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How do people respond to health news? The role of personality traits

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When a patient receives a health diagnosis, their response (e.g. changes in behaviour, seeking support) can have significant consequences for long-term health and well-being. Characteristics of health news are known to influence these responses, but personality traits have been omitted from this line of research. The current study examines the role of personality traits in predicting response to health news. Participants ($N = 298$) read scenarios in which they received health news that was manipulated to vary in severity, controllability and likelihood of outcomes. Participants then rated how likely they were to engage in a number of response behaviours. We examined the main effects and interaction of situational manipulations and personality traits on ratings of these behaviours. Both situations and personality traits influenced behavioural responses to health events. In particular, conscientiousness predicted taking action and seeking social support. Neuroticism predicted both maladaptive and adaptive behavioural responses, providing support for the 'healthy neurotic' hypothesis. Moreover, personality traits predicted best in weak (unlikely, controllable) situations. Both personality traits and situational characteristics contribute to behavioural responses to health news.

Keywords: personality; bad news response model; situation; health; health behaviors; conscientiousness

There are vast differences in the ways people respond to health events, like the onset of a major disease. The emotions that patients feel after a diagnosis and the subsequent actions they take impact long-term health and well-being (e.g. Greer, Morris, & Pettingale, 1979). For physicians, the ability to predict responses to health news or new health information can help them to direct patients towards the most effective actions and emotions (Fisher & Dickinson, 2014). Despite this promise, few studies examine the factors that influence how people respond to health news. The current study looks at the joint influence of situational and personality factors that influence how people respond to health news.

Possible responses to health news

Individuals can engage in a variety of responses to stressful situations. Coping strategies, which are thought to broadly capture responses to such events, suggest that

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individuals may engage in a variety of responses simultaneously, including seeking social support, planning for the future and disengaging through substance abuse (Carver, Scheier & Weintraub, 1989). When responding to specific health diagnoses, patients decide which, if any, treatments they will try (Charles, Whelan, Gafni, Reyno, & Redko, 1998; de Haes & Koedoot, 2003). Patients also have different psychological response to health problems, such as stoically accepting their new health status or feeling helpless (Greer et al., 1979).

Differences in how patients respond to health have long-term health and quality-of-life consequences (Demark-Wahnefried, Aziz, Rowland, & Pinto, 2005). Therefore, predicting response early becomes vital for targeting patients in need of extra guidance. A patient's response to news will be mainly driven by her perception or construal of the news, which is a function of both objective situational characteristics and individual differences, such as personality traits (Morse, Sweeny, & Legg, 2015; Sherman, Nave, & Funder, 2013). Thus, we need to consider how situational factors and personality factors separately predict response, as well as how they interact with one another.

Situational factors influence response to health news

Many situational factors influence a patient's response to health news. These factors encompass a wide range of features, including the disposition of the doctor, the patient's family history of illness and the resources available to the patient (e.g. Escher, Perneger, & Chevrolet, 2004; Miller, 2000). Of particular interest are situational factors that physicians can use to leverage optimal responding. By identifying situational factors that are under physicians' control, we can provide the added utility of guiding patient response. One salient factor under physicians' control is the ability to emphasise key characteristics of the news itself. The Bad News Response Model (BNRM; Sweeny & Shepperd, 2007) posits that the *likelihood*, *severity* and *controllability* of potential outcomes are significant factors in shaping a patient's response. That is, one way physicians can influence responses to health news is by emphasising some or all of these factors (Sweeny & Shepperd, 2007). These factors by no means encompass all potential situational factors that influence health response (e.g. the perception of the physician's interpersonal skills; Mager & Andrykowski, 2002), but are important in that they point to how physicians can actively manipulate news-giving to guide responses.

When a potential outcome is more likely, patients are more likely to respond actively, such as scheduling treatments, and less likely to wait and see if their health changes (Sweeny & Shepperd, 2009). For example, patients diagnosed with major cancers are very likely to suffer additional health declines; these patients are more likely to schedule surgeries to remove their tumours. When a potential outcome is more severe, patients are also less likely to simply monitor their health. Finally, when a potential outcome is more controllable, patients are less likely to wait or accept their health status, and more likely to actively seek treatment options or other resources.

Personality traits likely predict responses to disease

While situational factors like the ones described above are known to influence responses to health news, individual differences may also contribute to a patient's behavioural and psychological responses (Morse et al., 2015). For example, downstream outcomes may not be motivating enough for some individuals to change their habits.

Or it is possible that some individuals, regardless of their diagnosis, will feel compelled to actively change their behaviours in the hope of a more positive outcome. Personality traits are the ideal candidate to influence these types of decision processes, as personality traits are known to affect physical health and health behaviours. Personality traits predict longevity across many decades (Jackson, Connolly, Garrison, Levine, & Connolly, 2015) and prospectively predict disease onset (Jokela et al., 2013; Weston, Hill, & Jackson, 2014). The intervening mechanisms linking personality to these outcomes are largely health behaviours and stress (Hampson, Edmonds, Goldberg, Dubanoski, & Hillier, 2015; Lodi-Smith et al., 2010).

Personality traits are most commonly organised into the Big Five taxonomy (Goldberg, 1993). These five traits are thought to broadly represent the dimensions of human personality. Of these five, two traits are consistently linked to health and health behaviours: conscientiousness and neuroticism. Conscientiousness, the tendency to be organised and industrious, predicts engagement in healthy behaviours, such as exercise and wearing seat belts (Jackson & Roberts, *in press*), and protective behaviours, such as reducing risk of radon exposure (Hampson et al., 2000). Individuals high in conscientiousness are less likely to smoke (Bogg & Roberts, 2004) and also smoke less after they have developed a chronic disease (Weston & Jackson, 2014).

Neuroticism, the tendency to experience negative emotions, is generally related to lower levels of health (Lahey, 2009). This association occurs largely because neuroticism predicts engagement in unhealthy behaviours, including smoking and drinking (Turiano, Whiteman, Hampson, Roberts, & Mroczek, 2012), and greater physiological stress reactivity (Lahey, 2009). Individuals high in neuroticism are also more likely to use unhealthy behaviours, such as smoking and drinking, as a method to cope with stress (Malouff, Thorsteinsson, Rooke, & Schutte, 2007; Turiano et al., 2012). However, high levels of neuroticism may be protective in some situations where vigilance is required or when the patient has the self-control to overcome urges (Friedman, 2000). Some have suggested that neuroticism is healthy when paired with high conscientiousness, a trait that allows individuals to deal productively with stress (Gartland, O'Connor, & Lawton, 2012). When paired with high conscientiousness, high neuroticism has been found to predict lower levels of smoking (Turiano et al., 2012) and better physical health (Roberts, Smith, Jackson, & Edmonds, 2009; Turiano, Mroczek, Moynihan, & Chapman, 2013). Thus, while conscientiousness has consistent associations with positive health – and thus is expected to predict adaptive responses to health news – the links between neuroticism and health are more complex, and so it is unclear whether neuroticism will predict responses or in what direction.

One potential mechanism through which personality influences behavioural responses could be through how people perceive situations (Jerram & Coleman, 1999). That is, personality traits may lead individuals to view health news as more severe, likely or uncontrollable than it really is. For example, if a patient develops a mole and the doctor reports it *might* be cancerous, the individual may believe the mole to be *definitely* cancerous because of their tendency to focus on the negative. As a result, that individual would then act as though the situation were highly likely, instead of only moderately likely. Neuroticism is the trait most likely to influence perception of health news, as past studies find neurotic individuals perceive their health as worse than it is (Lahey, 2009) and report unfounded somatic complaints (Watson & Pennebaker, 1989). Given this, we predict that neuroticism will predict greater ratings of severity.

Person–situation transactions

In any situation, an individual's personality is manifest, and so both the characteristics of the situation and of the individual need to be considered simultaneously in order to predict behaviour. Typically, situations are thought to moderate the effect of personality on behaviour (Cooper & Withey, 2009). For example, the effect of personality on performance changes in different job settings (e.g. Schneider, 1978). One difficulty, however, is measuring real-world situations, as the components that are psychologically meaningful differ greatly from situation to situation (Wagerman & Funder, 2009). While there are a number of potential ways to address this problem (e.g. Funder, Furr, & Colvin, 2000), one of the most effective ways is to conceptualise situations as 'weak' and 'strong.'

A weak situation is one in which there are no clear expectations of normal behaviour, thus people may manifest a wide ranges of acceptable behaviours (Beatty, Cleveland, & Murphy, 2001). In the case of health, a weak situation may include diagnoses where many responses are appropriate. By contrast, a strong situation has very clear expectations, which constrain potential behaviours. The situational factors described above (i.e. severe vs. not severe, likely vs. unlikely, controllable vs. uncontrollable) could be construed along this weak–strong continuum. When a health outcome is not severe, unlikely and controllable there are many acceptable responses, and thus we may find that the effects of personality on response are greater. On the other hand, a patient who develops cancer faces a much stronger situation, characterised by the severity of the outcome and the lack of control over whether it occurs, and consequently the patient has far fewer choices available. With fewer behaviours available, there is less variability in patient responses and potentially a smaller influence of personality above and beyond the situation.

Current study

Variability in patient health and well-being is partly due to how people respond to health news. Despite this, few studies have systematically examined the range of responses to health news. Furthermore, those studies that do examine responses omit the role of personality traits, despite the associations between personality traits and health behaviours. As a result, it is unclear whether personality traits impact responses above and beyond the effect of the consequences. It is also unclear whether personality traits impact responses more in some situations than others.

The current study aims to overcome these limitations by using an experimental design to test the effects of situation and personality on responses to health news. Participants were asked to read hypothetical news from a physician, where news characteristics were experimentally manipulated to vary on the severity, controllability and likelihood of a health outcome. Participants will report the behaviours they would enact as well as provide perceptions about the situation's controllability, severity and likelihood. Participant responses are predicted from the situation factors, personality traits and the interaction of situation and personality. The current study has four aims:

Aim 1: examine the range of behavioural responses to a health event

Few studies attempt to chronicle the various ways that patients may respond to a health event. As a first step in looking at health responses, we will test whether there are

typical styles of response to health news. To do so, we ask participants how likely they are to engage in a list of possible behavioural and emotional responses and determine the empirical structure of these responses. Based on previous work (e.g. Carver et al., 1989; Sweeny & Shepperd, 2009), we hypothesise that there are multiple distinct styles of health responses, with some containing active behavioural responses while others index avoidance responses.

Aim 2: test the situational factors that influence health responses

Using the behavioural responses to a health event as our outcome measures, we aim to replicate the finding that the severity, controllability and likelihood of health outcomes lead to changes in behavioural responses (Sweeny & Shepperd, 2009). We mimic the methodology of this study, described below, to specifically test whether manipulations of controllability, severity and likelihood impact health responses. We improve upon the methodology by testing two scenarios per participant – one event happening to the participant and the other happening to a family member – which will allow us to increase power and generalisability. We hypothesise that we will replicate the effects of situations on health responses.

Aim 3 examine the effect of personality traits on health responses

It is hypothesised that conscientiousness and neuroticism will predict behavioural responses, given their well-documented role in health, above and beyond situational factors. We also examine whether traits predict perceptions of severity, likelihood and controllability. We hypothesise that neuroticism will predict perceptions of health news as more severe.

Aim 4: test the influence of person–situation transactions

Finally, we will examine whether personality traits are more important for predicting response styles in specific situations. We hypothesise that if the downstream consequences are severe, we may expect all participants will actively respond to health news. However, if downstream consequences are non-severe, we expect only conscientious participants to engage in such responses.

Method

Participants were 298 adults (50% female) recruited through Amazon Mechanical Turk. Participants ranged from 18 to 69 years old ($M = 36.69$, $SD = 12.1$). Nearly all participants (99.32%) had at least a high school degree, and a majority (53.71%) had at least a college degree. Although many (47.65%) had never been married, most (60.94%) were in a committed relationship.

Experimental procedure

The experimental procedure was designed to replicate the original study (i.e. the Bad News Response Model; Sweeny & Shepperd, 2009) as closely as possible. Participants

read two hypothetical scenarios describing a health concern and a possible underlying medical condition. In one scenario (taken from the original study), the health concern was a mole and the possible medical condition was skin cancer. In the other scenario, the health concern was a lump and the possible medical condition was a tumour. In each scenario, three characteristics of the medical condition were varied: its severity, controllability and likelihood. The wording for the mole scenario is as follows:

Imagine that you make an appointment with your doctor about a suspicious mole on your back. After examining the mole, your doctor determines that, if the mole is cancerous, it is most a likely a **(non-severe/severe)** form of skin cancer that grows (slowly/quickly) and is (unlikely/likely) to cause health problems. Although the mole **(cannot/can)** be removed through surgery, your doctor determines that there is **(only a 1–2%/a 50–60%)** chance that the mole is cancerous. Your doctor decides to biopsy the mole to determine if it is cancerous, and the biopsy results will be ready in 1–2 weeks.

For the lump scenario, the wording was nearly identical, except all instances of ‘mole’ were replaced with ‘lump;’ ‘skin cancer’ was replaced with ‘tumor’ and ‘severe;’ and ‘non-severe’ were replaced with ‘malignant’ and ‘benign.’ Participants were randomly assigned to read one of these scenarios about themselves and the other scenario about their spouse (e.g. ‘Imagine that your spouse makes an appointment with a doctor about a suspicious mole...’).

After reading each scenario, participants were asked to rate on a scale from 1 to 9 how severe (1 = *Not at all bad*, 9 = *Very bad*), likely (1 = *Very unlikely*, 9 = *Very likely*) and controllable (1 = *Little to no control*, 9 = *Full control*) the possible medical condition was. These responses were used as both manipulation checks and a way to index perceptions of the scenario. Participants were also asked whether they had actually experienced an event like on the one described; 44 participants (15%) had experienced one of the two events and 18 participants (6%) reported experience with both events. This variable was used as a control in the models.

Measures

Behavioural response items

Participants were then given a list of 23 behavioural responses and asked to report how likely they would be to engage in that behaviour from 1 (*Very unlikely*) to 4 (*Very likely*). Some of these behavioural responses were generated by taking statements directly from the descriptions of response type in Sweeny and Shepperd (2009). These items allowed to us examine whether the effects of the situational manipulations replicated in our study. For example, ‘research skin cancer/tumors’ was taken directly from the description of the response-type active change. Other responses were generated by health experts with the aim of capturing a variety of behaviours that patients might engage in as responses to these specific situations. This allowed us to capture more specific behaviours than may be included in a more general coping response scale. A full list of behaviours is included in Table 1.

The original study (Sweeny & Shepperd, 2009) provided participants with descriptions of the three response styles. Participants were then asked to rate how likely they were to engage in each of these styles. We departed from this method of measurement to empirically determine the structure of responses rather than assuming the existence

Table 1. Pattern matrix of the factor analysis of behavioural responses.

	Avoid Problem	Gather Information	Take Action	Adjust Future Expectations	Seek Social Support	h^2
Put off undergoing surgery until a later time.	.67	.03	.14	-.07	-.05	.45
Ignore the mole and hope it will go away on its own.	.63	-.07	-.07	.06	.07	.42
Wait to take action until things get worse.	.62	.02	-.20	.14	.09	.42
Disregard surgery as an option.	.61	-.07	.19	-.02	-.04	.41
Book a procedure to have the mole removed.	-.42	.10	.08	.11	.19	.34
Read up on skin cancer.	-.03	.84	.00	-.04	-.01	.69
Look up different kinds of moles.	.03	.81	-.01	.03	-.01	.65
Check your mole periodically for changes.	-.06	.42	-.02	.03	.10	.23
Re-evaluate life values, goals, and priorities.	-.05	.04	.55	.16	.22	.62
Search for a homeopathic remedy.	.19	.16	.52	.11	-.11	.39
Update your will.	.01	.00	.48	.18	.11	.42
Cry.	-.02	.04	.38	.17	.30	.48
Create a plan for if tests come back positive.	-.24	.18	.38	-.04	.09	.35
Pray and/or attend religious services.	.08	.00	.37	-.03	.07	.15
Look up support groups or Internet message boards.	.04	.17	.30	.09	.29	.41
Get a second opinion.	-.03	.20	.26	.05	.10	.22
Go through finances and health care policies to determine how surgery could be paid for.	-.24	.18	.25	.09	.12	.31
Reduce commitments to others.	-.04	.01	.01	.81	-.04	.65
Avoid making future plans.	.07	-.01	.02	.74	.01	.58
Go about life as usual and wait for the biopsy results.	.29	.09	-.18	-.31	-.04	.24
Seek emotional support from your spouse, close family and friends.	-.01	-.01	.11	-.07	.74	.59
Tell family and friends about the mole.	.01	.04	-.10	.04	.70	.47
Distract yourself to avoid thinking about the mole.	.25	.12	-.01	.06	.27	.16

Notes: Items presented are for the self-mole condition. In the lump condition, all instances of 'mole' are replaced with 'lump' and instances referring to cancer are replaced with references to tumours. In the spouse condition, items which involve taking direct action on the problem are prefaced with 'Suggest spouse...'

of only three, as well to provide more precision in how a participant would responded. For the analyses attempting to replicate the original findings, we predicted responses to the items taken directly from the descriptions of the response styles. For example, we used the items ‘Put off undergoing surgery until a later time’ and ‘Check your mole periodically for changes’ as the outcome variables when replicating effects on Watchful Waiting. Figure 1 and Supplementary Table 3 indicate which items replicate which findings.

Personality

Participants completed the SPI50 (Condon, 2014), a 50-item measure of personality traits that was empirically derived from the International Personality Item Pool (Goldberg et al., 2006). Items are included in the supplementary material. Each of the Big Five traits was measured using an average of ten items from this scale. For example, extraversion was assessed with items such as ‘I love to chat’ and ‘I seem to derive less enjoyment from interacting with people than others do.’ Participants were asked to rate how well the statement described them from 1 (*Very inaccurate*) to 6 (*Very accurate*). Scales showed good reliability for all Big Five traits, with α ranging from .85 (openness to experience) to .95 (extraversion). We present only findings for conscientiousness and neuroticism here, as these traits are the most consistently linked to health. However, all traits were included and reported in the supplementary material.

Analyses

Multilevel modelling was used to conduct the analyses, with each participant used as the level 2 grouping variable. This allowed for the greatest power to detect effects while controlling for the dependency of responses by the same participant. Behaviour

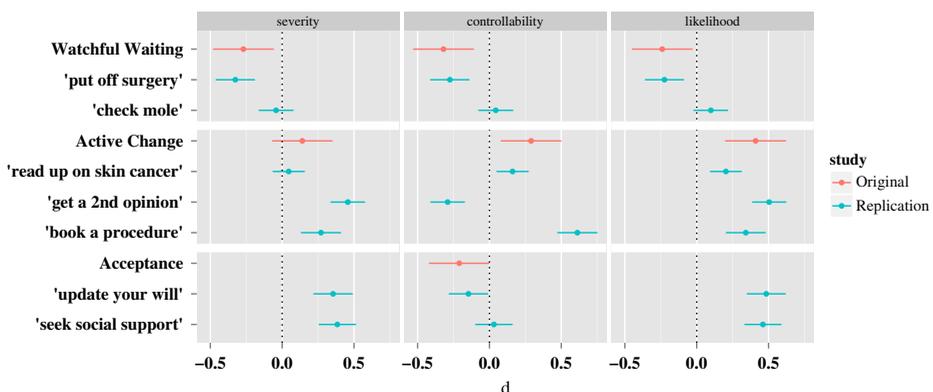


Figure 1. Comparison of results between Sweeny & Shepperd (2009) and the current study. Notes: Effects are presented as d -scores. Each box represents the effect of one manipulation (severity, controllability or likelihood) on one type of response (Watchful Waiting, Active Change or Acceptance). The effect size of the original study is presented in the top row and is coloured orange, while the effect sizes found in the current study are presented in the bottom rows and coloured blue. A dashed line is placed at $d = 0$, to indicate the test of null-significance.

responses were predicted using the five manipulated conditions (severity, controllability, likelihood, self vs. spouse, lump vs. mole) as the predictor variables. Preliminary analyses found that the self vs. spouse factor and lump versus mole factor did not influence the results, and thus will not be discussed. However, we account for the influence of these factors, partialling out any potential influence.

Results

Ratings of severity, likelihood and controllability were used as manipulation checks. The severity, controllability and likelihood conditions all lead to the expected increases in perceived severity, controllability and likelihood, respectively. See Supplementary Table 1 for full results.

Examine the range of behavioural responses to a health event

To clarify the ways in which people respond to health news, we performed an exploratory factor analysis with oblique rotation on all the response behaviours. Parallel analysis suggested that 4–6 factors would be best, with a scree plot indicating five factors. All solutions were examined; at the six-factor solution, two-item couplet factors emerged, so a five factor solution was chosen instead. The final solution is presented in Table 1. Correlations between these factors ranged from $r = .05$ to $r = .44$.

The first factor included items associated with either a lack of action or deliberate attempts to ignore the medical problem, and so the factor was labelled Avoid Problem. The second factor included seeking more knowledge and was labelled Gather Information. The third factor included the largest number of responses. While there was no consistent goal or action in these responses, the common thread in these responses appeared to be taking initiative. This factor was labelled Take Action. The fourth factor included items related to future plans and was labelled Adjust Future Expectations. Finally, the fifth factor included items involving being close to others and was labelled seek social support. All together it appears that there are at least five ways people respond to health events.

Test the situational factors that influence health responses

First, as a replication of Sweeny and Shepperd (2009), we predicted responses to the items that were directly included in the original study's description of the response styles. Overall, we were able to replicate the effects of the previous study. As demonstrated in Figure 1 (upper panel), participants in the original study were more likely to endorse Watchful Waiting (i.e. adopt a 'wait and see' mentality and stay vigilant) if the news was low in severity, controllability or likelihood. We replicated these effects for the Watchful Waiting item 'Put off surgery until a later time' such that those in the more severe, controllable and likely conditions indicated they were less likely to engage in this behaviour ($d_s = -.33$, $d_c = -.28$, $d_l = -.22$). We did not find the same effects for the second Watchful Waiting item "Check mole periodically for changes" ($d_s = -.04$, $d_c = .03$, $d_l = .10$; see Supplementary Table 3 for full results). This is based both on non-significance of the effects on this item and on non-overlapping confidence intervals (see the upper row of Figure 1), which stands for a formal test of the difference of the

effects. As for active change (i.e. addressing the news through information seeking, prevention and treatment of the event), the original study found that greater control and likelihood predicted greater endorsement of active change. We replicated these effects such that people were more likely to ‘Read up on skin cancer’ when likelihood was greater ($d_l = .20$) and ‘Book a procedure’ when control ($d = .61$) and likelihood ($d = .34$) were greater. In contrast to the expected active change findings, ‘Get a second opinion’ was less likely to occur when control was high ($d = -.29$) but was more likely to occur when likelihood was high ($d = .50$). Finally, the original study found that less control predicted greater likelihood of acceptance (i.e. seeking support and meaning), and we found this for the item ‘Update your will’ ($d = -.15$) but not ‘seek social support’ ($d = .03$).

Second, we predicted responses to the five behavioural factors found in the exploratory analyses. Just as the original study found that manipulating the situations to be more severe, likely or controllable increased likelihood of taking action, we expected these factors to lead to greater endorsement of all factors except the avoid the problem factor. The manipulated conditions influenced the behavioural response factors largely in the expected directions (see Table 2 for results and Figure 2). Participants were more likely to endorse avoid the problem responses when the underlying problem was unlikely ($d = -.53$), non-severe ($d = -.36$), and could not be controlled ($d = -.53$). Participants were more likely to endorse responses related to gathering information if the underlying problem was more likely ($d = .42$). Participants were more likely to endorse responses which reflect taking action if the problem was more likely to occur ($d = .77$). Participants were more likely to endorse adjust future expectation responses if the underlying problem was more likely ($d = .21$) and severe (.42). Finally, participants

Table 2. Regression predicting response groups from condition, personality and covariates.

	Avoid problem	Gather information	Take action	Adjust expectations	Seek social support
<i>Covariates</i>					
Age	.00(.00)	.00(.00)	.00(.00)	.00(.00)	.00(.00)
Gender	-.02(.09)	.06(.10)	.12(.09)	.06(.10)	-.03(.09)
Education	.02(.03)	.02(.03)	-.03(.03)	-.03(.03)	-.05(.03)
Previous	-.07(.10)	.03(.09)	.05(.08)	.07(.10)	.12(.09)
<i>Experimental Manipulations</i>					
Severe	-.15(.04)	.03(.04)	.20(.03)	.16(.04)	.17(.04)
Control	-.23(.04)	.07(.04)	-.05(.03)	-.04(.04)	.04(.04)
Likely	-.23(.04)	.13(.04)	.22(.03)	.07(.04)	.23(.04)
Spouse	-.23(.05)	.00(.04)	-.03(.04)	-.08(.04)	-.19(.04)
Mole	-.03(.05)	.00(.04)	-.07(.04)	-.04(.04)	-.02(.04)
<i>Personality traits</i>					
Conscientiousness	.04(.08)	.13(.09)	.26(.09)	.14(.09)	.18(.08)
Neuroticism	.13(.05)	.16(.05)	.20(.05)	.22(.05)	.20(.05)

Notes: Analyses conducted within a multilevel model framework, behavioural response factor score as the outcome variable, manipulated conditions as level-one predictors, covariates and personality traits as level 2 predictors and participant as the level 2 grouping variable. Previous = previous similar experience. Results are presented in the format of estimate (standard error of the estimate). The traits extraversion, agreeableness, and openness were included in the models as covariates but not reported. Those coefficients are included in the supplementary materials. Bolded coefficients are significant at $p < .05$.

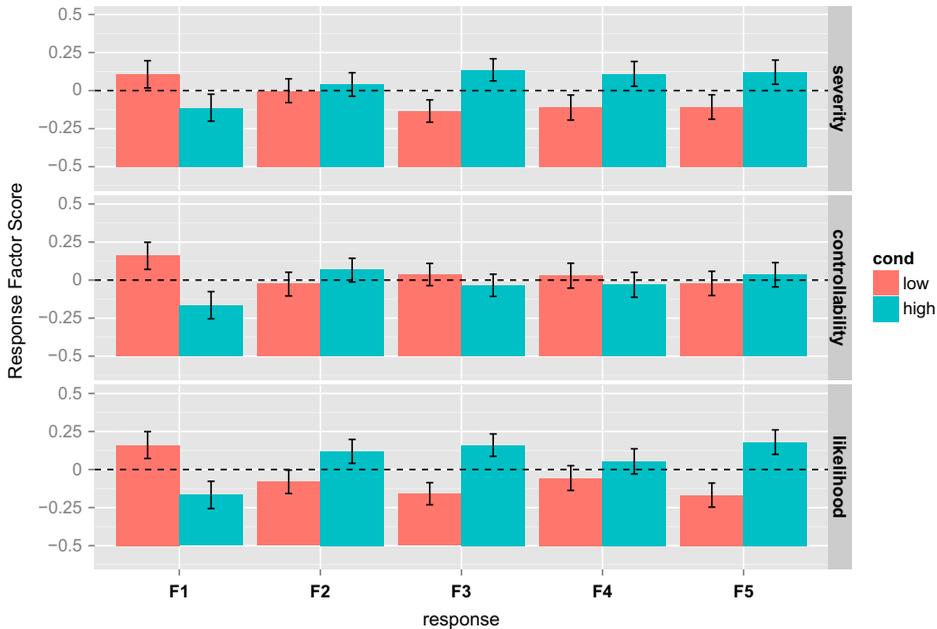


Figure 2. Group differences on response factors. Predicted means of response factor score by group. Predicted means control for demographics (age, gender, education, previous experience) and other manipulated conditions. Response factor scores are standardised, so a dashed line is drawn through a score of 0, or the mean score. Bars represent 95% confidence intervals.

were more likely to endorse Seek Social Support responses if the problem was more severe (.46) and more likely to occur (.70).

Does personality predict responses to health news?

Next, the relationship between personality traits and behavioural responses was examined (see Table 2). As hypothesised, the personality traits of conscientiousness and neuroticism were strongly linked with responses to health news above and beyond situational factors. Conscientious individuals were more likely to take action ($b = .26$, $SE = .09$, $p = .003$) and seek social support ($b = .18$, $SE = .08$, $p = .03$). Most interestingly, individuals high in neuroticism endorsed all five responses more strongly (b range from .13 to .20, p 's range from $<.001$ to $.005$). In other words, neurotic individuals were more likely to take action, but they were also more likely to avoid the problem. We examined the interaction of conscientiousness and neuroticism, to explicitly test whether this form of 'healthy neuroticism' predicted responses. However, there were no significant predictions (see Supplementary material for full models).

Personality may predict responses in part through perception. For example, neurotic individuals perceive more somatic problems than are medically founded (Watson & Pennebaker, 1989); thus, neurotic individuals may also perceive existing problems as more severe or likely than they are. To test this possibility, we predicted the ratings of severity, controllability and likelihood from the personality traits, controlling for

condition. Neither of the traits predicted ratings of situations (b 's ranged from .01 to .37, p 's range from .11 to .96). Overall, this suggests that responses were not due to how personality influencing the perception of a health event. Instead, the differences in responses reflect different choices individuals make in similar situations.

Do person-situation transactions predict responses?

We examined the interaction between each trait and the three experimental manipulations to assess whether certain personality traits matter more or less in different situations. A few notable interactions occurred. As seen in Figure 3, controllability moderated the effect of conscientiousness such that when controllability was low, conscientiousness was a stronger predictor of both gathering information ($b = .34$, $SE_b = .17$, $p = .046$) and taking action ($b = .51$, $SE_b = .12$, $p < .001$). However, when controllability was high, conscientiousness was not predictive of the former response ($b = .11$, $SE_b = .13$, $p = .40$) and the effect on the latter was diminished ($b = .30$, $SE_b = .12$, $p = .01$). Conscientiousness was not moderated by any other situation. Likelihood moderated the effect of neuroticism, such that when likelihood was low, neuroticism was a stronger predictor of avoiding the problem ($b = .27$, $SE_b = .07$, $p < .001$) and adjusting future expectations ($b = .27$, $SE_b = .07$, $p < .001$) but when likelihood was high, neuroticism did not predict avoiding ($b = .13$, $SE_b = .07$, $p = .06$) and was a

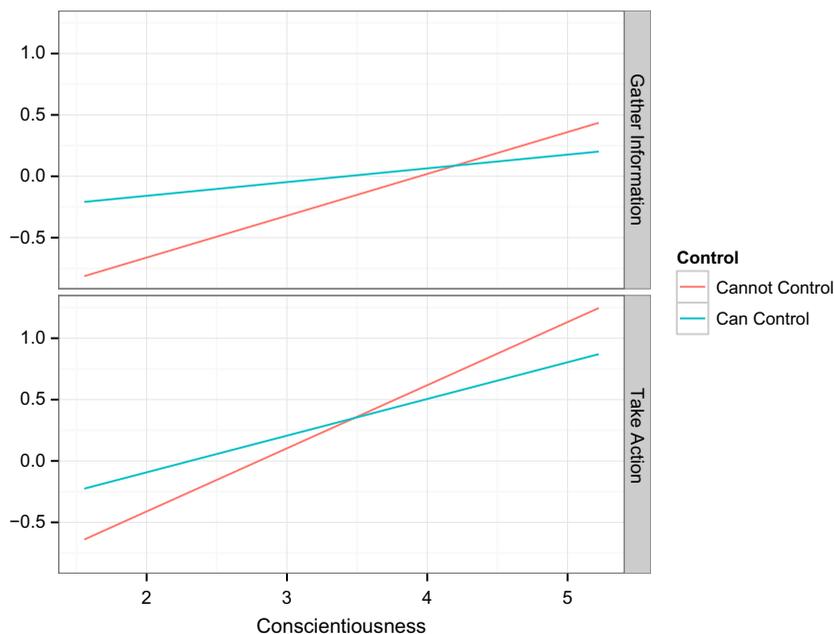


Figure 3. The interaction between conscientiousness and control. Two separate behaviour responses are shown: taking action is in the top panel and gathering information is in the bottom panel. The relationship between conscientiousness and these responses is graphed, with different lines representing the two experimental conditions: control and no control.

weaker predictor of adjusting expectations ($b = .21$, $SE_b = .07$, $p = .003$). Overall, it appears that conscientiousness predicts responses only when controllability is low. Similarly, neuroticism only predicts responses when likelihood is low. Thus, when the situational demands are low (e.g. the event is unlikely to happen or little is required from the patient), personality characteristics have a strong impact on behaviour. However, when situational demands are high, those demands limit the importance of personality.

Discussion

The current study investigated both situational and personality factors that influence how people respond to health news. Four important findings emerged. First, there is a large range of ways people respond to health news. Second, the responses to health news were associated with situational factors such as the severity, controllability and likelihood of health outcomes. Third, personality characteristics influence behavioural responses above and beyond the situational factors. Fourth, we found evidence that these personality characteristics mattered more in some situations than others. Overall, we find that how people respond to health news is varied and depends on a number of situational and dispositional factors. Below we discuss the implications of this study for better understanding the health process.

To our knowledge, the current study is the first to empirically examine the styles of responses to health news. The five factor structure suggests that patients respond to health news in ways that range from behavioural to emotional to cognitive to social. Ultimately, differences in responses to a health event explain why some patients experience better quality of life and physical health outcomes than other patients (de Haes & Koedoot, 2003). While most of the behaviours are positive or at least not harmful (e.g. getting more information, seeking support), the avoid problem factor could be extremely detrimental if patients are not adhering to their medication or going to follow-up appointments (Horne, 1997). Future research should examine what response is best suited for particular diseases or outcomes, thus potentially alerting physicians to ways they can aid patients (e.g. locate social support groups, provide more information about the potential outcomes). Furthermore, the extent to which responses to health events mirror a patient's general coping strategies is unexplored. It may simplify research to know that patients will take similar attitudes towards stressful health events as they would to other events (e.g. Carver et al., 1989).

Situational factors influenced these behavioural responses, replicating the major findings of Sweeny and Shepperd (2009). These findings were largely in the same direction: greater severity, control and likelihood predicted less waiting or acceptance and more action. Ultimately, these findings will help inform physicians on how to best frame health news through highlighting the severity, likelihood or controllability of downstream consequences to subtly push patients towards optimal responses. For example, a physician who hopes their patient will engage in a treatment might emphasise how much control the patient has over their outcomes. Despite the importance of severity, controllability and likelihood of outcomes, other factors influence patient responses. For example, physicians not only control how news is provided to patients but they also control the tone of the interaction; when a physician creates a supportive environment for the patient, in addition to setting expectations, patients can experience better health

outcomes (Di Blasi, Harkness, Ernst, Georgiou, & Kleijnen, 2001). Other factors are outside the physician's control. The resources available to patients place a large constraint on their response options whereby those with little income are unable to receive consistent care through general practitioners or specialists and consequently use emergency services more frequently (Miller, 2000). Future research should address the relationships between these additional factors and health responses.

Even after accounting for the influence of situational factors, personality traits influenced behavioural responses. While the association between personality traits and health behaviours is well established (e.g. Bogg & Roberts, 2004), few studies consider the effect that personality has on behaviour after a health event. This is problematic because traits can have different associations with behaviour when a health problem is present (Weston & Jackson, 2014). Moreover, some health behaviours are only applicable after a health event occurred, such as glucose-level monitoring for diabetes. As a result, it is important to begin to document the behaviours associated with personality after health events to fully understand how personality influences health status.

In the current study, the patterns associated with conscientiousness largely match the existing research on this trait and health behaviours. Conscientiousness has been linked with better health and longevity (e.g. Jackson et al., *in press*), so finding that this trait predicts adaptive response behaviours is consistent with the processes that lead up to the health event. The association between conscientiousness and the behaviour-focused responses lines up with research linking conscientiousness to actively engaging in other health behaviours (Bogg & Roberts, 2004) and behaviour in general (Jackson et al., 2010).

Perhaps the most intriguing finding is that neuroticism predicted greater endorsement of all behavioural categories. The positive relationship between neuroticism and the first behavioural response, avoid problem, is evidence of unhealthy coping. However, there are also positive relationships between neuroticism and the healthier behavioural response factors. This positive and negative side of neuroticism may indicate that there are negative and positive health-related consequences of being neurotic. On the well-established negative side of neuroticism, anxiety leads individuals to act in maladaptive ways (Friedman, 2000). In the current study, anxious patients are essentially reporting that they will engage in any behaviour they can think of. But engaging in these contradictory behaviours could lead to a null effect or no benefit, or it could lead to worse health and well-being. On the positive side, anxiety could be channelled towards maintaining or increasing beneficial behaviours through vigilance (Friedman, 2000). Currently, the majority of studies that test this so called 'healthy neurotic' only do so in individuals who are both high in neuroticism and high in conscientiousness – taking the worry and pairing it with a trait associated with doing something about that worry (e.g. noticing and then stopping poor health habits; Turiano et al., 2013; Weston & Jackson, 2014). However, this interaction did not predict health responses. It has been proposed that the association with conscientiousness may not be necessary for this positive side of neuroticism to come out. Instead, the presence of a real threat, such as the possibility of death due to a major health event, may be the key to channelling anxiety into vigilant action (Weston & Jackson, 2014). Consistent with this interpretation is the lack of association between neuroticism and perceptions of health news, as those high in neuroticism did not perceive health news as more severe than it actually was. Our findings suggest that neuroticism does not lead to catastrophising existing health

problems but instead may channel some of the worry associated with neuroticism to positive behaviours. In other words, healthy neuroticism may manifest as finding problems where none exist (e.g. Watson & Pennebaker, 1989) but when there is a reason to worry, such as when someone is diagnosed with cancer, anxiety is channelled away from perception of threats and into action.

We also found that person–situation transactions occurred such that neuroticism and conscientiousness were most predictive of responses when the health news was not likely or uncontrollable, respectively. In other words, the presence of a strong situation, like the diagnosis of an extreme illness, can overwhelm the effects of personality traits. However, there is likely ambiguity in the potential health outcomes for most patients, e.g. some high cholesterol patients will develop heart disease but other will not. In these weaker situations, personality will play a larger role in driving behaviour (Cooper & Withey, 2009).

The relationship of personality and responses adds to general call for the inclusion of personality measurement in health care (Chapman, Roberts, & Duberstein, 2011; Israel et al., 2014). One way that personality assessments can be used in an applied setting is through the tailoring of recommendations by a physician. For example, our findings indicate that a patient who is low on neuroticism may be less likely to seek out information about his or her medical condition; thus, a physician may want to spend more time reviewing the important details of that condition and its treatments. This low-cost form of personalised medicine adds to the benefits of including personality in health care settings for preventative reasons, given that personality traits are known risk factors for chronic disease and health status (Weston et al., 2014). Together, a patient's personality scores can be used to guide physicians in targeting patients who require more screening prior to a health event and specific behavioural changes after the event occurs. Assessments of personality can be easily gathered through friend, family or even staff ratings (e.g. Israel et al., 2014; King, Jackson, Morrow-Howell, & Oltmanns, 2014), making this a low-cost improvement to the health care system.

The current study improves the literature by testing the effects of both situations and personality on health responses. Furthermore, this study empirically derives response styles, as opposed to relying solely on theory. The primary limitation is that the current study is unlikely to have captured all possible responses to health news. We can see the response styles found here were conceptually similar to those responses styles suggested in the Bad News Response Model (i.e. Watchful Waiting, Active Change, Acceptance and Non-Responding; Sweeny & Shepperd, 2007), suggesting some convergence on response styles. However, these styles are unlikely to capture extreme and rare responses that a few individuals may engage in. It is possible that some items presented to the participants could have been broken down further and allowed for more precise responses (e.g. 'Seek emotional support' may be broken down into information-based support, like 'Seek advice,' and emotion-based support, like 'Seek encouraging words'; Carver et al. 1989). Future research is needed to uncover the range and structure of responses to health news generally, as well as to specific health news. This study is further limited by its use of Internet participants. Research conducted in medical settings, such as tracking the behaviours of patients after a diagnosis, would be ideal. Such a study would incorporate the population of interest and actual behaviour, as well as allow researchers to track behaviours over time, to assess whether additional events or situational changes would influence additional changes in behaviours.

In conclusion, this study found that personality traits were important predictors of how people respond to health news. In doing so, the study adds to a growing call for the inclusion of personality traits in the study of disease responses and primary care. Importantly, our results indicate that in doing so, one needs to also incorporate situational factors, as these moderate the importance of personality traits. Overall, our study finds that including personality traits into health research and practice is one promising way to more personalised and effective health care.

Supplemental Data

Supplemental data for this article can be accessed here: <http://dx.doi.org/10.1080/08870446.2015.1119274>

Disclosure statement

No potential conflict of interest was reported by the authors.

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