Understanding the potential of teachable moments: the case of smoking cessation

C. M. McBride, K. M. Emmons[1] and I. M. Lipkus

Abstract

The label 'teachable moment' (TM) has been used to describe naturally occurring health events thought to motivate individuals to spontaneously adopt risk-reducing health behaviors. This manuscript summarizes the evidence of TMs for smoking cessation, and makes recommendations for conceptual and methodological refinements to improve the next generation of related research. TM studies were identified for the following event categories: office visits, notification of abnormal test results, pregnancy, hospitalization and disease diagnosis. Cessation rates associated with pregnancy, hospitalization and disease diagnosis were high (10–60 and 15–78%, respectively), whereas rates for clinic visits and abnormal test results were consistently lower (2–10 and 7–21%, respectively). Drawing from accepted conceptual models, a TM heuristic is outlined that suggests three domains underlie whether a cueing event is significant enough to be a TM for smoking cessation: the extent to which the event (1) increases perceptions of personal risk and outcome expectancies, (2) prompts strong affective or emotional responses, and (3) redefines self-concept or social role. Research in TMs could be improved by giving greater attention to assessment of conceptually grounded cognitive and emotional variables, appropriately timed assessment and intervention, and inclusion of appropriate target and comparison samples.

Cancer Prevention, Detection and Control Research Program, Duke University Medical Center, Durham, NC 27710, and [1]Dana Farber Cancer Institute and Harvard School of Public Health, Boston, MA 02115, USA. E-mail: mcbri002@mc.duke.edu

Introduction

The label 'teachable moment' (TM) has been used to describe naturally occurring life transitions or health events thought to motivate individuals to spontaneously adopt risk-reducing health behaviors. The occurrence of TMs is supported by accepted conceptual models that emphasize the importance of cues in prompting motivation for behavior change (Hochbaum, 1958). The concept is appealing because timing formal interventions to take advantage of these naturally occurring events might increase the effectiveness of self-directed and low-intensity interventions that are also low in cost and amenable to widespread dissemination. Moreover, observing the cognitive and behavioral changes that occur at TMs could give insight into the mechanisms that underlie motivation more generally. While TMs have practical implications for health promotion and plausible conceptual underpinnings, there has been no evaluation of the evidence to support their existence either broadly or for specific behaviors.

There are a plethora of references to the TM across an array of contexts. TMs have been suggested in relation to sexual behaviors and HIV prevention (Fabiano, 1993), alcohol consumption (Mitka, 1998), injury prevention (Helmkamp, 2000), and general lifestyle change (Nutting, 1986). Varying target populations, definitions of behavioral outcomes and timing of assessments across these behaviors make it difficult to evaluate

the evidence supporting TMs broadly. Focusing on a single behavior enables comparison across studies of relatively standardized outcomes measured at common follow-up intervals with target populations that have some similarities. The implications from this example behavior then can be tested to evaluate whether TMs and common related themes exist for other behavioral outcomes.

Smoking cessation offers an excellent behavioral example for an initial evaluation of the evidence to support TMs. A host of health events are associated with cigarette smoking (e.g. heart attack, diagnosis of cancer) (Peto *et al.*, 2000; US Department of Health and Human Services, 2000), a number of which, such as poor pregnancy outcomes and cervical cancer, are specific to women (US Department of Health and Human Services, 2001). Health events (e.g. respiratory infections, asthma and lung cancer) also occur to non-smokers who are exposed to environmental tobacco smoke (Pirkle *et al.*, 1996). The nature of these events and the widespread public awareness of their association with smoking (US Department of Health and Human Services, 1989) provides a full spectrum of opportunities for evaluating the existence of TMs.

Another advantage to the context of smoking is that a large number of descriptive and intervention studies have been targeted to populations of smokers that are experiencing smoking-related health events. However, there has been no summary of subsequent cessation rates that might suggest the existence of TMs. Moreover, to date, there has been no systematic attempt to characterize the conceptual elements that might underlie TMs for smoking cessation. To this end, this article has two objectives: (1) to summarize the evidence of TMs for smoking cessation, and (2) to make recommendations for conceptual and methodological refinements to improve the next generation of TM research.

Methods

Identifying TM studies

Inconsistency in the terminology used to describe TMs impeded a systematic literature review.

Though the term 'teachable moment' has been used colloquially with great frequency, review of Medline, ERIC and Social Science library databases yielded no formal definition that could be used to select key words for the literature search. Thus, to identify a representative set of studies, we first examined published articles we knew were related to TMs to identify possible MESH terms. Two phrases, 'teachable moment' and 'opportunity', were commonly used in these articles. For example:

> A child's visit to a physician for (respiratory illness) represents a *teachable moment* to...counsel parents regarding the health effects of passive smoking. (Narce-Valente, 1992)

> ...diagnosis and commencement of treatment for cancer introduces a *special moment of opportunity* for presenting a smoking cessation intervention. (Gritz, 1991)

Medline searches of manuscripts published in the past 10 years that included combinations of the key words 'teachable moments' or 'opportunities' and 'smoking' or 'smoking cessation' together yielded about 280 citations. A research assistant then reviewed all abstracts to identify those in which smoking cessation was assessed, and were (1) observational studies of populations defined by a smoking-related health event or (2) randomized intervention trials timed to coincide with a smoking-related health event and included a minimal intervention (e.g. self-help manual, provider advice) or a no-treatment control condition.

Combining the aforementioned steps reduced the pool to 160 publications (three-quarters were observational studies) that fell into the following event categories: office visits (predominantly for well-baby checks, reproductive health, and smoking-related acute and chronic care), notification of abnormal test results, pregnancy, hospitalization and disease diagnosis. Relevant studies referenced by those identified in the Medline search also were included. In order to ensure a minimum of three example studies for each of the above event categories, the 10-year time frame was not strictly

maintained. The large literature in smoking cessation during pregnancy, following disease diagnosis and hospitalization necessitated inclusion of review articles and selected representative studies to characterize the range of cessation rates related to these events. Cessation rates from descriptive studies and minimal intervention/control groups are reported to characterize as closely as possible the impact of the health event on smoking cessation.

The following section gives a representative overview of the cessation rates associated with each of the four event categories.

Results: health events and smoking cessation

Clinical visits for health promotion and acute illness

Office visits related to reproductive health, pediatric well care, asthma management and dental care all have been suggested as TMs. A number of editorials have suggested that these visits are opportune times for providers to make linkages between patients' presenting complaints (whether their own or that of a family member) and the benefits of smoking cessation (Sachs, 1990; McKay, 1993; Shelton, 1993). However, very few reports of cessation following these visits have been described in the literature.

Jelley and Prochazka assessed rates of cessation as part of routine new or annual visits to county family planning clinics (Jelley and Prochazka, 1995). Women in the control group received only provider advice to quit smoking and a brief pamphlet about smoking cessation. Of the 96 women who agreed to follow-up, 2% reported having quit smoking at the 4-month follow-up. Similarly, in targeting pediatric visits for smoking cessation, Wall *et al.* assessed mother's ($n = 2901$) smoking status 6 and 12 months after initial well-baby visits (Wall *et al.*, 1995). Smoking cessation rates in the control group were 3 and 5% at 6- and 12-month follow-ups, respectively (Wall *et al.*, 1995; Severson *et al.*, 1997). A more recent intervention

trial (Emmons *et al.*, 2001) assessed cessation rates among parents recruited through family practice, obstetrics and pediatric departments of community health centers. Rates of cessation in the parents randomized to the minimal intervention arm ($n = 141$) were 8 and 10% at 3- and 6-month follow-ups, respectively.

Several interventions have targeted pediatric allergy clinic visits to promote smoking cessation among families of asthmatic children (Hovell *et al.*, 1994; Wahlgren *et al.*, 1997). A study in which 28 families were randomized to a monitoring control arm reported only one parent (4%) had quit smoking at a 9-month follow-up clinic visit. Irvine *et al.* reported similar results in a 1-year follow-up of a provider-delivered environmental tobacco smoke (ETS) reduction intervention (Irvine *et al.*, 1999), only 2% of parents in the usual care arm ($n = 501$) had quit smoking. In another study (McIntosh *et al.*, 1994) in which parent smokers ($n = 48$) were counseled briefly about ETS and advised to quit smoking, 17% had quit smoking at the 6-month follow-up.

Cohen *et al.* evaluated dental visits to promote smoking cessation (Cohen *et al.*, 1989). Among smokers seen by dentists trained in the NCI's 4 As cessation counseling protocol (i.e. ask, advise, assist and arrange), 7% of returnees ($n = 428$) and 3% ($n = 1027$) of all enrollees had quit smoking by the 12-month follow-up.

Notification of abnormal test results

Notification of abnormal test results has been suggested as a TM because results provide personalized feedback of the harms of smoking and in so doing, may increase motivation for cessation. The earliest of these studies evaluated feedback of abnormal spirometry test results as an indication that smoking had decreased lung functioning. Loss *et al.* in a sample of 73 smokers found that 7% of those with abnormal spirometry had quit smoking at the 6-month post-test follow-up (Loss *et al.*, 1979). Cessation rates were not assessed among those with normal results. Hepper *et al.* conducted spirometry testing with smokers from 10 commu-

nities (Hepper *et al.*, 1980). Among those with first-time abnormal tests (*n* = 973), 21% had quit smoking 2–3 years after their result compared to 12% of those with normal results (*n* = 9530).

More recently, McBride *et al.* attempted to capitalize on the delivery of Pap screening test results to promote smoking cessation (McBride *et al.*, 1999b). Women smokers (*n* = 580) who were seeking Pap screening in managed care clinics participated in the intervention trial. While women strongly endorsed concern about the association between smoking and cervical cancer as a motivator for cessation (McBride *et al.*, 1999b), smokers in the control group with abnormal Pap test results were no more likely to quit than those with normal results; 15% of those with abnormal results and those in the control group reported 7-day abstinence at the 15-month follow-up.

The advent of genetic markers of susceptibility to tobacco-related harms has been suggested by several researchers (Ostroff *et al.*, 1999) as providing opportunities to promote smoking cessation in dental clinics and other settings. However, genetic testing is not currently available routinely in clinical care and has only begun to be used in interventions to motivate smoking cessation (Lerman *et al.*, 1997; McBride *et al.*, 2000a).

Pregnancy

Pregnancy has been referred to widely as a TM because of mothers' strong motivation to protect the well being of the fetus and strong social pressure to avoid smoking during pregnancy (Floyd *et al.*, 1993). Both observational and intervention studies consistently report that women who quit smoking do so before their first prenatal visit (Cnattingius, 1989; Fingerhut *et al.*, 1990; McBride *et al.*, 1992; Bolumar *et al.*, 1994; Ershoff *et al.*, 1999). While cessation rates as low as 10% have been reported among pregnant smokers, in particular those with low income (Kendrick *et al.*, 1995; Hartmann *et al.*, 1996), the majority of studies have reported substantially higher cessation rates ranging from 30 to 40% (Floyd *et al.*, 1993). For example, in a national sample, Fingerhut *et al.*

reported that among those who smoked prior to pregnancy, 39% quit after becoming pregnant, a rate 8 times that reported among smokers in the general population (Fingerhut *et al.*, 1990). Other researchers (Ershoff *et al.*, 1999; McBride *et al.*, 1999a) have reported even higher rates among smokers seen in managed care settings; 44–60% of pre-pregnancy smokers reported having quit smoking by the first prenatal visit. Cessation rates among pregnant women have been high internationally as well (Cnattingius, 1989; Bolumar *et al.*, 1994). For example, among 1000 pregnant Spanish women, of whom 67% were smokers prior to pregnancy, Bolumar reported that 48% of the women had quit smoking by the first prenatal visit, a rate 3 times that observed among Spanish women of reproductive age (Bolumar *et al.*, 1994).

Only one study has evaluated rates of cessation among pregnant and non-pregnant smokers within the same time frame (Haug *et al.*, 1994). Rates of cessation among pregnant (*n* = 252) and age-matched non-pregnant smokers (*n* = 163) who were followed up 18 months later were not different (7%). Changes in patterns of smoking were less favorable among the pregnant women. While 25% of pregnant women reduced the number of cigarettes they smoked up until delivery, 53% increased their level of smoking during the 12 months after delivery. By comparison, 34% of non-pregnant women reduced their smoking and only 29% reported an increase in the following 12 months. Both groups perceived that 'smoking was a big problem' (47 versus 44%), but significantly more pregnant women reported being encouraged by their partner to quit smoking than the non-pregnant women (58 versus 42%). It is noteworthy that the 16% of pregnant women who had quit smoking after notification of pregnancy but prior to the first prenatal visit were excluded from the study. Thus, the pregnancy-associated cessation rate was higher than reported.

Hospitalization and disease diagnosis

Hospitalization has been referred to by many as a TM for smoking cessation. The 1995 ban on

smoking imposed in all Joint Commission on Accreditation of Healthcare Organization hospitals requires patients either to abstain from smoking while hospitalized or overcome sizeable logistical barriers to smoke outside. Disease diagnosis, which can occur in the context of hospitalization or outpatient care, also has been suggested as a TM because it provides direct experience with the harmful effects of smoking. A large number of studies have assessed smoking cessation subsequent to these events. Large descriptive studies such as the Framingham Heart Study have indicated that hospitalization in the preceding 2 years was associated with a 30–40% increase in likelihood of smoking cessation (Freund *et al.*, 1992). A number of other studies of both middle aged, (McWhorter *et al.*, 1990; Croog and Richards, 1977; Novotny *et al.*, 1990) and older adults (Hermanson *et al.*, 1988; Salive *et al.*, 1992) have found that diagnosis of a chronic disease at least doubles the odds of smoking cessation. Greater desire and need for assistance to quit smoking has been reported by patients with chronic diseases (e.g. heart disease, hypertension and diabetes) than age-matched healthy controls (desire: 45 versus 30%, $P = 0.02$ and need assistance: 38 versus 23%, $P = 0.05$, respectively) (Wilkes and Evan, 1999). However, not all chronic disease diagnoses may have the same impact. For example, available reports suggest that smoking rates among diabetics and non-diabetics may be similar (26% for both) (Malarcher *et al.*, 1995), and intervention trials with diabetic smokers have reported low cessation rates (e.g. 2%) (Canga *et al.*, 2000).

Diagnosis of head and neck and lung cancers (associated with poor survival rates) consistently have been associated with high rates of smoking cessation. In a prospective observational study (Gritz *et al.*, 1991) of smokers who had undergone surgery for early stage lung cancer ($n = 526$), 49% reported not smoking at all follow-up visits (in most cases more than 2 years) and another 29% reported some period of abstinence during the follow-up period for a total of 78% prevalent abstinence. Other studies have reported similar patterns of cessation (Spitz *et al.*, 1990; Richardson

et al., 1993; Ostroff *et al.*, 1995). Rates of cessation were highest among those patients who were treated with radiotherapy (Ostroff *et al.*, 1995), had laryngeal or pharyngeal cancers (Spitz *et al.*, 1990; Ostroff *et al.*, 1995; Vander Ark *et al.*, 1997), had more extensive disease (Ostroff *et al.*, 1995) and were older (Vander Ark *et al.*, 1997).

A number of intervention studies also have been conducted during hospitalization and as follow-up to disease diagnosis. A recent review summarized results of 20 intervention trials (France *et al.*, 2001). The 12-month follow-up quit rates among hospitalized smokers who received no formal intervention ranged from 15 to 78%. Reason for hospitalization has been suggested as an important cofactor in cessation rates. Long-term abstinence rates were highest among cardiac patients and those receiving care for cancers (31–78%) (Gritz *et al.*, 1991, 1993; DeBusk *et al.*, 1994; Rigotti *et al.*, 1994; Johnson *et al.*, 1999); rates were lowest among patients admitted for non-specific reasons and for surgery (15–29%) (Stevens *et al.*, 1993; Wewers *et al.*, 1994; Pelletier and Moisan, 1998). This variation may reflect, in part, differences in the priority given to smoking by health care providers. For example, providers in general medical units focused less attention on their patients' smoking than providers in cardiovascular disease units (Emmons and Goldstein, 1992).

Summary of health events and cessation rates

To characterize the magnitude of cessation associated with each of the posited TMs, cessation rates were graphed. The criteria for selecting the rates were that the rate be observed by more than one study, and that a low, middle and high rate be represented to characterize the full range of cessation observed for each event (see Figure 1). These criteria could not be applied to the test result context because too few studies have been conducted.

Two yard marks were noted in Figure 1 to give perspective on the magnitude of these rates—the estimated annual population cessation rate (5%)
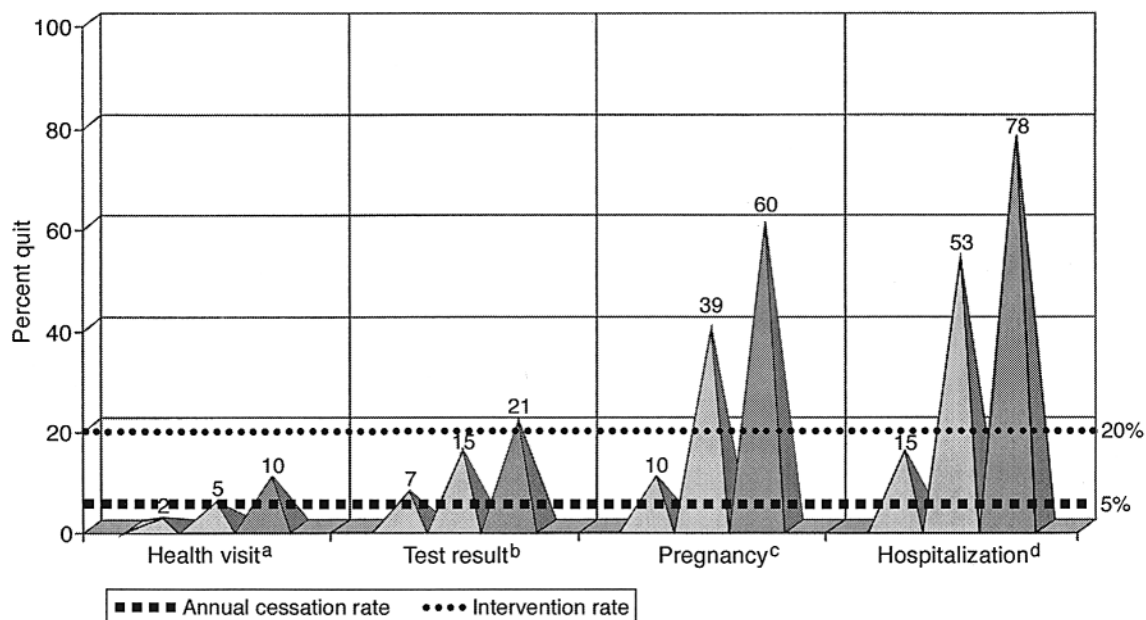
Fig. 1. Cessation rate ranges by events studied as TMs. [a](Jelley *et al*., 1995; Wall *et al*., 1995; Emmons *et al*., 2001); [b](Loss *et al*., 1978; Hepper *et al*., 1980; McBride *et al*., 1999); [c](Kendrick *et al*., 1995; Fingerhut *et al*., 1990; Ershoff *et al*., 1999); and [d](Pelletier *et al*., 1998; Debusk *et al*., 1994; Gritz *et al*., 1993).

and the cessation rate commonly achieved by minimal interventions (20%) (Curry, 1993). As shown in Figure 1, the range of cessation rates associated with pregnancy and medical treatment for life-threatening illnesses was large (10–60 and 15–78%, respectively), whereas rates for clinic visits and abnormal test results were consistently and substantially lower (2–10 and 7–21%, respectively). However, it is difficult to evaluate whether this observed variability in outcomes indicates true differences in the potency of these events as TMs or simply reflects differences in the target populations, cessation measures used and the timing of follow-up. Variability also might have been influenced by the non-systematic approach we took in the literature search that may have over- or under-represented studies in some domains.

Among the studies identified, a number of general design weaknesses make it difficult to evaluate whether smoking cessation was cued by the TM. Study designs rarely included appropriate compar-

ison groups, i.e. age- and gender-matched individuals who were not experiencing the cueing event. The majority of the studies assessed smoking status weeks, months and even years after the posited TM event. Measurement of potential mediating factors was superficial and did not assess psychosocial processes hypothesized to lead up to or follow the TM. In most cases, smoking status was based on self-report only and not biochemically confirmed. This may be especially problematic in studies of pregnant women and cancer patient populations that may have strong motivation to downplay their smoking; coincidentally, the events that were associated with the highest rates of cessation. Lastly, few studies were identified relating to test results and two of the three identified were over 20 years old.

However, the relatively high cessation rates proximal to the occurrence of several health events (in many cases substantially above the 20% achieved by formal interventions) suggest that
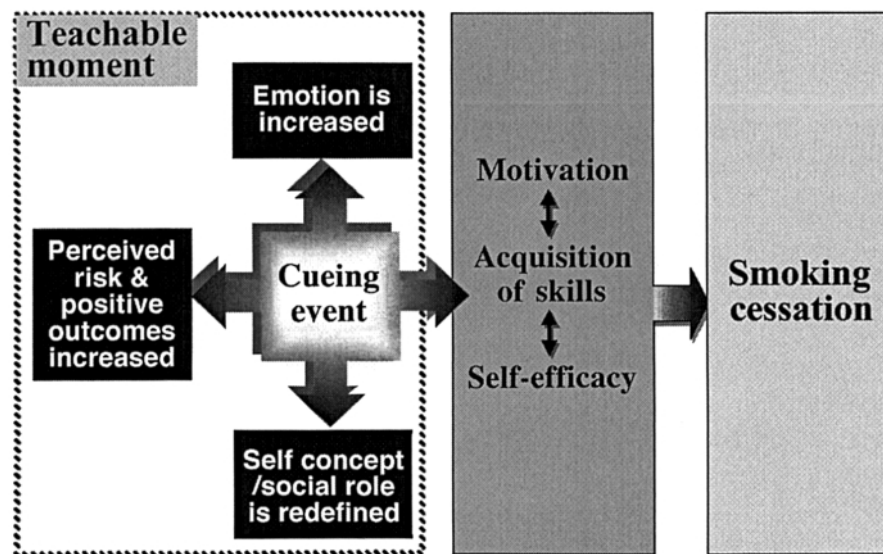
Fig. 2. Heuristic model for TM.

some events may well be TMs. Thus, refinements in related research could improve our understanding of how to maximize the potential of these events to promote smoking cessation.

Conceptual elements of teachable moments

Refinements in research could be informed by considering TMs strong foundation in widely accepted conceptual models of behavior (Parsons, 1951; Hochbaum, 1958; Fishbein and Ajzen, 1975; Bandura, 1977; Weinstein, 1988; Lazarus, 1993). Hochbaum's Health Belief Model (HBM) was among the first to emphasize the importance of cues to action, a concept that is now an accepted precursor of behavior change (Hochbaum, 1958). The HBM and models developed since then suggest that the TM is a cognitive experience—a process of 'sensemaking' (Weick, 1993)—and that an individual's interpretation and judgments of an event (e.g. its significance, cause and meaning) determine whether it will prompt subsequent behavior change. Drawing from these models, we suggest a TM heuristic that includes three key constructs that

underlie whether a cueing event is significant enough to be a TM for smoking cessation (Figure 2). They include the extent to which the event (1) increases perceptions of personal risk and outcome expectancies, (2) prompts strong affective or emotional responses, and (3) redefines self-concept or social role. The heuristic assumes that life and health events are comprised of objective experiences to which individuals have a subjective response. Specific events (e.g. pregnancy, hospitalization), although variable in manifestation, have common objective characteristics that we argue influence an individual's subjective or cognitive response. As Figure 2 depicts, the cognitive response precedes motivation, skills acquisition and self-efficacy that in turn, increase the likelihood of smoking cessation. Not depicted in the heuristic, although key to consider, are predisposing factors such as age, dispositional and cultural characteristics that may influence an individual's cognitive response to the objective experience of the cueing event.

The next sections will describe the mechanisms through which the heuristic's three key cognitive domains might create TMs. Each domain is sup-

ported by a large literature to which the reader is referred to for more in-depth discussion.

Risk perceptions and outcome expectancies

Health behavior models (Hochbaum, 1958; Fishbein and Ajzen, 1975; Bandura, 1977; Lazarus, 1993; Weinstein, 1988) concur that perceptions of heightened vulnerability are important in adoption of preventive health behaviors, including smoking cessation (Weinstein, 1998). These models also acknowledge individuals' tendency to deny personal susceptibility to risk and contend that this optimistic bias (Klein and Weinstein, 1997) extends to the perceived harms of smoking as well (Weinstein, 1989; Strecher *et al.*, 1995). The experience of a health event, whether direct or vicarious, increases the cognitive availability of risk perceptions and, in turn, may increase the salience of risk (Strecher and Rosenstock, 1997; Weinstein, 1998). Thus, our TM heuristic suggests that events which provide individuals with direct or vivid vicarious experience of risk may over-ride optimistic biases, and prompt increased motivation and smoking cessation.

Likewise, expectancies and judgments about the outcomes of behavior also are central factors that cue behavior change. Social Cognitive Theory and others suggest that individuals engage in behaviors that maximize positive or minimize negative outcomes (Baranowski *et al.*, 1997). Yet individuals vary in their judgments of the value of particular outcomes. In the case of smoking, individual's who expect that continued smoking will lead to negative health outcomes (or alternatively that quitting smoking will bring about positive outcomes) and give value to these outcomes are most likely to quit smoking. Thus, our heuristic suggests that events that sharply increase individuals' expectancies of possible good or bad outcomes related to smoking and the value given to these outcomes are most likely to be TMs.

In harking back to the events targeted as TMs, pregnancy and disease diagnosis provide immediate and personal experience with risk, and might shift expectancies of and value given to smoking-related outcomes (e.g. quitting smoking may keep me alive or is good for the baby, respectively). Although health care visits and notification of abnormal test results may also impact risk perceptions and outcome expectancies, the impact of these events on risk is likely to be qualitatively and quantitatively different from that of pregnancy or disease diagnosis. Thus, consideration of the event's impact on risk perceptions and outcome expectancies is key to consider in understanding its potential as a TM.

Affective response

Several theories suggest that emotional or affective responses influence an individual's judgments about the significance and meaning of an event (Lazarus, 1993; Aspinwall and Taylor, 1997; Lerman and Glanz, 1997; Bagozzi *et al.*, 1999; Folkman and Moskowitz, 2000). Emotions, in turn, prompt cognitive and behavioral coping responses that may include denial, avoidance or steps to remediate threat via behavior change (Bagozzi *et al.*, 1999). Negative affect, i.e. fear, may be particularly impactful because it increases vigilant attention and prompts the survival instinct (Frijda, 1986). However, negative emotional responses, if too great, may prompt an individual to cope by cognitively downplaying the event which may discourage behavior change (Carver, 1998). Although less studied, positive affect also has been proposed to influence behavior (Folkman and Moskowitz, 2000). While positive emotions have been thought to signal safety and so decrease vigilant attention to an event, they also have been shown to expand and sharpen attention (Isen *et al.*, 1991; Estrada *et al.*, 1997; Fredrickson, 1998; Isen, 2000), which may increase systematic consideration of an event's meaning and significance. Thus, events that elicit strong emotional responses, be they negative or positive, will be attended to and appraised as significant and meaningful, and as such, enhance the likelihood of a TM.

Again, in the context of the previously described health events, pregnancy may prompt feelings of

elation and fear about the well being of the fetus and efforts to cope may cue pregnant smokers to take steps to quit. Acute care visits may induce emotion if linkages between presenting complaints and smoking are emphasized or dramatized by health care providers. By contrast, well care visits may induce little positive or negative emotion and thus not serve as a strong cue to action. Thus, consideration of the degree of emotional response associated with an event is key to understanding its potential as a TM and determining appropriate intervention components.

Change in social role and self-concept

Social Role Theory (Parsons, 1951), the Theory of Reasoned Action (Ajzen and Fishbein, 1980) and others (e.g. Social Cognitive Theory) suggest that role expectations and other social influences are important in promoting or inhibiting behavior change. Two related components key to this association are individual's perceptions of (1) their role responsibilities and the importance assigned to these roles (Parsons, 1951; Meile, 1986), and (2) whether important others approve or disapprove (i.e. subjective norms) and level of motivation to comply (Fishbein and Ajzen, 1975; Montano and Taplin, 1991). A large body of literature suggests that social expectations of roles and norms are most impactful when failure to comply results in social stigmatization (Goffman, 1958). However, like outcome expectancies, individuals do not ascribe all roles or norms with equal importance. The more committed the individual is to the role or norm, the greater the sense of obligation to comply and avoid the stigma of non-compliance.

Recent theories of the self suggest individual's tendency to maintain positive self-illusions or 'esteem motivation' also contribute to how individuals interpret and cope with significant life events (Steele, 1988; Taylor *et al.*, 2000). Individuals see greater personal relevance in events that threaten or increase their self-esteem, undermine or enhance feelings of personal control and endanger positive expectations of the future (Jannoff-Bulman and Frieze, 1987; Tennen and Affleck, 1987; Aspinwall and Brunhart, 1996). Events with these charac-

teristics typically evoke greater cognitive, emotional and physiological responses than do neutral events (Taylor, 1991). Thus, our heuristic suggests that events that prompt changes in perceived norms or self-concept that make smoking incompatible with role obligations or that diminish self-esteem related to smoking will be optimal TMs.

Events suggested as TMs such as cancer diagnosis may increase perceptions that smoking is unacceptable for a patient in turn and desire to avoid the stigma of continued smoking may increase motivation to quit. Similarly, a visit to a health care provider for a child's asthma may increase the stigma of smoking because it endangers the health of the vulnerable child and parents are obliged a protective role. By contrast, a reproductive health visit may impact role or self-esteem only if the individual's smoking is directly linked to important role obligations or esteem motivation. Thus, again, consideration of the event's impact on social role and self-concept is important to consider in evaluating both the potential of the TM and for targeted interventions.

Summary

The three domains in our heuristic model have strong conceptual support for their role in creating TMs. We suggest that consideration of the extent to which an event impacts each domain is key in understanding the potency of the TM and for suggesting essential intervention components. It is not our contention that an event must necessarily or fully impact all three domains in order to be a TM. However, we posit that the greater the degree to which a health event alone or in combination with a proximally timed intervention influences all three domains, the greater the likelihood the event will prompt behavioral change. The relative importance of these domains in creating the TM also is an area that could be explored in future research. Study designs that elucidate the mechanisms through which events do or do not impact these cognitive factors could advance our understanding of TMs and enable interventions to capitalize on them to promote smoking cessation.

Recommended improvements in study design and intervention

Although the TM concept has been used frequently, related research is in its infancy. The preceding sections taken together suggest that research in TMs could be improved with conceptual and methodological refinements. Specifically, these include, in order of our judgment of their significance, the following: (1) assessment of conceptually grounded cognitive and emotional variables, (2) greater attention given to the timing of measurement and intervention and (3) inclusion of appropriate target and comparison samples.

Assessment of conceptually based variables

As suggested by our heuristic, selection of intervention components should consider the impact of the event on risk perceptions, emotions, social role and self-concept. Assessment of all three domains in relation to specific events would enable us to evaluate their individual and combined contribution to creation of TMs. Assessments of risk perceptions and outcome expectancies have been ubiquitous in studies of health behavior change, however, the measures have varied widely (Velicer *et al.*, 1985; Diefenbach *et al.*, 1993; Wetter *et al.*, 1994). Greater attention needs to be devoted to reliability and validity of these measures. For example, to best characterize cognitive responses to life events, perceptions of risk should be conditional on time frames and behavior (e.g. perceived risk of getting lung cancer in the next 10 years if one continues to smoke or quits). In addition, perceptions of absolute and comparative risk (i.e. self versus others) that is based on appropriate comparison groups should be assessed (Ronis, 1992; Klein and Weinstein, 1997).

Assessments of the emotional impact of health events have focused predominantly on post-traumatic stress responses. These scales (Horowitz *et al.*, 1979; Lazarus and Folkman, 1984; Watson *et al.*, 1994) largely have focused on negative affect (Stanton *et al.*, 2000). The increasing acknowledgement that threatening health events elicit positive emotional responses that can influence behavior change suggests the need for better assessments of event-related positive affect (Folkman and Moskowitz, 2000).

Measures of self-concept and social influences related to health events are few (Hooker and Kaus, 1992; Black *et al.*, 2001). Lengthy paper and pencil assessments of self (Linville, 1985) are infeasible for use in population-based studies. Many of these self-assessments are based on the assumption that the self is a static characteristic. Assessments are needed that can be sensitive to event- or intervention-induced changes in social role and self-concept. Moreover, widely used assessments of subjective normative influences (Fishbein and Ajzen, 1975) have provided no information about perceptions of social role obligations and concerns about stigma that may influence responses to life events.

Development and evaluation of conceptually based interventions

Our heuristic provides a useful framework for considering and selecting appropriate intervention components for targeting TMs. For example, interventions that coincide with events prompting sharp increases in risk perceptions (e.g. abnormal test results) but little emotional response might seek to heighten affective response to motivate cessation. Cessation interventions timed to pregnancy might give greater emphasis to how smoking relates to parental self-concept to encourage cessation. Biomarker test result interventions might be impactful in event contexts that also strongly impact affect or self-concept (e.g. diagnosis of a friend or family member's smoking-related illness). Conventional intervention modalities such as print materials, telephone or provider counseling could be adapted to emphasize these domains alone or in combination to take optimal advantage of the specific TM context. Testing interventions to address single or multiple domains of the heuristic framework could enable greater understanding of their separate and combined influence on smoking cessation.

Timing of measurement and intervention

Understanding the optimal timing of measurement and intervention is an important direction for future research. Prospective study designs that enable proximal assessment before and after target events are essential to better characterize cognitive and emotional responses. The appropriate timing for these assessments and intervention likely will vary across events, but must be timed to meaningful transitions in the course of the event experience. For example, assessment of cognitive and affective responses may be most informative in the days and weeks following disease diagnosis when changes in perceptions of risk, emotional response and shifts in expectations regarding role obligations might be greatest, rather than months or years into treatment for a chronic condition. Interventions timed during the initial event experience may have great potential impact or, alternatively, may be too stressful for behavior change interventions (McBride *et al.*, 2000b) Meaningful sub-events (e.g. being told of a cancer diagnosis, undergoing surgery or initiating the treatment, telling family members) might be targeted by intervention components that take advantage of the differential impact these sub-events may have on risk perceptions, emotions or self-concept. Exploratory work is needed to characterize individuals' responsiveness to proximally timed interventions and to identify meaningful sub-events.

Proximal and prospective assessment undoubtedly will present logistical challenges because many significant health events cannot be anticipated. Initial research that focuses on predictable events (e.g. screening and diagnostic testing) could enable assessment of cognitive and affective responses to cueing events. New technologies such as hand-held computers that facilitate ecological momentary assessments (Shiffman, 1995) and automated telephone assessments (McBride and Rimer, 1999) could offer the opportunity to better elucidate in real time the factors that underlie TMs. Qualitative methodologies including autobiographical narratives could retrospectively characterize individual's responses to health events and could

be informative as well [see, e.g. (Stein *et al.*, 2001)]. Experimental or analogue studies in which in a laboratory setting, individuals are instructed to imagine having experienced events or scenarios and cognitive responses are elicited via thought-listing activities also could be used to gain understanding of cognitive and emotional processes that underlie TMs, e.g. see Croyle's work (Croyle and Ditto, 1990; Croyle and Hunt, 1991).

Target samples that can elucidate mechanisms of TMs

With few exceptions, prior studies have not included appropriate comparison groups of age-matched individuals who were not experiencing the cueing event. This information is essential for a true evaluation of the TM. Observational studies that assess the heuristic's mechanisms in comparison groups could be used to gain understanding of cognitive responses that are specific to these events. Alternative approaches, although weaker in design, such as within-subject longitudinal studies could be used to assess retrospective recall of emotions, risk perceptions and self-concept prior to the event, and to track changes over time.

TM studies have focused almost exclusively on clinical cueing events. Evaluating a broader array of events and target groups also should be considered. It is particularly important to identify events that might be TMs for young and healthy populations. Life transitions such as entering college or getting married may impact all three domains of the heuristic. Also important to consider is that the occurrence of and reactions to cueing events amongst healthy populations may present different challenges and opportunities for TMs than those observed among patient populations.

Individuals directly impacted by events have been the primary target groups of TM studies. Greater attention should be given to those indirectly impacted by events. For example, events such as pregnancy may impact prospective dads' and grandparents' outcome expectancies related to smoking and shift social role expectations that may encourage smoking cessation (Waterson *et al.*, 1990; Pollak and Mullen, 1997). Similarly, a

patient's diagnosis of cancer or other chronic disease may impact family members' perceptions of personal risk, fear responses and role expectations that are conducive to smoking cessation (Sarna, 1995; Kristeller *et al.*, 1996; Schilling *et al.*, 1997).

Conclusions/recommendations

Evidence suggests that some health events are associated with high rates of spontaneous cessation. Understanding the potential of these and other life events to be TMs is a promising area of research with the potential to inspire innovation in interventions to improve a variety of health behaviors. However, maximizing the potential of a full spectrum of events for promoting behavior change will require a new generation of studies with better designs, conceptually driven measures and interventions. We have suggested one heuristic framework to guide this effort. Although we have focused on the case of smoking cessation, our suggested heuristic also could be used to consider the potential of TMs for other behavior changes.

Acknowledgements

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