Conceptualizing and Measuring Risk Perceptions of Skin Cancer: A Review

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Abstract

Background: Perceived risk is commonly conceived as a joint function of the perceived evaluations about the probability estimate of a negative outcome, and the perceived seriousness of the consequences of that negative outcome. Theories typically posit that once people perceive their vulnerability to health risks or outcomes, they form intentions to take preventive actions to reduce their risk. This theoretical proposition is not supported in skin cancer preventative behavior studies, which could be due to improper measurement of perceived risk. **Purpose and Methods**: The purpose of this manuscript was to assess how risk perception of skin cancer has been conceptualized and measured in the literature to date. Literature retrieval was facilitated through EBSCO, PubMed, PsycInfo, MEDLINE, and ERIC databases. Twenty potentially relevant articles were identified for this review. **Results**: In the literature, skin cancer risk has been operationalized in two ways: absolute risk and comparative risk. However, these measures have some serious limitations. For example, there is great uncertainty regarding the quality of risk perception measurements (i.e., whether the items used to measure perceived risk are reliable and valid). Future studies are warranted to better understand the significance of using conditional risk measures.

Keywords: Perceived risk; skin cancer; health behavior theories.

Introduction

Perceived risk, also called perceived likelihood, probability, susceptibility, or vulnerability, has been defined in a number of ways. It is often conceived as the joint function of the probability estimate of a negative outcome and the perceived seriousness of the consequences of the negative outcome (Brewer, Weinstein, Cuite, & Herrington 2004; Windshitl, 2003). These consequences may be linked to an expected outcome that may happen in the future or to a present condition such as preexisting health issues (Miles, 2012). People are expected to differ considerably in whether they focus on probability or consequences of the outcome when perceiving their own risk (Drottz-Sjöberg, 1993).

Individuals' judgments about risk are viewed as an important component of most health specific behavior theories (Brewer et al., 2004). For example, the Health Belief Model, the Protection Motivation Theory, and the Self-Regulation Model explicitly include several constructs important to risk perception, while the Social Cognitive Theory and the Theory of Planned Behavior include risk perception as part of outcome expectancies and attitudinal beliefs (Brewer et al., 2007; Janssen, Osch, Vries, & Lechner, 2011; Norman & Conner, 2005).

All of the aforementioned theories typically posit that once people perceive their vulnerability to health risks they form intentions to take preventive actions to reduce their risk (Vollrath, Knoch, & Cassan, 1999). This implied positive association between perceived risk and subsequent adoption of protective behaviors is found in many research studies of skin cancer prevention behavior (Azzarello, Dessureault, & Jacobsen, 2006; Berwick, Fine & Bolognia, 1992; de Vries, Lezwijn, Hol, & Honing, 2005; Douglass, McGee, & Williams, 1997; Hammond, Reeder, Gray, & Bell, 2008; Mermelstein & Riesenberg, 1992). Other studies have offered contradictory findings. For example, measures of perceived skin cancer risk showed no association or even a negative association to skin cancer preventive behaviors

(Johnson, 2011; Kim et al., 2009; Lamanna, 2004; Mujumdar et al., 2009 ; Nahar et al., 2013; Pichon, Corral, Landrine, Mayer, & Adams-Simms, 2010). Such inconsistent results may lead some researchers to believe that the predictive utility of perceived risk in health behavior measurement is questionable.

These inconsistent findings could be the result of improper measurement of risk perception or the study design (Brewer et al., 2004). Experimental and prospective studies are the preferred designs to determine whether risk perception exerts causal influence on behavior intentions, since these designs determine risk perception before the respondents take (or do not take) actions to engage in the health behavior (Brewer et al., 2007). Unfortunately, most risk perception studies have not been prospective.

Purpose

Every year over 3.5 million new cases of skin cancer are diagnosed in the US, and a majority of these are attributable to sun exposure (American Cancer Society [ACS], 2013, Saraiya et al., 2004). Although skin cancer is the most frequently diagnosed cancer, it is also highly preventable (Stock et al., 2009). Behavioral strategies such as sun avoidance during mid-day, wearing sun protective clothing (e.g., hats), and sunscreen are recommended to reduce the incidence and risk of skin cancer (ACS, 2013). Unfortunately, a majority of individuals report low levels of engagement in sun protection despite efforts to promote sun protection practices (Arthey & Clarke, 1995; Kasparian, McLoone, & Meiser, 2009; Saraiya et al., 2004).

Health behavior theories propose that a high risk of personal harm should motivate individuals to take risk reducing actions (Brewer et al., 2007; van der Pligt, 1996). This has led researchers to study the role of perceived risk as a factor in persuading individual's sun protection behaviors. The theoretical proposition of perceived risk is not supported in skin cancer preventive behavior studies, which could be due to improper measurements of perceived risk.

Considering this issue, the purpose of this research was to assess how risk perception of skin cancer was conceptualized and measured in the literature. This research will provide us a better understanding of how to better formulate skin cancer risk perception items and scales in future research. Moreover, this research will demonstrate how individuals perceive their risk of having skin cancer which will provide health promotion specialists a better understanding of how to tailor skin cancer prevention programs.

After observing the inconsistent findings among studies dealing with patterns of relationships between perceived risk and skin cancer prevention behaviors, we predicted that items applied to measure perceived skin cancer risk would be different. This distinction could be in phrasing of items, number of items, or types of scales with anchors.

Methods

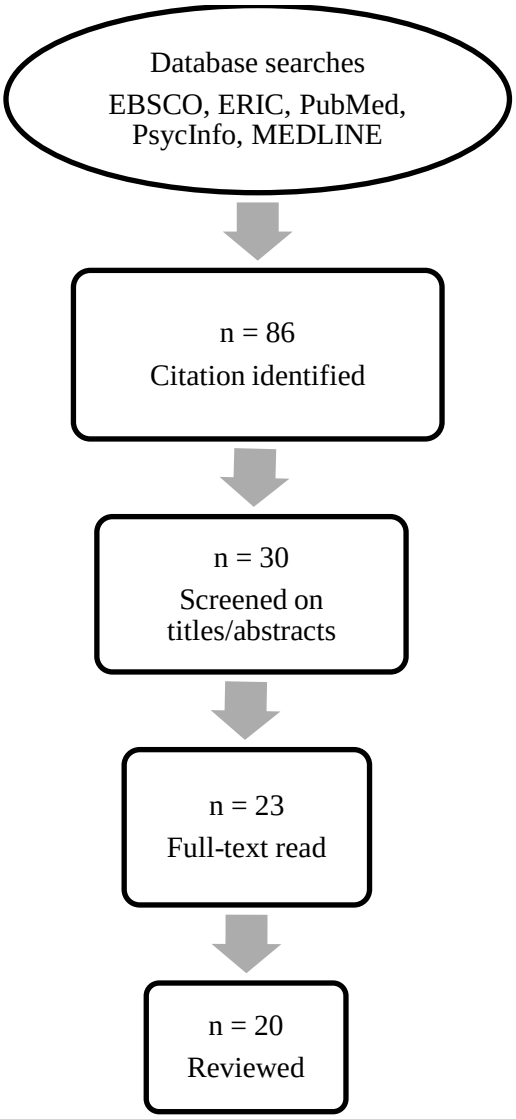
Literature retrieval was facilitated by searching EBSCO, PubMed, PsycInfo, MEDLINE, and ERIC databases. The terms "perceived risk," "perceived likelihood," "perceived probability," "perceived susceptibility," "perceived vulnerability," "health behavior theory," "skin cancer," "melanoma," and "sun protection behavior" were searched as keywords or phrases.

The search was limited to studies published from 1990 to the present and written in English. Additionally, this review is limited to published studies which were identified only through a literature search of the aforementioned electronic databases. The search netted a total of 86 citations; 56 of them were excluded because they were not original studies - they were either duplicates, surveys, editorials, case series, case reports, letters or commentaries. Another seven articles were excluded because they were conference abstracts or reviews. A total of 23 full-text articles were retrieved and read for relevance. Of these, three articles were excluded because single items measured two constructs (i.e., measures of perceived risk are conflated with measures of another construct).

The research studies were included in this review if they provided enough information to interpret how perceived risk was measured. The studies in which researchers measured perceived risk with both perceived susceptibility and severity were also included, since health behavior theories define perceived risk as a combined function of "perceived susceptibility" of contracting an illness and the anticipated "perceived severity" of such illness (Janssen et al., 2011). A total of 20 potentially relevant articles were selected for the review. Figure 1 illustrates the literature search process.

Figure 1

Flow Chart of the Literature Search.



The following section categorizes the relevant information in the selected articles that pertain to the purpose of this review. In the first two categories, we reported two major perceived skin cancer risk measures: absolute and comparative. For these measures, we provided a definition, followed by a classification of and examples of the items. In the third category, we presented studies that used both absolute and comparative measures. The fourth category included studies that used severity measures. Finally, we turned to reporting diverse items and their scales with anchors. Table 1 provides a summary of the articles selected for this review.

Results

Absolute Measures

One of the measures of perceived risk that has been widely applied in the literature is the absolute measure of perceived risk. This measure addresses one's belief about the risk of contracting a disease or condition, and it is typically classified into two major categories: unconditional measures and conditional measures (Gerrard & Houlihan, 2012; Janssen et al., 2011). The unconditional risk estimate refers to the subjective probability that a certain event will occur based on whatever sets of factors individuals take into consideration (e.g., perceptions of control or the efficacy of precautionary behaviors) and no condition is specified in the questions. One example is, "what are your chances of developing skin cancer?" (Azzarello et al., 2006; Berwick et al., 1992; Brandberg et al., 1996; Carmel, Shani, & Rosenberg, 1994; Castle, Skinner, & Hampson, 1999; Douglass et al., 1997; Hammond et al., 2008; Johnson, 2011; Marlenga, 1995; Pichon et al., 2010; Rosenman, Gardiner, Swanson, Mullan, & Zhu, 1995; Salas, Mayer, & Hoerster, 2005; van der Velde, Hooyakas, & van der Pligt, 1996; Webb, Friedman, Bruce, Weinberg, & Cooper, 1996).

Table 1

Measurement of Perceived Risk of Skin Cancer.

Author, Date	Population, Sample Size (*n*), Ethnicity, Gender, Mean age (*M*)	Measures (Number of Items)	Type of Scale (Response Anchors)	Validity & Reliability
Berwick et al. (1992)	Individuals who had attended community skin cancer screening, *n* = 214, 94.3% Caucasian, 65.4% women, age: > 59 years = 34.1%	Absolute Measure 1 = unconditional	Likert-type low to high	-----
Carmel et al. (1994)	General population, *n* = 509, 59.1% Israeli-born, 55.8% women, age: 25-64 years = 79%	Absolute Measure 1 = unconditional 1 = Severity Measure	Likert-type no to high chance; recover fully to serious damage remains permanently	-----
Marlenga (1995)	Dairy farmers, *n* = 202, 100% men, *M* = 50.88 years	Absolute Measure: 1 = unconditional Comparative Measure: 1 = direct 2 = Severity Measure	Likert-type strongly disagree to strongly agree	Pilot-tested, validated. $\alpha = 0.87$ (health beliefs)
Brandberg et al. (1996)	Participants in public melanoma screening: *n* = 511, 56 % women, *M* = 60 years for women; 63 years for men; General population: *n* = 1,070, 50 % women, *M* = 40 years for both men and women	Absolute Measure 5 = unconditional	Likert-type None to very much; very small to very high; no to yes; never to often Dichotomous scale yes/no	-----
Rosenman et al. (1995)	Farmers and their spouses, *n* = 1,342, $\geq$ 40 years	Absolute Measure 1 = unconditional	Likert-type very likely to unlikely	Pilot-tested
Webb et al. (1996)	Hospital employees, *n* = 384, 78% White, 80% women, *M* = 41 years	Absolute Measure 1 = unconditional	Likert-type very small to very high	-----
Clarke et al. (1997)	General population, *n* = 355, 53% women, *M* = 19.4years	Comparative Measure 2 = indirect 1= Severity Measure	Numerical probability estimate out of 100 Likert-type not a problem to a severe problem	-----
Douglass et al. (1997)	General population (21 years), *n* = 909, 51.1% men	Absolute Measure 1 = unconditional	Likert-type low to high	-----
Castle et al. (1999)	Education students, *n* = 97, 100% women, *M* = 17.5 years	Absolute Measure 1 = unconditional; 2 = conditional 1 = Severity Measure	Likert-type strongly disagree to strongly agree	Perceived susceptibility scale: $\alpha = 0.60$
Branstrom et al. (2005)	Visitors to mobile skin cancer screening program, *n* = 722, 61% women, *M* = 46 years	Comparative Measure 3 = indirect	Likert-type very low to very high; less than 1,000 to more than 20,000; much lower than for other people to much higher than for other people	-----

Table 1 (cont'd)

Measurement of Perceived Risk of Skin Cancer.

Author, Date	Population, Sample Size (*n*), Ethnicity, Gender, Mean age (*M*)	Measures (Number of Items)	Type of Scale (Response Anchors)	Validity & Reliability
de Vries et al. (2005)	Adolescents, *n* = 500, 94.2% Dutch 51.4% women, *M* = 17.5 years	Absolute Measure 1 = conditional	Likert-type no to high	Pilot-tested and reviewed by experts
Hay et al. (2005)	Melanoma patients, *n* = 115, 96% White, 55% women, *M* = 60 years	Comparative Measure 2 = direct	Likert-type much less than others to much more than others	-----
Salas et al. (2005)	Farmworkers, *n* = 326, 100% Latino, 100% men, *M* = 32.79 years	Absolute Measure 1 = unconditional	Dichotomous scale yes/no	Pilot-tested
Azzarello et al. (2006)	Unaffected first degree relatives of individuals having melanoma, *n* = 100, 100% Caucasian, 53% women, *M* = 57 years	Absolute Measure: 1 = unconditional; 1 = conditional Comparative Measure: 1 = direct 5 = Severity Measure	Likert-type much lower to much higher; strongly disagree to strongly agree Numerical probability estimate: 0% to 100%	Perceived susceptibility scale: α = 0.80 Perceived severity scale: α = 0.60
Ma et al. (2007)	High school students, *n* = 369, 60% White Hispanic and 40% White non-Hispanic, *M* for White Hispanics = 17.2 years, *M* for White non-Hispanics = 16.5 years	Comparative Measure 1 = direct	Likert-type lower than average to higher than average	-----
Coups et al. (2008)	*n* = 28,235, 71.1% White non-Hispanic, 52% women, age: 18 – 29 = 22.3% and 50 – 64 = 22.8%	Comparative Measure 1 = direct	Likert-type less likely to more likely	-----
Hammond et al. (2008)	Outdoor occupational groups, *n* = 74, 82% men, *M* = 35 years	Absolute Measure 1 = unconditional	Likert-type low to high	Not tested
Majumdar et al. (2009)	Melanoma patients, *n* = 115, 99% Caucasian, 55% women, *M* = 60 years	Comparative Measure 1 = direct	Likert-type much less to much more	-----
Pichon et al. (2010)	African American adult, *n* = 1,932, 57.7% women, *M* = 43.37 years	Absolute Measure 1 = unconditional	Numerical probability estimate: 0 to 100	-----
Johnson (2011)	US civilian, non-institutionalized, adult population, *n* = 1,736, 67% Caucasian, *M* = 44.3 years	Absolute Measure 1 = unconditional	Likert-type very low to very high	-----

On the other hand, a conditional risk estimate would require respondents to report their perceived risk, given their present skin cancer protection behavior. In addition, respondents are asked to report their perceived risk if they would change their specific behaviors (van der Velde et al., 1996). A conditional risk can be defined as the probability that an event will occur if precautionary action is taken, or the probability an event will occur if no precautionary action is taken. One example is, "what are your chances of developing skin cancer, if you protect yourself from the sun each day?" or "what are your chances of developing skin cancer, if you do not protect yourself from the sun each day?" (Azzarello et al., 2006;

Castle et al., 1999; de Vries et al., 2005; van der Velde et al., 1996).

Comparative Measures

Another commonly used measure to assess risk perception in the literature is the comparative (or relative) measure in which respondents are asked to rate their own risk as compared to others (van der Pligt, 1996). The comparative measure is divided into direct and indirect measures. The direct measure asks respondents to provide a single comparative risk judgment, in which they report their risk of experiencing a negative outcome in the future, compared to others of similar age and gender. An example of such an item is, "compared to others your age, how likely is it that you will get skin cancer at some time in the future?" (Azzarello et al, 2006; Coups, Manne, & Heckman, 2008; Gerrard & Houlihan, 2012; Hay et al., 2005; Marlenga, 1995; Ma et al., 2007; Mujumdar et al., 2009). The indirect measure asks respondents to make two absolute judgments: one for their own chances that a negative event will happen and one for a comparison target. An example of such an item is, how likely is it that you will get skin cancer at some time in the future?" and "how likely is it that the average person your age and gender will get skin cancer?" (Branstrom, Kristjansson, & Ullen, 2005; Clarke, Williams, & Arthey, 1997; Gerrard & Houlihan, 2012).

Combined Measures

Some studies utilized both absolute and comparative risk measures to assess perceived risk, since it has been suggested that respondents make an involuntary comparison of their own risk with others when responding absolute risk questions (Klein & Weintein, 1997). Marlenga (1995) measured perceived susceptibility by using two items: "I am likely to get skin cancer sometime during my lifetime" and, "as a farmer, I am more likely than the average person to get skin cancer." Responses to all these items were on a five-point, Likert-type scale, where, 1 = "strongly disagree" and 5 = "strongly agree." In addition, Azzarello, Dessureault, and Jacobsen (2005) assessed perceived risk by asking respondents to rate their chances of a) developing skin cancer during their lifetime (0 = 0% to 10 = 100%), b) developing skin cancer if they never took actions to protect themselves from the sun (0 = 0% to 10 = 100%), and c) developing melanoma relative to other persons of similar age (1 = much lower to 5 = much higher).

Severity Measures

Five studies could be identified that assessed the perceived severity of skin cancer. Carmel, Shani, and Rosenberg (1994) measured severity by asking participants, "skin cancer is a disease from which people" - recover fully; recover, but signs remain; some damage remains permanently; serious damage remains permanently. Marlenga's (1995) skin cancer survey included two five-point items (1 = strongly disagree to 5 = strongly agree) regarding the statements, "I think skin cancer is a serious disease" and "if I get skin cancer I will not be able to continue farming." Clarke, Williams, and Arthey (1997) operationalized perceived skin cancer severity for individuals and for the general population. Questions could be responded on a four-point scale, with the choices being "not a problem," "a slight problem," "a fairly major problem," and "a severe problem." Moreover, Castle and coworkers (1999) assessed respondents' perceived severity by asking "I could die from skin cancer." This was indicated on a five-point Likert-type scale from 1 = strongly agree to 5 = strongly disagree. Lastly, Azzarello et al. (2006) measured severity with five items, using six-point Likert-type scale, responses ranging from 1 = strongly disagree to 6 = strongly agree (e.g., I don't consider melanoma life-threatening).

Number of Items, Scales, and Anchors

Perceived risk was measured with both single and multiple items. However, a large volume of studies used single-item measures to index perceived risk. Webb, Friedman, Bruce, Weinberg and Cooper (1996) asked respondents, "what do you think your chances are of getting skin cancer some day?" Responses were measured on a four-point scale, with one representing "very small" and four representing "very high." Douglass, McGee, and Williams (1997) asked participants to define their risk of getting skin cancer as "high risk," "medium risk," "low risk" or "do not know." Another

example is de Vries, Lezwijn, Hol, and Honing's (2005) study, in which perceived risk was measured on five-point scale, with a question that asked respondents to assess their risk of getting skin cancer when not protecting themselves sufficiently against the sun (0 = no risk; 1 = low risk; 2 = moderate risk; 3 = relatively high risk; 4 = high risk). Furthermore, Ma, Collado-Mesa, Hu, and Kirsner (2007) asked participants to describe their chances of developing skin cancer in the future as one of four categories from "lower than average" to "higher than average."

Moreover, Hammond and colleagues (2008) found that perceived risk of developing skin cancer was indicated on a nine-point Likert-type scale from one (low) to nine (high). Mujumdar et al. (2009) assessed perceived risk by asking respondents to compare their chances of developing skin cancer with other skin cancer patients of their same age and sex (much less = 1 to much more = 5). In a more recent study conducted by Johnson (2011), participants were asked, "how likely do you think it is that you will develop skin cancer in the future?" This was followed by five-point Likert-type scale ranged from "very low" to "very high." Branstrom, Kristjansson, and Ullen (2005) assessed the respondents' skin cancer risk perception with three questions. First, "what is your personal risk of developing skin cancer?" (very high = 5; rather high = 4; neither high nor low = 3; rather low = 2; very low = 1). Second, "How many people in Sweden do you think will get a skin cancer diagnoses during this year?" (<1000 = 1; 1000 – 2000 = 2; 2000 – 5000 = 3; 5000 – 10,000 = 4; 10,000 – 20,000 = 5 and >20,000 = 6). Third, "compared to others your age, how likely is it that you will get skin cancer?" (much lower than for other people = 2; somewhat lower than for other people = 1; the same as for other people = 0; somewhat higher than for other people = -1 and, much higher than for other people = -2).

Likert-type response scales were utilized for the majority of questions (e.g., 1 = much lower to 5 = much higher). However, a limited number of studies employed scales that call for a numerical probability estimate. Clarke and colleagues (1997) determined perceived risk with the question, "what chance out of 100 does an average person (do you) have of getting skin cancer?" In Azzarello et al.'s (2006) study, skin cancer risk perception was assessed by asking participants to rate their likelihood of developing skin cancer during their lifetime (0 = 0% to 10 = 100%), and their likelihood of developing skin cancer if they never engaged in sun protection behaviors (0 = 0% to 10 = 100%). Moreover, Pichon et al. (2010) measured skin cancer risk perception on a scale of 0 to 100, with a question that asked participants, "what do you think your chances of getting skin cancer are?" Perceived skin cancer risk was categorized as "no risk" (0), "low risk" (1-25), "medium risk" (26-74) and "high risk" (75-100).

Discussion

This literature review found that a substantial body of research focusing on skin cancer risk perception has been conducted, and the findings were relevant to perceived risk measurement constructs. Researchers assessed perceived skin cancer risk in a variety of ways, including absolute and comparative measures.

Unconditional Measures

The most commonly applied measure to assess perceived risk in the domain of skin cancer prevention behaviors was unconditional absolute risk measures. Nevertheless, a serious limitation with this approach is that these measures are limited in their assessment of expectations, behavioral intentions and current risk behavior. For instance, when asked the question, "how likely is it that you will get skin cancer?" individuals who are planning to increase their preventive behavior in the future might report less risk than their current behavior would suggest (Gerrard & Houlihan, 2012). Furthermore, Windschitl (2003) points out that with regard to an unconditional measure (e.g., "how likely is it that you will get skin cancer?"), respondents can formulate two completely distinctive interpretations; beliefs about the objective probability of skin cancer or intuitive feelings about one's susceptibility to skin cancer. Therefore, respondents may experience difficulty understanding what the researcher is

asking and these differing interpretations may lead to inaccurate results.

Conditional Measures

In addition, it was documented that conditional measures of perceived risk have several advantages over unconditional measures of perceived risk (van der Pligt, 1996). First, a conditional measure is more similar to the original construct defined by Beker's (1974) Health Belief Model and Roger's (1975) Protection Motivation Theory (Weinstein, 1993). Unlike unconditional risk measures, conditional risk measures provide a possibility for respondents to disentangle expectations and use their behavioral intentions in a consistent and interpretable fashion to anticipate levels of risk in the future (van der Pligt, 1996). However, conditional measures have not been used to the extent that unconditional measures have been used.

Unrealistic Optimism

Several studies in this literature review focused on comparative risks (i.e., a person's own risk as compared to the average of others). The comparative risk measures can affect one's qualitative judgment of perception of risk by creating an illusion of invulnerability (van der Pligt, 1996). It is highly likely that when people are asked about their chances of experiencing a negative event in the future, they have a tendency to estimate their risk as less than that of the average of others. This bias was first introduced by Weinstein (1982) as unrealistic optimism (van der Velde, 1996). In fact, Weinstein (1988) suggested that there is a three stage approach to characterize risk perception. First is the awareness regarding existence of health threat; second is the assessment of the seriousness of the threat, including how many people are affected by this threat (unrealistic optimism arises in this second stage); and third is how individuals personalize their threat (Norman & Conner, 2005).

Non-specific Reference

Another drawback of risk perception questions in the literature was that they referred to people in general (e.g., "how serious is skin cancer?"). Psychosocial theories of individual health behavior are developed in terms of one's beliefs about himself or herself, not a broader population group (Brewer et al., 2007). Questions could have been more useful if they had referred to the respondent (e.g. "how serious would it be if you got skin cancer?"), since questions referring particularly to the respondent are more likely to be related with the respondent's own behavior (Brewer et al., 2007).

Single-item Measures

A number of studies have conceptualized and measured risk perception of skin cancer as a unitary construct, and only one of the measures of perceived risk was included. The majority of researchers overlooked the fact that there are a variety of constructs that may influence risk perception (e.g., knowledge of risk, feelings of risk, worry, perceived susceptibility and severity) (Loewenstein, Weber, Hsee, & Welch, 2001; Windchitl, 2003). The key problem with using only one question is that no accurate estimate can be made of an individuals' understanding of the risk (Weinstein, 1999). Classic measurement theory suggests that with a single-item measure, individuals are less likely to provide consistent replies over time (Bowling, 2005; Lewis-Beck, Bryman, & Liao, 2004). Also, a response to a single-item measure is more subject to alteration from socio-psychological biases which can increase random error (Bowling, 2005). Asking several questions can reduce the above problems and produce more reliable and valid risk measures (Lewis-Beck et al., 2004).

Probability Scales

Absolute numerical and categorical probability scales were used to assess risk perception measures. However, there is great uncertainty regarding quality of perceived skin cancer risk measurement scales, since in the majority of studies, no attempt was made to examine the reliability and validity of these scales. Moreover, in general, there is no definitive measurement scale for risk perceptions (Gerrard & Houlihan, 2012). Also, it is noteworthy that a large volume of studies indicated misuse and misinterpretation related to numeric probability scales. For example, it was reported that respondents frequently use the scales in ways not intended by

researchers or in ways that show the respondents misunderstand the constraints of the scale (Black, Nease, & Tosteson, 1995; Borland, 1997; Fischhoff & Bruine De Bruin, 1999; Lipkus, Samsa, & Rimer, 2001; Windschitl, 2002). One psychometric issue is that respondents may interpret a probability scale as a scale of concern rather than a scale of probability (Borland, 1997; Eiser, 1994; Windschitl, 2003).

Further, because the results of this literature review were presented in the context of skin cancer prevention, it is beneficial to address measurement of risk perceptions of other types of cancer to explore diversity in perceived risk measures, as well as to assess the quality of the measures used by the researchers in survey research. We found that a meta-analysis of breast cancer studies (Katapodi, Lee, Facione, & Dodd, 2004) included studies that had similar measures of perceived risk measurement: in terms of operationalization (i.e., comparative risk measures), number of items (i.e., single and multiple) and scale response anchors (i.e., verbal and numerical) This finding indicates that approaches to measure perceived risk vary among researchers in other domains as well. It is difficult to compare research outcomes due to the different manners in which perceived risk is measured (van der Pligt, 1996). Thus, it is essential to explore common approaches to best conceptualize and operationalize perceived risk for various forms of cancer.

Limitations

Caution must be exercised when interpreting the findings of this review. The most important limitation lies in the fact that few articles provided modest information about the psychometric properties of different operationalizations of perceived skin cancer risk. Further research should be conducted to investigate if order of the questions measuring perceived risk affects the responses of the individuals.

Conclusion

Risk perception should be assessed with a wide range of measures because they may correspond to different domains of the risk perception as a whole construct, including one measure is challenging, and may underestimate or overestimate the associations between perceived risk and skin cancer preventive behaviors (Dillard, Ferrer, Ubel, & Fagerlin, 2012). The concept of optimistic bias (i.e., individual's belief that they are at lower risk) should be included in operationalizations of perceived skin cancer risk measures. Future studies are warranted to better understand the significance of using conditional risk measures. More attention should be paid to the theoretical aspects of risk perception when conceptualizing and assessing perceived skin cancer risk.

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