POSTTRAUMATIC GROWTH, HEALTH-RELATED QUALITY OF LIFE AND SUBJECTIVE HAPPINESS AMONG GREAT EAST JAPAN EARTHQUAKE SURVIVORS ATTENDING A COMMUNITY KNITTING PROGRAM TO PERFORM ACTS OF KINDNESS

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Yarn Alive (YA) is a non-profit organization that was started after the 2011 Great East Japan Earthquake to support women through a knitting group that provided social support, creative expression, and opportunities to practice acts of kindness. In this study, we examined whether YA changed the level of posttraumatic growth (PTG), health-related quality of life (HRQOL), and subjective happiness as measured by the subjective happiness scale (SHS). We conducted a retrospective correlational study through administering a cross-sectional survey to 98 YA participants and 97 YA non-participants in May-July 2017. Questionnaires were received from 72 YA participants (response rate=73.5%) and 63 non-participants (response rate=64.9%). Data was analyzed by conducting descriptive, correlational, and multiple linear regression analyses. Participation in the YA program was shown to have a positive impact on HRQOL (R^2=.18, adjusted R^2=.15, p<.0001) and SHS (R^2=.07, adjusted R^2=.05, p=.013), which is positively correlated with time. Participants with a high school education or less seemed to benefit more from the program than those with at least a college or university degree (R^2=.18, adjusted R^2=.15, p<.0001). We also found the spiritual domain of PTG to be higher among YA participants (t=2.9, p=.004) and overall PTG to be positively associated with incremental impact experienced during the disaster (R^2=.12, adjusted R^2=.11, p<.0001). This study shows that formal academia-led evaluation of grassroots community programs can yield information that may help direct resources to the most appropriate and acceptable programs by the community and strengthen their implementation.

Keywords: *Great East Japan earthquake, posttraumatic growth, quality of life, subjective happiness, participatory research, behavioral science.*

1. Introduction

The Great East Japan Earthquake (GEJE), magnitude 9.0 on the Richter scale, occurred offshore of the Sanriku region on March 11, 2011 (Japan Geological Society, 2011). This earthquake triggered a catastrophic tsunami that resulted in the meltdown of two of the four nuclear reactors in Fukushima, creating one of the worst disasters in modern time Japan (Japan Geological Society, 2011). As of June 10, 2019, it has been estimated that the disaster resulted

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in 15,897 deaths, 6,157 injuries, and 2,532 missing people (National Police Agency of Japan, 2017).

The significance of the damage pertains not only to human loss but also loss of critical housing infrastructure, with 121,991 collapsed homes, and 730,114 homes partially destroyed (National Police Agency of Japan, 2017). Two-thirds of the people who died in GEJE were over 60 (66.1%) and 70 years old (46.5%) (Cabinet Office of Government of Japan, 2013). Immediately after the disaster, many people were forced to take refuge in school gymnasiums and community halls for a minimum of 2 months and up to 9 months while temporary housings were built and homes were repaired (Miyagi Prefecture Earthquake and Recovery Division, 2017). Government-built temporary housing became available as early as the end of April 2011. March 2012 was the peak when 126,948 people (53,301 households) were staying in temporary accommodation in Miyagi Prefecture alone, and this has decreased to 10,639 people (5,057 households) as of September 30, 2017 (Miyagi Prefecture Earthquake and Recovery Division, 2017).

Following the GEJE, a significant amount of the population was affected by post-disaster mental health issues, including but not limited to posttraumatic stress disorder, anxiety, and depressive symptoms (Harada et al., 2015). Shortly after the disaster, the World Health Organization reported significant mental health stigma among the populations around the rural coastal area of Miyagi Prefecture (Yamazaki, Minami, Sasaki & Sumi, 2011). Within one week of the earthquake, The Japanese Association of Psychiatric Hospital, Japanese Society for Psychiatry and Neurology, National Center of Neurology and Psychiatry and the Ministry of Health mobilized and dispatched personnel to provide standard mental health care and set up a disaster response committee for the affected population (Yamazaki et al., 2011). To provide longer-term psychological support, a Disaster Mental Health Care Center was also established in Miyagi, Iwate, and Fukushima Prefectures – the three most affected prefectures. In rural areas, the GEJE further exacerbated the mental health needs among these communities that already had a low access to mental healthcare before the earthquake (Yamazaki et al., 2011). Therefore, many non-profit organizations (NPOs) and volunteer groups started various psychosocial support and rehabilitation programs in these communities to supplement formal mental health services. However, most of the civil-society-led support programs were not formally evaluated to measure the degree of benefit and impact to the beneficiaries and the broader community.

Yarn Alive is one of the NPOs that was started in July 2011 in the coastal town of Shichigahama in Miyagi Prefecture, four months after the GEJE. The Yarn Alive program first began by bringing a few female survivors of the GEJE to knit and crochet together in their temporary housing as the founder did not want them to give up after the disaster and wanted to bring purpose to their lives through a philanthropic cause by donating their craftworks to others who also experienced hardship. The Yarn Alive program is run by an American who is well-integrated into the community and have lived in Japan for more than 40 years, along with eight Japanese local volunteers from the same community. The classes are organized into four separate two- to three-hour classes either weekly or bi-monthly, with a total of approximately 100 women, mostly 65 years or older attending. Due to the Shichigahama town being a relatively rural area, transportation is an issue. Therefore, participants often carpool to attend the classes. However, some may not be able to join when transportation is not available. The Yarn Alive program accepts anyone who wants to be part of this community, learn knitting or crocheting, meet new friends, or serve others less fortunate through donating their craftworks. As of 2020, when this article was written, Yarn Alive remains to be one of the few NPOs still providing an avenue for GEJE survivors in Miyagi Prefecture to come together as a community, as well as to give back and serve others.

The program has a heavy philanthropic focus and organically incorporated three evidence-based components that have been shown to improve mental well-being in its activity: 1) social support by bringing disaster survivors together (Painter et al., 2016; Bekele et al., 2013; Cadell et al., 2003); 2) creative expression through knitting (Riley et al., 2013; Burt & Atkinson, 2011); and 3) practicing acts of kindness (Otake et al., 2006; Aknin et al., 2012) through donating their creations such as blankets, hats, slippers, gloves, and scarves to other disaster survivors and people in need around the world including countries as far as Nepal, Philippines, Jordan, and Mozambique.

There are many anecdotal evidences on the benefits of knitting and crocheting programs on mental well-being, however, only a few are rigorous peer-reviewed studies (Riley et al., 2013; Bekele et al., 2013). Based on our literature review, there is a lack of research in using validated psychological scales to examine the benefit of knitting and crocheting. From our initial discussion with the Yarn Alive founder and the volunteers, they believed the major benefits they saw from participants attending Yarn Alive was a re-invigorated sense of meaning, better mental health, and improved mood. We wanted to measure and capture these, however, we were also cognizant of the balance of using excess number of scales in the questionnaire which may lead to participant fatigue and inaccurate results. Therefore, together with the Yarn Alive founder, we decided to select three outcome measures, posttraumatic growth (PTG), health-related quality of life (HRQOL) and subjective happiness as measured by the subjective happiness scale (SHS), which have all been well-validated globally, as well as translated and validated in the Japanese setting (Shimai et al., 2004; Taku et al., 2007; Tokuda et al., 2009).

In this study, we aim to examine whether the Yarn Alive program changed the level of PTG, HRQOL and SHS among the GEJE-affected women attending this program. In addition, we are also interested to see if Yarn Alive participants' PTG, HRQOL, and SHS scores would vary according to the length of time participants spent in the Yarn Alive program.

Increasing evidence in community psychology have suggested distress experienced post-disaster by survivors is more pronounced from long-term psychosocial implications such as losing a community or social ties, as opposed to from the disaster itself (Stewart et al., 2012). Furthermore, post-disaster informal support has been found to be more common than formal psychosocial support for disaster survivors (Ibañez et al., 2003). Our goal is to elucidate strengths and areas for improvement of this informal and organically formed psychosocial support program that has been running successfully since 2011 to provide future direction for community psychosocial support programs.

2. Methods

2.1 Study design

This is a retrospective correlational study using a cross-sectional survey to examine the PTG, HRQOL and SHS (outcome measures) of the 2011 GEJE survivors who attended the Yarn Alive program (exposure group) and those who did not attend the classes (non-exposure control group). All participants were residing in Shichigahama and the surrounding areas, in Miyagi Prefecture, Japan. This study was approved by Tohoku University Human Ethics Committee on April 24, 2017.

2.2 Measures

The survey questionnaire consists of four sections, as outlined below:

Demographics and disaster-related experiences. The first section of the questionnaire consisted of demographic variables (e.g., age, city of current residence, level of education,

living situation, marital status, and working situation); disaster-related experiences (e.g., the impact of the GEJE on them and previous experience of disasters before the GEJE); and other support individuals received besides Yarn Alive after the 2011 GEJE. There was a total of eleven main questions for this section.

Among these main questions, we also asked sub-questions relating to our three outcome variables - PTG, HRQOL and subjective happiness. Previous studies have shown factors such as self-disclosure, the level of disruption of the assumptive world, spirituality, social support, religious beliefs, and deliberate rumination can affect the level of PTG, HRQOL and subjective happiness within an individual (Bekele et al., 2013, Cann et al., 2010; Cadell et al., 2003; Calhoun et al., 2010; Khachadourian et al., 2015; Lyubomirsky et al., 2011; O'Connell & Skevington, 2005; Riley et al., 2013; Taku et al., 2015; Tomita et al., 2017). Consequently, these variables were collected to examine their association with PTG, HRQOL and subjective happiness reported by the study participants.

Post-Traumatic Growth Inventory (PTGI). This 21-item inventory was originally created by Professors Calhoun and Tedeschi (1996) and has been widely validated worldwide (Horswill et al., 2016; Shakespeare-Finch & Barrington, 2012). It measures positive change and growth of an individual in five areas: 1) relating to others; 2) new possibilities; 3) personal strength; 4) spiritual change; and 5) appreciation of life. The PTGI summary score has been used for scoring worldwide to measure PTG, and a validated Japanese version is used for this study (Taku et al., 2007; Tedeschi & Calhoun, 1996).

SF-8 Health Survey. This 8-item inventory was inserted into our questionnaire to measure HRQOL. Similar to the longer 36-item version, the SF-8 short form has been adapted from the Medical Outcomes Study (MOS) and provides a good measure of both physical and emotional health and how an individual's daily life is affected (Ware & Sherbourne, 1992). Scores were calculated by averaging all items measured in the scale (Ware et al., 1993; Ware et al., 2001). The Japanese version of the health survey is available and has been validated (Tokuda et al., 2009).

Subjective Happiness Scale. This 4-item scale, originally developed by Professors Lyubomirsky and Lepper in 1996, was incorporated in our questionnaire to measure subjective happiness (Lyubomirsky & Lepper, 1999). According to the SHS scoring manual, scores should be calculated by averaging scores from the four questions (Lyubomirsky, 1999; Lyubomirsky & Lepper, 1999). The SHS has been validated, and the Japanese translated version has also been published and validated (Shimai et al., 2004).

2.3 Sample size calculation

Based on an estimated change in PTGI score of 12 between the Yarn Alive group and the control group, 80% power, a significance level of 0.05, a 2-sided test, and an estimated standard deviation of 20, a sample size of 44 participants was required for each group. To account for an estimated 50% refusals with mail surveys, we decided to approach everyone attending the Yarn Alive classes (approximately 100 participants) to ensure we have the minimum required sample size. For the non-exposure control group, we gave an extra questionnaire to the Yarn Alive participants to recruit the other 100 participants who also experienced the GEJE but are not currently attending the Yarn Alive classes.

2.4 Participant recruitment and data collection

Study participants were recruited during four visits to Yarn Alive morning and afternoon classes on 17, 23, and 26 May 2017. Ninety-eight questionnaires were distributed to Yarn Alive participants and ninety-seven to Yarn Alive non-participants recruited through the Yarn Alive

participants. Selection criteria of the Yarn Alive non-participant were someone of the same sex and age who is living in a similar area and has also experienced the GEJE (Lau, 2017). A participant information sheet was given to each study participant to inform them of the study purpose, voluntary participation, confidentiality of data collected, approximate time required to complete the questionnaire, and the selection criteria. The participants were advised to return the anonymous questionnaire within one month with the stamped return envelope provided and were informed that agreement to participate in the study would be assumed if they return the questionnaire. No personally identifiable data was collected nor written consents obtained to protect the identity of the participants.

Upon receiving all hardcopy questionnaires, data were entered into an electronic database in Epi-Info 7 (CDC, Atlanta).

2.5 Data analysis

Data were first cleaned for inconsistencies as well as data entry errors. Subsequently, we conducted a descriptive analysis of the demographics and the disaster experience of the participants. Results were presented either as frequency and percentages for categorical data or mean and standard deviation for continuous data. Since the length of Yarn Alive participation among study participants varies broadly (from four months to six years), we aggregated the two groups (those participating and have not participated in the Yarn Alive program) into one dataset where time spent in Yarn Alive for those who did not participate in the Yarn Alive program were coded as 0 months.

We then utilized the stepwise backward elimination approach (Abd El-Sallam et al., 2003) to conduct the multiple regression analysis using 21 predictor variables (based on a literature review) and the three outcome variables, PTG, HRQOL and SHS. First, we conducted bivariate Pearson correlational analysis to investigate the strength of association between the 21 predictor variables and three outcome variables. All continuous outcome variables were checked through scatterplot and the Shapiro-Wilk test in SAS for normality. The 21 predictor variables were then included in the base model for each of the three outcome variables in the multiple regression analysis (PTG: Model 22; HRQOL: Model 22; SHS: Model 22). To address multicollinearity, we then sequentially removed all variables from the highest to the lowest variance inflation factor (VIF) until no variables with VIF higher than ten remained.

Thereafter, we assessed effect modification and confounding. Given our *a priori* hypothesis that increased time spent in Yarn Alive may be the predominant variable predicting PTG, HRQOL and SHS scores, interaction terms between time (number of years) spent in Yarn Alive and all other predictor variables were created. Each set of interaction terms was then assessed using the TEST statement in SAS version 9.4 (SAS Institute, Inc., Cary, NC). Interaction terms were sequentially removed by a significance level of 0.05 to determine whether there was evidence of effect modification with time spent in Yarn Alive in these data. Based on the model with added interaction terms, we continued to assess the significance and confounding of each remaining predictor variable. We determined whether each remaining predictor variables were potential confounder by assessing the percentage of absolute difference in their regression coefficients between the univariate model and the regression model, with a 10% difference being the cutoff point. After the assessment of potential confounder, predictor variables were fitted to create our final models (PTG: Model 43; HRQOL: Model 41; SHS: Model 42).

We first conducted the data analysis as mentioned above using the complete dataset where we only included individuals with no missing data to examine if there are correlations between time spent in Yarn Alive and our three outcome variables. To verify our initial analysis and to capture other associating covariate that we might have missed due to the reduced sample size for some of the questions due to missing data, we then conducted missing data imputation in

five iterations using SPSS version 25.0 (IBM Corp., Armonk, NY) and repeated the same analysis using the post-imputation dataset. Mean scores were calculated for HRQOL and SHS according to the scoring manual. To ensure consistency in methodology used between the three scales, we also calculated the mean PTG scores. We compared the imputed and non-imputed data by examining the association between each of the 22 selected predictor variables and the outcome variables, PTG score, HRQOL score, and SHS score, before and after data imputation using scatter plots and Pearson correlations. All data analysis except missing data imputation was conducted in SAS version 9.4 (SAS Institute, Inc., Cary, NC). Statistical significance was set at 0.05 for assumption checks in the multiple regression analysis. The Bonferroni correction method was subsequently used to adjust for multiplicity in the omnibus test with adjusted alpha set at 0.17 to reduce the likelihood of type I error given three separate multiple regression analyses were conducted (Nobel, 2009).

3. Results

3.1 Demographics of survey respondents

Questionnaires were received from 72 Yarn Alive participants (response rate = 73.5%) and 63 non-participants (response rate = 64.9%). Three surveys from the non-participants were not included in the analysis given they did not meet the selection criteria for the study. The mean age for Yarn Alive participants was 68.2 years old (SD=8.3) and 64.4 years old (SD=10.2) for Yarn Alive non-participants (data not shown). Participants 60 years of age or older comprised 83.3% (n=60) of the respondents in the Yarn Alive participant group and 73.3% (n=44) in the non-participant group (Table 1). Most survey respondents obtained a minimum of high school education, 75.0% (n=54) and 76.7% (n=46), and resided in Schichigahama, 90.3% (n=65) and 78.3% (n=47), for the Yarn Alive participants and non-participants respectively. Of all survey respondents, only one (1.7%) Yarn Alive non-participant still lives in temporary housing while the majority live with families (Yarn Alive participants: n=65, 90.3%; Yarn Alive non-participants: n=52, 86.7%) and a few reported living alone (Yarn Alive participants: n=6, 8.3%; Yarn Alive non-participants: n=5, 8.3%). Nineteen (26.4%) Yarn Alive participants and 14 (23.3%) non-participants identified as single, divorced, or widowed. Seven (9.7%) Yarn Alive participants and 17 (28.3%) Yarn Alive non-participants reported that they were working at the time they completed the questionnaire; the rest of the Yarn Alive participants responded as currently not working (n=11, 15.3%), having retired (n=20, 27.8%), or did not respond (n=9, 12.5%). Buddhism was the most commonly reported religious affiliation (Yarn Alive participants: n=54, 75.0%; non-participants: n=33, 55.0%).

As shown in Table 2, 91.7% (n=66) of the Yarn Alive participants and 76.7% (n=46) of the non-participants reported having experienced damages or losses in the 2011 GEJE. Loss of income following the GEJE was reported by a higher proportion of Yarn Alive participants (n=19, 26.4%) than non-participants (n=10, 16.7%). Loss of or damage to the home following the GEJE was also reported by a higher proportion of Yarn Alive participants (n=59, 81.9%) than non-participants (n=34, 56.7%). In the six months immediately following the GEJE, the majority of the respondents across both groups thought about the disaster every day or at least a few times a week (Yarn Alive participants: n=57, 79.1%; non-participants: N=48, 80.0%; Table 2). Six years after the GEJE, fewer respondents reported thinking about the disaster every day or a few days per week (Yarn Alive participants: n=18, 56.9% and non-participants n=11, 18.3%). Nearly two-thirds of Yarn Alive participants (n=41, 56.9%) and non-participants (n=37, 61.7%) reported their way of thinking about the disaster has changed from immediately following the GEJE to six years after.

Table 1. Demographics of Yarn Alive program participants and non-participants, cross-sectional survey, Shichigahama, May-June 2017

Demographics	Yarn Alive participants N=72		Yarn Alive non-participants N=60	
	n	%	n	%
Age[1]				
30-39	0	0.0%	1	2.0%
40-49	3	4.2%	5	8.3%
50-59	8	11.1%	8	13.3%
60-69	27	37.5%	24	40.0%
70-79	26	36.1%	17	28.3%
80-89	7	9.7%	3	5.0%
Highest level of education[2]				
Primary/elementary school	15	20.8%	12	20.0%
High school/old system middle school	43	59.7%	31	51.7%
Junior college/technical college	10	13.9%	13	21.7%
University	1	1.4%	2	3.3%
City of residence[3]				
Shichigahama	65	90.3%	47	78.3%
Other neighboring city	5	6.9%	11	18.3%
Type of housing[4]				
Own home	62	86.1%	55	91.7%
Temporary housing/ government housing	7	9.7%	2	3.3%
Other	2	2.8%	1	1.7%
Living arrangement[5]				
Living with family	66	91.7%	55	91.7%
Living alone	0	0.0%	0	0.0%
Marital status[6]				
Married	50	69.4%	42	70.0%
Widowed	0	0.0%	0	0.0%
Divorced	0	0.0%	0	0.0%
Single	0	0.0%	0	0.0%
Other	0	0.0%	0	0.0%
Working situation[7]				
Currently working	7	9.7%	17	28.3%
Not Currently working/ retired	31	43.1%	21	35.0%
Other working situation	25	34.7%	18	30.0%
Religion[8]				
Buddhism	56	77.8%	34	56.7%

1. Missing data for Age – Yarn Alive participants: n=1(1.4%); non participants: n=2(3.3%)
2. Missing data for Highest level of education – Yarn Alive participants: n=3(4.2%); non-participants: n=2(3.3%)
3. Missing data for City of residence – Yarn Alive participants: n=2(2.8%); non-participants: n=2(3.3%)
4. Missing data for Type of housing – Yarn Alive participants: n=1(1.4%); non-participants: n=2(3.3%)
5. Missing data for Living arrangement – Yarn Alive participants: n=6(8.3%); non-participants: n=5(8.3%)
6. Missing data for Marital status – Yarn Alive participants: n=22(30.6%); non-participants: n=18(30.0%)
7. Missing data for Working situation – Yarn Alive participants: n=9(12.5%); non-participants: n=4(6.7%)
8. Missing data for Religion – Yarn Alive participants: n=16(22.2%); non-participants: n=26(43.3%).

Approximately half of all respondents had experienced other major natural disasters before the GEJE (Yarn Alive participants: n=33, 45.8%; non-participants: n=32, 53.3%; Table 2). Of the 33 Yarn Alive participants who reported previous disaster experiences, 13 (39.4%) experienced Miyagi offshore earthquake in 1978, 6 (18.2%) the Chilean earthquake in 1960, and 18 (54.5%) with unspecified previous natural disaster experience. Of the 32 Yarn Alive non-participants, 7 (21.9%) experienced the Miyagi offshore earthquake in 1978, 6 (18.8%) the Chilean earthquake in 1960, and 15 (46.9%) with unspecified previous natural disaster experience. Among these respondents, less than half reported experiencing damage or losses in previous disasters (Yarn Alive participants: n=15, 45.5%; non-participants: n=14, 43.8%).

Table 2. Disaster-related impact and experiences of Yarn Alive program participants and non-participants, cross-sectional survey, Shichigahama, May-June 2017

	Yarn Alive participants N=72		Yarn Alive non-participants N=60	
	n	%	n	%
Frequency of thoughts about the disaster				
In the six months immediately following GEJE[1]				
Everyday	41	56.9%	30	50.0%
A few times a week	16	22.2%	18	30.0%
Once a week	2	2.8%	4	6.7%
Once a month	3	4.2%	0	0.0%
Once every few months	4	5.6%	2	3.3%
Not at all	1	1.4%	3	5.0%
Currently (six years following GEJE)[2]				
Everyday	11	15.3%	5	8.3%
A few times a week	7	9.7%	6	10.0%
Once a week	12	16.7%	10	16.7%
Once a month	15	20.8%	17	28.3%
Once every few months	20	27.8%	11	18.3%
Not at all	0	0.0%	5	8.3%
Ways of coping with the disaster				
Talking to others	39	54.2%	28	46.7%
Attending Yarn Alive classes	30	41.7%	-	-
Spending time with important people in my life	28	38.9%	28	46.7%
Self-reflection such as journaling	9	12.5%	7	11.7%
Spiritual/religious faith	0	0.0%	2	3.3%
Experience of other major natural disasters before the 2011 disaster[3]				
Yes	33	45.8%	32	53.3%
Previous disaster		0.0%		0.0%
1960, Chilean Earthquake	6	18.2%	6	18.8%
1968, Tokachi Earthquake	0	-	1	3.1%
1978, Miyagi Offshore Earthquake	13	39.4%	7	21.9%
1983, Sea of Japan Earthquake	0	-	2	-
2005, Miyagi Offshore Earthquake	0	-	1	3.1%
Unspecified	18	54.5%	15	46.9%
Damage and losses				
Yes	15	45.5%	14	43.8%
Lost home	10	30.3%	7	21.9%
Lost household items	3	9.1%	1	3.1%
Lost source of income	2	6.1%	2	6.3%
Lost at least one family member	1	3.0%	0	-
Lost car / boat	1	3.0%	0	-
Almost lost own life	0	-	1	3.1%
Physical disability resulting from the disaster	0	-	1	3.1%
Lost Pet	0	-	0	-
Unspecified	1	3.0%	3	9.4%
Did not experience any damage or losses	17	51.5%	14	43.8%
No	32	44.4%	24	40.0%

1. Missing data for Frequency of thoughts about the disaster in the six months immediately following the disaster – Yarn Alive participants: n=5(6.9%); non-participants: n=3(5.0%)

2. Missing data for Frequency of thoughts about the disaster currently, six years following the disaster – Yarn Alive participants: n=7(9.7%); non-participants: n=6(10.0%)

3. Missing data for Experience of other major natural disasters before the 2011 disaster – Yarn Alive participants: n=1(3.0%); non-participants: n=4(12.5%)

Respondents reported a variety of mechanisms that helped them cope post-disaster. Yarn Alive participants reported utilizing coping methods of talking to others (n=39, 54.2%), attending Yarn Alive classes (n=30, 41.7%), spending time with important people (n=28, 38.9%), and self-reflection such as journaling (n=9, 12.5%; Table 2). Similarly, among the Yarn Alive non-participants, coping methods reported were, talking to other (n=28, 46.7%), spending time with important people (n=28, 46.7%), and self-reflection such as journaling (n=7, 11.7%).

3.2 Posttraumatic growth

No statistical significance (p=.252) was found between the mean total score of PTGI among Yarn Alive participants (Mean=63.7, SD=19.3) and Yarn Alive non-participants (Mean=58.8, SD=21.1). However, the spiritual domain of PTG among Yarn Alive participants (Mean=5.1, SD=2.4) was 41.7% higher (t(51)=2.94, p=.004) compared to the non-participants (Mean=3.6, SD=2.7).

Pearson correlational analysis showed there were significant positive associations between PTG and four factors: 1) having experienced some form of damage or losses during the GEJE (R(89)=.26, p=.014); 2) the number of losses/damages experienced in the GEJE (R(89)=.31, p=.003); 3) higher frequency of ruminating about the disaster (R(89)=.27, p=.010); and 4) receiving social or emotional support following the GEJE (R(89)=.25, p=.018) (Table 4).

Result of multiple linear regression analysis for PTG indicated one factor, the number of losses or damages experienced in the GEJE (t=3.1, p<.001), significantly accounted for 11% of the variance in PTG (F(1,121)=16.67, p<.001, R^2=.12, adjusted R^2=.11; Table 5 and 6). Further investigation utilizing imputed data indicated the same finding with the number of losses or damages experienced in the GEJE (t=3.9, p<.001) to significantly account for 12% of the variance in PTG (F(2,129)=10.15, p<.001, R^2=.14, adjusted R^2=.12; Table 5 and 6). We suspect the increase from 11% to 12% variance explained by the model was due to an increase in sample size from data imputation where we imputed 24 of the 132 PTG scores (18%).

3.3 Health-related quality of life

There were no statistically significant differences (p=0.581) between the mean total HRQOL score of Yarn Alive participants (Mean=18.7, SD=5.8) and non-participants (Mean=19.3, SD=5.9; Table 3). However, there was a statistically significant decrease (9.1%, P<.05) in general health score of HRQOL among Yarn Alive participants (Mean=3.0, SD=07) compared to the non-participants (Mean =3.3, SD =0.8) where a lower score represents better health outcome. The Yarn Alive participants also reported an average 12.5% decrease in mental health score (Mean=2.1, SD=0.9) compared to non-participants (Mean=2.4, SD=1.1) but with no statistical significance (p=0.114) where a decrease in scores signified an improvement in mental health.

Pearson's correlation indicated there was a significant negative association between level of education and HRQOL (R(89)=-.27, p=.011). Two predictor variables, number of human losses/damages experienced in the GEJE (R(89)=.24, p=.024), and currently have a religious belief (R(89)=.23, p=.033) were significantly associated with HRQOL (Table 4).

Multiple regression analysis indicated three predictor variables and one effect modifier accounted for 15% of the variance in HRQOL (F(4,115)= 6.32, p=.0001, R^2=.18; adjusted R^2=.15; Table 5 and 6). The three predictor variables and one effect modifier were: time spent in Yarn Alive program (t=-4.0, p<.0001); level of education (t=-4.5, p<.0001); currently have a religious belief (t=2.8, p=.007); and an interaction term between the level of education and the time spent in Yarn Alive (t=3.0, p<.01) (Table 5; Table 6).

Table 3. Posttraumatic growth, health-related quality of life and subjective happiness among Yarn Alive program participants and non-participants, cross-sectional survey, Shichigahama, May-June 2017.

	Sample size		Yarn Alive participants Mean (SD)	Yarn Alive non-participants Mean (SD)	Mean difference	Percentage mean difference (%)	st	value
Posttraumatic growth inventory (PTGI), total score[1]	**n_{YA} = 47**	**n_{Non-YA} = 41)**	3.7 (19.3)	58.8 (21.1)	4.9	8.3	54	252
Factor I – Relating to others[2]	n_{YA} = 56	n_{Non-YA} = 52)	2.2 (6.8)	21.1 (7.5)	1.1	5.2	54	446
Factor II – New possibilities[2]	n_{YA} = 53	n_{Non-YA} = 48)	4.3 (5.3)	13.7 (5.8)	0.6	4.4	39	557
Factor III – Personal Strength[2]	n_{YA} = 60	n_{Non-YA} = 53)	2.4 (4.3)	11.4 (4.2)	1.0	8.8	53	251
Factor IV – Spiritual change[2]	n_{YA} = 56	n_{Non-YA} = 52)	.1 (2.4)	3.6 (2.7)	1.5	41.7	37	**004***
Factor V – Appreciation of life[2]	n_{YA} = 59	n_{Non-YA} = 53)	1.2 (3.1)	10.5 (2.7)	0.7	6.7	03	231
Health-related quality of life (HRQOL), total score[3]	**n_{YA} = 65**	**n_{Non-YA} = 56)**	8.7 (5.8)	19.3 (5.9)	0.6	3.1	53	581
General health[4]	n_{YA} = 71	n_{Non-YA} = 59)	.0 (0.7)	3.3 (0.8)	0.3	9.1	85	**049***
Physical function[4]	n_{YA} = 70	n_{Non-YA} = 58)	.1 (1.0)	2.2 (1.2)	0.1	4.5	40	523
Impact of physical health on daily work and activities[4]	n_{YA} = 65	n_{Non-YA} = 58)	.1 (1.0)	2.3 (1.1)	0.2	8.7	36	351
Bodily pain[4]	n_{YA} = 71	n_{Non-YA} = 60)	.5 (1.2)	2.7 (1.1)	0.2	7.4	55	514
Vitality[4]	n_{YA} = 71	n_{Non-YA} = 59)	.6 (0.9)	2.7 (0.8)	0.1	3.7	88	699
Social functioning[4]	n_{YA} = 71	n_{Non-YA} = 59)	.0 (1.2)	2.0 (1.0)	0	-	15	988
Mental health[4]	n_{YA} = 71	n_{Non-YA} = 58)	.1 (0.9)	2.4 (1.1)	0.3	12.5	92	114
Impact of mental health on daily work and activities[4]	n_{YA} = 70	n_{Non-YA} = 58)	.0 (1.0)	2.1 (1.1)	0.1	4.8	14	754
Subjective happiness scale (SHS), total score[5]	**n_{YA} = 65**	**n_{Non-YA} = 58)**	.1 (1.0)	4.9 (1.0)	0.2	4.1	23	224

YA, Yarn Alive group; Non-YA, Non-Yarn Alive group; PTG, posttraumatic growth; HRQOL, health-related quality of life; SHS, subjective happiness scale. *p<.05.

[1]PTGI total score ranged from 0 (did not experience change) to 105 (experienced change to a very great degree).

[2]PTGI individual question scores ranged from 0 (did not experience change) to 5 (experience change to a very great degree). Factor I consisted of seven questions (possible score of 0-35); Factor II consisted of five questions (possible score of 0-25); Factor III consisted of four questions (possible score of 0-20); Factor IV consisted of two questions (possible score of 0-10); Factor V consisted of three questions (possible score of 0-15).

[3]Health-related quality of life total score ranged from 8 (excellent health/ no difficulty with daily activities) to 42 (Very poor health/ could not do daily activities).

[4]Health-related quality of life individual scores ranged from 1 (excellent health/ no difficulty with daily activities) to 5 (Very poor health/ could not do daily activities), except for general health in which the maximum score is 6 (very poor health).

[5]Subjective happiness scale total score ranged from an average score of 1 (Not a very happy person) to an average score of 7 (a very happy person).

Table 4. Univariate of predictor variables and Pearson's correlational analysis with Posttraumatic growth (PTG), Health-related Quality of Life (HRQOL) and subjective happiness (SHS) score during model building

Predictor variables	Predictor variables	N	UNIVARIATE ANALYSIS				PTG CORRELATIONAL ANALYSIS		HRQOL CORRELATIONAL ANALYSIS		SHS CORRELATIONAL ANALYSIS	
			Min	Max	Mean	SD	*ρ*	*p*-value	*ρ*	*p*-value	*ρ*	*p*-value
1	Time spent in Yarn Alive[1]	72.0	0.0	6.0	1.6	2.0	0.1	0.551	-0.13	0.216	0.07	0.500
2	Age[1]	72.0	39.0	81.0	64.2	9.4	0.1	0.269	0.15	0.148	0.07	0.517
3	Level of Education[2]	69.0	1.0	4.0	2.0	0.7	-0.1	0.630	-0.27	**0.011***	0.12	0.268
4	Living Situation[2]	72.0	0.0	1.0	0.9	0.3	0.1	0.465	0.1	0.376	-0.02	0.869
5	Living with[2]	72.0	0.0	1.0	0.9	0.3	0	0.864	0.04	0.730	0.19	0.068
6	Marital Status[2]	72.0	0.0	1.0	0.8	0.4	0	0.790	-0.06	0.608	0.19	0.082
7	Working Situation[2]	72.0	0.0	1.0	0.2	0.4	-0.1	0.594	-0.04	0.694	-0.14	0.198
8	Have a religious belief[2]	72.0	0.0	1.0	0.7	0.5	0.2	0.130	0.23	**0.033***	-0.06	0.579
9	Have experienced damages or losses in the 2011 GEJE[2]	72.0	0.0	1.0	0.9	0.3	0.3	**0.014***	0.150	0.156	0.070	0.536
10	Number of losses/damages experienced in the 2011 disaster[1]	72.0	0.0	5.0	1.2	0.9	0.3	**0.003***	0.121	0.257	-0.069	0.519
11	Number of losses/damages in asset experienced in the 2011 disaster[1]	72.0	0.0	3.0	1.1	0.7	0.2	0.047	-0.01	0.954	0.02	0.841
12	Number of human losses/damages experienced in the 2011 disaster[1]	72.0	0.0	3.0	0.1	0.5	0.3	**0.010***	0.239	**0.024***	-0.164	0.125
13	Frequency of ruminating about the disaster 6 months after the 2011 GEJE[1]	72.0	0.0	1.0	0.7	0.4	0.1	0.568	0.02	0.822	-0.01	0.952
14	Frequency of ruminating about the disaster now[1]	72.0	0.0	1.0	0.1	0.3	0.3	**0.018***	0.06	0.563	0.03	0.796
15	Difference in the frequency of rumination about the disaster now and 6 months after the 2011 GEJE[1]	72.0	-1.0	1.0	-0.5	0.4	0.1	0.348	0.02	0.879	0.02	0.826
16	Number of coping methods used after the disaster[1]	72.0	0.0	4.0	1.5	0.9	0.2	0.054	0.00	0.963	0.10	0.371
17	Talking to others as a method of coping[2]	72.0	0.0	1.0	0.5	0.5	0.1	0.300	0.16	0.144	-0.02	0.879
18	Spending time with important people in life as a method of coping[2]	72.0	0.0	1.0	0.5	0.5	0	0.743	-0.09	0.400	0.12	0.247
19	Attend Yarn Alive as a method of coping[2]	72.0	0.0	1.0	0.2	0.4	0.1	0.551	-0.07	0.544	-0.02	0.868
20	Experienced other major natural disasters before the 2011 disaster[2]	72.0	0.0	1.0	0.5	0.5	0.2	0.087	-0.16	0.145	0.2	0.056
21	Received social or emotional support following the 2011 earthquake[2]	67.0	0.0	1.0	0.7	0.5	0.30	**0.005***	-0.06	0.586	0.07	0.496

PTG, posttraumatic growth; HRQOL, health-related quality of life; SHS, subjective happiness scale. *p<.05.
[1]Continuous Variable
[2]Categorical Variable

Table 5. Multiple linear regression testing the association between time spent in Yarn Alive and Posttraumatic growth (PTG), Health-related Quality of Life (HRQOL) and subjective happiness (SHS) by model steps for pre-imputed and post-imputed data, cross-sectional survey, Shichigahama, May-June 2017.

			DF	B	Standard Error	t	Sig.	95% CI for B		Collinearity Statistics	
	Final Model	**Variables**						**LB**	**UB**	**Tol.**	**VIF**
PTG	Pre-imputation (Model 43)	Constant	1	51.4	3.7	13.9	<0.001	44.1	58.8	-	0
		Number of losses/damages experienced in the 2011 disaster	1	7.5	2.4	3.07	<0.001	2.6	12.3	1.0	1.0
	Post-imputation (Model 43)	Constant	1	53.3	2.8	18.8	<0.001	47.7	59.0	-	0
		Number of losses/damages experienced in the 2011 disaster	1	7.8	2.0	3.9	<0.001	3.9	11.8	1.0	1.0
HRQOL	Pre-imputation (Model 41)	Constant	1	26.1	2.0	13.4	<0.001	22.3	30.0	-	0
		Time Spent in Yarn Alive	1	-2.9	0.7	-4.0	<0.001	-4.3	-1.5	0.1	9.4
		Level of Education	1	-3.8	0.9	-4.5	<0.001	-5.56	-2.1	0.6	1.6
		Currently have a religious belief	1	2.9	1.1	2.8	0.007	0.8	5.0	1.0	1.1
		Time Spent in Yarn Alive x Level of Education	1	1.1	0.4	3.0	<0.003	0.4	1.8	0.1	9.2
	Post-imputation (Model 41)	Constant	1	25.2	2.6	9.9	<0.001	20.1	30.3	-	0
		Time Spent in Yarn Alive	1	-2.6	0.9	-3	0.003	-4.3	-0.9	0.1	9.3
		Level of Education	1	-4.2	1.1	-3.9	<0.001	-6.3	-2	0.6	1.6
		Currently have a religious belief	1	3.5	1.2	2.9	0.005	1.1	6	0.9	1.1
		Time Spent in Yarn Alive x Level of Education	1	0.9	0.4	2.3	0.026	0.1	1.8	0.1	8.8
SHS[1]	Post-imputation (Model 42)	Constant	1	4.6	0.1	32.6	<0.001	4.3	4.9	-	0
		Time Spent in Yarn Alive	1	0.1	0.0	2.3	0.026	0.01	0.2	1.0	1.0
		Have experienced a major disaster prior to the 2011 GEJE	1	0.4	0.2	2.1	0.036	0.02	0.7	1.0	1.0

PTG, posttraumatic growth; HRQOL, health-related quality of life; SHS, subjective happiness scale; DF, degrees of freedom; β, regression coefficient; t, t statistics, p, p-value; SE, standard error; CI, confidence interval; LB, lower bound; UB, upper bound; Tol., tolerance statistics; VIF, variance inflation factor.

[1] No covariates were found to be statistically significant in the pre-imputation data for SHS; hence only post-imputation results were shown.

Table 6. Model summary for linear regression analysis testing the association between time spent in Yarn Alive and Posttraumatic growth, Health-related Quality of Life and subjective happiness before and after data imputation, cross-sectional survey, Shichigahama, May-June 2017.

	Imputation	Model	R	R^2	Adjusted R^2	Standard Error
PTG	Pre-imputation	22[1]	18.31	0.31	0.18	29.36
		35[2]	18.66	0.16	0.13	29.91
		43[3]	18.86	0.12	0.11	30.22
	Post-imputation	22[1]	18.27	0.3	0.18	29.21
		33[4]	18.34	0.19	0.15	29.21
		43[3]	18.67	0.14	0.12	29.73
HRQOL	Pre-imputation	22[1]	5.54	0.27	0.14	29.28
		32[5]	5.41	0.23	0.18	28.57
		41[6]	5.51	0.18	0.15	29.1
	Post-imputation	22[1]	5.44	0.29	0.17	28.58
		30[7]	5.29	0.27	0.22	27.81
		41[8]	5.39	0.21	0.19	28.33
SHS	Pre-imputation	22[1]	0.98	0.23	0.10	19.76
		32[9]	0.98	0.15	0.10	19.77
		-	-	-	-	-
	Post-imputation	22[1]	0.97	0.21	0.08	19.66
		32[10]	0.97	0.16	0.09	19.52
		42[11]	0.98	0.07	0.05	19.74

PTG, posttraumatic growth; HRQOL, health-related quality of life; SHS, subjective happiness scale.

[1] Predictors: (Constant), Time spent in Yarn Alive, Age, Level of education, Living situation, Living with, Marital status, Working situation, Have a religious belief, Have experienced damages or losses in the 2011 GEJE, Number of losses/damages experienced in the 2011 disaster, Number of losses/damages in asset experienced in the 2011 disaster, Number of human losses/damages experienced in the 2011 disaster, Frequency of ruminating about the disaster 6 months after the 2011 GEJE, Frequency of ruminating about the disaster now, Difference in the frequency of rumination about the disaster now and 6 months after the 2011 GEJE, Number of coping methods used after the disaster, Talking to others as a method of coping, Spending time with important people in life as a method of coping, Attend Yarn Alive as a method of coping, Experienced other major natural disasters before the 2011 disaster, Received social or emotional support following the 2011 earthquake.

[2] Removed variables with VIF larger than 10 from largest to lowest sequentially. Predictors: (Constant), Have a religious belief, Number of losses/damages experienced in the 2011 disaster, Talking to others as a method of coping, Experienced other major natural disasters before the 2011 disaster

[3] Removed variables with a p-value larger than 0.05. Predictors: (Constant), Number of losses/damages experienced in the 2011 disaster. (Final Model)

[4] Removed variables with VIF larger than 10 from largest to lowest sequentially. Predictors: (Constant), Have a religious belief, Number of losses/damages experienced in the 2011 disaster, Number of losses/damages in asset experienced in the 2011 disaster, Frequency of ruminating about the disaster now, Spending time with important people in life as a method of coping.

[5] Removed variables with VIF larger than 10 from largest to lowest sequentially. Predictors: (Constant) Time spent in Yarn Alive, Level of education, Have a religious belief, Number of losses/damages experienced in the 2011 disaster, Frequency of ruminating about the disaster now, Experienced other major natural disasters before the 2011 disaster.

[6] Removed variables with a p-value larger than 0.05. Predictors: (Constant), Time spent in Yarn Alive, Level of education, Have a religious belief, Number of losses/damages experienced in the 2011 disaster, Time spent in Yarn Alive x Level of education. (Final Model)

[7] Removed variables with VIF larger than 10 from largest to lowest sequentially. Predictors: (Constant), Time spent in Yarn Alive, Level of education, Have a religious belief, Number of losses/damages experienced in the 2011 disaster, Number of losses/damages in asset experienced in the 2011 disaster, Frequency of ruminating about the disaster now, Attend Yarn Alive as a method of coping, Experienced other major natural disasters before the 2011 disaster.

[8] Removed variables with a p-value larger than 0.05. Predictors: (Constant), Time spent in Yarn Alive, Level of education, Have a religious belief, Time spent in Yarn Alive x Level of education.

[9] Removed variables with a p-value larger than 0.05. Predictors: (Constant),), Time spent in Yarn Alive, Age, Level of education, Living with, Frequency of ruminating about the disaster now, Attend Yarn Alive as a method of coping, Experienced other major natural disasters before the 2011 disaster.
[10] Removed variables with VIF larger than 10 from largest to lowest sequentially. Predictors: (Constant), Time spent in Yarn Alive, Age, Level of education, Living with, Have a religious belief, Frequency of ruminating about the disaster now, Attend Yarn Alive as a method of coping, Experienced other major natural disasters before the 2011 disaster, Attend Yarn Alive as a method of coping, Experienced other major natural disasters before the 2011 disaster
[11] Removed variables with a p-value larger than 0.05. Predictors: (Constant), Time spent in Yarn Alive, Experienced other major natural disasters before the 2011 disaster. (Final Model)

Education levels were defined as "high education" for those with junior college/technical college or university level education (n=11), and "low education" for those with high school/old system middle school or elementary/primary school level education (n=58). Stratified analysis showed that for those with at least a college or university education, spending more time in the Yarn Alive program did not change their HRQOL outcome. However, for those with a high school education or less, the more time people spend in Yarn Alive, the better their HRQOL outcome. Further analysis conducted with imputed data suggested the same predictor variables and interaction term could explain 19% of the variance in HRQOL ($F(4,122)= 8.25$, $p<.0001$, $R^2=.21$, adjusted $R^2=.19$; Table 5 and 6). We suspect the increase from 15% to 19% variance explained by the model was due to an increase in sample size from data imputation where we imputed 11 of the 132 HRQOL scores (8%).

3.4 Subjective happiness level

There was no statistically significant difference ($p=0.224$) in the mean total SHS score between the Yarn Alive participants (Mean=5.1, SD=1.0) and the Yarn Alive non-participants (Mean=4.9, SD=1.0; Table 3).

Analysis based on non-imputed data suggested no predictor variables were found to be significantly correlated with subjective happiness under Pearson correlation analysis. Furthermore, in the multiple linear regression model, we did not find any predictor variables to be statistically significant in explaining the SHS scores. Nonetheless, the final regression model conducted with imputed data suggested two variables, time spent in Yarn Alive program ($t=2.3$, $p=.026$) and having experienced a major disaster prior to the GEJE ($t=-2.1$, $p=.036$), to account for 7% of the variance in SHS ($F(2,129)= 4.54$, $p<.013$, $R^2=.07$; adjusted $R^2=.05$; Table 5 and 6).

4. Discussion

Following the 2011 GEJE, many NPOs started psychosocial support programs to supplement formal mental health services in the disaster affected areas, and the majority was not formally evaluated. Yarn Alive, a community-led psychosocial support program established to bring women together to knit and donate their creations to others in need, was one of the few psychosocial support programs that continue to operate over nine years following the GEJE. The evaluation of the Yarn Alive initiative, a self-sustaining community-led program, illustrated that HRQOL and subjective happiness were higher in Yarn Alive participants than non-participants. Moreover, our analysis showed that increased length of program participation was associated with higher HRQOL and subjective happiness among Yarn Alive participants.

4.1 Spiritual growth and incremental impact from disaster associating with higher PTG

Greater spiritual growth (factor IV in PTG) was observed among Yarn Alive participants compared to Yarn Alive non-participants, which we speculated may be due to two factors. First, the Yarn Alive classes created a safe and trusting space for participants to make sense of what happened during the disaster through self-disclosure and social support (Tucker, 2010). A program like Yarn Alive is rare in Japan given it is considered culturally inappropriate to burden others with one's own problems even though self-disclosure has been associated with higher PTG scores among a Japanese population (Taku et al., 2009). Second, Yarn Alive offered a socially supportive space which is rare in Japan and can be beneficial as seeking professional mental health support is often stigmatized (Cadell et al., 2003; Yamazaki et al., 2011). As a previous systematic literature review of religion, spirituality and PTG suggested, social support and acceptance of difficulties are important factors contributing to spirituality and growth through trauma (Shaw et al., 2005).

Our finding of enhanced spiritual growth among Yarn Alive participants aligns with available evidence that spiritual change can play a significant role in PTG (Schultz et al., 2010; Tadeschi & Calhoun, 1995, 1996). When implementing trauma interventions for a disaster-affected community, considerations of cultural sensitivity and participants acceptance of mental health support can be crucial to program efficacy. In situations where psychological support is scarce and stigmatized, providing a safe environment to encourage self-disclosure and social support may be a plausible option in post-disaster mental health support.

Surprisingly, the time participants spent in Yarn Alive was not statistically significant in the multiple regression for PTG. We hypothesize this may be due to the small sample size. We believe the elevated PTG scores observed among Yarn Alive participants could still indicate the critical role Yarn Alive plays in promoting post-disaster psychological growth and can be clinically relevant, especially given a recent article called for a cease in discounting research findings based solely on the p-value significance criteria (Amrhein et al., 2019). We found the scale of damages and losses from the GEJE to be the only statistically significant factor associated with elevated PTG. This was also consistent with previous research findings that positive changes can occur after experiencing significant losses and challenges (Tedeschi & Calhoun, 1995, 1996, 2004), and that positive correlation is observed between severity of traumatic experiences and PTG (Colville & Cream, 2009; Schubert et al., 2016).

4.2 Participation in Yarn Alive program over time was statistically associated with health-related quality of life and subjective happiness

We believe components within the program, including but not limited to act of kindness, social support, and creative expression through knitting may have contributed to the positive correlation observed between time spent in Yarn Alive, HRQOL and SHS. Studies have found that act of kindness, a form of prosocial behavior, to influence one's happiness and subjective well-being (Otake et al., 2006; Aknin et al., 2012). Good social relationships cultivated through acts of kindness may translate to enhanced social support among community members. Social support has been shown to help improve HRQOL after various trauma contexts (Painter et al., 2016; Bekele et al., 2013). Furthermore, a previous cross-cultural study found knitting as an outlet for creativity significantly contributed to one's perceived happiness, social connection, well-being, and quality of life (Riley et al., 2013). Another recent study also suggested giving out self-knitted products to be a meaningful outcome of knitting as one enhances social connection by passing on something of value to others (Lamont & Ranaweera, 2019). In the same study, the authors also found knitting as a form of creative expression to be associated with a higher level of happiness compared to music playing (Lamont & Ranaweera, 2019). We

believe social support, performing acts of kindness, and encouraging creativity are important elements within the Yarn Alive program and could be integrated into future community programs to promote happiness and quality of life for survivors post-disaster.

It is interesting to note that attending Yarn Alive program as a self-perceived coping method was not associated with the three outcome variables. However, we hypothesize with the program's heavy emphasis on avoiding self-victimization and coming together to serve others in need, there is a high possibility that the Yarn Alive participants did not view the program as a coping mechanism for themselves but rather as an altruistic activity to help others less fortunate.

Although we found that the length of time spent in the Yarn Alive program positively correlated with the participants' HRQOL and subjective happiness, it is difficult to know whether new psychosocial support programs with the same elements would replicate these outcomes. We hypothesize that individuals, the program leadership, and the dynamics of participants in psychosocial support programs may also play a big role in participants' experience and outcomes. The Yarn Alive program leadership team highly valued creating a safe environment and emphasized the concept of a sustained community, especially after survivors experienced multiple moves, from their destroyed home to temporary housing, then eventually to government housing. Yarn Alive leadership also encouraged various ways of self-expression, whether through knitting itself or sharing of their experiences and thoughts about the GEJE. As a result, Yarn Alive participants fostered a trusting relationship within the group that may contribute to the benefits observed. However, this can be difficult to replicate in a culture that discourages burdening others and stresses self-discretion and stoicism as a virtue. We hope that the findings from this study can further encourage programs such as Yarn Alive in cultivating a trusting community, especially following major disasters.

4.3 YA participants with lower education had a more pronounced positive correlation with health-related quality of life over time

Previous studies have shown that education is positively associated with better health outcomes among Japanese population and older adults (Chapman et al., 2007; Shimbo et al., 2004). In our study, we observed the number of years spent in Yarn Alive has little impact on HRQOL for people with higher education level (college or university degree). Yet among those with lower education level (primary school or high school), HRQOL had a statistically significant association with more time spent in Yarn Alive. We hypothesize that through participating in the Yarn Alive program, those with less education were able to obtain life skills to improve their HRQOL. Such improvement could be due to program elements such as social support, acts of kindness, creativity, or by interacting and learning various life skills from more educated members within the group. Given the benefits observed, programs such as Yarn Alive could complement existing mental health and welfare system, especially for populations with a lower level of education.

We believe that it is essential to identify more choices of mental health support for a community in the aftermath of a disaster. Formal mental health support may not be accessible since the number of affected people from a large disaster may vastly outnumber the mental health professionals available to provide mental health support (Yamazaki et al., 2011). Furthermore, some individuals may not feel comfortable seeking these types of support due to stigmatization or their inability to talk about the trauma. Programs such as Yarn Alive may create a safe environment that is optimal for trauma recovery through peer-support and experience sharing. We hope to see more efforts in understanding the most appropriate and culturally sensitive approaches to provide mental health support at the population level following major public health crises.

5. Limitations

There were several limitations to this study. First, questionnaires and inventories were all initially designed in English then translated to Japanese. We tried to minimize the potential impact by using previously validated Japanese-translated scales and back-translating our questionnaire to verify the original translation. However, there may still be a certain degree of cross-cultural misinterpretation to some of the questions asked which could contribute to missing data or misrepresentation of data. Second, the study participants were a self-selected group of Japanese female mostly 60 years or older living in rural Japan; therefore, the study findings may not be generalizable outside the scope of the participant population. Third, we saw relatively small variance in our regression results which is not uncommon for social science studies. However, this also means that these variances could be changed after adding other predictor variables that were not included in the current study. There were missing data in our dataset, which reduced our sample size, possibly due to difficulties participants encountered in understanding certain concepts such as spirituality. Therefore, in addition to analysis based on original non-imputed data, we also tried to compensate for the reduced sample size by repeating the analysis on imputed data to explore additional potential factors associated with the three outcome variables. Finally, participant recall bias might be present due to the retrospective nature of this study, while the cross-sectional study design limits the determination of causality. A follow-up qualitative study would help to identify the factors contributing to the observed benefits among these female GEJE survivors attending the Yarn Alive program.

6. Conclusions

In this study, we showed that participation in the Yarn Alive program was statistically associated with HRQOL and subjective happiness, which increased with time. While participation in the program did not positively correlate with one's overall PTG over time, we found Yarn Alive participants to have a higher average in the spiritual domain of PTG than non-participants and that an incremental increase in damage or loss due to the GEJE was associated with PTG. Long-term community psychosocial support programs may play an important role in assisting with the well-being of communities following a large-scale disaster.

Through this study, we want to emphasize the important opportunities that exist in academia-community collaboration to further understand what is working or not working in community-driven programs, potential impact of these programs and possible contributing factors. Here, we used a partnership and participatory approach which can be mutually beneficial. Academia can play an important role in supporting grassroots community programs to evaluate their impact formally. In turn, these community programs can offer insight into the types of strategies that are most accepted by the community to address identified challenges (Hébert et al., 2018). Instead of setting up programs academic researchers perceived as beneficial to the community, academic researchers could learn from successfully-operating programs developed by the community itself (Coppock, 2016). As we have shown through this study, there is value in exploring the benefits of an organically-formed post-disaster psychosocial program in its natural state without external intervention.

On the other hand, local community programs could benefit from being formally evaluated through collaboration with academia to investigate benefits resulting from its natural progression. NPOs are often set up by local or international bodies after disasters to help affected communities. Formal program evaluation could be useful for elucidating the program effects in terms of output, outcomes, or impact. In addition, it can identify strengths of current approaches and areas for improvement, inform the future direction of the program, and provide

insights for new programs (Centers for Disease Control and Prevention, 1999). Moreover, this could help the community program in advocating for further resources, boost morale within the program staff and potentially generate interest in further expansion to other locations or population groups. Following this study, we co-created pamphlets along with Yarn Alive founder and volunteers outlining the key findings to disseminate to study participants and to promote Yarn Alive within the community. The pamphlets also served as a tangible proof of the added value this program brings to the community.

In summary, our study demonstrated the value of partnership between academia and communities who ultimately understand what works best for them in their specific context, and could generate information to further improve mental health within communities post-disaster. Moving forward, we hope to see an increase in the perceived value and uptake of participatory approaches in identifying more evidence-based programs as supplementary resources to formal mental health care for disaster-affected populations.

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