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Abstract

Objective: We compared social support with other potential psychosocial predictors of post-traumatic stress after cancer. These included family identification, or a sense of belonging to and commonality with family members, and family constraints, or the extent to which family members are closed, judgmental, or unreceptive in conversations about cancer. We also tested the hypothesis that family constraints mediate the relationship between family identification and cancer-related post-traumatic stress. Methods: We used a cross-sectional design. Surveys were collected from two hundred and five colorectal cancer survivors in Tayside, Scotland. Results: Both family identification and family constraints were stronger independent predictors of post-traumatic stress than social support. In multivariate analyses, social support was not a significant independent predictor of post-traumatic stress. In addition, there was a significant indirect effect of family identification on post-traumatic stress through family constraints. Conclusions: Numerous studies demonstrate a link between social support and post-traumatic stress. However, experiences within the family may be more important in predicting post-traumatic stress after cancer. Furthermore, a sense of belonging to and commonality with the family may reduce the extent to which cancer survivors experience constraints on conversations about cancer; this may, in turn, reduce post-traumatic stress.

Background

Post-traumatic stress (PTS) is one of the potential psychological consequences of cancer; symptoms of cancer-related post-traumatic stress include re-experiencing of events, avoidance of reminders of cancer, and hyperarousal symptoms such as an exaggerated startle response [1]. Levels of post-traumatic stress may vary according to a number of psychosocial determinants. For instance, there is an extensive literature documenting associations between social support, formulated in many different ways, and PTS [e.g., 2, 3-6]. However, there are a number of problems with the way that "social support" is conceptualized. One such problem is that social support is a nebulous term that encompasses many different and potentially disparate dimensions, as discussed by Haslam, Reicher, and Levine [7]. These conceptual problems lead to questions relating to who should optimally provide such support, when it is most needed, and how that support should best be offered to someone who has had cancer.

The current cross-sectional survey study auditions other psychosocial factors alongside social support to determine which is the best predictor of PTS. In particular, this study investigates two aspects of family life that might influence PTS after cancer. PTS can lead to feelings of isolation from other people [8], and in some cases family connections may be among the few social relationships that are maintained throughout diagnosis and treatment. Therefore, it is of crucial importance to understand how family dynamics contribute to or protect against post-traumatic stress. The first aspect of family life that this study investigates is family identification, or a sense of belonging to and commonality with family members. Research on social identification, inspired by the social identity approach [9], emphasizes the importance

of "ingroups," rather than generalized others, and the importance of a subjective sense of belonging to ingroups in terms of psychological well-being [10]. It is theorized that this sense of belonging provides the basis for meaningful and mutual support, which improves mental and even physical health outcomes [7]. In this context, the social identity approach fills a gap left by the literature on social support by suggesting who might be most helpful to those who have experienced cancer, i.e., those with whom cancer survivors might perceive a sense of belonging and commonality. Identification is correlated with PTS [11], but the relative strengths of the relationships between PTS, identification, and social support have never been established.

A second potential psychosocial determinant of PTS is family constraints, or the extent to which family members are perceived to be critical, judgmental, or "closed" in conversations about cancer [12]. This concept comes from social cognitive processing theory, or social constraints theory [13]. This theory fills another gap in the literature by suggesting when support might optimally be provided (during conversations) and how that support might best be provided (by avoiding constraints on conversation). Social constraints are correlated with PTS [14], but many of the studies in this area tend to focus on dyadic, and specifically spousal relationships [e.g., 15, 16]. The current study investigates perceived social constraints on conversations about cancer within the family.

Furthermore, this study aims to establish whether there is a relationship between family identification and family constraints in determining levels of PTS. In particular, it is possible that family constraints mediate the relationship between family identification and PTS. In other words, a sense of belonging and commonality with the family could lead to lower levels of constraints within family conversations about cancer, which in turn leads to lower levels of PTS. This hypothesis is

concordant with literature showing that identification with social groups is beneficial in terms of other psychosocial outcomes [17] and in terms of mental health [18, 19], and with literature showing that social constraints increase PTS [14]. If it is empirically supported, then this mechanism might address some of the abovementioned problems with the conceptualization of "social support" by theorizing how support should be offered, when it should be offered, and by whom.

To summarize, the hypotheses of this study were as follows. The first hypothesis was that family identification and family constraints will predict levels of cancer-related PTS independently from social support (H1). Concurrently, we wanted to explore the relative strengths of family identification, family constraints, and social support as predictors of PTS. Our second hypothesis was that family constraints will mediate the relationship between family identification and PTS (H2).

Methods

Participants

Participants were colorectal cancer survivors (N = 205) who were treated at Ninewells Hospital and Medical School in Dundee, Scotland. Average age at the mailing of the first survey was 71.0 ($SD = 8.2$); the youngest participant was 37 and the oldest was 85. Age was recorded on the day the participant was identified by the oncologist as eligible for the study. Average age at diagnosis was 61.9 ($SD = 8.5$) and average time between diagnosis and data collection was 9.1 years ($SD = 4.9$), although time since diagnosis ranged widely from 1.0 to 19.0 years. 60.5% of the participants were men and 39.5% were women. 15.6% of participants had less than a high school education, 42.0% had a high school education, 13.7% had a college

diploma, and 27.8% had at least a university education. Most participants (97.6%) defined themselves as "white."

Clinical data were extracted from patients' medical records. Cancer stage was classified according to modified Duke's stages [20]. 10.2% of respondents had minimally invasive polyps or stage A tumors; 35.1% had stage B tumors; 47.8% had stage C tumors; and 6.8% had stage D tumors, including locally advanced and metastatic tumors. The two most common types of surgery performed were anterior resection (23.4%) and right hemicolectomy (15.6%). Of participants for whom data were available, 43.3% did not have laparoscopic surgery while 38.1% did. Of the 65 patients for whom data were available, 66.2% did not have a stoma and 33.8% did.

Participants lived in Dundee City (33.7%), Fife (11.2%), Angus (31.2%), Perth and Kinross (21.5%), Aberdeenshire (1.5%), and Edinburgh (0.5%). Deprivation data were derived from participant postcodes as indexed by the Scottish Index of Multiple Deprivation (SIMD; percentile data from 2009, rank data from 2006) [21]. 24.4% of the sample came from the two most deprived quintiles (fifths) of the SIMD postcodes and 57.5% came from the two least deprived quintiles. In the SIMD, postcodes are also ranked from most deprived in Scotland (1) to least deprived (6,505); the mean rank was 3,895 ($SD = 1,623$).

Measures

Participants were mailed a two-page double-sided survey including demographic questions and validated scales. Gender, education, and ethnicity were assessed via self-report. The following scales were included in the survey.

PTS was assessed using the Post-Traumatic Stress Checklist (PCL) [22]. The PCL is a seventeen-item self-report scale assessing all three DSM-IV symptoms of PTS: hyperarousal, avoidance and emotional numbing, and intrusive/re-experiencing

symptoms. The PCL has demonstrated acceptable convergent and discriminant validity [23]. The PCL is widely used in cancer research. The PCL-C, the civilian version intended for non-combat samples, was used, but amended to refer to cancer rather than a generic stressful event.

Social support was assessed using the Medical Outcomes Study (MOS) social support survey [24], as shortened by the Consortium of Multiple Sclerosis Centers Health Services Research Subcommittee [25]. This shortened version of the MOS survey includes five items rather than the standard eighteen. The subset included the five items which were most highly correlated with the overall MOS social support survey score, including at least one item representing each subscale of the original scale (tangible, emotional/informational, affectionate, and positive interaction support) [25]. This scale has demonstrated good convergent and discriminant validity [26].

Family conversational constraints were assessed using a social constraints scale devised by Lepore, Silver, Wortman, and Wayment [13]. This scale is comprised by five items assessing participants' perception that other people are judgmental or avoidant in conversations about a stressful event. The scale was also amended to reference conversations about cancer in particular. Participants were asked to complete this scale with reference to the family. Detailed psychometric assessment of this scale is not available because it was not in use for long before being supplanted by a longer scale [27].

Finally, family identification was assessed using the Group Identification Scale [GIS; 28]. The GIS is a four-item global scale of identification with an ingroup focusing on a sense of belonging to the ingroup as a whole and a sense of similarity with the members of the ingroup. The GIS has good convergent and discriminant

validity as well as good temporal stability [28]. Participants were asked to complete this scale with reference to the family.

Procedures

Potential participants were identified on a rolling basis from March 2013 to October 2015 using the Tayside Colorectal Cancer Database. Survey packs were mailed in batches. Eligible participants were clinically disease-free survivors of colorectal cancer, aged over 18 who had been treated at the Tayside Cancer Centre. Patients with active cancer, or other serious illness, were excluded.

Survey packs, mailed from the oncologist at the hospital, included an invitation letter from their oncologist, a survey, and an information sheet. Consent was implied by the return of the survey in a pre-addressed envelope. Participants were anonymized using a unique study number. The study was approved by the East of Scotland Research Ethics Committee 1.

Statistical methods

Data were analyzed using IBM Statistical Package for the Social Sciences (SPSS), Version 22. Scale totals were calculated by summing all items included in the scale after reversing any required items, as per published conventions for each scale. Reliability of each scale was assessed using Cronbach's alpha. T-tests and chi-square tests were used to determine whether responders differed from non-responders. Bivariate correlations were calculated to examine relationships between continuous variables. Multiple linear regression was used to examine predictors of PTS and the Preacher and Hayes [29] technique for examining indirect effects was used to assess mediation.

Results

Comparing respondents to non-respondents

Anonymised data were available from clinical records for participants who responded (N = 205) as well as for non-respondents (N = 281). 45.8% of men and 37.5% of females responded, although gender was not statistically significantly related to whether someone responded or not, χ^2 (1, $N = 486$) = 3.2, $p = 0.07$. Respondents and non-respondents did not differ in terms of mean age, $t(470.9)$ = -0.54, $p = 0.59$. All geographic areas sampled were represented.

The mean SIMD vigintile corresponding to respondents' postcodes was 12.6, while non-respondents' mean postcode vigintile was 11.7; this difference bordered on significance, $t(477) = -1.94$, $p = 0.05$. As SIMD vigintiles range from 1 to 20 in order of decreasing deprivation, this indicates that respondents were slightly more "affluent" or "privileged" than non-respondents. This is also reflected in the comparison between mean SIMD area deprivation rank; out of a possible 6,505 areas, respondents' average rank was 3,896 while non-respondents' average rank was 3,611, $t(482) = -1.88$, $p = 0.06$. While these differences did not reach statistical significance, the trend suggested that respondents were slightly less deprived overall than non-respondents.

In terms of clinical variables, response rates were not related to Duke's stage, χ^2 (3, $N = 486$) = 2.7, $p = 0.43$; having had a stoma, χ^2 (1, $N = 83$) = 0.1, $p = 0.74$; or having had laparoscopic surgery, χ^2 (2, $N = 99$) = 5.0, $p = 0.08$.

Scale reliability

Scale reliabilities were satisfactory for PTS (α = 0.94), social support (α = 0.91), and family identification (α = 0.91). Concerning family constraints, initial reliability was acceptable (α = 0.76); however, dropping one item ("How often do family members make you feel that you can discuss your feelings about cancer with them when you want to?") improved the α value slightly to 0.78. Therefore, we decided to exclude this item from the calculation of participants' total score on family constraints.

Descriptive statistics

Means, standard deviations, and minimum/maximum scores for PTS and psychosocial variables are shown in {Table 1.

{Table 1: Descriptive statistics for PTS and psychosocial variables}

Univariate analyses

Pearson's correlations were run to determine the relationship between PTS and demographic, clinical, and psychosocial variables. These univariate relationships are shown in {Table 2. PTS correlated negatively and significantly with age (r = -0.34), social support (r = -0.24), and family identification (r = -0.37). PTS was found to correlate positively and significantly with family constraints (r = 0.62). There were small but significant negative correlations between PTS and time since diagnosis (r = -0.16) and the two SIMD indicators of deprivation (r = -0.17 for SIMD vigintile and r = -0.16 for SIMD area rank). Therefore, there was a tendency for PTS to decrease with increasing affluence. An almost perfect correlation between 2006 SIMD area rank and 2009 vigintile (r = 0.98), suggests that area deprivation did not change substantially between 2006 and 2009. Both were weakly but significantly correlated

with PTS, indicating that either is an acceptable control variable for social deprivation.

{Table 2: Correlation matrix showing univariate relationships between PTS and clinical, demographic, and psychosocial variables}

PTS did not seem to differ in accordance with any of the other demographic or clinical variables that were recorded.

Predictors of PTS

Multiple regression was performed to assess the independent effects of family identification, family constraints, and social support on levels of PTS, while controlling for age, social deprivation, and time since diagnosis. Preliminary analyses confirmed the suitability of the data for linear regression. The results of this regression analysis are shown in {Table 3, below. These results reveal that, concerning the psychosocial variables, both family identification and family constraints exert statistically significant effects on PTS, with the effects of family constraints being noticeably stronger ($\beta = 0.54$) than the effects of family identification ($\beta = -0.14$). In contrast, the effects of social support on PTS were very small and non-significant ($\beta = 0.03$). Concerning the control variables, age was the only one to have a statistically significant influence on PTS ($\beta = -0.20$). The regression model overall explained 47% of variance in PTS ($R^2 = 0.47$).

{Table 3: Summary of multiple regression analyses for variables predicting PTS (N=205)}

Mediation analyses

As specified above, mediation models were assessed using Preacher and Hayes' [29] indirect effects technique and Andrew Hayes' PROCESS add-on for SPSS [30]. A 99% confidence interval for bootstrapping estimates was specified. Controlling for current age, deprivation, and time since diagnosis, there was evidence that family identification exerted a significant indirect effect on PTS through family

constraints, b = -0.45, 99% BCa CI [-0.93, -0.17]. See {Figure 1 for an illustration of this indirect effect.

{Figure 1: A diagram showing the indirect effect of family identification on PTS through family constraints}

To determine the effect size of this mediation, the completely standardized indirect effect was computed. This figure, -0.21 [99% CI -0.36, -0.10], refers to the number of standard deviations by which PTS decreases for each standard deviation increase in identification indirectly via constraints [31]. In other words, for every one standard deviation increase in family identification score "funneled through" family constraints, one could expect a 0.21-standard deviation decrease in PTS score.

Conclusions

In general, these results seem to support the first hypothesis that family constraints and family identification predict PTS independently of social support. The multiple regression analyses show that both family identification and family constraints are significant independent predictors of PTS, although constraints predict PTS more strongly than identification. Both, however, are better predictors than generic social support, which exerts no independent effect on PTS. This finding suggests that interventions related to family functioning, such as systemic and family therapy, may be particularly useful after cancer diagnosis and treatment.

This finding is also particularly interesting in light of the well-researched link between social support and PTS. In Brewin et al.'s [6] meta-analysis of post-traumatic factors associated with PTS, they found that post-traumatic social support is one of the variables most strongly related to levels of PTS. This finding has been so frequently replicated as to pass into accepted wisdom. However, the present study shows that other psychosocial factors, particularly those relating to experiences within

the family, may be more important in predicting PTS than generic social support from other sources. However, while generic social support may not be predictive of PTS, there is evidence that support may be helpful when provided within the context of a group with which one identifies [17]. Meanwhile, the current study shows that identification may pave the way for lower constraints, which may be construed as a type of support. Therefore, there is more research to be done to determine when, and within what social contexts, support is most helpful.

Another noteworthy finding is that the magnitude of the relationship between family constraints and PTS is quite high, almost a "strong" correlation ($r = 0.62$). This speaks to the close relationship between these conversations and PTS. However, because the data are cross-sectional, it is not clear from this analysis whether there is a bidirectional relationship between these two variables. Avoidance of reminders of the trauma (in this case, cancer) is a feature of PTS, but constraints reflect an experience which is subtly different from avoidance: constraints reflect the perception that other people are not receptive in conversations about the trauma, while people with avoidance symptoms might see other people as being too open to talking about cancer. Regardless, there are other mechanisms by which PTS might cause conversational constraints. For instance, PTS may contribute to social isolation, which in turn might contribute to increased constraints within relationships. So, while group constraints seem to be highly related to PTS in this cross-sectional analysis, longitudinal data would provide better evidence of the directionality of this link.

The second hypothesis tested in this study was that family identification facilitates lower conversational constraints within the family, which, in turn, lowers PTS. Using Preacher and Hayes' [29] indirect effects technique, we found evidence of a statistically significant indirect effect of family identification on PTS through family

constraints. However, as mediation is an attempt to explain causal pathways, cross-sectional data cannot provide definitive evidence that mediation does or does not exist [32]. Rather, the results from this part of the analysis are suggestive of mediation, although they cannot prove it.

Of the control variables, age was the strongest independent predictor of PTS. This relationship has been established previously [33]. However, despite literature showing that women experience higher levels of PTS than men [34], the mean PTS scores for men and women did not differ in this sample. There was no significant effect of education level on PTS, although higher deprivation was associated with lower PTS. Levels of PTS did not seem to differ by locality within our region. No clinical variables were associated with levels of PTS, although time since diagnosis was weakly associated with PTS.

With the exception of the fact that respondents tended to be more affluent, this sample of respondents seems to be representative of the population of Tayside cancer survivors as a whole. The mean national area deprivation rank of respondents was 3,896 out of a possible 6,505. Although there does seem to be some sampling bias, we could argue that deprivation levels among respondents are, in national terms, at approximately the middle of the ranks.

Our study's limitations require discussion. Firstly, ceiling and floor effects meant that some of the variables had a positive or negative skew. Although this is not a requirement for using regression and related techniques [35], this may reflect participants' desire to communicate that their coping with cancer was mostly positive. For instance, most participants endorsed only a few symptoms of PTS. Only nine participants (4.4%) met a conservative 50-point cut-off for post-traumatic stress disorder. Likewise, the majority of participants reported low constraints and high

identification and social support. It is difficult to determine whether these scores are accurate reflections of participants' well-being, or whether these scores are partially influenced by sociocultural imperatives to "think positively." Indeed, many of the questions were highly personal, and the tendency to provide a positive depiction of one's coping and one's social life would be understandable. It is possible that this might mean that some of the correlations provided above are somewhat inflated. However, this cannot explain why social support is less highly correlated with PTS, while constraints are quite highly correlated.

Taken at face value, however, the results demonstrate that colorectal cancer survivors in Tayside are not faring poorly, at least in terms of the variables measured. This is consistent with Wells et al. [36], who showed that cancer survivors in Scotland generally report a good quality of life, while only a minority report poor outcomes.

Finally, these data provide intriguing avenues for further inquiry, but from the cross-sectional data available, it is impossible to make causal claims. The present research team is currently collecting follow-up data from survey participants, which will provide stronger evidence for causality. However, this study demonstrates a clear pattern whereby generic social support is not necessarily the only psychosocial factor influencing PTS after cancer; family relationships, and family conversations about cancer, may also be important in predicting PTS.

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Tables

Table 1: Descriptive statistics for PTS and psychosocial variables

Variable	*N*	Mean	Standard deviation	Observed range	Possible range
PTS	203	24.0	10.2	17-74	17-85
Social support	201	20.3	5.7	5-25	5-25
Family constraints	196	5.4	2.6	4-16	4-20
Family identification	196	24.8	4.6	4-28	4-28

Table 2: Correlation matrix showing univariate relationships between PTS and clinical, demographic, and psychosocial variables

	1	2	3	4	5	6	7
1. PTS							
2. Current age	-.34**						
3. Social support	-.24**	.01					
4. Family constraints	.62**	-.16*	-.39**				
5. Family identification	-.37**	.18*	.34**	-.39**			
6. Time since diagnosis	-.16*	.24**	-.03	-.04	-.00		
7. 2009 SIMD vigintile	-.17*	.17*	.16*	-.06	-.04	.19**	
8. 2006 SIMD area rank	-.16*	.18*	.17*	-.06	-.01	.16*	.98**

*Significant at the p<0.05 level

** Significant at the p<0.01 level

Table 3: Summary of multiple regression analyses for variables predicting PTS (N=205)

	B	SE	β	
Constant	40.19	6.40		
Family identification	-.30	.14	-.14*	
Family constraints	2.09	.24	.54**	
Social support	.05	.11	.03	
Age	-.24	.07	-.20**	
SIMD 2006 rank	-.00	.00	-.09	
Time since diagnosis	-.15	.12	-.07	
R^2				0.47

* $p<0.05$; ** $p<0.01$