



# User characteristics and usage of an open access moderated internet support group for depression and other mental disorders: A prospective study



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## ABSTRACT

**Background:** Internet support groups (ISGs) for mental ill-health are common but little is known about the characteristics of users, the usage and predictors of ISG usage and if and how these change over time.

**Aim:** This study evaluated the attributes of a publically accessible ISG for depression and other mental disorders including: (1) the demographic and other characteristics of its users; (2) their patterns of usage; and (3) the factors which predict posts to and retention on the ISG.

**Method:** User characteristics (gender, age, user type, country and location of residence) were collected at the time of registration on the ISG BlueBoard ([blueboard.anu.edu.au](http://blueboard.anu.edu.au)). All board log data were downloaded for the period October 2008 to May 2014. Predictors of post frequency and retention on the board were examined using logistic regressions. Other data were analysed using descriptive statistics.

**Results:** 2932 users contributed 131,004 posts to the ISG. The majority were female, aged 20 to 34 years, and mental health consumers. Although most users were city dwellers, 19% resided in rural or remote regions. Frequency of posts and retention on the board varied across users, with a moderate association between retention and number of posts. Growth in posts substantially exceeded the growth in new users over the monitoring period. Multivariate analysis demonstrated that consumers posted more often and remained longer than carers or others, and that younger users posted less often; however, the model predicted very little of the variance.

**Conclusions:** A small minority of active users are sufficient to ensure the sustainability and growth of an online mental health ISG. Further research is required to understand why so many support group members limit their contributions to one or a very small number of posts and what factors predict and promote active engagement and long-term retention in virtual mental health communities.

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## 1. Introduction

Internet support groups (ISGs) are accessible and popular (Dosani et al., 2014; Fox and Duggan, 2013; Parikh and Huniewicz, 2015) and have the potential to provide valued social support to individuals with depression and other common mental disorders (Barak et al., 2008; Griffiths et al., 2015). While there is uncertainty regarding the effectiveness and safety of ISGs (Eysenbach et al., 2004; Griffiths et al., 2009a; Hoybye et al., 2010; Parikh and Huniewicz, 2015; Rice et al., 2014; Takahashi et al., 2009), recent high quality evidence suggests that such support groups may improve mental health outcomes (e.g., (Griffiths et al., 2012, Ali et al., 2015)) and increase users' sense of empowerment (Crisp et al., 2014), self-esteem (Crisp et al., 2014)

and perceived quality of life (Crisp et al., 2014). However, there is little systematically collected evidence on the characteristics of those who use ISGs for depression or mental ill-health, or what determines the level of participation and retention of users in these groups (Griffiths et al., 2009b).

There is some evidence that the predominant users of depression support groups are consumers (Houston et al., 2002; Powell et al., 2003; Salem et al., 1997; Alexander et al., 2003; Nimrod, 2012) who are primarily in their mid-20s to 40s (Dosani et al., 2014; Houston et al., 2002; Nimrod, 2012; Powell et al., 2003); there is mixed evidence regarding gender of users (Dosani et al., 2014; Fekete, 2002; Houston et al., 2002; Nimrod, 2012; Powell et al., 2003; Salem et al., 1997; Takahashi et al., 2009). However as noted by Griffiths et al. (2009b), a limitation of most previous studies of public depression support groups is that they have been derived from surveys posted on ISGs or by inferring the users' status from posts. Thus, the data collected from these studies is typically either restricted to those ISG members who remain on the board and who chose to participate in the surveys, or conclusions

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are based on inferences of unknown validity. A more valid approach would analyse data collected at the time of registration.

To date, few studies have investigated patterns of usage of open access mental health support groups across forum topics or over time (Griffiths et al., 2009b) based on all registered users and registration details. Although one group has undertaken a study of membership duration and its predictors in a cross-sectional survey (Nimrod, 2012), as noted above there are limitations to the conclusions that can be drawn from such methodologies. We are not aware of any systematic studies of the retention patterns for all users of an online mental health support group. Nor – with the exception of cross-sectional studies – are we aware of studies that have systematically investigated individual differences in mental health support group usage by ISG members or the predictors of any such differences based on details at registration. We have recently reported the distribution of posts across an entire online support group for depression and related disorders (blueboard.anu.edu.au), finding that they conformed to a Zipfian distribution (Carron-Arthur et al., 2014). However, the study did not investigate individual differences in detail.

Accordingly, the current study sought to document: (1) the demographic and other characteristics of users of the publically accessible bulletin board on registration; (2) the patterns of usage on the board; and (3) the factors which predict usage of the board and retention on the board.

## 2. Method

Data were collected from the database of the peer-to-peer ISG BlueBoard. Ethics clearance was obtained from the ANU Human Research Ethics Committee prior to the establishment of the board to enable the investigators to undertake research investigating the characteristics of the board and its users.

### 2.1. The Internet support group: BlueBoard (blueboard.anu.edu.au)

This service was provided by the National Institute for Mental Health Research/Centre for Mental Health Research at the Australian National University with funding from Australia's Department of Health. BlueBoard comprised 10 forums including: (1) Eight *condition* forums each focused on a different mental disorder (depression, bipolar disorder, generalised anxiety, social anxiety, panic disorder, obsessive compulsive disorder, borderline personality disorders and eating disorders). Each of the condition forums comprised two sub-forums: "Living with [condition, e.g., depression]" and "Taking care of our ourselves"; (2) A *carer* forum ("Caring for someone with a mental health problem") comprising four sub-forums: "General", "Depression and Bipolar disorder"; "Anxiety disorders" and "Other disorders"; and (3) a *general* forum comprising four sub-forums 'Chit-chat', "Having a laugh", "Creative corner" and "Suggestions box". The Board was moderated by consumers who were trained and supervised by a registered clinical psychologist (JR). The Board was originally established as a mood disorder support group in 2003 but was closed in 2007 and 2008 due to lack of funding. The current study is focused on the second phase of the service. All forums were established on 1 October 2008 except the Obsessive Compulsive, Borderline Personality and Eating Disorder forums which were established on the 1 June 2009, 1 March 2010 and 30 July 2012 respectively. Further details of the Board can be found elsewhere (Griffiths et al., 2015).

### 2.2. Measures

User characteristics were collected at the time of registration on BlueBoard and included: age range, gender, country of residence, location of residence (rural/capital city/other city) and type of user (consumer/carers/other). Usage data were collected by downloading all

posts, their time stamps, and forum and sub-forum details, for the period 1 October 2008 and 23 May 2014.

### 2.3. Analyses

Analyses were undertaken using SPSS Statistics Version 22.0. User characteristics and usage (number of posts contributed, and user retention on the board in months) were analysed using descriptive statistics. Simple bivariate relationships between user characteristics and usage were assessed using Kruskal-Wallis and Mann-Whitney tests. Multivariate analysis of predictors of usage were examined using logistic regression analyses. Retention data were further analysed using Cox proportional hazards regressions with (i) no censoring; (ii) right censoring of users who posted in the last 2 weeks of the data collection period and (iii) right censoring of users who posted in the last 12 weeks.

## 3. Results

A total 4823 individuals registered on BlueBoard (excluding those who were banned for spamming or related activity) in the relevant period, of whom 2932 contributed at least one post. The focus of this paper is on those registrants who contributed one or more posts; they will be referred to here as 'users'.

### 3.1. Characteristics of users

Table 1 summarises the characteristics of the BlueBoard users who provided demographic and other data. Missing data ranged from 8.6% (gender) to 15% (participant type). Two-thirds of users were women and the majority were consumers. Although the Board was used by older people including some aged over 75 years, the majority of users were aged between 20 and 34 years. Users resided in 76 different countries, with most living in Australia. The next most frequent user locations were the United States and the United Kingdom. Approximately half of all users lived in a capital city but a substantial minority (almost 19%) resided in rural or remote areas.

**Table 1**

Characteristics of users ( $\geq 1$  post,  $n = 2932$ ) at registration. Values are numbers (percentages) unless otherwise stated.

Characteristic	n (%)	
Gender ( $n = 2680$ )		
Women:	1812 (67.6%)	Chi-square (1) = 1812, $p < 0.001$
Age category ( $n = 2662$ )		
<20 yrs	174 (6.5%)	
20–34 yrs	1489 (55.9%)	
35–49 yrs	737 (27.7%)	
50–64 yrs	243 (9.1%)	Chi-square (4) = 2691.07, $p < 0.001$
65 yrs +	19 (0.7%)	
Location/rurality ( $n = 2602$ )		
Rural/remote	483 (18.6%)	
Capital city	1367 (52.5%)	Chi-square (2) = 473.50, $p < 0.001$
Other city	752 (28.9%)	
Country ( $n = 2671$ )		
Australia	2195 (82.2%)	
United States	202 (7.6%)	
United Kingdom	70 (2.6%)	
Canada	29 (1.1%)	
New Zealand	16 (0.6%)	
India	15 (0.6%)	
Other	144 (5.4%)	
User type ( $n = 2493$ )		
Consumer	1664 (66.7%)	
Carer	238 (9.6%)	
Other	591 (23.7%)	Chi-square (2) = 1327.48, $p < 0.001$

### 3.2. Patterns of usage

#### 3.2.1. Distribution of posts across forums and sub-forums

Users contributed a total of 131,004 posts during the 68-month study period. Of these, the majority were posted in the condition forums ( $n = 89,667$ ; 68.4%) and a substantial minority were in the general forum ( $n = 38,780$ , 29.6%); the remainder were posted to the carer forum ( $n = 2557$ , 2%).

Table 2 provides further details of the distribution of posts across forums and sub-forums. Of all the posts to condition forums, the overwhelming majority were in the “Living with...” sub-forums. Of the eight condition forums, the majority of posts were made to the depression forum followed by the bipolar forum. Similarly, within the carer forum, the majority of posts were made to the depression and bipolar disorder sub-forums. In addition, a significant minority of the carer forum posts were made to the carer general sub-forum. Finally, the majority of the posts in the general forum were made to the chit-chat sub-forum (‘general off-topic chit chat’), although a significant minority of the general forum posts were attributable to ‘creative corner’ where participants shared ‘poetry, short stories or articles...or talk about other creative endeavours’.

#### 3.2.2. Distribution of posts and new users across time.

Total posts increased from 900 in 2009 to 60,251 in 2013, a growth factor of 67 times (6700%). This reflected the high growth rates in posts in most forums (see Table 3). During the same period the number of new users increased by from 207 to 622, a growth of 3 times (300%). Cumulative users grew from 252 at the end of 2009 to 2637 at the end of 2013, a growth factor of 10.5. Since not all of the early users remained active in 2013, this is an overestimate of users for 2013. Despite this, the growth factors in posts far exceeded the growth in registered users.

### 3.3. Individual differences in usage: posts

We have previously reported that the distribution of posts for all registered members conformed to a Zipfian (power) distribution (Carron-Arthur et al., 2014) with total posts for individuals ranging from 0 to 11,994. The current study focused on the participants who made at least 1 post. Of these 10% of users ( $n = 239$ ) contributed 93.8% of the posts, each contributing between 19 and 11,994 posts. They will be referred to here as ‘active users’. A total of 41.2% of users ( $n = 1207$ ) contributed one post each only; they will be designated here as ‘one-off users’. The remaining group of users ( $n = 1432$ , 48.8% of users) posted between 2 and 18 posts and will be referred to as ‘multiple users’.

#### 3.3.1. Interrelationship between posts across forums

The intercorrelations between post frequencies for different forums were in most cases statistically significant but very small. However, as noted above, over 40% of the users posted only once and almost half of all users posted fewer than 19 times, limiting the likelihood that posts would be distributed across different forums. Accordingly, the data were examined for the 349 ‘active users’ who posted at least 19 times. For these users, there was a statistically significant moderate association between the posts in the condition forum (combining all sub-forums) and the combined posts in the general forum (including the Chit Chat, Creative Corner, Having a laugh, and Suggestion Box sub-forums) (Spearman rho = 0.51,  $p < 0.001$ ). There was also a small significant correlation between the frequency of posts for the condition and carer forum posts (Spearman rho = 0.36,  $p < 0.001$ ). Similarly, there was a significant, moderate relationship between the posts in the carer and general forums (Spearman rho = 0.57,  $p < 0.001$ ). Thus, the more an active user posted in one forum, the greater their number of posts in other forums.

#### 3.3.2. Association between user characteristics and posts.

Given the markedly skewed distribution of posts, bivariate analyses of the effect of different users characteristics on usage were undertaken using non-parametric tests. These analyses found no difference in post frequency for male and female users (Mann-Whitney U = 754.187,  $p = 0.074$ ). However, there was a significant difference in total posts across different user types ( $n = 2493$ , Kruskal Wallis Chi-square(2) = 27.43,  $p < 0.001$ ). Pairwise comparisons, adjusted for multiple comparisons, showed that consumers posted more frequently than carers (adjusted  $p < 0.001$ ) or ‘others’ (adjusted  $p < 0.001$ ). There was no significant difference in post frequency for carers and others (adjusted  $p = 1$ ). There was a significant difference in usage across the five age groups (Kruskal Wallis: Chi-square (4) = 10.92,  $p = 0.027$ ) with younger users (<20 years) posting less frequently than those aged 35 to 49 years ( $p = 0.019$  after adjustment). Uncorrected comparisons suggested that those aged <20 years posted less frequently than users aged between 20 and 34 years and between 50 and 65 years (uncorrected  $p = 0.018$ ) but these differences were no longer statistically significant following correction for multiple comparisons ( $p = 0.18$ ). Finally there was no statistical difference in total posts based on whether the participant resided in a rural location, a capital city or another city (Kruskal-Wallis, Chi-square (2) = 3.90;  $p = 0.14$ ).

Normal probability plots (P-plots) of the residuals indicated that the assumption of normality was not met either for the total posts or log-transformed total posts. It was therefore not appropriate to undertake a linear regression analysis. Predictors of post frequency were then investigated using the three-category classification (active, multiple and one-off users) described above. However, when an ordinal regression

**Table 2**  
Number and percentage of posts within forums and sub-forums (Oct 2008–May 2014).

Forum type	Forums	n (%)	Sub-forum	n (%)
Condition forums $n = 89,667$	Depression	52,904 (59.0%)	Living with...	86,235 (96.2%)
	Bipolar disorder	24,829 (27.7%)	Taking care of ourselves	3432 (3.8%)
	Generalised anxiety disorder	6898 (7.7%)		
	Social anxiety disorder	2144 (2.4%)		
	Borderline personality disorder	1363 (1.5%)		
	Eating disorder	807 (0.9%)		
	Panic disorder	507 (0.6%)		
	Obsessive compulsive disorder	215 (0.2%)		
Carer forum $n = 2557$			Depression & bipolar	1536 (60.1%)
			General	719 (28.1%)
			Anxiety	244 (9.5%)
			Other	58 (2.3%)
			Chit-chat	29,016 (74.8%)
General forum $n = 38,780$			Creative corner	7948 (20.5%)
			Having a laugh	1087 (2.8)
			Suggestion box	729 (1.9%)

**Table 3**  
Posts and new users as a function of year.

	2008 (Oct–Dec)	2009	2010	2011	2012	2013	2014 (Jan–May)
Depression	188	529	1948	4292	15,787	25,187	4973
Bipolar disorder	33	59	662	1281	9071	11,628	2095
Generalised anxiety disorder	15	64	84	548	2655	2770	762
Social anxiety	17	30	58	329	1062	558	90
Panic disorder	0	14	15	127	98	203	50
OCD <sup>a</sup>	N/A	1	8	25	90	90	1
Borderline personality disorder <sup>a</sup>	N/A	N/A	32	229	343	660	99
Eating disorder <sup>a</sup>	N/A	N/A	N/A	N/A	512	142	153
Caring for someone with a mental health problem	4	44	117	346	1356	575	115
General (Chit chat, Creative corner, Having a laugh, Suggestion Box)	128	159	414	855	16,893	18,438	1893
Total posts each year	385	900	3338	8032	47,867	60,251	10,231
Total new users each year	45	207	453	576	734	622	295

<sup>a</sup> The OCD, borderline personality and eating disorder forums were commenced on 1 June 2009, 1 March 2010 and 30 July 2012.

was undertaken with gender, age, location and user as independent variables, the assumption of parallel lines was violated and there were a substantial number of cells with zero or small sample sizes primarily in the 'Active' category. Similarly, a multinomial regression was not appropriate due to the number of zero and small sample size cells.

Accordingly the usage data was dichotomised into two categories (1 = one post only users; 2 = multiple post users) and a logistic regression undertaken entering gender, age, location, and user status as independent variables, the latter three being coded as dummy variables (see Table 4 (i)). This analysis demonstrated an overall significant effect for the model (Chi-square(9) = 19.85,  $p = 0.02$ ), with a higher frequency of posts for consumers compared to carers and others, fewer posts for those aged <20 years compared to the 20 to 34 and 35 to 50 year old groups, and a trend towards lower posts among rural and remote residents compared with their city counterparts ( $p = 0.051$ ). Gender was not a predictor of multiple compared to one-off posts. The Hosmer-Lemeshow test indicated that the model provide an adequate fit to the data (Chi-square(8) = 7.79,  $p = 0.35$ ). However, the Nagelkerke  $R^2$  value was only 0.011, indicating that the effect was very weak.

Dummy variables: Age reference group  $\leq 20$  yrs; Location reference group = Capital city; User type reference group = Consumer.

### 3.4. Individual differences in usage: retention on the board

Retention of users on the board, calculated as the time between registration and the last user activity at the time of data download, ranged from 0 to 5.5 years. The distribution was highly negatively skewed with half of the users engaged with the board for <1 day (49.0%;  $n = 1438$ ), 30.3% visiting for between 1 day and a month ( $n = 887$ ), 17% for between one month and 1 year ( $n = 498$ ), and the remaining 3.7% ( $n = 109$ ) returning to the Board for more than one year. These four categories of users will be denoted: minimal, short-term, medium-term

**Table 4**  
Predictors of post frequency: logistic regression for a two-category dependent variable (1 post vs multiple posts).

Independent variables	Unstandardized coefficient		Standardized coefficient Exp beta	Wald	Sig
	B	SE			
Gender	0.09	0.09	1.10	1.03	0.311
Age 20–34 yrs	–0.41	0.17	0.66	5.62	0.02
Age 35–49 yrs	–0.44	0.18	0.65	5.85	0.02
Age 50–64 yrs	–0.31	0.21	0.73	2.13	0.14
Age 65+ yrs	–0.55	0.51	0.58	1.20	0.27
Other city	–0.01	0.10	1.01	0.003	0.196
Rural remote	–0.22	0.12	0.80	3.80	0.051
Carer	–0.29	0.14	0.75	4.21	0.04
Other	0.20	0.10	1.22	4.05	0.04

and long-term users. Overall, the correlation between posts and retention was 0.68 (Spearman rho) and 0.53 (Kendall tau).

#### 3.4.1. Association between user characteristics and retention

Since the distribution of user retention periods was skewed, bivariate analyses of the effect of different user characteristics on retention were undertaken using non-parametric tests. The results of these analyses were broadly consistent with those for user posts, although retention was longer for female than male users ( $n = 2680$ , Mann-Whitney  $U = 741,027$ ,  $p = 0.015$ ). Retention differed across user types ( $n = 2493$ , Kruskal Wallis Chi-square(2) = 52.41,  $p < 0.001$ ) with Bonferonni adjusted pairwise comparisons demonstrating that consumers remained active on the board longer than carers (adjusted  $p < 0.001$ ) or 'others' user types (adjusted  $p < 0.001$ ). There was no significant difference in retention for carers and others after adjustment for multiple comparisons (adjusted  $p = 0.084$ ). Retention differed across location of user (Kruskal Wallis Chi-square(2) = 6.66,  $p = 0.036$ ), with adjusted pairwise comparisons demonstrating that users from rural/remote areas remained active for longer than those from non-capital cities (adjusted  $p = 0.033$ ). A similar pattern was seen for rural/remote users compared to those from capital cities, but the effect was no longer statistically significant after Bonferonni adjustment (adjusted  $p = 0.13$ ). There was a significant difference in retention across age groups categorized into 5 groups ( $n = 2662$ , Kruskal Wallis Chi-square(2) = 13.06,  $p = 0.011$ ). Without adjustment for multiple comparisons those aged <20 years remained active on the board for less time than those aged 35–49 years ( $p = 0.044$ ) or 50–65 years ( $p = 0.009$ ); in addition those aged 20–34 remained active less time than those aged 35 to 49 years ( $p = 0.009$ ). However, none of these effects remained statistically significant after Bonferonni adjustment.

Normal probability plots (P-plots) of the residuals indicated that the assumption of normality was not met either for the retention data or the log-transformed retention data, the latter being distributed bimodally. An attempt was made to investigate predictors of retention by undertaking a multinomial analysis on the four-category classification of the retention periods described above (namely minimal, short-term, medium-term and long-term users). To reduce the number of cells with zero sample sizes for this variable, before undertaking the analysis each of the independent variables were dichotomised based on the pattern of differences demonstrated by the bivariate analyses (Age: 1  $\leq 35$  years 2 = 35 years and above; User: 1 = consumer 2 = carer or other; Location: 1 = capital or other city; 2 = rural/remote) before undertaking the analysis. However, the assumption of parallel lines was violated.

The retention data were therefore dichotomised into two categories (1 = active for 1 day or less ( $n = 1438$ ); 2 = active for >1 day ( $n = 1492$ )) and a logistic regression undertaken using gender, age, location, and user status as independent variables. The latter three factors were coded as dummy variables (see Table 5 (i)). The analysis demonstrated

**Table 5**

Predictors of retention: logistic regression for a two-category dependent variable (retention <1 day vs 1 or more days).

Independent variables	Unstandardized coefficient		Standardized coefficient Exp beta	Wald	Sig
	B	SE			
Gender	0.05	0.09	1.05	0.33	0.57
Age 20–34 yrs	−0.26	0.17	0.77	2.19	0.14
Age 35–50 yrs	−0.32	0.18	1.37	3.01	0.08
Age 50–64 yrs	−0.15	0.21	0.86	0.52	0.47
Age 65+ yrs	0.52	0.52	1.68	0.98	0.32
Other city	−0.05	0.10	1.05	0.23	0.63
Rural remote	−0.17	0.11	0.85	2.28	0.13
Carer	0.60	0.14	0.55	17.34	<0.001
Other	0.36	0.10	1.43	13.09	<0.001

Dummy variables: Age reference group ≤20 years yrs; Location reference group = Capital city; User type reference group = Consumer.

an overall significant effect for the model (Chi-square(9) = 35.43,  $p < 0.001$ ), and greater retention by consumers compared to carers ( $p < 0.001$ ) and other users ( $p < 0.001$ ). There were no other significant predictors. The Hosmer-Lemeshow test indicated that the model provided an adequate fit to the data (Chi-square(7) = 1.76,  $p = 0.97$ ). However, the Nagelkerke  $R^2$  value was only 0.02, indicating that the effect was very weak. A similar pattern of findings was demonstrated when the retention data were dichotomised into retention for <1 month and retention of 1 month and greater (Chi-square(9) = 43.54,  $p < 0.001$ , Hosmer-Lemeshow Chi-square(8) = 6.27,  $p = 0.62$ , Nagelkerke  $R^2 = 0.037$ ) with a consumers more likely than carers and others to use the Board for at least a month (consumer vs carer Wald (1) = 9.75,  $p = 0.002$ ; consumer vs other Wald (1) = 21.78,  $p < 0.001$ ). As a final consistency check three survival analyses (Cox proportional hazards regression with (i) no censoring, right censoring for last (ii) 2 and (iii) 12 weeks of data collection) were undertaken on the data. In each case the findings were consistent with those of the logistic regression except that the trend in the logistic regression for those aged 20 years to remain for less time than users aged 35 to 50 years achieved statistical significance in the survival analyses.

#### 4. Discussion

Using details collected at registration we found that over the almost 5.75 year period of the study, a total of 2932 people contributed a total 131,004 posts to a publicly accessible, moderated online support group for depression and related disorders. The majority of users were women, aged between 20 and 34 years, and consumers (with direct experience of mental ill-health). Most resided in a city and lived in Australia, although visitors were from 76 different countries and 19% of users were from rural or remote regions. Posts were primarily to condition forums (and the 'Living with Depression' forum in particular), although a substantial minority of posts were concerned with more general topics (in particular 'Chit-Chat'). There was a very large growth in posts over the monitoring period that substantially exceeded the growth in new users. Of the active BlueBoard users, those who posted more in one forum also posted more in other forums. Retention periods on the board varied across users with a moderate association between retention and number of posts. Bivariate analyses suggested that consumers posted more often and remained more engaged than other users and that younger users (<20 years) posted less actively than older users and tended to remain engaged with the board for less time. Further, these uncontrolled analyses indicated that women remained on the Board over a longer period than men, as did people from rural and remote areas compared with their city counterparts - although the latter effects were not statistically significant after adjustment for multiple comparisons. Multivariate analyses confirmed consumers posted more often and engaged with the board for longer,

and that young people posted less often and engaged over a shorter period than some older age groups. However gender and location effects on retention were not sustained after controlling for other factors; rural and remote users showed a trend to lower post frequency.

The distribution of characteristics among users of BlueBoard was consistent with previous reports that consumers (Houston et al., 2002; Powell et al., 2003; Salem et al., 1997; Alexander et al., 2003) comprise a greater proportion of users of online depression support groups than their counterparts. Significantly, in contrast to most previous research the methodology of the current study used registration data that did not rely on potentially unrepresentative surveys or unvalidated inferences based on the content of posts. Together with the findings in the current study that consumers posted more frequently and over a longer period of time, the findings from the current and previous studies suggest that online support groups for depression and related disorders are more important for those with lived personal experience of the condition than for carers. Alternatively, it is possible that the contributions from carers initially fell short of the critical mass required to sustain carer peer engagement thereby compromising further growth of carer involvement, that the strong consumer presence reduced carer sense of ownership and identification with the Board and that carers might prefer a space dedicated to their needs and priorities.

Our finding that there were more users among the younger (20–34 years) than the older cohorts is consistent with the findings of previous survey studies (Dosani et al., 2014; Houston et al., 2002; Powell et al., 2003). Could this pattern simply reflect the age distribution of the population? According to Australian Bureau of Statistics census figures, 22% of Australians were aged between 20 and 34 years in 2012–13 (Australian Bureau of Statistics, 2015a). Clearly then this age group was substantially overrepresented among users of the board which accounted for 55% of the current sample. Further, this overrepresentation cannot be explained by the relatively small disparity in Internet access among age groups (Australian Bureau of Statistics, 2014). The higher prevalence of common mental disorders among the younger cohort may have contributed at least in part to this pattern (Australian Bureau of Statistics, 2008). However, given the magnitude of the observed difference in frequency of users in each of these age groups it is likely that age exerted an independent effect on initial engagement with the online support group that was not explained by other factors such as internet access and mental health status.

Young users <20 years were more likely than those aged 20 to 50 years to make only one post and posted on the board over a shorter period than those aged 35 to 50 years. This group is apparently less engaged by the activities on the board. There may be a number of explanations for this. The age group comprised only a small proportion of users. A lack of availability on the board of age-matched peers with shared life experience and interests may have served as a barrier to frequent and sustained participation. Age can confer a perception of authority, mitigating against the operation of equal peer relationships. Alternatively, mirroring face-to-face barriers, young people may have difficulty in or be reluctant to articulate their emotional problems. On the other hand, peer support groups may in fact be less engaging for young people than for older consumers. Further research is required to investigate the usage and drivers of online peer-to-peer support among this age group.

Whereas previous studies have reported mixed findings with respect to the gender of users (Dosani et al., 2014; Fekete, 2002; Houston et al., 2002; Powell et al., 2003; Salem et al., 1997; Takahashi et al., 2009), the current study showed a clear predominance of women (67%) among users of the online support group. These figures may reflect the higher rates of depression in women, with studies consistently reporting a prevalence of depression in women that is twice that of men (Kessler, 2003). The lack of gender effects on post frequency and retention on the board after controlling for other factors suggests that once they post on an online support group men and women engage to a similar extent.

The finding that a substantial minority of users of the bulletin board resided in rural or remote regions is important. Overall, census figures indicate that almost two-thirds (66%) of Australians resided in a capital city in June 2014 whereas only a little over one-half (52%) (Australian Bureau of Statistics, 2015b) of BlueBoard users were from a capital city. It is unclear if this higher prevalence of users from outside the main cities reflects a preference among these citizens for self-help or to provide help to others, a lower access to face-to-face mutual support groups, the lack of accessible professional services in rural areas, or the impact of some other factor. It does however suggest that an online service of this type may be an acceptable and feasible source of support for citizens residing in rural areas who otherwise lack either face-to-face peer support or accessible professional services.

Although the majority of users were from Australia, the findings emphasise the potential reach of an online support group such as this with users residing in 76 different countries. If, as has been proposed, the concept of universality of illness is an important factor in recovery (Yalom and Leszcz, 2005), then it is conceivable that the commonality of experiences shared by people from diverse backgrounds might contribute to recovery among users of the service.

It was notable that the majority of posts were to the condition forums within which there was less emphasis on 'Taking care of ourselves' forums. The "Living with" forums are for "reaching out to others and sharing your experiences. You are not alone with [the condition]" whereas the 'Taking care of ourselves' forum is about "What do you do to take care of yourself? Here is a supportive forum where you can share the things you do to feel good." The difference in popularity of the forums may reflect a focus by users not only on sharing the impacts of the condition and seeking support but also on providing support to those in distress rather than focusing specifically on communicating positive strategies." Moreover, it may be that some of the posts in the "Living with" condition include sharing positive strategies as part of the support provided by users to others. Recent research on a cancer support group has found that members were less likely to respond to messages expressing positive emotion (Lewallen et al., 2014). Thus, the response patterns of members may encourage users to focus on negative content. On the other hand, the relatively high rate of posts to the general forum comprising 'Chit-Chat' indicates that users were not solely focused on the negative effects of their condition. For active users there was a positive relationship between posts to the condition and general forums suggesting that these users were forming connections that transcended their disorders. It is possible that such interactions have a positive effect on mental health through the pursuit of safe but normalising interactions at a time of the user's choosing. The latter may be difficult to sustain in the course of face-to-face interactions, the timing and duration of which are less easily controlled and the nature of which may be less predictable and less supportive.

The large growth in posts relative to a smaller growth in new users suggests that an increase in posts may generate greater engagement among existing users. Recent research indicates that receiving online problem- and emotion-focused support increases a person's willingness to reciprocate by providing support (Lin et al., 2015). It has previously been suggested that insufficient activity may compromise the sustainability of support groups (Jones et al., 2004). Conversely, however, it is thought that too much activity might discourage users by creating a less personal space and information load among visitors (Jones et al., 2004). Clearly, the current support group was still in the growth phase after 5 years.

In the current sample, only 3.7% of users engaged with the bulletin board for more than one year. It is instructive to compare this figure with the distribution of users reported in the cross-sectional survey undertaken by Nimrod et al. (Nimrod, 2012) in which 40% of respondents had been members for over one year. This raises questions about the use of survey methodology to explore the characteristics of online support groups. More particularly it casts doubt on Nimrod et al.'s conclusion that participants in their survey were 'quite representative of members

of online depression support groups' ((Nimrod, 2012), p. 1255). Nevertheless, both the latter study and the current study reported higher retention among older participants and neither reported a gender effect on retention.

#### 4.1. Limitations and future research

Although there was a consistent effect of user type on post frequency and duration of usage, the effect was extremely weak. This suggests that other factors not identified in the current study are the major contributors to differences in usage. A limited range of personal characteristics were measured at registration. Future research should incorporate additional variables at registration (e.g., symptoms severity) to enable a more comprehensive investigation of the predictors of usage and to identify the factors which predict usage on online support groups.

The current study did not examine the relationship between user characteristics or usage and outcomes, either positive or negative. Even if ISGs are associated with an positive health outcomes at a group level, or as reported previously that higher usage is linked to better outcomes (Houston et al., 2002), it cannot be assumed that the effects apply to all individuals. A substantial minority of users in a research-specific ISG reported "feeling upset that they could not help the other members of the ISG more" (29%) and 'frustration that they could not meet the other members of the ISG in person' (17%) (Crisp and Griffiths, 2016). Other studies of ISGs have reported the potential for 'a downward depressive spiral triggered by aggravated psychological burden' (Takahashi et al., 2009) and one study reported an association between online forum use and increased suicidal ideation among young people (Dunlop et al., 2011). Further, although an analysis of user posts to BlueBoard are characterized by a predominantly positive user perspective, potential disadvantages of participation occur when an individual does not feel that they belong in the group due to the severity of their problems or other personal characteristics such as age (Griffiths et al., 2015). Accordingly, there is a need not only to undertake further investigations of ISG user characteristics, usage and outcomes individually but also to examine how they interact and in particular how a user's characteristics and fit within the composition of the support group affect the outcomes of participation.

## 5. Conclusion

Online support groups attract consumers with depression and related disorders including young adults and those from rural and remote areas. Although only a small minority of users were active, the evidence from the current study suggests that a small group of regular users is sufficient to ensure the sustainability and growth of the group. Further research is required to understand why so many support group members limit their contributions to one or a very small number of posts, what factors predict and promote active engagement and long-term retention in virtual mental health communities and which if any user characteristics and usage factors affect health outcomes.

#### Authors' contributions

KG conceived the study, undertook the statistical analyses and wrote the paper. BC pre-processed the data, undertook the survival analyses, and contributed to the interpretation of the data. JR, AB and KB contributed to the data collection. All authors edited the paper and have read and approved the final manuscript.

#### Declaration of interest

KG established BlueBoard and KG, JR KB and AB were responsible for the provision of the BlueBoard service. None of the authors derived personal financial benefit from the operation of the service.

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