Published in final edited form as:

J Behav Med. 2014 October ; 37(5): 931–954. doi:10.1007/s10865-014-9553-x.

Monitoring Style of Coping with Cancer Related Threats: A Review of the Literature

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Abstract

Building on the Cognitive-Social Health Information-Processing model, this paper provides a theoretically guided review of monitoring (i.e., attend to and amplify) cancer-related threats. Specifically, the goals of the review are to examine whether individuals high on monitoring are characterized by specific cognitive, affective, and behavioral responses to cancer-related health threats than individuals low on monitoring and the implications of these cognitive-affective responses for patient-centered outcomes, including patient-physician communication, decision-making and the development of interventions to promote adherence and adjustment. A total of 74 reports were found, based on 63 studies, 13 of which were intervention studies. The results suggest that although individuals high on monitoring are more knowledgeable about health threats, they are less satisfied with the information provided. Further, they tend to be characterized by greater perceived risk, more negative beliefs, and greater value of health-related information and experience more negative affective outcomes. Finally, individuals high on monitoring tend to be more demanding of the health providers in terms of desire for more information and emotional support, are more assertive during decision-making discussions, and subsequently experience more decisional regret. Psychoeducational interventions improve outcomes when the level and type of information provided is consistent with the individual's monitoring style and the demands of the specific health threat. Implications for patient-centered outcomes, in terms of tailoring of interventions, patient-provider communication, and decision-making, are discussed.

Keywords

monitoring; cancer; communication; decision-making; tailored interventions; adherence

In decades of research, social scientists have proposed patient-centered frameworks that specifically address the issue of how to capture individual differences empirically (Bandura, 2001; Cameron & Leventhal, 2003; Carver & Scheier, 2012). Integrating relevant social-cognitive theory and findings, the Cognitive-Social Health Information-Processing (C-SHIP) model postulates that individuals' encodings, beliefs and expectancies, health-related values and goals, and self-regulatory competencies (Table 1) interact dynamically with levels of

distress to produce specific patterns of response to health challenges (Diefenbach et al., 2008; Miller, Shoda, & Hurley, 1996b; Scheier, Carver, & Armstrong, 2012). Although the network of cognitive and affective units activated in response to a threat is unique to a given person, the goal is to identify relatively homogeneous subgroups of individuals, who can be characterized into cognitive-affective subtypes, so that these subtypes can be more readily assessed and addressed in the health care setting (Miller et al., 1996b). One dimension that lends itself well to such a patient-centered approach is the degree to which individuals monitor, that is attend to, scan for, and amplify threatening cues (Anker, Reinhart, & Feeley, 2011; Krohne & Hock, 2011; Miller, 1995; Miller et al., 1996b).

This review updates accumulating evidence on the nature and impact of coping profiles, using monitoring as the exemplar, in the cancer context. Specifically, the review aims to answer the following questions: 1. Are individuals high on monitoring characterized by specific cognitive, affective, and behavioral responses to cancer-related health threats when compared to individuals low on monitoring?; and 2. What are the implications of these cognitive-affective responses for patient-centered outcomes, including patient-physician communication, decision-making and the development of interventions to promote adherence and adjustment?

Literature Search Strategy, Inclusion, and Assessment Criteria

We conducted a systematic search of PubMed and PsycInfo to identify all empirical studies published between January 1994 and May 2013 in English, relating to the monitoring concept. We focused on cancer-related studies published after January 1994 because the last review on this topic was published in 1995 (Miller, 1995). The following search terms were used in different combinations to identify relevant publications: Monitoring coping style, information coping style, and attentional coping style, in combination with cancer, cancer treatment, oncology, genetic testing, cancer screening, and cancer diagnosis.

During the search we found that the following instruments were used to measure the concept of monitoring when faced with cancer health threats: The Miller Behavioral Style Scale or Monitoring Blunting Style Scale (MBSS; Miller, 1987), the Monitoring-Blunting Questionnaire (MBQ; Muris, van Zuuren, de Jong, de Beurs, & Hanewald, 1994), and the Threatening Medical Situations Inventory (TMSI; van Zuuren, de Groot, Mulder, & Muris, 1996). Therefore, we searched the same databases again for studies using these instruments. Specifically, we used the terms Miller Behavioral Style Scale or Monitoring Blunting Style Scale, MBSS, Monitoring-Blunting Questionnaire, MBQ, Threatening Medical Situations Inventory, TMSI as key words, one at a time, combined with the terms cancer, cancer treatment, oncology, genetic testing, cancer screening, and cancer diagnosis.

We included studies with adults at risk and cancer populations only. To be included, studies had to be designed to answer the specific questions addressed in this review. The search was limited to studies measuring a dispositional preference to attend to threats and excluded studies measuring information seeking in a specific health context (e.g., Anker et al., 2011). A few studies measured monitoring by subtracting the blunting score from the monitoring score and used a median split to identify monitors and blunters (Table 2). We included those

studies but we report monitoring findings only. In total, we found 63 studies and 74 papers (Tables 2 & 3) that met our criteria (MBQ: $N=1$; MBSS: $N=60$; TMSI: $N=12$; both MBSS and TMSI: $N=1$). Fifty were correlational (Table 2) and thirteen were intervention studies (Table 3). Six of the intervention studies presented baseline correlational findings or main effects. Those are also included in Table 2.

Correlational papers¹ were evaluated using the following criteria: Number of participants greater than 100 or power analysis for expected effects (one point); consent rate greater or equal to 0.70 (half a point); paper was theory based and/or monitoring was the main focus (one point); the monitoring score was based on the monitoring subscale only (one point); prospective study (one point); clinical population (half a point), as opposed to general population; actual clinical situations (half a point), as opposed to imaginary scenarios; single paper (half a point), as opposed to multiple papers from one study, and/or report that the findings are part of a larger study. We did not include a criterion related to the quality of the outcome measures, because the reviewed papers used a diverse group of theory-guided variables. Points were summed for each paper, with a maximum rating of six. Papers were then classified as of high (4.5-6), moderate (2.5-4), or low (0-2) quality. Twenty two papers were rated as high quality, forty one as moderate and four as low.

For the intervention studies, we used the following criteria: Participants per group greater than 60 or power analysis to detect expected effects on outcomes (one point); specification of randomization process (one point); blind method reported (half a point); description of interventions (one point); inclusion criteria reported (half a point); consent rate greater or equal to 0.70 (half a point); use of validated outcome measures (one point); more than one measurement points (i.e., at least one measurement, other than the post-intervention measurement) (one point); study was theory based (half a point); intervention design took into account coping style (half a point); response rate greater or equal to 80% (half a point); the monitoring score was based on the monitoring subscale only (one point). Points were summed for each study (maximum rating = 9). Studies were then classified as high (7.0-9), moderate (4.5-6.5), or low (0-4) quality. Five studies were rated as high quality, six as moderate and two as low.

Cognitive-Affective Units

Cancer-Relevant Encodings and Self-Construals

The first cognitive-affective unit (Table 1) refers to the individual's factual knowledge regarding the health challenge (Anker et al., 2011), as well as to cancer-relevant encodings and self-construals, such as perceived personal risk and sense of vulnerability (Aiken, Gerend, Jackson, & Ranby, 2012). Overall, five studies examined the relationship between monitoring and knowledge, four of which showed a positive relationship. A paper rated low in quality showed a non-significant result (Kelly et al., 2007) (Table 2). Individuals high on monitoring, who tend to focus on threat, know more about their health problems and acquire more detailed and voluminous information, in response to cancer risk and diagnosis (Kola,

¹In some cases ($N=7$) we had to make a decision as to whether to rate the published paper or the study. We decided to rate the papers as this causes the least confusion. As a result we consistently use the term "paper" in relation to the quality ratings.

Walsh, Hughes, & Howard, 2013; Mancini et al., 2006; Miller et al., 2005; Williams-Piehot, Pizarro, Schneider, Mowad, & Salovey, 2005). For example, among first time colposcopy patients, high monitors had higher knowledge about cervical cancer screening and colposcopy (Kola et al., 2013).

Three papers² rated high in quality reported that individuals high on monitoring are more likely to overestimate their personal risk, that is they report higher levels of perceived risk than those low in monitoring, presumably because they focus more on impending threats (Culler et al., 2002; Miller et al., 2005; Schwartz, Lerman, Miller, Daly, & Masny, 1995). As an example, among unaffected women at increased risk for ovarian cancer, monitoring was positively related to higher perceived risk, regardless of true risk (Schwartz et al., 1995). Similarly, among women callers seeking expert information about breast cancer risk, individuals high on monitoring showed an increase in perceived risk over a six-month follow-up period (Miller et al., 2005). However, six papers, whose quality varied from low to high, reported non-significant findings (Cull, Fry, Rush, & Steel, 2001; Gurmankin, Baron, & Armstrong, 2004; Nordin, Liden, Hansson, Rosenquist, & Berglund, 2002; Wakefield, Homewood, Mahmut, Taylor, & Meiser, 2007; Wardle, 1995; Weinberg et al., 2009).

Beliefs and Expectations

Individuals vary in terms of their health-relevant beliefs (e.g., degree of expected severity of health threat) and expectancies (e.g., the degree to which the health threat is perceived to be treatable or personal self-efficacy beliefs) (Bowen et al., 2009a; H. Leventhal, Brissette, & E.A. Leventhal, 2003). Four studies showed that monitoring is associated with negative beliefs and expectations about cancer threats (Table 2). Because high monitors tend to focus on threat, they are more likely to magnify it and thus to exaggerate the severity and seriousness of the threat, both for themselves and their relatives (Constant et al., 2005; Lerman, Daly, Masny, & Balshem, 1994; Miller, Roussi, Altman, Helm, & Steinberg, 1994; Williams-Piehot et al., 2005). For instance, among women seeking cancer information from the Cancer Information Service (CIS), individuals high on monitoring considered breast cancer a more severe condition than those low on monitoring and believed the condition to be more difficult to treat (Williams-Piehot et al., 2005). High monitors not only believe that their condition is more serious but also expect that they will have a more negative personal reaction to potentially threatening cancer-related feedback (Lerman et al., 1994). In addition, high monitors can blame themselves for their health problems and believe that they are responsible for the disease course (Miller et al., 1994). In a recent study, Kasparian Meiser, Butow, Simpson, and Mann (2008) found that, for patients who believed that the occurrence of malignant melanoma has no genetic basis, melanoma-specific distress levels were three times higher for high monitors than for low monitors with the same beliefs. The authors speculate that high monitors who believe that malignant melanoma has no genetic basis may attribute their melanoma to their own lifestyle choices, such as sun exposure, and thus may feel responsible and to blame for the occurrence of the disease. In support of this

²When the number of studies and papers is identical, then one of the two terms is used. When there is discrepancy, then both numbers are reported.

interpretation, there were no differences between high and low monitors who believed that there is a genetic basis for melanoma. One paper, rated low in quality, reported non-significant results (Johnson et al., 1996).

Values and Goals

Values and goals involve the degree of personal importance that individuals assign to health-related issues and their goals with respect to cancer-related feedback and management recommendations (Leventhal et al., 2003; Scheier et al., 2012). An important issue for individuals high on monitoring is acquiring information, especially when faced with ambiguous health threats (Han et al., 2011). Seven studies examined the relationship between preference for information and monitoring, five of which showed a positive relationship (Janssen, Oort, Willems, de Haes, & Smets, 2009; Meulenkamp et al., 2010; Ong et al., 1999; Parker et al., 2001; Sie, Prins, Spruijt, Kets, & Hoogerbrugge, 2013). Monitoring is associated not only with a desire for more detailed information about the health problem, but also with a preference to know more about upcoming medical procedures and the likely sensations experienced during these procedures. Seeking information may help individuals high on monitoring to problem-solve, but also to reduce uncertainty, increase predictability and safety cues, and promote feelings of reassurance (Bouckennooghe, Vanderheyden, Mestdaghe, & Van Laethem, 2007; Krohne & Hock, 2011; Rosen & Knauper, 2009). Indeed, individuals high on monitoring state that they need the information for both its problem-focused and its emotion-focused value and that they feel comforted by the availability of information (Shiloh & Orgler-Shoob, 2006). Two studies showed non-significant results (Marwit & Datson, 2002; Nikoletti, Kristjanson, Tataryn, McPhee, & Burt, 2003).

It is increasingly recognized that health behaviors within a given family are interdependent and that these dyadic processes need to be taken into account in order to understand “individual” health behavior (Lewis & Butterfield, 2007; Miller, McDaniel, Rolland, & Feetham, 2006). Consistent with this premise, individuals monitor not only with respect to their own health threats but also with respect to the threats of family members (Rees & Bath, 2000a, b). Specifically, individuals high on monitoring are more likely to search multiple sources to gather information not only for themselves (Cowan & Hoskins, 2007; Muusses, van Weert, van Dulmen, & Jansen, 2012) but also for their relatives (Rees & Bath, 2000b). Further, monitoring partners are more likely to discuss cancer-related topics with patients in their family (Rees & Bath, 2000a).

Because a state of certainty is difficult to achieve with an ambiguous health threat, individuals high on monitoring tend to feel dissatisfied with the information provided to them. A handful of studies [$N = 4$ (five papers) vs. $N = 1$ showing a non-significant result] showed that monitoring is negatively related to satisfaction with the information received (Cowan & Hoskins, 2007; Nordin et al., 2002; Rees & Bath, 2000a, c; Timmermans, van Zuuren, van der Maazen, Leer, & Kraaimaat, 2007 vs. Elf & Wikblad, 2001). In fact, one study (two papers) showed that individuals high on monitoring believed that their relatives avoid giving them cancer-related information (Rees & Bath, 2000a, c).

Cancer-Relevant Affective Responses

Emotional distress, while not universally experienced by cancer patients (especially early stage patients), typically takes the form of cancer-related worry, intrusive and avoidant ideation, depression, and anxiety (for a review see Jacobsen & Donovan, 2011). Identifying the sources of individual differences in affective responses to cancer-related threats is important for understanding short- and long-term outcomes, such as quality of life and adherence to surveillance regimens and behavioral recommendations.

The majority of studies (20 positive results vs. 6 non-significant results) showed that individuals high on monitoring report negative affective responses to health threats, in both cross-sectional and prospective studies (Table 2). Specifically, individuals high on monitoring report more cancer-related worries and concerns, cancer-specific distress, and general distress among individuals at risk for malignant melanoma (Kasparian et al., 2008), women at risk for breast or ovarian cancer (Fletcher et al., 2006; Lerman et al., 1996; Mellon et al., 2008; Nordin et al., 2002; Schwartz et al., 1995) and at risk individuals seeking genetic testing for HNPCC (Nordin et al., 2002; Shiloh, Koehly, Jenkins, Martin, & Hadley, 2008). Similar results have been found with individuals facing follow-up diagnostic procedures (Andrykowski & Pavlik, 2011; Kola et al., 2011; Miller, Rodoletz, Schroeder, Mangan, & Sedlacek, 1996a) and cancer survivors (Kelly, Shedlosky-Showmaker, Porter, DeSimone, & Andrykowski, 2011; Marwit & Datson, 2002; Mellon et al., 2008; Michel, Greenfield, Absolom, & Eiser, 2011). For example, among women undergoing colposcopy for an abnormal Pap smear or follow-up transvaginal sonography (TVS) for ovarian cancer risk, individuals high on monitoring were likely to experience both intrusive and avoidant ideation, a stress response that entails repetitive reliving and unsuccessful effortful attempts to avoid thinking about the threatening experience (Andrykowski et al., 2002; Miller et al., 1996a). The stronger distress responses of individuals high on monitoring are also evident at the somatic level. High monitors express more concerns and worries about the procedural and sensory aspects of diagnostic procedures (Miller et al., 1994; van Zuuren et al., 2006).

Affective outcomes have also been shown to be the result of the interaction of monitoring and other personality dimensions (Andrykowski et al., 2002; Andrykowski, Boerner, Salsman, & Pavlik, 2004; Fletcher et al., 2006). Andrykowski et al. (2002) compared women undergoing a breast biopsy, which eventually received a benign test result, to a healthy control group and found that the highest levels of distress were experienced by individuals high on monitoring who underwent the biopsy and who were low in optimism. For women high in optimism, the differences between high and low monitors were not as pronounced. Because individuals high in optimism are characterized by positive expectations about health outcomes, they may not experience the cognitive and emotional amplification of threat typically characteristic of a high monitoring style.

Medical stressors frequently involve periods of uncertainty, as the patient awaits diagnostic and/or treatment procedures to be completed and test results to be disclosed. Under these types of uncertainty, perceived threat appears to be the highest just before receipt of news (Sweeny & Cavanaugh, 2012). Consistent with this finding, anxiety seems to be highest when individuals high on monitoring are in the anticipation phase and less pronounced after exposure (Andrykowski et al., 2004; Andrykowski & Pavlik, 2011; Nordin et al., 2002;

Tercyak et al., 2001). For example, high monitors reported higher levels of anxiety than low monitors prior to *BRCA1/2* genetic test result disclosure, a period of maximal uncertainty (Tercyak et al., 2001), but at post-disclosure, high and low monitors who tested positive did not differ on levels of distress, as both groups appeared to experience low levels of distress.

As pairs of individuals interact, the thoughts, affects, and behaviors experienced by each are the result of the unique combination of the two people in the dyad (Lewis & Butterfield, 2007). Barnoy, Bar-tal, and Zisser (2006) explored the affective impact of correspondence in coping styles between cancer patients and their spouses. For female patients, when the caregiver exhibited a high monitoring style, the higher the correspondence to the patient's monitoring style, the less the distress of the patient. The positive effects of a corresponding monitoring style may be due to the fact that both members of the dyad equally value information and/or are more supportive of each other's concerns when confronting ambiguous information (Lambert & Loiselle, 2007; Rosen & Knauper, 2009).

The evidence reviewed here indicates that individuals high on monitoring may be a more reactive group at both the affective and the somatic level. Moreover, affective responses are moderated by dyadic processes, by high and low optimism, and by characteristics of the threat, notably the level of certainty involved.

Competencies: Self-regulatory and Coping Strategies

Even when individuals resolve to take the necessary steps to deal with a cancer-relevant threat, some may not be able to do so because they lack the necessary coping skills to fulfill two main functions: problem solving and managing cancer-related distress (Stanton, Sullivan, & Austenfeld, 2009). Despite the importance of this construct, self-regulation is a relatively under-studied area in cancer. Of the few existing studies ($N=3$), two suggest that monitoring is positively related to both engagement and avoidant/disengagement coping (Fletcher et al., 2006; Miller et al., 1996a), potentially suggesting an adaptive approach (*monitor* when information seeking is instrumental and *avoid* for relief and when additional information would not be of value), versus one study that showed a lack of relationship to coping (Epping-Jordan et al., 1999). The problem-focused strategies high monitors adopt, combined with their higher levels of knowledge and perceived risk, would be expected to facilitate action and adherence to routine recommended medical regimens. Two studies explored the relationship between monitoring and adherence and reported the findings in three separate papers. One paper, rated moderate in quality, reported higher frequency of digital rectal exams among men high on monitoring (Consedine, Morgenstern, Kudadjie-Gyamfi, Magai, & Neugut, 2006), whereas two papers (one study), rated high in quality, showed non-significant findings for adherence to breast self-examination and follow-up recommendations to benign breast biopsy among women (Andrykowski et al., 2001; Beacham, Carpenter, & Andrykowski, 2004). Women tend to be more adherent to cancer screening than men (Martinez et al., 2013; Ritvo et al., 2013). As a result, a bigger sample size may be needed to detect the effect of monitoring on screening behavior among women, although the number of studies ($N=2$) examining adherence is too small to draw firm conclusions.

Implications for Patient-Centered Outcomes: Patient-Provider Interaction, Decision Making, and Interventions

Patient – Provider Interaction

Providers are an important source of information for patients (O'Leary, Estabrooks, Olson, & Cumming, 2007). However, since the information conveyed is often ambiguous, the quality of the patient-physician communication can affect the extent to which the individual is adherent and satisfied (Makoul & Curry, 2007). Communication between cancer patients and their providers is a multidimensional dynamic process (Baile, Aaron, & Parker, 2009) and includes both the concrete content of the discussion (e.g., background of the disease and explanation and discussion of the recommendations) and the affective component of the interaction (e.g., the emotional effects that both provider and patient experience during the conversation). Monitoring style is related not only to the amount of information desired from the provider and level of satisfaction with that information, but also to the nature of the interaction with the provider. Two studies used videotapes of the interactions between cancer patients consulting for the first time with an oncologist before initiating treatment. Monitoring was positively related to asking questions about alternative treatments or abstention from treatment, dominance and assertiveness during the interaction (e.g., interrupting the physician), and use of utterances consenting to the oncologist's treatment proposal (Ong et al., 1999; Timmermans et al., 2007). Individuals high on monitoring also stated a preference for participating in medical decision making (Ong et al., 1999). In addition, among a subgroup of cancer patients referred to the oncologist for palliative care, monitoring was related to longer consultations (Timmermans et al., 2007).

Three studies showed that individuals high on monitoring also appear to be more in need of the affective support provided by the health care communication (Michel et al., 2011; Parker et al., 2001; Timmermans et al., 2007), although one study showed a non-significant result (Pieterse et al., 2005). Among cancer patients, individuals high on monitoring were more likely to rate both medical and supportive reasons as important for attending a follow-up visit with their physician (Michel et al., 2011) and were more likely to use emotional utterances (e.g., express worry) when consulting with their oncologist in order to make a treatment decision (Timmermans et al., 2007). Notably, individuals high on monitoring rated as important reasons for the follow-up: "get advice about how to keep healthy," "check the cancer has not come back," and "to receive psychological support." In addition, they rated as important the availability of social support groups and professional counseling (Michel et al., 2011). One study showed a negative relationship between monitoring and unscheduled patient-initiated contacts with health care providers among late-stage cancer patients (Rose, Bowman, Radziewicz, Lewis, & O'Toole, 2009). It is likely that patients with this diagnosis appraise their health problem as a loss, that is as a situation with a negative but certain outcome, as opposed to a threat, which entails uncertainty. In such circumstances, all patients may be characterized by maximal emotional reactivity.

Shared Decision Making

Shared decision making is becoming a key feature of the patient-provider interaction, in which "patients and providers consider outcome probabilities and patient preferences and

reach a health care decision based on mutual agreement” (Frosch & Kaplan, 1999), particularly when making preference-sensitive decisions. The majority of the studies that looked at decision making show that monitoring is positively related to intentions to undergo optional medical tests and procedures ($N=5$; Beckendorf et al., 1997; Cowan, Meiser, Giles, Lindeman, & Gaff et al., 2008; Culler et al., 2002; Fang, Miller, Daly, & Hurley, 2002; Mellon et al., 2009 vs. $N=2$; Gaff, Cowan, Meiser, & Lindeman, 2006; Weinberg et al., 2009) (Table 2). Two of these papers are based on the same study but report somewhat inconsistent results. Specifically, among men with a family history of Pca, high monitors were more likely to be interested in genetic testing (Cowan et al., 2008) but not more likely to be interested in a “combined” service that included genetic information, medical advice and support to men with a family history of Pca (Gaff et al., 2006), although there was a trend ($p=.13$) in the expected direction.

Individuals high on monitoring also stated that a person should be able to obtain genetic testing even if their physician has given the opposite recommendation (Beckendorf et al., 1997). Presumably, in cases where high monitors are concerned about hereditary risk for cancer, they expect that information in the form of genetic test results can provide them with increased certainty and predictability (Bouckennooghe et al., 2007; Krohne & Hock, 2011; Rosen & Knauper, 2009). A study designed specifically to tease apart high monitors' motivations for seeking information (instrumental value vs. reduction of uncertainty), using hypothetical health threatening genetic testing scenarios, found that high monitors were more interested than low monitors in hypothetical genetic testing when the test result reduced uncertainty regarding whether or not one would develop the disease (Shiloh, Ben-Sinai, & Keinan, 1999). Both high and low monitors were very interested in testing when the test result provided useful information that allowed one to screen early and control the course of the disease. Thus, the impact of monitoring style becomes more salient in decision making when the results of a test provide emotional value in the form of reducing uncertainty, but not as much when the test provides instrumental information, as when the patients have the opportunity to control the disease. However, three studies that looked at actual participation in genetic counseling or testing found non-significant results (Bartle-Haring, 2008; Kasparian, Meiser, Butow, Simpson, & Mann, 2009; Wakefield et al., 2007). Although individuals high on monitoring intend to undergo optional tests, reaching an actual decision may be challenging for them.

High monitors' desire for certainty and aversion of ambiguity extends to their family members. Mellon et al. (2009) examined the intentions of women affected with breast/ovarian cancer and those of an unaffected relative, typically a daughter or a sister, as dyads, to obtain genetic testing. They found that each member's monitoring style influenced the other member's decision-making process. Regardless of whether they were a patient or an unaffected relative, individuals high on monitoring underscored both the pros and cons of genetic testing and had *partners who were more inclined* to participate in testing, highlighting the fact that interacting partners can influence each other's outcomes.

Three studies focused on decision-making outcomes, two of which showed that individuals high on monitoring are more likely to experience decisional regret and conflict (Sie et al., 2013; Timmermans et al., 2007) and one showed decisional regret among low monitors

experiencing high anxiety (Sheehan, Sherman, Lam, & Boyages, 2007). For example, among oncology patients referred for radiotherapy consultation for treatment, those high on monitoring were more likely to doubt the treatment decision six weeks later and to be dissatisfied with the information they were provided with (Timmermans et al., 2007).

The Impact of Psychoeducational Interventions

We found 13 studies that explored the impact of monitoring style on the effect of psychoeducational interventions, four of which showed a lack of an interaction effect for monitoring. The interventions varied with regard to the channel utilized for conveying information (e.g., print material, audio-visual, counseling), the way the information was framed (e.g., neutral, loss or gain), and the degree to which the intervention focused on patient skills. The majority of the studies assessed affective and/or behavioral outcomes ($N=11$).

With short-term diagnostic and surgical procedures ($N=3$), detailed procedural and sensory preparatory information was found to be helpful to individuals high on monitoring (Kola et al., 2013; van Vliet, Grypdonck, van Zuuren, Winnubst, & Kruitwagen, 2004; van Zuuren et al., 2006), presumably because the information facilitated the formation of accurate expectations about what was to follow, thereby decreasing uncertainty and worry by increasing predictability and providing a sense of reassurance (Krohne & Hock, 2011; Rosen & Knauper, 2009). One study indicated that providing high monitors with an easy way to distract, as for example by making available a neutral video during a colposcopy procedure, also results in low arousal (Kola et al., 2013). It may be that when information has already been gathered, distractors allow high monitors to relax and tune out during the experience itself. Low monitors, on the other hand, tend to generally fare better with low information messages or interventions which give them the option to keep the psychological distance they desire (Kola et al., 2013).

With long-term cancer threats, where health behaviors need to be executed and maintained over time, individuals high on monitoring may need help with self-regulatory skills that enable them to cue health behaviors, while simultaneously managing the distress this generates. Individuals low on monitoring may benefit from concise information in order to counteract their tendency to ignore health problems while still maintaining low levels of anxiety. Studies which have varied the way information is framed and the degree to which reassurance is provided show a differential impact on affective and behavioral responses ($N=4$) depending on the individual's monitoring style (Miller et al., 1999a; Petersson et al., 2002; Williams-Piehotta et al., 2009; Williams-Piehotta et al., 2005). For example, among women diagnosed with dysplastic cervical lesions, individuals high on monitoring who received a detailed but negative message (focused on the cost of *not* adhering to recommended screening behaviors) showed more intrusive ideation than those who received a neutral message (basic information about the condition and needed actions, without framing the need for diagnostic adherence) (Miller et al., 1999a), but the differential framing did not appear to have an impact on behavioral responses. It may be that when individuals high on monitoring, who tend to amplify threat, receive a negative message, without immediate actionable steps to reduce anxiety, they experience more intrusive ideation than if

the message were reassuring. However, individuals low on monitoring who received the loss-framed intervention reported less intrusive ideation and less canceling/rescheduling six-months later. Thus, low monitors were able to act on the information they received regarding the cost of not adhering to the recommended screening regimen without experiencing elevated distress.

Williams-Piehot et al. (2009) provided individuals high on monitoring not only with detailed information about fruit and vegetable consumption, but also with reassurance and information to facilitate more positive expectancies. Specifically, the message contained detailed information about cancer prevention through life-style changes, but also facilitated positive expectancies regarding the impact of the targeted behaviors in reducing cancer development. Two months later, the targeted behavior was increased among individuals high on monitoring. Taken together, individuals high on monitoring may do best when interventions provide detailed information that increases their sense of certainty and predictability, but also provide cues to help them form more positive expectancies and increase their sense of self-efficacy, and self-regulatory strategies. One study explored whether the impact of an intervention to initiate patient-provider discussions regarding clinical trials was moderated by monitoring style (Duncan et al., 2013). Low monitors who received the tailored (brief) message were more likely to initiate discussions with their provider regarding clinical trials. Similarly, among individuals considering genetic testing for inherited cancer risk, high monitors who received tailored (detailed) information showed the highest increase in knowledge (Wakefield et al., 2007).

All four studies reporting non-significant interaction effects for monitoring included interventions designed to have an impact on the dependent variables (e.g., distress and decision making). At the same time, these studies explored the moderating effect of monitoring (Diefenbach et al., 2012; Lerman et al., 1996; Lobb et al., 2002; Miller et al., 2005). Although the interventions varied in terms of amount of information provided, they were not designed to address specifically the needs of high and low monitors and thus the interventions were not tailored to coping style. Furthermore, three of these studies (Lerman et al., 1996; Lobb et al., 2002; Miller et al., 2005) examined the impact of an educational intervention in the genetic counseling context. In this context, the majority of the women were self-referred and thus quite well informed, so interventions aiming at increasing knowledge may not have been relevant (Lobb et al., 2002; Miller et al., 2005). Furthermore, in the context of genetic counseling, detailed and personalized information is provided to all women, so interactions between educational interventions and monitoring style may be more difficult to detect. Interventions that contain psychosocial components (e.g., self-regulatory skills) may be more successful at improving behavioral and affective responses among high monitors in these types of contexts.

Conclusions and Directions for Future Research

This review suggests that there is utility in considering individual differences in the cancer context. High monitoring seems to be associated with a specific cognitive and affective profile, characterized by higher levels of knowledge, possibly higher perceived risk, more negative beliefs and expectancies, and higher negative affect when faced with cancer threats,

although not all studies show these effects. The impact of monitoring style on adjustment seems to be moderated not only by the characteristics of the threat (e.g., degree of uncertainty in the genetic context), but also by other personal factors (e.g., optimism), contextual variables (e.g., familial experience with cancer), and interpersonal variables (e.g., monitoring style of partner). Although more work needs to be done in this area, preparatory or psychoeducational interventions seem to improve adjustment *and* adherence to cancer health threats when the specific demands of the stressful situation are taken into account. For example, detailed procedural and sensory information appears to be helpful to individuals high on monitoring when they face a short-term stressor, such as a medical procedure (Kola et al., 2013; van Zuuren et al., 2006), but reassuring statements and coping skills to manage distress appear to be more important when they face a long-term threat (Williams-Piehot et al., 2009). Conversely, distraction and brief messages, in general, seem to be helpful to individuals low on monitoring.

A goal for future research will be to design more customized, patient-centered interventions that can be implemented into routine care (Bowen et al., 2009b). For example, individuals high on monitoring characterized by negative expectancies may constitute a vulnerable group, affectively, and may require a different kind of intervention than high monitors characterized by positive expectancies (Andrykowski et al., 2004; Andrykowski et al., 2002). Having access to patients' coping profiles may allow for more refined tailoring; patients themselves could also better self-select the types and amount of information and support they need, given the specifics of the health threat. Web-based adjuncts to care might allow for the identification of the patient's specific cognitive-affective profile to a health threat. In future research, it will also be important to more clearly delineate and respond to high monitors' motivations for seeking information, in order to best design and tailor interventions to prepare and manage adaptive responding over time.

Individuals high and low on monitoring differ in terms of their interactions with, and expectations about, providers, in that they ask more questions, and demand more time and support (Michel et al., 2011; Ong et al., 1999; Timmermans et al., 2007). Decision making in health contexts can be understood as comprising three steps: information exchange, decision deliberations, and decisional control (Flynn, Smith, & Vanness, 2006). In line with this framework, individuals high on monitoring prefer and seek more information, state that they prefer to participate in decision-making, and actually play a more active role than individuals low on monitoring during decision-making deliberations with their physicians (Ong et al., 1999; Timmermans et al., 2007). However, there is as yet no evidence that high monitors want to exercise decisional control. Indeed, individuals high on monitoring tend to doubt their medical choices and experience more decisional conflict (Sie et al., 2013; Timmermans et al., 2007). These findings suggest that high monitors may have trouble reaching decisional closure and may remain more focused on possible alternative courses of action (Bouckenooghe et al., 2007). Personalized medicine increasingly recognizes that patients need to process complex and ambiguous information (Elwyn et al., 2006) in order to reach decisions that are right for them. Given the importance of shared decision making, especially under medical ambiguity, more research is needed to better understand how

individuals high on monitoring tolerate uncertainty and reach decisional closure (Bouckennooghe et al., 2007).

In conclusion, engaging in high or low monitoring can be advantageous or disadvantageous, depending on the demands of the health threat and the context. The cognitive-affective units proposed by the C-SHIP model provide a useful framework not only for describing and understanding individual differences with regard to a particular health behavior, but also guide the development of specific interventions to address the unique psychological profile of each individual so as to maximize cancer control efforts. The overarching agenda for future research should be to contribute to improving the quality of patient outcomes and to providing more effective patient-centered care in the context of increasingly complex and ambiguous health-related challenges.

Acknowledgments

This work was supported in part by NIH grants R01 CA158019, R01 CA104979, RCI CA14506663, and P01 CA057586, the Fox Chase Cancer Center Behavioral Research Core Facility P30 CA06927, as well as Department of Defense grants DAMD 17-01-1-0238 and DAMD 17-02-1-0382. We are indebted to John Scarpato and Kerry Sherman for their valuable comments and Mary Anne Ryan and Gem Roy for their technical assistance.

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Table 1
Key Psychosocial Units of Behavioral and Emotional Responses to Health Threats

1	Health-relevant encodings, such as perceived risk, refer to appraisals regarding one's own health, personal health risks and vulnerabilities, and illness and disease. Includes appraisals of incoming threat and risk-relevant information (e.g., cancer risk feedback).
2	Health-relevant beliefs and expectancies refer to the individual's beliefs about the health-threat and outcome and efficacy expectancies (eg., outcomes of prophylactic behaviors, being confident that one is able to adhere to a medical regimen or a lifestyle change).
3	Health-relevant values and goals refer to desires and values about health outcomes (eg., importance of personal and family health).
4	Health-relevant affects refer to emotional states activated when processing health-relevant information (e.g., cancer risk-related worries and anxieties).
5	Health-relevant self-regulatory competencies and skills refer to the skills necessary to manage both practical (eg., financial constraints to deal effectively with a health problem) and psychological barriers (eg., active avoidance to manage anxiety). Self-control skills are particularly important in the management of anxiety.

Note. Adapted from Miller, Fang, Manne, Engstrom, & Daly, 1999b.

Table 2
Characteristics of Studies Examining Monitoring Cognitive-Affective Correlates in the Cancer Context

Source/Rating	Scale Dich/Cont H/L or No-split N CR	Population Design	Significant Findings	Non-significant Findings
Andrykowski et al., 2001 ¹ H(4.5)	MBSS-SF Dich No-split N=114 CR=84%	Benign breast biopsy (BBB) group, interviewed some time after result receipt. Prospective.		Behavioral responses: Monitoring (mon) unrelated to adherence to follow-up recommendations.
Andrykowski et al., 2002 ¹ H(5.5)	MBSS-SF Dich No-split N=100 CR=84%	1. BBB group, 2. Healthy comparison group. Prospective.	Affective Responses: Immediate impact of notification results: Mon associated with intrusive and avoidant ideation only when optimism was low.	Affective Responses: No findings at four-months follow-up.
Andrykowski et al., 2004 H(6.0)	MBSS-SF Dich No-split N=540 CR=88%	First TVS screening for OC among high risk women (personal history of breast cancer or family history of OC or BC). Prospective.	Affective Responses: Two week follow-up: Mon associated with intrusive ideation (distress) when optimism was low among women who received an abnormal test result (ATR). Mon associated with distress when there was no family history of OC among women who received an ATR. Mon associated with avoidant ideation when there was a family history of OC among women with ATR.	
Andrykowski et al., 2011 H(5.0)	MBSS-SF Dich No-split N=278 CR=95%	Women at risk who had received an abnormal TVS and were repeating test. CS.	Affective Responses: Just before 2 nd screening: Mon associated with intrusive ideation only when there was a family history of ovarian cancer.	
Barnoy et al., 2006 H(4.5)	MBSS Dich No-split N=196 CR=88%	1. Cancer patients, 2. Spouses (interview while waiting for chemotherapy). CS.	Affective Responses: Women whose caregivers were: 1. low on mon experienced higher general distress and lower well-being; 2. high on mon reported lower well-being when their mon style was mismatched to that of their partner.	Affective Responses: No effects for male patients or caregivers.
Bartle-Haring et al., 2008 ² M(4.0)	MBSS-SF Dich No-split N=166 CR=100%	Women who agreed to participate in breast cancer education sessions. CS.		Decision making: Unrelated to uptake of individualized risk assessment.
Bartle-Haring et al., 2010 ² H(5.0)	MBSS-SF Dich No-split N=181 CR=100%	Women who agreed to participate in breast cancer education sessions. Prospective.	Affective responses: Mon predicted more change in worry after an education session.	
Beacham, et al., 2004 ¹ H(4.5)	MBSS-SF Dich No-split N=103 CR=84%	BBB group. Women interviewed after notification of biopsy results. Prospective.		Behavioral responses: Did not predict change in BSE frequency over 8 months period.

Source/Rating	Scale Dich/ Cont H/L or No-split N CR	Population Design	Significant Findings	Non-significant Findings
Beckendorf et al., 1997 M(3.5)	MBSS Dich No-split N=238 CR=58%	Unaffected women with a family history of BC and/or OC. CS.	Decision-making: The higher the mon, the more likely to agree that individuals should be able to undergo genetic testing even if their physician recommends against it.	
Consedine et al., 2006 M(3.0)	MBSS-SF Dich Sub N=308 CR NR	Non-clinical population, asked questions about Pca screening. CS.	Behavioral responses: Mon positively related to self-rep DRE's for Pca in bivariate analyses.	
Constant et al., 2005 H(4.5)	MBQ Cont Sub N=185 CR=100%	Chronic hepatitis C patients. CS.	Beliefs: Mon associated with perceived severity.	
Cowan et al., 2007 M(3.5)	MBSS-SF Dich H/L N=36 CR=42%	Cancer patients undergoing chemotherapy. CS.	Information source: HM used more sources, more likely to use books, journals, newspapers, and magazines. Information satisfaction: Although HM rated the amount of information they received more highly, they rated the quality as lower.	
Cowan et al., 2008 ³ L(2)	MBSS Dich Sub N=280 CR=59%	Men with a Pca family history. CS.	Decision making: Mon positively correlated with interest in genetic testing for Pca, were it available, in bivariate analyses.	
Cull et al., 2001 M(4.0)	MBSS-SF Dich No- split N=196 CR=85%	Women with a family history of OC newly referred for counseling. Interview prior to counseling. CS.		Encoding: Unrelated to perceived risk overestimation or underestimation. Affective responses: Mon did not predict distress (case level scores for distress).
Culler et al., 2002 H(4.5)	MBSS Dich No-split & H/L N=206 CR=17%	Men visiting urology clinic [Pca patients (23%) and other patients]. CS.	Encoding: HM: Perceived risk was higher among men with prostate cancer, compared to other patient groups. No differences among LM. Decision making: Mon associated with interest in genetic testing for Pca.	
Elf et al., 2001 M(4.0)	MBSS-SF Dich No- split N=30 CR=88%	Cancer patients undergoing chemotherapy. CS.		Information satisfaction: Unrelated.
Epping-Jordan et al., 1999 M(4.0)	MBSS Dich No-split N=80 CR NR	Women newly diagnosed with BC. Prospective.		Affective Responses: Unrelated to general distress. Coping: Unrelated.
Fang et al., 2002 M(4.0)	MBSS Dich No-split N=80 CR=82%	Female relatives of women with OC enrolled at a Family Risk Assessment Program. CS.	Decision making: Mon related to inclination to undergo prophylactic surgery. HM more so when they felt at low risk to develop OC and LM more inclined to undergo surgery when they felt at high risk.	

Source/Rating	Scale Dich/Cont H/L or No-split N CR	Population Design	Significant Findings	Non-significant Findings
Fletcher et al., 2006 H(4.5)	MBSS-SF Dich H/L N=624 CR=94%	Female FDRs of women recently diagnosed with BC. CS.	Affective responses: Bivariate analysis: HM related to distress. Path analysis: High optimism negatively related to distress, but more so among HM. Coping: HM more likely to use both engagement and avoidant coping.	
Gaff et al., 2006 ³ M(3.0)	MBSS Dich No-split N=280 CR=59%	Men with a family history of Pca. CS.		Decision-making: Unrelated to interest in genetic counseling.
Gurmankin et al., 2004 L(1.5)	MBSS NA NA N=217 CR NR	General population, imagining scenarios involving physician cancer risk communications. CS.		Encoding: Unrelated to perceived risk.
Janssen et al., 2009 M(3.0)	TMSI-SF Cont No-split N=552 CR=68%	Gastroenterology patients who had a colonoscopy in the past nine months. Used vignettes. CS.	Values: Mon associated to wish to be informed about small risk of complications regarding colonoscopy.	
Johnson et al., 1996 L(1.5)	MBSS Dich H/L * N=76 CR NR	BC patients, within six months of surgery. CS.		Beliefs: Unrelated to fears and concerns. Decision making: Unrelated to desire for physician to have made recommendations for type of surgery.
Kasparian et al., 2008 ⁴ M(3.5)	MBSS Dich H/L N=121 CR=72%	Individuals with a family history of melanoma. CS.	Affective responses: HM more likely to report cancer-specific distress. Among HM, those who endorsed a genetic model of melanoma experienced less anxiety than those who did not endorse such a model.	
Kasparian et al., 2009 ⁴ H(4.5)	MBSS Dich No-split N=119 CR=72%	Family history of melanoma and a known family-specific mutation. Prospective.		Decision making: Did not predict genetic risk assessment.
Kelly et al., 2007 ⁵ L(2.0)	MBSS-SF Dich No-split N=96 CR=67%	Cancer patients presenting for treatment. CS.		Knowledge: Unrelated to accuracy of cancer family history reporting.
Kelly et al., 2011 ⁵ M(2.5)	MBSS-SF Dich No-split N=96 CR=71%	Patients with a prior diagnosis of cancer. CS.		Affective responses: Unrelated to worry.
Kola et al., 2011 ⁶ M(3.0)	MBSS Dich No-split N=150 CR NR	First time colposcopy patients. CS.	Affective responses: Mon related to state anxiety in bivariate analyses.	
Kola et al., 2013 ⁶ M(4.0)	MBSS Dich H/L N=117 CR NR	First time colposcopy patients.**	Knowledge: HM had higher knowledge regarding cervical cancer screening and colposcopy than LM.	
Lerman et al., 1994 M(4.0)	MBSS Dich H/L N=103 CR=79%	Women with a family history of ovarian cancer. CS.	Expectancies: HM had more negative expectations about the	

Source/Rating	Scale Dich/ Cont H/L or No-split N CR	Population Design	Significant Findings	Non-significant Findings
			impact of a hypothetical genetic test result for OC.	
Lerman et al., 1996 M(3.0)	MBSS Dich Sub, H/L 7V=239 CR=52%	Women undergoing BC risk counseling. ***	Affective responses: HM experiencing higher levels of general distress at 3-months follow-up.	
Mancini et al., 2006 M(3.0)	MBSS-SF NA NA N=560 CR=87%	Affected women undergoing genetic counseling for BRCA1/2. ***	Knowledge: Mon related to higher knowledge regarding the genetic basis of BC and OC.	
Marwit et al., 2002 M(3.5)	MBSS Dich No-split N=112 CR=81%	Cancer support group patients. CS.		Values: Unrelated to preference for disclosure of terminal prognosis.
Meiser et al., 2002 M(3.5)	MBSS-SF NR N=143 CR=89%	Women with a family history of BC and/or OC. Comparison of women undergoing genetic testing vs. those to whom testing was not offered. Prospective.		Affective responses: No interaction effect between study group and mon.
Meiser et al., 2004 M(3.0)	MBSS Dich Sub N=95 CR=85%	Individuals with a known HNPVC mutation in the family, seeking genetic testing. Prospective.		Affective responses: No interaction between mon and type of result.
Mellon et al., 2008 ⁷ M(3.0)	MBSS Dich No-split N=292 CR=40%	Dyads consisting of cancer survivors at risk for familial BC/OC and their unaffected relatives. CS.	Affective responses: Mon related to worries experienced by women.	
Mellon et al., 2009 ⁷ M(3.0)	MBSS Dich No-split N=292 CR=40%	As above.	Decision making: Higher mon for the partner related to higher probability the other member of the dyad made a decision to seek cancer risk information. Higher mon related to higher probability that women would report both pros and cons to making a decision to seek inherited cancer risk information.	
Meulenkamp et al., 2010 M(3.0)	TMSI-SF Cont No-split N=1678 CR=68%	General population and patients participating in genetic research. CS.	Beliefs: Mon related to belief that researchers have a duty to communicate research results to the participants. Values: Mon related to preference to receive hypothetical biobanks' research results.	
Meyer et al., 2007 M(3.5)	MBSS Dich No-split N=117 CR NR	Using a hypothetical scenario, males from the general population (ages 20-87) asked about treatment decisions about Pca. CS.		Decision making: Unrelated to type of decision.
Michel et al., 2011 M(3.5)	TMSI Cont Sub N=198 CR=57%	Cancer survivors (ages 18-45), min 5 years since diagnosis. CS.	Affective responses: Mon related to survivor-specific distress. Values: Mon related to likelihood of attending follow-up for both clinical and supportive reasons.	

Source/Rating	Scale Dich/Cont H/L or No-split N CR	Population Design	Significant Findings	Non-significant Findings
Miller et al., 1994 M(4)	MBSS Dich H/L N=36 CR=90%	Women undergoing colposcopy and cervical biopsy. CS.	Affective responses: HM more likely to worry about the seriousness of their condition and about the sensory and procedural aspects of their diagnostic examination. Beliefs: HM more likely to blame themselves about their condition and to feel they have responsibility for its course.	Beliefs: No differences regarding importance of the appointment, consequences of the condition or physician's control over the disease.
Miller et al., 1996a H(4.5)	MBSS Dich No-split N=101 CR NR	Women scheduled for colposcopy. CS.	Affective responses & Coping: Path analysis: mon related to intrusive ideation. Intrusive ideation leads to higher avoidant ideation which leads to denial and disengagement coping. HM related to intrusive and avoidant ideation.	
Miller et al., 2005 H(5.0)	MBSS Dich H/L N=175 CR=36%	Women calling the CIS about their risk for BC and OC. ***	Between baseline and 6-months follow-up, among the average risk group only: Knowledge: HM exhibited a greater increase; Encoding: HM exhibited a greater increase in perceived risk.	
Mireskandari et al., 2007 M(3.5)	MBSS Dich No-split N=95 CR=63%	Partners of women at hereditary risk for BC/OC. CS.	Affective responses: HM who reported high perceived risk experienced lower levels of distress.	
Muusses et al., 2012 M(4.0)	TMSI-SF Cont No-split N=345 CR=59%	Cancer patients receiving chemotherapy. CS.	Information Source: Mon related to use of the internet and brochures in order to be informed about chemotherapy.	
Nikoletti et al., 2003 H(4.5)	MBSS Dich H/L **** N=141 CR=55%	Caregivers of women who underwent BC surgery, collected within three weeks post-surgery. CS.		Information source: Unrelated. Values: Unrelated to number of information needs. Information satisfaction: Unrelated.
Nordin et al., 2002 M(4.0)	MBSS-SF Dich TMSI Cont Sub, H/L N=63 CR=94%	Individuals referred for genetic counseling for BC, OC or colorectal cancer. A number of those underwent genetic testing. Prospective.	Information satisfaction: Within a few days of counseling: Mon negatively related to satisfaction with information provided during counseling. Affective responses: HM more worried both before and after the visit. HM more anxious before the visit but not after the visit. HM more depressed prior to receipt of the test result.	Perceived risk: Unrelated to accuracy of perceived risk.
Ong et al., 1999 M(4.0)	TMSI-SF Cont No-split N=137 CR NR	Cancer patients referred to oncology for treatment. CS.	Values: Mon related to preference for detailed information. Decision-making: Mon related to preference to participate	Physician-patient communication: Unrelated to physician's communicative behaviors.

Source/Rating	Scale Dich/Cont H/L or No-split N CR	Population Design	Significant Findings	Non-significant Findings
			in medical decision-making. Physician-patient communication: Mon related to question asking and dominance.	
Parker et al., 2001 M(4.0)	MBSS Dich No-split N=351 CR=91%	Cancer patients visiting oncology clinic. CS.	Values: Mon related to perceived importance of getting detailed information about their cancer and getting support from their physician.	
Pieterse et al., 2005 M(3.5)	TMSI-SF Cont No-split N=200 CR=32%	Individuals referred for genetic counseling for cancer. Interviewed once prior to visit. CS.	Values: Mon related to perceived importance of general counseling-related issues and cancer-specific issues, such as meaning of being a carrier and risk of developing cancer.	Values: Unrelated to importance of emotional support and assessment of susceptibility to disease.
Rees et al., 2000a ⁸ M(3.0)	MBSS Dich H/L N=109 CR=66%	Partners of women diagnosed with breast cancer. CS.	Information satisfaction: HM more likely to think that patients avoided giving them information. Information source: More likely to discuss cancer topics with patients.	
Rees et al., 2000b ⁸ M(3.5)	MBSS Dich H/L N=97 CR=72%	Adult daughters of women diagnosed with breast cancer. CS.	Information source: HM more likely to seek information from multiple and divergent sources.	
Rees et al., 2000c ⁸ M(2.5)	MBSS Dich H/L N=97 CR=72%	Adult daughters of women diagnosed with breast cancer. CS.	Information satisfaction: HM more likely to think that patients avoided giving them information.	
Rose et al., 2008 ⁹ H(4.5)	MBSS-SF Dich No-split N=323 CR=71%	Patients with late stage cancer. Prospective. One month time-frame.	Patient-provider communication: Mon negatively related to unscheduled patient-initiated contacts with health care providers.	
Rose et al., 2009 ⁹ H(4.5)	MBSS-SF Dich No-split N=210 CR=71%	Patients with advanced cancer. Coping and communication support intervention administered to all patients. Prospective. Two months time-frame.		Patient-provider communication: Unrelated to frequency of contact with support personnel initiated by patients.
Schwartz et al., 1995 H(4.5)	MBSS Dich No-split N=103 CR=79%	Women at high risk for OC. CS.	Encoding: Mon related to perceived risk. Affective responses: Mon related to distress. Perceived risk mediated the effect of mon on intrusive ideation.	
Sheehan et al., 2007 H(4.5)	MBSS Dich No-split N=123 CR=52%	Women diagnosed with BC who underwent reconstructive surgery. CS.	Decisional regret: Women who experienced high level of anxiety and were low on mon more likely to report regret.	
Shiloh et al., 1999 M(3.5)	TMSI Cont H/L N=209 CR NR	Professionals responding about intentions to undergo genetic testing about hypothetical diseases. CS.	Decision making: HM more interested in genetic testing, particularly so with regard to tests with high predictive power.	

Source/Rating	Scale Dich/ Cont H/L or No-split N CR	Population Design	Significant Findings	Non-significant Findings
Shiloh et al., 2008 H(5.0)	MBSS Dich H/L N=253 CR NR	Patients with HNPCC and at-risk family members undergoing genetic testing. Prospective.	Affective responses: Among carriers and indeterminates, HM reported more distress than LM. Effect at baseline and follow-ups (6- & 12 months).	Affective responses: Differences between HM and LM not observed among negatives.
Sie et al., 2013 M(2.5)	TMSI Cont Sub ***** N=111 CR=51%	Between the ages of 18 & 25, genetically tested for BRCA1/2 or Lynch syndrome. Retrospective.	Values: Monitors and neutrals exhibited a higher need for information. Decisional conflict: Monitors and neutrals more likely to report decisional conflict.	
Tercyak et al., 2001 H(5.5)	MBSS Dich H/L N=107 CR NR	Women undergoing BRCA1/2 testing, affected and unaffected. Prospective.	Affective responses: HM experienced more state anxiety than LM at predislosure.	Affective responses: No effect at postdisclosure.
Timmermans et al., 2007 H(5.5)	TMSI-SF Cont No-split N=116 CR=92%	Cancer patients referred to oncology for palliative and curative radiotherapy. Prospective (Six weeks).	Information satisfaction: In both groups, mon was related to dissatisfaction with the information provided. Provider-patient communication: In the palliative group, mon was related to questions with both biomedical and psychosocial content, to emotional utterances and to the duration of the consultation. In the palliative group, mon was related to length of consultation. Decision-making: In both groups, mon was related to utterances expressing consent about treatment proposal and questions regarding alternative treatments. Decisional regret: In both groups, mon doubted their treatment decision six weeks after the consultation.	
Wakefield et al., 2007 H(5.0)	TMSI Cont No-split N=247 CR NR	Individuals considering genetic testing for inherited cancer risk. ***	Encoding: Mon was negatively related to perceived risk.	Affective responses: Unrelated to distress. Decision-making: 92% decided to undergo genetic testing six months post-consultation. Mon unrelated to decision.
Wardle 1995 M(3.5)	MBSS-SF Dich No-split N=920 CR=70%	1. Women with familial OC, prior to screening, 2. Women screened 1-year earlier. CS.	Affective responses: Mon related to worry about cancer. Mon who received a false positive test result exhibited greater deterioration in well-being following receipt of the test result.	Encoding: Unrelated to perceived risk for OC.
Weinberg et al., 2009 M(3.0)	MBSS-SF Dich No-split N=318 CR=49%	Women, older than 50, noncompliant with CRC screening recommendations. CS.		Encoding: Unrelated to perceived risk. Decision-making: Unrelated to intentions to screen.

Source/Rating	Scale Dich/Cont H/L or No-split N CR	Population Design	Significant Findings	Non-significant Findings
Williams-Piehot et al., 2005 M(3.0)	MBSS-SF Dich Sub, H/L N=500 CR=69%	Individuals calling CIS. **	Knowledge: Monitors more knowledgeable. Beliefs and expectancies: Monitors perceived BC as a more severe disease and less easy to treat.	
Van Zuuren et al., 2006 M(3.5)	TMSI Cont No-split & H/L N=95 CR=95%	Patients scheduled to undergo gastrointestinal endoscopy. ***	Affective responses: Mon related to worrying about the endoscopy prior to the procedure, anxiety during the endoscopy, and evaluating the experience as negative.	

Note. Where more than one measure was used for each category of outcome variables and significant findings were obtained with only one of them, only significant findings are summarized. Non-significant interaction effects are not reported. Where more than one group of participants are included in a study but the monitoring variables are used with only one group of participants, only the relevant group is reported. Superscripts with the same number indicate reports from the same study. H, M, L: high, medium, low rating, respectively. Dich/Cont: a Yes/No format for each item or a 5-point Likert scale, respectively. H/L: median split was used to identify high and low monitors. No-split: analyses are based on total monitoring score. CR: consent rate. NR: not reported. CS: Cross-sectional design. Sub: blunting score subtracted from monitoring score in order to calculate monitoring and blunting.

* Used a median split to identify high and low monitors and high and low blunterners. Used combinations of these two categories to form four groups. Results are based on two of the four groups formed: High monitors/low blunterners and low monitors/high blunterners.

** Intervention study. Baseline results reported here.

*** Intervention study. Main effects found.

**** High monitoring defined using norms as cut-off points.

***** Formed three categories (monitors, blunterners, neutrals).

Table 3
Characteristics of Studies Examining the Moderating Role of Monitoring on Interventions to Improve Knowledge, Adjustment, and Adherence

Source	Scale Dich/Cont H/L or No-split N CR RR	Population Design	Type of Intervention	Significant Findings	Non-significant Findings
Diefenbach et al., 2012 M(4.5)	MBSS-SF Dich Sub N=91 CR=75% RR=79%	Men newly diagnosed with Pca. RCT pilot study. Pre/post measurements.	Two preparatory aids using a variety of electronic media and self-navigational aids to make a treatment decision. A detailed version and a short version.		Affective responses: Tailored group no different than non-tailored. Decision-making: As for affective responses.
Duncan et al., 2013 H(8.0)	MBSS Dich H/L N=538 CR=65% RR=52%	Cancer survivors calling the CIS with scheduled provider visit within the next three months after baseline interview. RCT.	1. Detailed information about clinical trials. 2. Less detailed information about clinical trials. Both messages encouraged patients to discuss issue with provider and provided list of questions. Print material.	Patient-physician communication: Twelve weeks later, among low monitors (LM) who received the briefer message, the proportion of survivors who initiated discussions on clinical trials was significantly greater than the proportion that did not.	
Kola et al., 2013 H(7.0)	MBSS Dich H/L N=117 CR NR RR=100%	First time colposcopy patients. Intervention during procedure. Pre/post RCT.	1. Low information: Watched video during the colposcopy. 2. High information: Watched colposcopy on monitor. Asked to focus on sensations and to think of them in non-emotional terms. 3. Control group: Usual care. Minimal information given during colposcopy.	Physiological responses: LM experienced an increase in SBP during colposcopy when in the high information group and a decrease when in the low information or the control groups. High monitors (HM) experienced a decrease in SBP when in the high or low information groups but no change when in the control group. HM in the control group experienced the highest DBP than all other groups and LM in the low information group exhibited the lowest (a trend).	
Lerman et al., 1996 M(6.5)	MBSS Dich Sub, H/L N=239 CR=52% RR=63%	Women undergoing BC risk counseling. RCT.	1. Risk counseling and print material with personalized risk information & preventive options. 2. Health information to control for nonspecific factors.		Affective responses: Three months later, monitoring did not interact with intervention to impact distress.
Lobb et al., 2002 M(6.0)	MBSS Dich Sub N=160 CR=80% RR=82%	Women at familial risk for BC (affected and unaffected). RCT. Three weeks follow-up.	1. Genetic counseling consultation plus receipt of an audiotape of the meeting. 2. Participation in genetic counseling only.		Seeking information: Unrelated to listening to the tape. Affective responses: No interaction with intervention.
Miller et al., 1999a H(7.5)	MBSS Dich No-split N=76 CR=71% RR=86%	Women scheduled for colposcopy. Baseline prior to colposcopy. Intervention administered just prior to examination. Follow-ups one week and six months later. RCT.	1. Loss framed information: Emphasized cost of not adhering to recommended screening behaviors. 2. Gain framed information: Emphasized benefits of adhering to recommended screening. 3. Neutrally framed information: Basic information about adhering to recommended screening behaviors. Audio form.	Knowledge: One week post-colposcopy, LM more knowledgeable in the loss framed condition. Affective responses: One week post-colposcopy, LM reported less intrusive ideation in the loss framed condition whereas HM reported more intrusive ideation. Behavioral responses: Six months post-colposcopy, LM who received the	

Source	Scale Dich/Cont H/L or No-split N CR RR	Population Design	Type of Intervention	Significant Findings	Non-significant Findings
Miller et al., 2005 M(6.0)	MBSS Dich H/L N=279 CR=57% RR=63%	Women calling the CIS about their risk for BC or OC. RCT. Six months follow-up.	1. General information about familial BC and OC. 2. More detailed, personalized information was provided and the opportunity to discuss it was given. Accompanied by an additional NCI publication.	loss framed or the gain framed condition loss framed or the gain framed condition loss framed or the gain framed condition	loss framed or the gain framed condition loss framed or the gain framed condition loss framed or the gain framed condition
Petersson et al., 2002 L(4.0)	MBSS Dich Sub, H/L N=442 CR=71% RR=86%	1. BC patients. 2. Pca patients. Planned as RCT but collapsed four groups into two to increase power. Pre/ post.	1. Eight weekly group sessions. Includes educational component and CBT. 2. Individual support and standard care.	Affective responses: HM in the Pca group benefited more from the rehabilitation group.	Affective responses: BC patients in rehabilitation group: No change. Control group: improved.
Wakefield et al., 2007 M(4.5)	TMSI Cont H/L N=247 CR=NR RR=79%	Individuals considering genetic testing for inherited cancer risk. RCT. Six-months follow-up.	1. Decision aid: Detailed balanced information on the options and the meaning of results. Encourages listing of pros and cons. 2. Control pamphlet: Similar information but briefer.	Knowledge: Improved the most with decision aid only among HM.	
Williams- Piehota et al., 2005 H(7.0)	MBSS-SF Dich Sub, H/L N=500 CR=69% RR=61%	Individuals calling CIS. RCT.	1. Monitor-focused: Detailed information regarding BC and its early detection. Reassuring statements to address anxiety. 2. Blunter-focused: basic information only.	Affective responses: HM who received the blunter- focused message reported more negative affect.	Behavioral responses: At 6- months, non-significant interaction although in the expected direction (higher screening by those who received the detailed message).
Williams- Piehota et al., 2009 H(7.0)	MBSS Dich Sub, H/L N=531 CR=67% RR=51%	Individuals calling CIS. RCT.	1. Monitor-focused: detailed information and reassuring statements. 2. Blunter- focused message: simple message highlighting benefits. Interventions were delivered in telephone and printed form at baseline, one week, two months and three months post-baseline. Final assessment at four months follow-up.	Encoding: HM who received the simple (blunter) message reported higher perceived risk. Values: Monitors who received a tailored message reported that it was more important for them to be healthy. Behavioral responses: Two months later, intake of fruits and vegetables increased when the message was matched to coping style.	Behavioral responses: Effect not observed at 4-months.
van Vliet et al., 2004 L(4.0)	TMSI Cont H/L N=260 CR NR RR NR	Patients scheduled to undergo gastrointestinal endoscopy. Pre/post RCT.	1. Extensive information, including sensory. 2. Basic information plus suggestions for distraction. 3. Less extensive information but varied a lot (control).	Affective responses: HM in the experimental conditions (both) had a more positive view of their preparation for the procedure.	Affective responses: Anxiety levels across the conditions did not differ among HM or LM.
Van Zuuren et al., 2006 M(5.0)	TMSI Cont No split & H/L N=95 CR=95% RR=100%	Patients scheduled to undergo gastrointestinal endoscopy. Pre/post RCT.	1. Mailed-in brochure with extensive sensory and procedural information combined with coping skills. 2. Basic information provided by nurse upon arrival (control).	Affective responses: Highest anxiety after the procedure experienced by HM in the control group.	Information seeking: 96% read the brochure. Monitoring not related to reading the brochure more times.

Notes. H, M, L: high, medium, low rating, respectively. Dich/Cont: a Yes/No format for each item or a 5-point Likert scale, respectively. H/L: median split was used to identify high and low monitors. No-split: analyses are based on total monitoring score. Sub: blunting score subtracted from monitoring score in order to calculate monitoring and blunting. CR: consent rate. NR: not reported.