

Perceived health in lung cancer patients: the role of positive and negative affect

Jameson K. Hirsch · Andrea R. Floyd ·
Paul R. Duberstein

Accepted: 12 May 2011
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Abstract

Purpose To examine the association of affective experience and health-related quality of life in lung cancer patients, we hypothesized that negative affect would be positively, and positive affect would be negatively, associated with perceived health.

Methods A sample of 133 English-speaking lung cancer patients (33% female; mean age = 63.68 years old, SD = 9.37) completed a battery of self-report surveys.

Results Results of our secondary analysis indicate that trait negative affect was significantly associated with poor physical and social functioning, greater role limitations due to emotional problems, greater bodily pain, and poor general health. Positive affect was significantly associated with adaptive social functioning, fewer emotion-based role limitations, and less severe bodily pain. In a full model, positive affect was significantly associated with greater levels of social functioning and general health, over and above the effects of negative affect.

Conclusions Reduction of negative affect is an important therapeutic goal, but the ability to maintain positive affect may result in greater perceived health. Indeed, engagement in behaviors that result in greater state positive affect may, over time, result in dispositional changes and enhancement of quality of life.

Keywords Positive and negative affect · Perceived health · Role limitations · Lung cancer · Oncology

Introduction

Lung cancer is the leading cause of cancer-related mortality in the United States, accounting for 29% of all cancer deaths [1]. Because lung cancer is often diagnosed in an advanced stage, prognosis is typically poor, with an overall 5-year survival rate of only 15% [2]. Lung cancer patients typically experience many adverse physical symptoms including debilitating fatigue and weakness, pain, shortness of breath, and nausea as well as appetite and weight loss [3].

Not surprisingly, psychological distress is common [4]. Negative affect and depressive symptoms may occur in up to 98% of lung cancer patients, contributing to reduced quality of life [5]. In general, negative affect is associated with greater levels of mental and physical symptoms such as pain and functional impairment and poor perceived health [6], including in cancer patients [7].

Despite the presence of psychological distress in lung cancer patients, many patients are able to identify positive or meaningful aspects of their illness; 63% of a sample of older adult lung cancer patients reported positive meaning and 53% described their illness as a “challenge” to be overcome [8]. Therefore, it is important to distinguish, conceptually, between positive and negative affect; positive affect is more than just the absence of negative affect [9]. Some research suggests that positive and negative affect are two independent constructs, not opposite ends of a single continuum [10]. Positive affect may effectively neutralize some of the consequences of negative affect [11], and research suggests that it is the absence of positive affect, rather than the presence of negative affect, that

J. K. Hirsch (✉) · A. R. Floyd
Department of Psychology, East Tennessee State University,
Johnson City, USA
e-mail: hirsch@etsu.edu

J. K. Hirsch · P. R. Duberstein
Department of Psychiatry, University of Rochester Medical
Center, Rochester, USA

exerts a greater influence on self-reported general health, future expectations of poor health, and functional status [12, 13].

Dispositional models of affect suggest that individuals have an affective set point that they return to following a negative disturbance [14]. Theorists have suggested that those with greater levels of positive affect utilize homeostatic motivational and decision-making processes to regain their typical positive disposition [15, 16]. Patients with greater levels of trait positive affect tend to perceive their global health and functioning favorably and exhibit more adaptive coping and psychological adjustment to disease than individuals with less positive affect, in both cross-sectional [17] and prospective studies [18]. A dispositional tendency toward positive affectivity may help a patient to persevere in the face of adversity, adhere to treatment, and may facilitate provision of instrumental support and satisfaction from caregivers [19, 20].

In this cross-sectional study of treatment-seeking lung cancer patients, we investigated the relationship between affect and perceived health in lung cancer patients. Perceived health is important to study in disease populations due to its association with functional decline, healthcare utilization, quality of life, and mortality [21]. We hypothesized that trait negative affect would be significantly associated with poorer physical and social functioning, more role limitations occurring as a result of physical and emotional problems, more bodily pain, and worse general health. We predicted that trait positive affect would be associated with better physical and social functioning, fewer role limitations, less bodily pain, and better self-reported general health. Further, we hypothesized that trait positive affect would be associated with more adaptive levels of self-reported health, over and above the influence of covariates and trait negative affect, when entered into a single analytic model.

Method

Procedures

Participants were recruited to participate via introduction by their surgeon or oncologist, as part of a larger study focused on the adjustment of caregivers of lung cancer patients [22, 23]. English-speaking patients were eligible for our study if they had been diagnosed with and treated for lung cancer within the last 5 years and had no major sensory or cognitive impairments. After documenting informed consent, a 1- to 2-h interview-based psychosocial assessment was conducted by a trained, masters-level research assistant; surveys were often administered orally and generally occurred in the patients' home.

Participants

Our sample consisted of 133 English-speaking lung cancer patients (33% female). Patients had a mean age of 63.68 years old ($SD = 9.37$) and were predominantly White (97.7%). Average number of years of education was 12.97 ($SD = 2.04$). Nearly half the patients were diagnosed with Stage I cancer ($n = 65$, 49%); the remainder were diagnosed with Stage II ($n = 16$, 12%); IIIa ($n = 19$, 14%); IIIb ($n = 13$, 10%); or IV ($n = 19$, 14%).

Measures

We assessed *positive and negative affect* using subclusters from the NEO-Five Factor Inventory (NEO-FFI) [24], a 60-item, self-report questionnaire measuring five broad domains of personality. Items comprising the positive and negative affect facet scores are derived from the extraversion and neuroticism domains, respectively [25]. Four items are used to assess trait positive affect, and five items are used to assess trait negative affect. Positive affect items include: "I laugh easily;" "I don't consider myself especially 'light-hearted';" "I am a cheerful, high-spirited person;" and "I am not a cheerful optimist." Negative affect items include: "I am not a worrier;" "When I'm under a great deal of stress, sometimes I feel like I'm going to pieces;" "I rarely feel lonely or blue;" "I rarely feel fearful or anxious;" and, "I am seldom sad or depressed." Some items from each subcluster are reverse scored so that higher scores indicate greater trait levels of positive and negative affect. Given each scale's brevity, coefficient alphas were adequate for both positive (.70) and negative (.73) affect. The NEO inventories have been used successfully, with good reliability and validity, in prior clinical and medical research [26, 27].

Perceived health was assessed using the Medical Outcomes Study short form (SF-36) [28], which is a self-report instrument for measuring perceived health status and quality of life. The SF-36 subscales have adequate reliability and validity [29], including in use with older adults with disease [30]. The SF-36 is commonly used to assess health-related quality of life in cancer populations [31]. We assessed the following SF-36 subscales: physical and social functioning; limitations in role functioning due to physical health problems and emotional problems; bodily pain; and general health perceptions. To reduce patient burden, subscales assessing mental functioning were not included because detailed evaluations of psychiatric functioning were conducted as a component of our study.

Statistical analyses

Bivariate correlation analyses were used to determine basic associations between variables; no variables reached

accepted cut-offs for multicollinearity [32]. Multivariate, hierarchical, linear regressions were utilized to assess relationships between independent and outcome variables. Positive and negative affect were examined in independent models and, in a third model, were entered simultaneously to assess independent effects net of shared variance. All analyses statistically controlled for the effects of age, gender, education, and stage of cancer. Statistical significance was defined as $P < .05$, using two-tailed tests.

Results

Lung cancer patients reported a mean trait positive affect score of 9.99 (SD = 2.85) and a trait negative affect score of 7.79 (SD = 3.74). In our sample, negative affect was significantly and inversely associated with physical ($-.25$, $P < .01$) and social functioning ($-.25$, $P < .01$). Negative affect was significantly positively associated with physical ($.17$, $P < .05$) and emotional role limitations ($.34$, $P < .01$) as well as bodily pain ($.29$, $P < .01$). Higher negative affect was also significantly associated with poor general health ($-.40$, $P < .01$; See Table 1). Positive affect was significantly associated with social functioning ($.29$, $P < .01$), fewer emotional role limitations ($-.27$, $P < .01$), less bodily pain ($-.21$, $P < .05$), and general health ($.39$, $P < .01$). Positive and negative affect were moderately correlated ($-.37$, $P < .01$), providing support for their independence and simultaneous inclusion in analytic models.

In independent models, negative affect was significantly associated with poor physical functioning, $t = -2.57$, $P < .05$, Un β (SE) = -1.62 (.63), poor social functioning, $t = -2.22$, $P < .05$, Un β (SE) = -1.49 (.67), and greater role limitations due to emotional problems, $t = 3.08$, $P < .01$, Un β (SE) = 3.57 (1.16). Negative affect was also associated with greater bodily pain, $t = 2.70$, $P < .01$, Un β (SE) = 1.82 (.67), and poor general health, $t = -4.62$, $P < .001$, Un β (SE) = -2.14 (.46).

In another series of independent models, positive affect was significantly associated with adaptive social functioning, $t = 3.27$, $P < .001$, Un β (SE) = 2.73 (.84), fewer emotion-based role limitations, $t = -2.22$, $P < .05$, Un β (SE) = -3.40 (1.53), and less severe bodily pain, $t = -2.35$, $P < .05$, Un β (SE) = -2.03 (.87).

In full models (See Table 2), with positive and negative affect entered simultaneously, negative affect was significantly associated with poor physical functioning, $t = -2.21$, $P < .05$, Un β (SE) = -1.50 (.68), impaired role functioning as a result of emotional problems, $t = 2.46$, $P < .05$, Un β (SE) = 3.02 (1.23), more severe pain, $t = 1.97$, $P < .05$, Un β (SE) = 1.42 (.72), and poorer general health, $t = -3.16$, $P < .01$, Un β (SE) = -1.50 (.48). Over and above the effects of covariates and negative affect, positive affect was significantly related to greater levels of social functioning, $t = 2.62$, $P < .01$, Un β (SE) = 2.35 (.90), and general health, $t = 3.61$, $P < .001$, Un β (SE) = 2.19 (.61). In sum, inclusion of positive affect in our regression model resulted in less robust effects for negative affect; indeed, with the inclusion of positive affect, negative affect no longer had an association with social functioning. A reciprocal pattern also occurred; considering the effect of negative affect, positive affect was no longer related to role functioning linked to emotional difficulties or pain. Yet, despite the effect of negative affect, positive affect was beneficially associated with self-reported physical health.

Discussion

Our results contribute to the growing body of literature linking trait affect to self-reported health [33] and may have implications for quality of life and health promotion interventions in lung cancer and other medical patients. As hypothesized, greater negative affect was significantly associated with poor physical and social functioning and general health, emotion-based role limitations, and greater

Table 1 Bivariate correlations of study variables

	Gender	Education	Stage of cancer	Positive affect	Negative affect	Physical functioning	Physical health role limitations	Emotional problem role limitations	Social functioning	Bodily pain	General health
Age	.15	-.04	-.05	-.10	.06	-.22*	.04	.12	-.11	-.10	-.04
Gender	1.00	.13	.05	-.12	.02	.08	.09	.05	.05	-.12	-.11
Education	-	1.00	.03	-.08	-.11	.23**	-.07	-.04	.03	-.03	.01
Stage of cancer	-	-	1.00	.04	-.02	-.07	-.19*	-.02	-.18*	.02	-.32**
Positive affect	-	-	-	1.00	-.37**	.12	-.05	-.27**	.29**	-.21*	.39**
Negative affect	-	-	-	-	1.00	-.25**	.17*	.34**	-.25**	.29**	-.40**

* $P < .05$; ** $P < .01$; *** $P < .001$

Table 2 Multivariate regressions—positive and negative affect and physical functioning

Variable name	Physical functioning		Role limitations due to physical health		Bodily pain		General health		Social functioning		Role limitations due to emotional health	
	<i>t</i>	Un β [SE]	<i>t</i>	Un β [SE]	<i>t</i>	Un β [SE]	<i>t</i>	Un β [SE]	<i>t</i>	Un β [SE]	<i>t</i>	Un β [SE]
Age	-2.41*	-.61 [1.25]	.06	.03 [.39]	-1.39	-.38 [.27]	-.01	-.00 [.18]	-1.27	-.33 [.26]	.73	.34 [.47]
Gender	1.50	7.72 [5.16]	1.04	8.21 [7.92]	-1.39	-7.64 [5.48]	-.38	-1.36 [3.61]	1.63	8.75 [5.35]	-.34	-3.26 [9.70]
Education	2.20*	2.58 [1.17]	-.93	-1.68 [1.80]	-.37	-.46 [1.25]	.31	.26 [.82]	.14	.17 [1.22]	-.65	-1.51 [2.32]
Stage of cancer	-1.80	-2.85 [1.58]	2.38*	5.79 [2.43]	.18	.30 [1.68]	-4.63***	-5.14 [1.11]	-2.83**	-4.66 [1.64]	.47	1.41 [3.02]
Negative affect	-2.21*	-1.50 [1.68]	1.35	1.41 [1.04]	1.97*	1.42 [.72]	-3.16**	-1.50 [.48]	-1.14	-.80 [.70]	2.46*	3.02 [1.23]
Positive affect	.46	.40 [.87]	.27	.35 [1.33]	-1.47	-1.36 [.92]	3.61***	2.19 [.61]	2.62**	2.35 [.90]	-1.30	-2.07 [1.59]

Dependent variables = SF-36 subscale scores; Positive and negative affect = facet subscales of NEO-FFI extraversion and neuroticism domain scores

* $P < .05$; ** $P < .01$; *** $P < .001$

bodily pain. We also confirmed our hypothesis that greater positive affect was significantly associated with higher levels of social functioning and general health, and less bodily pain.

Previous research suggests that negative affect is associated with poor perceived health [6, 34], and our findings extend this to patients diagnosed with lung cancer, a diagnostic group often beset by affective dysfunction [4]. Concerns about declining functioning and increased mortality risk are common in cancer patients, and patients with negative affect are more likely to ruminate about the past or catastrophize about the future [35]. Lung cancer patients may experience a sense of guilt if they feel they have contributed to their own illness via poor health decisions, such as use of cigarettes [36]; on the other hand, the ability to formulate an explanation for illness may facilitate adaptation [37]. Importantly, low positive affect, in addition to the presence of negative affect, appears responsible for many aspects of poor psychological functioning in medical patients [7].

To the extent that negative affect can be ameliorated and positive affect enhanced, a patient may experience some level of emotional and physical benefits from cognitive-behavioral, motivational, and interpersonal therapeutic approaches [38, 39]. Although it might be argued that trait-based characteristics are unable to be modified, research suggests that state and trait affect are somewhat isomorphic and that encouragement of trait-like behaviors, such as acting extraverted, mimics the benefits of actually having that trait [40]. Additionally, encouragement of state-like experiences that promote positive affect may lead to longer-term changes in personality, perhaps via bio-behavioral function or increased susceptibility to positive events [41, 42]. Such benefits may occur because cancer patients able to maintain positive affect receive direct health benefits via enhanced psychoneuroimmunological functioning [43], although other factors such as interpersonal relationships may also be of particular importance.

We found that positive affect was related to greater levels of social functioning in lung cancer patients, which may have implications for the patient-caregiver relationship and for enhancing patient quality of life. Social functioning, size of social networks, and perceived social support are associated with lower levels of morbidity and mortality in cancer and other diseases [44]. Positive affect may also enhance the likelihood of eliciting caregiving from others [45]. Patients with a larger or more mobilized social network might receive encouragement to seek treatment or maintain treatment regimens. Finally, an ample social network may also facilitate greater access to and satisfaction with care [46]; patients with a strong social network may receive important treatment information and recommendations from others.

Lung cancer patients in our sample with higher levels of positive affect also reported higher levels of perceived general health. Although overly optimistic reporting of perceived health by some patients may explain our results [47], the pattern of our findings may also occur because individuals with high levels of trait positive affect are more likely to utilize a problem-focused coping strategy, perhaps resulting in adaptive health behaviors, while those with negative affect tend to utilize emotion-focused coping [7]. Directly attempting to address and overcome health-related life stressors may contribute to subsequent emotional and social benefits [16]. However, for patients who may perceive their life as time-limited, due to natural aging or disease, disengagement from unattainable goals or the adoption of a more emotion-focused approach to goal identification and interpersonal relationships may help to maximize positive emotional experiences [48, 49].

It is important to acknowledge the influence of negative affect on quality of life in this sample. In an independent model, we found that negative affect was associated with poor physical and social functioning, impaired role functioning as a result of emotional problems, more severe pain, and poorer general health. When both positive and negative affect were included in a full model, however, negative affect was no longer associated with poor social functioning; instead, positive affect was associated with better social functioning. Additionally, the beneficial independent influence of positive affect on pain-reporting and role limitations due to emotional difficulties dropped out of significance, yet a salutary effect was found for general health. This pattern of findings suggests that, in the context of otherwise negative affect, the presence of at least some positive affect may contribute to better social functioning and general health; this pattern may have important clinical implications. Even in the face of grave illness, and the low mood that often accompanies it, the promotion of positive affect may be of benefit, perhaps as a catalyst for improvement of social interactions but also for enhancement of perceived health quality of life. Because of its deleterious effects on quality of life, reduction of negative affect also remains an important clinical goal [50].

Another interpretation of our findings could also be entertained. Individuals with higher trait levels of positive affect may interpret health questionnaire items differently than those with higher trait levels of negative affect [51]. When asked about current well-being, an individual with greater levels of positive affect might compare themselves to other patients with a similar disease, minimizing their own perceived discomfort or limitations. In contrast, an individual with greater levels of negative affect might compare themselves to all other adults their age, resulting in a self-assessment as someone with less abilities or more suffering than the comparison group [51]. Future research

utilizing anchored comparisons or employing item response theory could address this possibility [52].

Finally, it is important to acknowledge the potential complexities that could be involved in the translational application of our findings. First, the trait-based or “set point” positive affect assessed by our measure of personality may be less amenable to change, both in the short and long-term, than state affect [53]. Yet, some research indicates that dispositional affect may be less stable for some age groups and under some contextual life circumstances; as an example, positive affect is more likely to vacillate for younger than older adults with the experience of a positive life event [54] and may reactively vacillate in response to life events. Genetic make-up, through its effect on personality, may also influence the degree to which an individual’s level of affectivity is able to be altered [55]. Negative events such as marital transitions, widowhood, unemployment, and medical illness are also noted to contribute to permanent shifts in subjective well-being [56], of which affect is a component, particularly for individuals already high in negative affect; likewise, extremely positive events may shift, upwards, the set point of an individual with an already elevated level of positive affect. Less extreme occurrences, such as greater levels of social interaction, also contribute to long-term increases in positive affect [57], whereas greater functional impairment resulted in reduced positive affect over time.

Second, although findings are mixed, the robustness of interventions to increase positive affect may be moderate, with diminishing results over time [58, 59]; however, a lack of consensus in this area may also be due to a paucity of prospective investigation. Preliminary research, with effects lasting between 6 and 54 months, suggests that changes in well-being and affect can be sustained—with intentional behavioral, cognitive, and volitional activity [60, 61]. Further, in the context of declining health, increases in coping resources (e.g., self-mastery, self-efficacy, and self-esteem) contribute to greater positive affect over time [62]. Such results suggest that cognitive-behavioral interventions to bolster these types of characteristics may have a more persistent effect than previously considered. Rigorous, longitudinal research is necessary to determine the effect of intervention on extended manifestation and influence of positive affect.

Although our study is the first to focus on the role of trait affect in a group of patients with a single type of cancer diagnosis, our results must be understood in the context of several limitations. Our sample was primarily White and consisted of only lung cancer patients; future research in populations with greater socio-cultural and disease diversity is necessary. While secondary analysis is common in psychosocial cancer research [63, 64], perhaps due to the difficulty of obtaining data from actively ill

patients, such an approach often restricts the ability to examine complex associations between variables; for instance, in our study, we did not have information on prognosis or time since diagnosis. Further, our cross-sectional design precludes the examination of causal associations and bi-directionality is a possibility; for instance, those with greater negative affect may report poorer quality of life. Therefore, caution is needed in the interpretation and generalizability of our findings. We also relied exclusively on self-report in this study, raising questions about shared method variance. On the other hand, the self-report measures of trait affect and self-perceived health used in this study are well-established, and we were primarily interested in examining the associations between these self-report measures. Additionally, we did not have an ideal measure of affect and, therefore, relied on a novel subclustering technique utilizing domain scores from a gold standard of personality research, the NEO-FFI. Whereas we examined trait affect, investigation of the association between state affect and health-related quality of life is important. Prospective research using measures intended to purposefully and more thoroughly assess affect are necessary.

Lung cancer is a disease that takes a tremendous physical and emotional toll on patients and their families. To our knowledge, this represents the first published study of dispositional positive and negative affect and perceived health in lung cancer patients. Although our findings may have implications for the development of targeted interventions aimed at promoting quality of life, it is important to note that positive affect may have limited benefits. For example, in our study, trait affect was not associated with role limitations due to physical problems. Some aspects of cancer-related illness burden and impairment may not be responsive to psychosocial interventions or simple encouragement from caregivers and health providers. Further, positive affect may be of little psychological solace in the context of a poor prognosis [33]. Clinicians, therefore, may want to consider a complementary therapeutic approach, simultaneously reducing negative affect while attempting to bolster and capitalize on positive affective characteristics.

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