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Measuring social activities and social function in long-term cancer survivors who received hematopoietic stem cell transplantation

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Abstract

Objective—Cancer survivors report deficits in social functioning even years after completing treatment. Commonly used measures of social functioning provide incomplete understanding of survivors' social behavior. This study describes social activities of survivors and evaluates the psychometric properties of the Social Activity Log (SAL) in a cohort of long-term survivors of hematopoietic stem cell transplantation (HSCT) for cancer.

Methods—One hundred two 5–20 year survivors completed the SAL, Short Form-36 Health Survey (SF-36), and other patient reported outcomes. Principal components analysis determined the factor structure of the SAL along with correlations and regressions to establish validity.

Results—Principal component analysis yielded three factors in the SAL: “non-contact events” (eg, telephone calls), “regular events” (eg, played cards), and “special events” (eg, concerts), which explained 59% of the total variance. The SAL possessed good internal consistency (Cronbach's $\alpha = 0.82$). SF-36 social function and SAL were moderately correlated ($r = .31$). In linear regressions, physical function and depression explained 16% of the variance in the SAL ($P < .001$), while physical function, depression and fatigue predicted 55% of the variance in SF-36 social function ($P < .001$).

Conclusions—Results support the use of the SAL as a measure of social activity in cancer survivors who received HSCT. Whereas the SAL is designed to measure social behaviors, SF-36 social function assesses subjective experience and is more strongly associated with depression and fatigue. The SAL appears to be a promising tool to understand the behavioral social deficits reported by long-term survivors of cancer.

Keywords

Social activity; cancer survivor; social function; hematopoietic stem cell transplantation; oncology

Introduction

Cancer and its treatment alter social roles and limit social activities of patients. As studies of long term survivors accumulate, it is increasingly apparent that perceived reductions in social function extend many years following treatment completion [1,2]. The costs of this reduced social function for cancer survivors may be connected with long-term physical as well as emotional health. Research has documented that social ties to friends, family, work, and community are beneficial to physical health. For example, studies have found that more social ties and greater social integration were associated with better resistance to illness [3], lower mortality [4], longer survival from myocardial infarction [5], lower risk of cancer recurrence [6], and improved cancer survival [7]. What remains unclear is whether self-reports of social dysfunction in survivors reflect actual reductions in social activities or qualities of social connections, or alternatively whether self-reports are more reflective of feelings of psychological isolation than social participation as such. A major barrier in determining the nature and extent of these social difficulties in survivors is the absence of adequate measures of social activity beyond subjective perceptions of social function.

Many quality of life investigators view social functioning as a dimension that is influenced by both physical and mental health [8–10]. Investigators have emphasized that in addition to “curing” the underlying disease, the long-term goal of any treatment strategy for cancer should include the reintegration of a survivor to social and work roles [11].

Despite the importance of this aspect of survivorship, many patients describe difficulties returning into their previous social roles after cancer treatment is completed [12,13]. Even among long-term survivors, results from global quality of life measures such as the Short-Form 36 Health Survey (SF-36) or the European Organisation for Research and Treatment of Cancer QLQ-C30 indicate that social deficits continue post-treatment for many [1,2,14,15]. These results are not uniform. For example, 80% of survivors an average of 4 years post-transplant reported their social activities as unimpaired in one study [16], and another study reported survivors three or more years post-transplant to have higher than normative social functioning scores [17]. Numerous variables could account for these mixed results, including time since transplant, disease type and treatment, and measurement differences.

In attempting to examine the source and qualities of these perceived deficits in social function, we found that existing measures of social activity participation in adults were designed for elderly or demented adults and included both solitary and social behaviors [18]. The very low functional expectations of these measures made most of the items inappropriate for higher functioning adults. For that reason, we developed a measure to evaluate social activities in adult cancer survivors. In testing this measure we focused on hematopoietic stem cell transplant (HSCT) recipients as cancer survivors who are required to maintain severely restricted social activities for six months to a year as a result of leukopenia.

HSCT is a treatment option for hematological malignancies, among other disorders. Consistent with other cancer survivors, HSCT recipients report quality of life improvements over the five years post-treatment [19,20]. Nonetheless, deficits in social function remain as long as 10 years after treatment [1,2,11,21]. Eight to 10 years after HSCT, studies have found that as many as 61% of survivors report problems with social functioning [14]. Some survivors feel stigmatized and have difficulty with personal relationships [13], while others experience major disruptions in their social roles [12,13]. A full 96% of transplant survivors in one study indicated that their social networks were less supportive over time and that this was the single most distressing hardship of long term survival [19]. A study of adult

survivors 6–18 years post-HSCT reported that dealing with friends, family, and peers was listed as one of the three things that continue to be most difficult years after treatment [22]. Included in these relationship difficulties were feelings of being dependent on others and feeling like others were guarded or stayed away because of the survivor's cancer history. In short, social functioning and reintegration are important issues to survivors and are commonly compromised in this patient population. However, the descriptive studies discussed here have not examined whether actual social activities are impacted by these perceived social changes, or whether these changes are mainly internal perceptions on the part of the cancer survivor. This absence of quantified social behavior in the literature may result from the lack of measures to adequately capture actual social activities.

The aim of the current study was to determine the nature and frequency of social behaviors in long term cancer survivors who received HSCT 5 to 20 years previously. To examine this question, we developed a measure of social activities, and present the psychometric properties of this measure here. The measure captured the frequency and diversity of voluntary social activities outside of daily responsibilities. In the measure, respondents endorsed the number of days they participated in different social activities in the past month. As a component of testing the validity of the measure, we examined whether social activity in HSCT survivors is related to physical capability and psychological well-being. Based on research findings that extensive social networks, meaningful social diversity and social integration benefit health [3–6], we hypothesized higher rates of reported social activities and higher subjective social function would be predicted by better physical function, lower depression and lower fatigue, recognizing that fatigue bridges both psychological and physical characteristics.

Methods

Participants and Procedures

All procedures were approved by the Fred Hutchinson Cancer Research Center institutional review board for use with human subjects. Patients who underwent a first HSCT 5 to 20 years before evaluation (between September 1986 and September 2001) were identified using the transplant center research medical record database. Since the aims of the research beyond the measurement of social activity included possible on-site testing for long term complications, those who lived in the in the region defined by a 98xxx zip code (Washington State) were contacted with a letter of approach if they appeared to meet the following additional inclusion criteria: between 18 and 50 years old, and able to read and understand English. Exclusion criteria for the patient-reported outcomes (PRO) component of the study included having a recurrence or second cancer that was actively treated in the previous two years. Two levels of study participation were possible: onsite objective testing plus PRO or PRO only completed at home (if participants were not eligible for onsite objective tests or declined the onsite testing). Both groups are included in this report of PRO results.

Two hundred twenty-two individuals were identified from the institutional research database as eligible for the study and were sent a letter of approach, with a request to respond or opt-out (Figure 1). Study staff called respondents to provide information about participation if they did not opt-out. Staff explained the study details and screened for eligibility. After screening, study staff obtained consent if the survivor agreed to participate. All contacts were tracked, including reasons for refusals or ineligibility. PRO was completed at the testing clinic for those participating onsite. For home PRO, survivors were mailed the forms and information for survey completion with a stamped return envelope for returning the completed materials. Participants who did not complete the assessment within two months

were contacted for an abbreviated assessment by phone. Study staff were available to both onsite and home participants to answer questions or address any concerns.

Measures

Medical records review provided diagnosis, transplant regimen, date of transplant, and dates of recurrent or second malignancy. Standard self-report items captured information on age, gender, race and ethnicity, education, income, marital status, work, treatment history and diseases.

Social Activity Log—The social activity log (SAL) was designed to capture the frequency and diversity of social activities outside of daily responsibilities. Since we frequently hear from survivors that their social networks are smaller, and that they are limiting activities to only immediate family or necessary events, we specifically focused on activities with people other than those with whom the survivor lives. The SAL was adapted from one of the few existing measures we found of social activity participation, the Pleasant Events Schedule [18]. Pleasant events schedules have included hundreds of items or have been designed for elderly or demented adults and have included many solitary as well as social activities. For the SAL we reviewed the original content and identified items that represented social activities of adults. This content was then reviewed by a focus group of 8 non-cancer adult volunteers who considered their own activities of the previous month and added or revised items. They also reviewed wording for awkwardness or grouping of activities into items containing similar types of activities (e.g., sports activities, entertainment, conversation-focused). Once consensus of the group was achieved, the resulting items were constructed into a measure which was then completed by 10 non-cancer volunteers who responded and noted awkwardness in wording or comprehension and assured the measure covered relevant content. A second set of 9 volunteers (including 4 cancer survivors and 5 non-cancer participants) then completed the revised final version to confirm that wording, clarity of meaning and response options could be completed without difficulty. As tested, the measure contained 17 items. The first question asked “Think about each day of the past 7 days and what you did other than working, taking care of your family, or doing necessary shopping. How many days in the past week did you do voluntary social activities?” The next 14 items asked how many days in the past month the person participated in common social activities. Sample activities include playing cards or games, going to a sporting event, and talking on the phone with friends and family. A final question asked about any additional social activities not captured by the previous items. Other recall formats were considered, including the daily diary method, but were not used due to reported non-adherence challenges with this method [23] and the more time-consuming implementation that would restrict its use in research.

The core theoretical foundation for the SAL was that social activities of survivors and non-survivors did not differ in kind but in frequency. Our goal was to set a wide net of potential activities. Since we did not expect that the repertoire of social activities for survivors and non-survivors would differ in kind as much as frequency, we did not selectively seek survivors as part of the focus groups. If there were content differences, we expected they would occur as activities non-survivors did that perhaps survivors did not do, rather than expecting that survivors would indicate specific types of social activities that non-survivors would not do. Finally, we believe that inclusion of non-survivors in the focus groups increases the potential for the measure to be usable by control non-survivors as well as survivors.

Additional PRO measures included the SF-36 version 2 scales for social function and physical component summary, the depression subscale of the Symptom Checklist 90-R, and the Fatigue Symptom Inventory.

SF-36—The SF-36 version 2 is one of the most widely used health-related quality of life measures in studies of cancer survivors and has age- and gender-specific norms for the United States [24]. It provides standardized T scores for 8 domains and a physical and mental component summary score. The instrument's internal consistency, validity among different medical groups, and test-retest reliability are excellent [17,24,25]. For the purposes of this study, we examined the SF-36 physical component summary as well as the social function scale. The social function scale contains 2 items that assess how much of the time and to what extent physical and emotional health interfere with social function [24]. This scale was used as a convergent validation test for the SAL.

Symptom Checklist 90-R—This measure is well standardized and widely used in medical studies [26,27]. Items are rated on a five point scale indicating how much each item caused distress in the past week (not at all to extremely).

Fatigue Symptom Inventory—The Fatigue Symptom Inventory total score has 13 items that assess the duration, intensity, and disruptiveness of fatigue and its impact on quality of life in the past week using a 0–10 rating scale. It was designed for use in the cancer population and evidence supports its reliability and validity [28,29].

Statistical Analyses

Descriptive and inferential analyses were performed using Statistical Package for the Social Sciences version 15.0 (SPSS; SPSS Inc, Chicago, IL). We calculated descriptive statistics for the demographic and treatment characteristics of the participants. According to Sapnas and 10 Zeller (2002), our sample size (N=102) is sufficient to use factor analyses [30]. Therefore, to examine the factor structure of the SAL, principal components analysis was performed using varimax rotation. Internal consistency reliability of the items in the resulting subscales and the total were calculated using Cronbach's alpha. One-way analyses of variance were used to examine predictive differences in SAL and social function scores across medical and demographic factors. Pearson correlations were used to test convergent validity of the SAL and social function and to investigate the associations between scores on the SAL, social function, and physical, depression and fatigue scores. Cohen's [31] criterion was used to interpret the magnitude of correlation coefficients ($r < 0.3$ = small, $0.3 \leq r < 0.5$ = medium, $r \geq 0.5$ = large). Linear regression was used to test the independent contribution of physical, psychological and fatigue measures relative to the SAL and social function. For all comparisons, an alpha level of .05 was used to evaluate statistical significance.

Results

Response Rate

Of the 222 potentially eligible participants identified in the institutional medical record database, 179 could be contacted for screening. Of these, 144 participants were eligible and agreed to participate. Of the 144 participants, 102 (70%) completed the full PRO that included the SAL and are included in this report (Figure 1). Remaining participants (43) completed an abbreviated assessment that did not include the SAL.

Participant Profile

Table 1 presents demographic and medical characteristics of the study participants. Approximately half of the sample was male. Mean age at the time of transplant was 28.5

years ($SD = 10.3$, range = 2.7 to 45.2) and mean age at the time of the assessment was 39.7 years ($SD = 8.9$, range = 18.6 to 50.6). Time between date of transplant and assessment ranged from 5.0 to 20.9 years, with a mean of 11.2 years ($SD = 4.58$). The majority self-identified as Caucasian (89.2%), without a college degree (68.7%), and married (64.7%). In addition, a majority reported working full time for pay (63.7%) and had a total household income of over \$60,000 (55.9%).

Social Activity Log Psychometrics

Before conducting psychometric analyses of the SAL, item response patterns and content of the ‘other’ item responses were reviewed. No unusual patterns were identified in responses. Nearly all written-in responses describing ‘other’ activities were actually elaborations of the previous items and did not add any unmeasured content, supporting the content validity of the measure. Suitability of the data for factor analysis was assessed prior to performing principal components analysis. Inspection of the correlation matrix revealed the presence of multiple coefficients of 0.3 and above. The Kaiser-Meyer-Olkin value was 0.74, exceeding the recommended value of 0.6 [32,33]. The Bartlett’s Test of Sphericity [34] reached statistical significance ($P < .001$), supporting the factorability of the correlation matrix.

Principal components analysis using varimax rotation for the 14 items of the SAL listing specific activities (excluding ‘other’ and not including items 1 and 2 on frequency of voluntary social activity in the previous week) revealed the presence of three components with eigenvalues exceeding 1, explaining 31.8%, 15.3%, and 12.3% of the variance respectively. An inspection of the scree plot revealed a clear break after the third component. Based on Catell’s [35] scree test, we retained the three components. The item ‘went to the movies with friends or family you do not live with’ was an infrequent event and did not load with the other items. Therefore, this item was not included in the final principal components analysis. In addition, the item ‘went to church or attended other religious services’ was also excluded from the final principal components analysis because it did not load with the other items and disrupted the reliability of the scale. Our psychometric analyses suggested that religious participation, as asked in this item, was not a ‘social activity’ of similar quality to the other social events. All remaining variables loaded substantially (factor load above 0.50) on only one rotated component, though two items also loaded on a second factor at 0.41 (vs. 0.55 on the identified factor) and 0.46 (vs. 0.61 on the identified factor). The communalities for the items ranged from 0.52–0.83.

In total, 12 items were used in the final factor structure and summary scores. Table 2 contains the items in the three subscales and their corresponding factor loadings. The three component solution with 12 items explained a total of 59.4% of the variance, with component 1 contributing 21.6%, component 2 contributing 20.3%, and component 3 contributing 17.6%. Component 1 was labeled ‘non-contact events’ as it contains events that are not face-to-face, and are high frequency (3 items). Component 2 was labeled ‘regular events’; it comprised social activities that have face-to-face contact and are of moderate frequency (6 items). Finally, component 3 was labeled ‘special events’; it contained social activities that are face-to-face but less frequent (3 items). SAL item 1 (‘number of days in the past week you did voluntary social activities’) did not load with the other items in the principal components analysis likely because of its different content and time reference, but contributed to reliability of the overall measure and was correlated with the subscales (Table 3). Therefore, it was included in the reliability calculations and mean score for the SAL. The SAL mean score was calculated as the mean of the means for non-contact events, regular events, and special event subscales, as well as SAL item 1. Internal consistency for non-contact was $\alpha = 0.81$, regular events $\alpha = 0.75$ and special events $\alpha = 0.63$. Overall internal consistency for the 13 items was $\alpha = 0.82$.

Frequencies of each SAL item are shown in Figure 2, grouped by subscale. Examination of skewness and kurtosis for the SAL mean score and subscales indicated normal distributions for the total score, moderate contact and item one (number of days doing voluntary activities in the past week) with all skewness and kurtosis values lower than 0.54. Non-contact frequent events and special events subscales had greater skew and kurtosis, though all values were lower than 1.5. Various transformations did not change the relationship of these two latter subscales to the other subscales or to SF-36 social function, thus transformations were not retained.

Table 3 describes the tests of convergent validity comparing correlations between SF-36 social function and SAL mean score as well as SAL subscales. The SF-36 social function and SAL mean score share a moderate amount of variance ($r < 0.31$).

Social Activity and Social Function Relationships to Mental and Physical Health

Analyses of variance and t-tests assessed whether the SAL mean and social function scores differed across age, gender, marital status, education, income, race/ethnicity, work status, years since treatment, diagnosis, treatment type, or history or presence of chronic graft versus host disease. No significant differences were found across these variables for either the SAL or social function (all P 's $> .2$).

Correlations performed for SAL and SF-36 social function with scores for physical component summary, depression and fatigue indicated much more shared variance with social function than for SAL. Social function was highly correlated, by Cohen's criteria, with fatigue and depression ($r = .67$ and $.70$ respectively) as well as with the physical component summary ($r = .54$). The SAL mean score was moderately correlated with all three measures ($r = .35$ – $.36$).

Table 4 contains linear regression results assessing the hypothesized independent contributions of SF-36 physical component summary score, depression, and fatigue to the SAL or social function. Both physical component summary ($P = .03$) and depression ($P = .02$) independently contributed to explained variance in the SAL and these two variables provided the best fit in the model. Fatigue weakened the overall fit of model, i.e., $F = 10.25$ without fatigue vs. $F = 6.82$ with fatigue. Total variance explained was 16% with the best fit model. For social function, physical component summary ($P = .02$), depression ($P < .001$), and fatigue ($P = .04$) each made significant unique contributions to the prediction of social function. The total amount of variance explained was 55%, with the final $F = 42.46$ ($P < .001$).

Discussion

This study provides evidence that the Social Activity Log (SAL) can be a useful new tool to measure social activities in cancer survivors, particularly those who have received HSCT. The SAL is focused on voluntary leisure time social activities and does not attempt to assess work, routine family roles or solitary activity. We note that the contents of the measure are not cancer-specific, so the measure could be used with other chronic illness or general population control groups, but requires confirmatory psychometric testing with a non-cancer cohort. All items in the principal components analysis load over 0.5 on only one of the factors, suggesting discrete categories of activities that are relatively independent. Validity testing indicates that, while correlated, a large proportion of variance is not shared between social activities on the SAL and social function on the SF-36. These results suggest that much of the behavior and frequency of specific social activities were independent of social perceptions. The moderate correlation between these two measures is consistent with that reported for other measures of behaviors versus attitudes [36].

Internal reliability is high for the overall SAL, but only adequate or marginal for the subscales. In addition, the non-contact and special events are skewed in distribution. Thus we would not suggest the subscales be used apart from the full scale. The lower-than-preferred reliability for the 'special events' subscale reflects a relatively restricted distribution range for these activities, and suggests that individuals may engage selectively in those that they prefer. Interestingly, for both principal component analysis and reliability, the 'church' and 'movie' items did not load with other social activities and did not contribute to reliability and so were removed from the measure. We speculate that church participation and movie attendance are not as consistently driven by social interest as the other items.

Both content and convergent validity of the SAL were supported by our results. Content validity was confirmed by the pre-testing of the items and the lack of substantive additions to content during the study. All participants were able to comprehend and complete the SAL items without missing data or questions. Convergent validity of the SAL was indicated by its moderate correlation with social function. In addition, the two measures had similar relationships to patient-reported depression and physical function. However, substantially more shared variance of measurement was seen between depression and SF-36 social function than depression and SAL. Both the SAL and SF-36 social function scale were moderately correlated with self-reported physical function, which supports the relevance of mobility and physical health on both aspects of social interaction [9].

It was interesting that neither SAL nor SF-36 social function differed on any of the demographic or medical variables tested even in univariate associations. It may be that by 5 years after cancer treatment, medical factors, even the impact of length of recovery, is blunted in its relationship to social function. Previous studies examining windows of time closer to treatment have reported improvements in social function over time [37], but in this study we found no such differences between individuals based on time.

Social reintegration after cancer treatment is an imperative part of the recovery process [38]. Although it is one of the most widely used measures for social function in cancer survivor studies, our results indicate that the SF-36 social function scale captures the mental health and perception of interactions components of social health, and not social *participation* as such. The SAL, on the other hand, measures social integration as indicated by behaviors, but not subjective perceptions of these interactions. Other methods of capturing social activity might be used to further examine social re-integration using, for example, real time diaries of activities along with subjective ratings of satisfaction or other qualities of social support.

The study design limits the population generalizability of our results and our knowledge of whether the SAL is useful as a predictive or outcome measure. Control data have not yet been collected for the SAL, which restricts understanding of whether the reported social activity levels in our cohort are low, high, or differ at all from norms. It also would be valuable to assess changes from pre-treatment, as this reference to previous patterns may be the source of some distress and perceived impairment for survivors, rather than absolute level of social activity. The cross-sectional design can only indicate the correlative relationship between social activity, mental health and physical function. This relationship does not indicate that physical or psychological processes cause differences in social function. These participants had all been diagnosed with a hematologic malignancy and had received HSCT, therefore, it remains unclear whether the findings will apply equally to other populations of cancer survivors. Future research is needed to determine whether HSCT survivors differ from other cancer survivors, or from non-survivor controls in social activity. In addition, these study participants had high household incomes, were mainly Caucasian, and about half had more than a high school education. The relatively high level of external

resources associated with the educational and financial characteristics of this sample may have contributed to the generally high level of observed physical, psychological, and social function. While this sample is representative of the patient population at the Fred Hutchinson Cancer Research Center, findings must be replicated with a larger sample size and at other cancer centers to assure applicability of the results to other survivor populations. In addition, this is the first presentation of this measure and further confirmatory studies, along with larger sample sizes would allow useful examination of the fit of the items within the subscales we present here.

As emphasized by the recent report from the Patient-Reported Outcomes Measurement Information System (PROMIS) social health working group, the concept of social health is multi-faceted [8]. Existing measures of social function, such as the popular SF-36 social function scale, do not fully capture the complexities of the social health domain. In addition to measuring perceived social function, it is essential to capture survivors' actual social participation and behavior. The current findings highlight this important discrepancy and accentuate the need for a more comprehensive and multidimensional understanding of social health. A behavior-based measure of social activities, such as the SAL, will be an important tool, potentially added to other domains such as satisfaction and emotional connections, along with work and household activities to gain an overall understanding of cancer survivor social health and functioning [8]. We note that technologies such as social networking, online gaming, and text messaging, all forms of electronic communication that have recently increased in popularity, were not included in the current version of the SAL, nor were they mentioned in the focus groups or added by any respondents on the 'other' open-ended item. Given their prevalent use, future testing of the SAL will include specific mention of these social options and examine their fit in the measure. We also note that the PROMIS focus group results were published after the completion of this study, so we were unaware of the theme of volunteerism that was detected through the PROMIS content analysis. These topics may be valuable content additions to test in future SAL research.

In summary, the psychometrics for the SAL suggest that this measure may be a promising tool for further research into understanding the social deficits reported by long-term survivors of cancer. As more patients survive cancer, and specifically HSCT, increasing attention must be paid to not only curing the underlying disease, but also to recognizing and improving long-term physical, psychological, and social sequelae of treatment. Multidimensional assessment that includes, but is not restricted to social activities, is needed in social health research on survivors. Realistic time frames for return to social roles and activities are necessary components to understanding treatment, regardless of the specific therapeutic regimen.

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Figure 1.
Flow of participants through the study.

Figure 2.
Mean frequency and standard deviation for Social Activity Log items grouped by subscale.

Table 1

Demographic and medical characteristics of survivors (N= 102)

Variable	N	%
Age at assessment, years (Mean = 39.7, SD = 8.9)		
18.6–29.9	19	18.6
30.0–39.9	24	23.5
40.0–50.6	59	57.8
Age at transplant, years (Mean = 28.5, SD = 10.3)		
2.7–17.9	20	19.6
18.0–29.9	28	27.5
30.0–39.9	43	42.2
40–45.2	11	10.8
Gender		
Male	50	49.0
Female	52	51.0
Ethnicity		
Hispanic or Latino	6	5.9
Not Hispanic or Latino	96	94.1
Race		
White/Caucasian	91	89.2
American Indian or Alaska Native	5	4.9
Asian or Pacific Islander	4	3.9
Black or African American	1	1.0
Mixed race	1	1.0
Education		
High school graduate, GED or less	18	17.7
Some college or vocational training	52	51.0
4-year college degree	18	17.6
Graduate degree	14	13.7
Annual household income		
< \$40,000	29	28.4
\$40,000 – \$59,999	10	9.8
\$60,000 – \$79,999	10	9.8
\$80,000 – \$99,999	12	11.8
\$100,000 or more	35	34.3
Missing	6	5.9
Marital status		
Married or cohabiting	66	64.7
Single	26	25.5
Divorced or Separated	10	9.8

Variable	N	%
Time since first transplant, years		
5–9.9	47	46.1
10–14.99	22	21.6
15–20.9	33	32.4
Diagnosis		
Acute Leukemia	34	33.3
Chronic myeloid leukemia	30	29.4
Lymphoma	24	23.5
Myelodysplastic Syndromes	9	8.8
Multiple Myeloma	3	2.9
Neuroblastoma	2	2.0
Stem Cell Donor		
Allogeneic related	42	41.2
Allogeneic unrelated	36	35.3
Autologous	24	23.5

Table 2

Principal components analysis final factor loadings for three subscales of social activity, with varimax rotation

Item:	Non-Contact Events	Regular Events	Special Events
Received emails, letters, cards, notes	.90	.04	.09
Sent emails, letters, cards, notes	.89	-.08	.16
Talked on phone	.65	.30	.01
Played cards or games	-.14	.80	.17
Participated in sports	-.05	.73	.11
Had friends or family come to visit	.32	.64	.10
Went to other social events	.46	.61	.18
Coffee, tea, other drinks	.40	.55	.11
Concert, theater, other cultural or musical event	.05	.11	.81
Museums, art exhibits, similar activities	.24	.04	.75
Shopping with those you don't live with	.03	.25	.69
Went to a sports game to watch	.03	.07	.54

Table 3
Convergent validation of the Social Activity Log (SAL) with the SF-36 social function, and intercorrelations of the SAL subscales

	SF-36 Social Function	SAL Mean Score	SAL Non-Contact Events	SAL Regular Events	SAL Special Events
Social Activity Log					
Mean Score	.31**				
Non-Contact Events	.17	.68**			
Regular Events	.24*	.80**	.36**		
Special Events	.09	.57**	.20*	.37**	
Item 1: Number of Days Socially Active	.35**	.83**	.34**	.59**	.38**

* $P < 0.05$
** $P < 0.001$

Table 4

Linear regressions for patient-reported outcomes hypothesized to predict social activity and social function.

Dependent Variables	Independent Predictors	Standardized Beta	P-value for Beta	Adjusted R ²	Model P-value
Social activity log					
	SF-36 physical component summary	.23	.03	.11	
	SCL-90-R depression	-.26	.02	.16	<.001
SF-36 social function					
	SF-36 physical component summary	.20	.02	.29	
	SCL-90-R depression	-.44	<.001	.54	
	Fatigue symptom inventory	-.23	.04	.55	<.001

* Fatigue did not contribute independent variance to predicting the Social Activity Log ($P = .72$), and weakened the overall variance explained by the model so is excluded from the final model.