing normative perceptions of friends (not different from statistical messages, but others). If normative evidence also affects perceptions of injunctive or subjective norms, this is important for illustrating the efficacy of these messages on pathways to behavior change, and has not previously been explored. This is particularly crucial because prior research has illustrated that normative perceptions of friends' behavior are more influential in behavior than normative perceptions of the typical college student (Campo et al., 2003). Normative evidence also had superior effects on several other variables, emphasizing the importance of expanding outcome variables measured in other norms studies.

Normative evidence was better than anecdotal, but not statistical, evidence in message ratings of believability. For AIME, anecdotal worked better than normative and scientific messages. Normative evidence was more effective than statistical messages, but not anecdotal messages, in ratings of realism. These differences in functioning of evidence types on message perceptions should continue to be explored, as they illustrate complex patterns (see Greene & Brinn, 2003; Kopfman et al., 1998). Normative messages also worked best in altering beliefs about both health protection and consequences of tanning beds, which are possible future targets for tanning bed use messages.

Statistical evidence (also labeled scientific) messages failed to be most effective with any outcome variable tested in this study. Some prior studies (e.g., Allen & Preiss, 1997; Baesler & Burgoon, 1994) have demonstrated superiority of statistical risk evidence, in particular, over anecdotal (or narrative) evidence messages. In this study, normative evidence was a type of statistical evidence. It was superior to anecdotal evidence in most cases. However, the absence of effects for statistical risk messages, which are more traditionally used, may be related to the type of information given in the message, or it could be that the information provided was evidence already known to the sample. This lack of effect could also be topic-specific. Students choosing to use tanning beds are often very concerned with their appearance (Greene & Brinn, 2003), and concern with attractiveness can be related to normative pressure. The norms and the anecdotal evidence messages may have been more persuasive for this reason. What our findings do suggest is that varying the type of statistical evidence given does matter, as all are not equivalent.

The absence of differences between the three message evidence formats and a no-message control is intriguing, as it highlights the need for researchers to consistently include this control condition in future research. Some changes in attitudes, perceptions, and intentions reported may simply be due to testing effects. These findings are also important to health communicators who need to consider their audience's current attitudes, beliefs, and behaviors. For example, if the population of interest has health beliefs that need to be altered, normative messages may work best. There is no universal recommendation based on these data for superiority of one message evidence type, which is a call to continue to expand message processing research, multiple outcomes, and varied measures of message perceptions.

Gender and Skin Color

Women are often the target of messages that are appearance-based or related to sun exposure, and this study also reports gender effects for several key variables. Women reported more intention to use tanning beds, as well as more prior use than men. In terms of normative perceptions of college students, women reported lower use than men. Because women are more likely to use tanning beds (Robinson et al., 1997), it may be that they are in a position to see how many or how few others are in the tanning salons with them. Women also reported higher perceived susceptibility, more benefits, and more consequences to tanning bed use than men. However, this does not stop women from using tanning beds at greater rates. Gender did not affect message perceptions, except for reflectiveness, suggesting that all three evidence types were equivalent in believability, realism, and AIME; men did report reflecting more on the message. Future research could explore if a measure of body consciousness (or need for approval) affect message perceptions, as well as HBM variables.

The outcomes for skin color did not explain much variance in this study, but the sampling plan also excluded the darkest-skinned individuals. There are a number of reasons for differences in perceptions of tanning beds by self-reported skin color, and this variable is particularly salient for the specific target behavior in question. Future research should continue to examine the relative contributions of features, such as skin color and other ethnicity-linked variables, in risk perceptions.

Limitations

There are a number of potential limitations in this study that should be noted. As with most message evidence studies, this was a cross-sectional design utilizing one topic with a single (or no) message and single (or no) exposure. In addition, we tested only one version of each message, although the messages were previously validated in prior studies. More items or scales with higher reliability would also be a benefit.

These results may be topic- or message-specific and should be replicated, particularly given that, although significant, the effects sizes were small. Tanning bed use is a clear example of a volitional behavior, making it a better message target than sun exposure alone, which also contains recreational and occupational exposure components. Behaviors under volitional control are ones for which persuasive messages should work best, so these could include protective (not just risk) tanning behaviors such as sunscreen use, wearing hats, and so forth (for examples of sun protection and skin cancer campaigns, see Buller, Buller, Beach, & Ertl, 1996). In addition, there are no ''safe'' levels of tanning bed use compared to a topic such as alcohol consumption. Tanning bed use is not illegal, as compared to illicit drugs or underage drinking, nor is it addictive, as are products such as tobacco (note that some students do report ''addiction to tanning beds''). Moreover, this is a less frequent behavior at any level that is performed in locations that are not highly visible

to others, as compared to bars or smoking outside of buildings, which may make the normative statistic easily believable in this case (different from student perceptions of alcohol norms messages and drinking norms). Although the location of the risk behavior might be less visible, some consequences of this behavior (darker skin) are, in fact, visible—different from other risk behaviors, such as smoking or drinking. For most students, these persuasive messages were maintenance or reinforcement of an existing lack of a behavior, and it would be possible to utilize an inoculation approach to explore this facet. Tanning bed use also does not have the secondary effects of alcohol and tobacco use, such as drinking and driving or secondhand smoke. This study was also done on a college campus where normative evidence messages are commonly used and previously touted as successful (Lederman & Stewart, 2005).

Because tanning bed use is not practiced by the majority of students, it may also be that this topic is one for which there is less emotional involvement for those not engaging in the behavior. Alternately, these tanning messages may be more novel for both prior users and non-users, compared with the proliferation of messages targeting tobacco use and drinking. Statistical and scientific messages have been found to work better in cases where the messages do not go against their existing values or behaviors (Slater & Rouner, 1996). The normative message may also have been superior to the other message types because it was the only one giving university-specific information that may have increased relevance and, consequently, attention. This study also used a written presentation of evidence, although recent literature suggests that statistical evidence may be better comprehended in verbal, rather than visual, form (Parrott, Silk, Dorgan, Condit, & Harris, 2005). For messages, we attempted to maintain as much control as possible in the message design, but wanted to maximize the likelihood that the messages would be relevant and consistent with what is commonly done in practice. The source of evidence also varied between messages, which is consistent with the type of message condition, mimicking what is done in health message practice. The narrative message relied on a particular case, the scientific message on medical information, and the normative message on university normative statistics.

Implications

This study has a number of implications for research and practice. We found that normative evidence messages have effects other than just altering normative perceptions. From a research standpoint, this may be just as important as the touted effects, depending on the population in which they are used. At this point, the normative evidence literature does not include clear exploration into other pathways of influence. These data make clear that a shift is needed in design and outcome variables for studies of normative evidence. This study also points to the need to include a no-message control condition in testing persuasive messages. In many cases, the no-message condition was equivalent to some evidence conditions—in particular, the statistical evidence message. Moreover, in this study, scientific evidence was

not superior to other evidence types in any case. This study points to the need for more research on why evidence types do not function in one clear way, which reinforces a call by O'Keefe (2003) to further explore message properties to better understand how and why messages function in particular ways. Results from this study indicate that evidence types do not directly influence behavioral intention. Instead, they do affect message perceptions, normative perceptions, severity, and health beliefs about the safety of tanning beds and their negative consequences. Clearly, these results, taken together, indicate various evidence types and involve different message processing or pathways to behavior change.

From a practice standpoint, practitioners need to remember that persuasive campaign messages can have unintended effects, which may be helpful or harmful to influencing health attitudes and behaviors (Campo & Cameron, 2006). Therefore, evidence type selection *in practice* needs to consider an audience's current attitudes, beliefs, and behaviors when selecting evidence types. Normative evidence also affected perceptions of injunctive or subjective norms. This can be helpful to practitioners because studies have suggested that these norms are often more influential on an individual's behavior than social norms (Campo et al., 2003; Yanovitzky, Stewart, & Lederman, 2006). In addition, those evaluating campaigns may want to add these additional variables to their outcome measures. Given that tanning bed use is a context in which the majority of students are making the healthy choice (not using tanning beds), and that those using tanning beds were also more likely to report higher normative use than others (suggesting a false consensus effect), the potential exists for social norms campaigns to be influential on student beliefs and attitudes, if not behaviors. In addition, the use of tanning beds and the attitudes regarding use were different based on gender. Women were more likely to use them, more likely to intend to use them, less likely to believe there were negative consequences, and more likely to perceive their benefits. Taken together, these findings point to the need for prevention efforts targeted toward younger adolescents, particularly girls, before the initiation of tanning bed use.

Notes

[1]   Self-reported skin color was utilized in this study, rather than race or ethnicity, to capture more variation in the relevant construct. Instructions stated the following: ''Think about a part of your body that is *not* normally exposed to the sun.'' The item asked, ''How would you describe your skin?,'' ranging from 0 (*very pale or fair*) to 10 (*very dark skin*) ($M = 4.21$, $SD = 2.16$). Because this study focused on intentions to use tanning beds, self-reported skin color was utilized as a filter, and 130 participants were eliminated (darkest skin color reported). Additional variation in skin color was explored by creating a median split on the remaining participants (0, 1) and used as a factor in the analyses of variance.
[2]   The project included two additional manipulations not described in this study: a manipulation of a tanning photo and a self-assessment to increase perceived risk. Neither of these manipulations interacted with evidence format, and they are available from the authors.
[3]   Analyses performed to ensure random distribution of relevant variables across experimental groups (i.e., message condition) indicated no differences.

[4] One item at the bottom of the message was a check of attention or reading the message, and 9% of participants failed to mark this item. Analyses performed excluding these participants did not differ from those including them; thus, they were retained for this study.

[5] We duplicated the results by prior tanning bed use. There were no significant differences in the pattern of results; thus, they are not reported here. Details are available from Kathryn Greene. Research indicates that prior behavior—in this case, past tanning bed use—should be considered in message design (see Hale, Householder, & Greene, 2002). Prior tanning bed use was a predictor in this study, as well as in previous literature, which indicates past behavior is often the best predictor of future behavior (Ajzen, 1991; Oullette & Wood, 1998). Those who had used tanning beds in the past had higher amount of invested mental effort ratings and invested more in reading the message (or tried harder), but this is not surprising. Those who previously used tanning beds were also more likely to report higher normative use than others, suggesting a false consensus effect (Baer, Stacey, & Larimer, 1991; Pollard, Freeman, Ziegler, Hersman, & Gross, 2000; Ross, Greene, & House, 1977). Prior users were also less likely to perceive personal negative consequences and to believe that tanning beds were safer, offering another good possible target for message designers seeking to influence tanning bed use. Those who perform negative health behaviors often minimize negative consequences to justify their behavior (Prochaska, Norcross, & DiClemente, 1994), and this should be explored.

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