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RESEARCH ARTICLE **OPEN ACCESS**

Association of Social Participation with Life Satisfaction Among Adults in Super-aged Japanese Communities: A Cross-Sectional Study

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Abstract:

Introduction/Objective: Japan's rapid population ageing calls for evidence on which social activities best support well-being. We examined the associations between five types of social participation and life satisfaction in two super-aged Japanese "new towns."

Methods: A cross-sectional questionnaire was delivered to all households in early 2022; 1,353 adults responded. The weekly frequency of volunteering, sports or exercise groups, hobby clubs, learning circles, and skills-sharing groups was recorded on a six-point scale and converted to times per week. Life satisfaction was measured with a single yes/no item. Bayesian logistic regression estimated Odds Ratios (ORs) for being satisfied with life per one unit increase in weekly participation, adjusting for residential area, age, sex, cohabitation, subjective health, and long-term care certification. Analyses were also stratified by sex and by age.

Results: More frequent volunteering was linked to higher life satisfaction (OR 2.44; 95 percent credible interval 1.21 to 6.70). Sports or exercise participation showed a positive association (OR 1.36; 95 percent credible interval 1.06 to 1.83). Hobby clubs, learning circles, and skills-sharing activities had no clear relationships. Associations were stronger in men and in adults aged 65 years or older.

Discussion: Volunteering and group exercise may enhance life satisfaction through meaningful social roles, expanded social networks, and improved mood, especially for older men who lose work-based ties after retirement. Leisure-oriented activities yielded limited additional benefits.

Conclusion: Promoting volunteering and organized physical activity appears to enhance life satisfaction among older adults. Further longitudinal and intervention studies are needed to validate causality and guide effective community programs.

Keywords: Aged, Japan, Social participation, Volunteers, Exercise, Life satisfaction, Cross-sectional studies, Sex factors.

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1. INTRODUCTION

The global population is aging, and many countries are recording a steady increase in the proportion of older adults [1]. Japan is at the forefront of this trend because people aged 65 years or older already account for almost one-third of the national population [2]. This demographic shift has refocused public health attention on the well-being of older people. As societies age, older adults become more vulnerable to physical and mental health problems such as dementia and social isolation, and these conditions can lower subjective well-being [3, 4].

Life satisfaction is widely regarded as an integrative indicator of well-being in later life [5]. Observational studies show that older adults who volunteer report higher life satisfaction than those who do not. For instance, longitudinal data from the U.S. Health and Retirement Study indicates that starting or continuing volunteer work is followed by significant increases in life satisfaction over time [6]. Regular physical activity is also positively linked to life satisfaction throughout adulthood. A multicohort study that monitored daily activity among adults aged 18 to 90 years found that people were more satisfied with life on days when they were more active than usual [7]. Intervention trials support this finding by demonstrating that sustained exercise enhances life satisfaction, partly because it strengthens self-control and emotion regulation [8].

Whether other kinds of social participation, such as hobby clubs or learning circles, confer the same benefits for life satisfaction, or whether certain activities have a stronger effect than others, remains uncertain. Additionally, little is known about how these associations vary by sex or age group. Clarifying these issues is especially important in super-aged communities, such as those found in Japan, where practical strategies to improve the well-being of older residents are urgently needed.

With this background, we conducted a cross-sectional survey in two Japanese communities that have exceptionally high proportions of older residents. We measured the frequency with which adults participated in five categories of social activity: volunteering, sports and exercise groups, hobby clubs, learning circles, and skills-sharing activities. We then estimated the association between each activity and the odds of reporting satisfaction with daily life. Finally, we examined whether these relationships differed by sex and age group, allowing us to identify which forms of social participation are most likely to enhance life satisfaction in different segments of the older population.

2. MATERIALS AND METHODS

2.1. Study Population

This cross-sectional study targeted 2,452 residents of two Japanese regions, Area A in Aichi Prefecture and Area B in Kanagawa Prefecture, during the first quarter of 2022, as described in detail elsewhere [9]. These areas were chosen because their population-aging rates (Area A: 38.6 percent, Area B: 45.5 percent) are well above the national average of 26.7 percent [10]. Both regions are planned “new towns” that now face rapid population decline and extreme aging [11]. To ensure feasibility, we obtained consent and support from the chairpersons of the local neighborhood councils. Since no resident list was available, community association directors distributed a questionnaire to every household in the two neighborhoods. The package included a reminder that asked the household head to complete the survey. One week later, the directors collected the completed questionnaires. No financial or other incentives were offered. Returning the questionnaire was regarded as informed consent to participate. The study protocol received approval from the Ethics Review Committee of the Osaka Metropolitan University Graduate School of Human Life and Ecology, Japan (approval number 22-53). Of the 1,569 questionnaires returned (response rate 64.0 percent), we excluded 15 with missing life-satisfaction data and 201 with missing information on social-activity type. The final analytic sample comprised 1,353 participants.

2.2. Data Collection

Information on social participation was obtained through a self-administered questionnaire. Each respondent indicated how often they engaged in five predefined activity categories: volunteering, participation in sports or exercise groups, membership in hobby clubs, attendance at learning circles or study groups, and activities that involve sharing special skills or life experiences. For every activity type, participants answered the prompt “How often do you participate in this activity?” by selecting one of six ordered response options: not at all, several times a year, one to two times a month, once a week, two to three times a week, or four or more times a week.

Daily life satisfaction was the primary outcome measure. It was assessed with the single item, “Overall, are you satisfied with your daily life?” We adopted this single-item measure to minimize respondent burden and maintain consistency with large population-based studies in Japan [12]. Responses were dichotomized so that “satisfied” was coded as 1 and “dissatisfied” was coded as 0.

2.3. Statistical Analysis

Participation in social activities was summarized as the mean and standard deviation when treated as a continuous variable and as counts with percentages when treated as a categorical variable. Missing values were imputed using multiple imputations by chained equations, implemented with the mice package in R version 4.5.1 [13]. The imputation model included all variables used in the analyses, including five social activity frequencies, the life satisfaction outcome, and covariates (residential area, sex, age, cohabitation status, subjective health perception, and long-term care certification). The outcome and exposure variables were required for inclusion and thus were not imputed. Logistic regression was used for binary variables,

polytomous regression for unordered categorical variables, and predictive mean matching for continuous variables. We created 20 imputed data sets under the assumption that data were missing at random. All subsequent analyses were performed separately within each imputed set, and the resulting posterior samples were then pooled.

Associations between weekly participation in social activities and life satisfaction were examined using Bayesian logistic regression, as fitted in the brms package. We adopted a Bayesian framework because several activity categories had relatively small sample sizes, and Bayesian estimation provides more stable inference under sparse data conditions. Frequency of participation was converted to a continuous measure by assigning numeric scores to the response categories as follows: “not at all” = 0; “several times a year” = 0.06 (3 ÷ 52); “1-2 times a month” = 0.375 (1.5 ÷ 4); “once a week” = 1; “2-3 times a week” = 2.5; and “4 or more times a week” = 5. This coding scheme allowed us to conduct trend tests and to estimate dose-response relationships.

The dependent variable was binary, indicating whether a participant reported being satisfied with life. All models were adjusted for age (continuous), sex (male or female), cohabitation status (living alone, living with spouse, or living with others), subjective health perception (very healthy, fairly healthy, not very healthy, or unhealthy), and long-term care certification (no, light, or severe). We also conducted stratified analyses by sex and age group (<65, ≥65 years).

Priors were set to be weakly informative. Regression coefficients were assigned normal priors with mean 0 and variance 1, and the intercept was assigned a Student-t prior with 3 degrees of freedom, mean 0, and scale 10, matching the default settings in brms. We adopted a Bayesian framework because several social activity categories had relatively small sample sizes, and Bayesian estimation provides more stable inference under sparse data conditions. Weakly informative priors (Normal(0,1)) are commonly used in similar studies and were selected to regularize estimates without imposing strong assumptions. Although we did not conduct a separate frequentist analysis, the magnitude and direction of the posterior estimates suggest that the conclusions would remain consistent under a frequentist framework. Posterior Odds Ratios (ORs) and their 95 percent Credible Intervals (CrIs) were obtained by pooling posterior draws across the 20 imputations. All models were estimated using four Markov chain Monte Carlo chains, each run for 2,000 iterations, with the first 1,000 iterations discarded as warm-up.

3. RESULTS

A total of 1,353 participants were included in the analysis (Table 1). The mean age was 67.6 years (SD 15.2), and 62.5% were 65 years or older. Women accounted for 53.6% of the sample. Most respondents lived with others, and 71.9% described their health as “fairly healthy.” Mean weekly participation frequencies were 0.14 for volunteering, 0.40 for sports activities, 0.21 for hobby clubs, 0.06 for learning circles, and 0.06 for activities that involved sharing special skills or experiences.

Table 1. Characteristics of study participants (n = 1,353).

Variable	n (%) or Mean ± SD
Age, years	67.56 ± 15.15
<65 years	498 (36.8)
≥65 years	845 (62.5)
Missing	10 (0.7)
Sex	
Men	619 (45.8)
Women	724 (53.6)
Missing	10 (0.7)
Cohabitation Status	
Living alone	135 (10.0)
Living with a spouse	578 (42.7)
Living with others	634 (49.6)
Subjective Health Perception	
Very healthy	222 (16.4)
Fairly healthy	973 (71.9)
Not very healthy	124 (9.2)
Unhealthy	33 (2.4)
Missing	1 (0.1)
Long-term Care Certification	
No	1,214 (89.7)
Light	79 (5.8)
Severe	16 (1.2)
Weekly Participation	
Volunteering	0.14 ± 0.60
Sports activities	0.40 ± 0.99
Hobby clubs	0.21 ± 0.63
Learning circles	0.06 ± 0.25
Sharing special skills or experiences	0.06 ± 0.41

Note: Values are expressed as a number (percentage) for categorical variables and as mean ± standard deviation (SD) for continuous variables. SD = standard deviation.

Table 2 demonstrates the association between weekly participation in each activity and life satisfaction. For visual interpretation, Fig. (**S1**) presents a forest plot of the posterior ORs with their 95% CrIs from the fully adjusted model (model 3). In every model, more frequent volunteering and sports participation were positively related to life satisfaction, and the 95% Credible Intervals (CrIs) did not include 1.0. In the fully adjusted Model 3, volunteering had an OR of 2.44 (95% CrI, 1.21 to 6.70) and sports had an OR of 1.36 (95% CrI, 1.06 to 1.83). Participation in learning circles displayed a positive but imprecise association, whereas hobby clubs and skills-sharing activities showed no clear relationship.

Sex-stratified results appear in Table 3. Among men, volunteering and sports participation were robustly associated with higher life satisfaction across all models (fully adjusted Model 3: volunteering, OR 3.23; 95% CrI, 1.13 to 13.97; sports, OR 2.02; 95% CrI, 1.14 to 4.75). Among women, volunteering remained positively associated with life satisfaction in every model, whereas the association for sports became uncertain after full adjustment. For hobby clubs, learning circles, and skills-sharing activities, the CrIs for both sexes included 1.0.

Table 2. Odds ratios (ORs) and 95 % credible intervals (CrIs) for the association between weekly participation in social activities and life satisfaction (n = 1,353).

Social Activity	OR (95% CrI)[1]	OR (95% CrI)[2]	OR (95% CrI)[3]
Volunteering	2.91 (1.42 to 7.92)*	2.92 (1.42 to 7.93)*	2.44 (1.21 to 6.70)*
Sports activities	1.46 (1.14 to 1.97)*	1.46 (1.15 to 1.98)*	1.36 (1.06 to 1.83)*
Hobby clubs	1.02 (0.77 to 1.45)	1.01 (0.76 to 1.44)	0.91 (0.68 to 1.30)
Learning circles	2.75 (1.01 to 9.69)*	2.67 (0.99 to 9.39)	2.68 (0.94 to 9.89)
Sharing special skills or experiences	1.36 (0.79 to 3.26)	1.36 (0.79 to 3.22)	1.25 (0.72 to 3.00)

Note: OR, odds ratio; CrI, credible interval.
[1]Adjusted for residential area, sex, and age.
[2]Adjusted for residential area, sex, age, and cohabiting family members.
[3]Adjusted for residential area, sex, age, cohabiting family members, subjective health perception, and need for long-term care certification.
ORs represent the change in odds of reporting life satisfaction per one-unit increase in weekly participation frequency.
* Indicates that the 95% credible interval does not include 1.0.

Table 3. Sex-specific odds ratios (ORs) and 95 % credible intervals (CrIs) for the association between weekly participation in social activities and life satisfaction (n = 1,343).

Social Activity	OR (95% CrI)[1]	OR (95% CrI)[2]	OR (95% CrI)[3]
Men (n = 619)			
Volunteering	3.60 (1.27, 14.85)*	3.66 (1.29, 14.69)*	3.23 (1.13, 13.97)*
Sports activities	2.15 (1.23, 5.27)*	2.18 (1.24, 5.41)*	2.02 (1.14, 4.75)*
Hobby clubs	1.20 (0.76, 2.30)	1.20 (0.76, 2.34)	1.15 (0.71, 2.32)
Learning circles	2.69 (0.77, 13.24)	2.55 (0.73, 13.68)	2.40 (0.67, 12.62)
Sharing special skills or experiences	2.40 (0.89, 11.15)	2.40 (0.86, 11.80)	2.21 (0.76, 11.29)
Women (n = 725)			
Volunteering	2.24 (1.13, 6.29)*	2.24 (1.13, 6.28)*	1.94 (1.00, 5.34)*
Sports activities	1.37 (1.04, 1.90)*	1.35 (1.03, 1.88)*	1.26 (0.96, 1.77)
Hobby clubs	0.93 (0.64, 1.47)	0.93 (0.63, 1.46)	0.83 (0.57, 1.30)
Learning circles	2.09 (0.74, 7.32)	2.04 (0.70, 7.52)	2.11 (0.71, 7.81)
Sharing special skills or experiences	0.98 (0.54, 2.35)	0.98 (0.52, 2.40)	0.87 (0.46, 2.28)

Note: OR, odds ratio; CrI, credible interval.
[1]Adjusted for residential area and age.
[2]Adjusted for residential area, age, and cohabiting family members.
[3]Adjusted for residential area, age, cohabiting family members, subjective health perception, and need for long-term care certification.
ORs represent the change in odds of reporting life satisfaction per one-unit increase in weekly participation frequency.
* Indicates that the 95% credible interval does not include 1.0.
Ten participants with missing sex information were excluded.

Age-stratified analyses are summarized in Table 4. In participants aged 65 years or older, volunteering (OR 4.86; 95% CrI, 1.65 to 19.56) and sports activities (OR 1.38; 95% CrI, 1.04 to 1.97) were clearly associated with higher life satisfaction in the fully adjusted model. In participants younger than 65 years, none of the social activities showed a definite association; hobby club participation produced a relatively large point estimate (OR 3.17), but the 95% CrI was wide (0.96 to 14.15).

4. DISCUSSION

The present study indicates that regular participation in volunteering and sports activities is positively associated with higher life satisfaction among Japanese adults, and this association is particularly pronounced for individuals aged 65 years or older. In sex-stratified analyses, the relationships were stronger in men than in women. These findings align with earlier research demonstrating that active social and physical engagement supports well-being in later life. Observational studies have consistently shown that older adults who engage in volunteer work report greater life satisfaction than those who do not [6, 7]. Additionally, higher levels of physical activity are linked to better life satisfaction across the adult lifespan [8]. Our results reinforce these patterns in rapidly ageing Japanese communities and clarify how the strength of the associations differs by sex and age group.

Table 4. Age-specific odds ratios (ORs) and 95 % credible intervals (CrIs) for the association between weekly participation in social activities and life satisfaction (n = 1,343).

Social Activity	OR (95% CrI)[1]	OR (95% CrI)[2]	OR (95% CrI)[3]
Aged <65 Years (n = 498)			
Volunteering	1.09 (0.52, 3.20)	1.10 (0.54, 3.26)	1.06 (0.51, 3.04)
Sports activities	1.37 (0.90, 2.47)	1.39 (0.91, 2.50)	1.36 (0.88, 2.43)
Hobby clubs	3.36 (0.99, 14.50)	3.19 (0.98, 13.87)	3.17 (0.96, 14.15)
Learning circles	2.11 (0.62, 10.17)	2.04 (0.57, 10.28)	1.97 (0.54, 9.60)
Sharing special skills or experiences	1.31 (0.49, 5.49)	1.28 (0.46, 5.44)	1.27 (0.45, 5.46)
Aged ≥65 Years (n = 845)			
Volunteering	5.62 (1.97, 21.64)*	5.76 (1.98, 22.04)*	4.86 (1.65, 19.56)*
Sports activities	1.53 (1.15, 2.17)*	1.51 (1.13, 2.17)*	1.38 (1.04, 1.97)*
Hobby clubs	0.95 (0.72, 1.34)	0.94 (0.71, 1.33)	0.86 (0.64, 1.21)
Learning circles	2.26 (0.78, 8.53)	2.24 (0.75, 8.70)	2.18 (0.70, 8.75)
Sharing special skills or experiences	1.45 (0.81, 3.88)	1.43 (0.78, 3.77)	1.30 (0.71, 3.41)

Note: OR, odds ratio; CrI, credible interval.

[1]Adjusted for residential area and sex.

[2]Adjusted for residential area, sex, and cohabiting family members.

[3]Adjusted for residential area, sex, cohabiting family members, subjective health perception, and need for long-term care certification.

ORs correspond to a one-unit increase in weekly participation frequency.

* Indicates that the 95% credible interval does not include 1.0.

Ten participants with missing age information were excluded.

Volunteering and participation in sports or exercise groups appear to enhance life satisfaction through complementary psychosocial and physical pathways. In later adulthood, volunteering offers meaningful social roles and a renewed sense of purpose that can compensate for the loss of work-related roles after retirement [14]. Such productive engagement helps older adults maintain positive self-esteem and autonomy [15], which in turn supports overall well-being [16]. Volunteer activities also foster regular social interaction and cooperation, thereby expanding social networks [17]. Consequently, older volunteers report better mental health and less loneliness than their non-volunteering peers [18]. Regular physical activity likewise improves mood, reduces anxiety and depression [19, 20], and strengthens self-efficacy [21]. When exercise is undertaken in group settings, it provides additional social bonding and support, further contributing to life satisfaction. Taken together, these findings suggest that altruistic engagement and an active lifestyle promote psychological well-being in later life, partly by reinforcing social connectedness, purpose, and self-worth [22].

Subgroup analyses revealed that the positive associations were strongest among participants aged 65 years or older, highlighting the importance of social activities for well-being in later life. Retirement often brings major life changes, such as leaving paid employment, children moving away, or the loss of a spouse. These events can shrink an older adult's social world and diminish their sense of purpose [23-25]. In such circumstances, engaging in volunteering or organized sports can provide new and meaningful roles that replace those lost during these transitions [26, 27].

Men in our sample appeared to gain more benefit from volunteering and sports than women, for whom the positive associations were weaker and not statistically significant. This sex difference may stem from the fact that older men, who have often relied on work-based networks, face greater difficulty maintaining social connections after retirement. In Japan, for instance, retirement is linked to increased depression among men, particularly those with lower occupational status, largely because of the loss of work-related relationships. Men who take up recreational social activities after retirement, however, show a much smaller rise in depressive symptoms [28]. Thus, continuing to engage in volunteering or sports may buffer men against the loss of work contacts and bolster their life satisfaction and mental health. Women, by contrast, often sustain broader networks through family and community ties, so the incremental effect of formal volunteering or sports on life satisfaction may be smaller. In many East Asian cultural settings, women are expected to prioritize household and family roles, whereas men tend to participate in activities outside the home [29]. Research also indicates that the life satisfaction of older Japanese women is more closely linked to living with family members and to neighborhood relationships than is true for men [30]. When an older woman already derives fulfilment and support from children, grandchildren, neighbors, or caregiving responsibilities, joining a volunteer organization or senior sports club may add relatively little additional satisfaction.

Not all forms of social participation were linked to higher life satisfaction in our study. Activities such as hobby clubs, cultural learning circles, and teaching or mentoring showed no significant associations. This finding does not imply that these pursuits lack value; rather, it indicates that the quality and context of engagement may be crucial. One explanation is that hobbies and cultural clubs, although enjoyable, may not deliver the same level of psychosocial reward that volunteering and sports provide. In other words, the psychosocial dividend from hobby participation

appears to be smaller than that from volunteering or sports. A longitudinal study of 93,263 adults aged 65 years and older in 16 countries found that hobbies mainly improved leisure-specific well-being, with only modest spill-over to overall life satisfaction [31]. Self-selection and contextual factors also deserve consideration. Individuals who join hobby or learning groups may already be relatively content or may pursue these activities for reasons unrelated to enhancing well-being [31, 32], whereas people who take up volunteering or exercise might do so partly to strengthen social ties or improve health. If this is the case, the additional gain in life satisfaction from hobbies or learning circles could be limited. Contextual and qualitative aspects may also play an important role. Activities like hobby clubs or learning circles may be more solitary or focused on personal fulfillment rather than fostering social connection or a sense of contribution, which are considered central factors for enhancing life satisfaction [33].

This study has several limitations. First, because the design is cross-sectional, causal relationships cannot be established. Although we adjusted for key covariates, reverse causation remains possible; individuals with higher life satisfaction may be more likely to participate in social activities, including volunteering and sports. Second, all measures were self-reported. Subjective ratings are standard in well-being research, yet perceptions of life satisfaction vary across individuals, and the reported frequency of participation does not capture qualitative aspects such as intensity or engagement quality. These measurement issues may produce misclassification bias and weaken observed associations. Third, the sample was drawn from ageing “new towns” in Japan, which are planned suburban communities undergoing rapid demographic change. Therefore, the generalizability of our findings to other contexts, such as rural villages or densely populated urban centers, may be limited. Cultural features unique to Japan, including strong traditions of civic groups and senior clubs, may also limit the applicability of our findings to Western populations. Nevertheless, the agreement between our results and the international literature suggests that some aspects of ageing and social participation are likely to be universal. Fourth, daily life satisfaction was measured using a single-item question, which may not fully capture multidimensional aspects of well-being. However, we used this approach to minimize respondent burden and to maintain comparability with previous large population-based studies conducted in Japan [12]. Finally, although we conducted stratified analyses by sex and age, we did not formally test interaction terms in the main models because this was beyond the primary scope of the present study. Future studies with larger sample sizes should examine potential effect modification by sex and age using formal interaction tests.

CONCLUSION

Regular engagement in volunteering and sports or exercise groups was associated with higher life satisfaction among adults living in two rapidly aging Japanese communities, and these associations were most pronounced for participants aged 65 years or older and for men. Other forms of social participation, such as hobby clubs and learning circles, showed no clear relationship with life satisfaction, suggesting that the quality and context of participation matter more than the mere presence of activity. Taken together, the findings suggest that promoting opportunities for altruistic and physically active involvement may be a practical strategy for supporting well-being in later life, particularly for older men who may lose work-based networks after retirement. Future longitudinal and intervention studies are needed to confirm causal pathways, explore qualitative aspects of engagement, and test whether the observed benefits can be replicated in more diverse cultural and geographic settings.

AUTHORS’ CONTRIBUTIONS

The authors confirm contribution to the paper as follows: S.U. and K.M.: Conceptualized and designed the study; Y.K., Y.L., H.S. and K.O Collected the data; S.U.: Conducted the analysis and interpreted the results; S.U.: Drafted the manuscript. All authors critically reviewed the manuscript and approved the final version.

LIST OF ABBREVIATIONS

Brms	=	Bayesian Regression Models using Stan (R package)
CrI	=	Credible Interval
MCMC	=	Markov Chain Monte Carlo
MICE	=	Multiple Imputation by Chained Equations
OR	=	Odds Ratio
R	=	R Statistical Software Environment
SD	=	Standard Deviation

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

This study was reviewed and approved by the Ethics Review Committee of the Osaka Metropolitan University Graduate School of Human Life and Ecology, Japan, (approval no. 22-53).

HUMAN AND ANIMAL RIGHTS

All procedures involving human participants were conducted in accordance with the ethical standards of the institutional and/or national research committee, as well as the 1975 Declaration of Helsinki and its subsequent amendments.

CONSENT FOR PUBLICATION

The study used anonymized questionnaire data. Written informed consent was not obtained; however, submission of the completed questionnaire was considered as implied consent to participate.

STANDARDS OF REPORTING

STROBE guidelines were followed.

AVAILABILITY OF DATA AND MATERIALS

The dataset cannot be made publicly available due to ethical restrictions. However, the data can be made

available from the corresponding author upon reasonable request, in accordance with the conditions approved by the Ethics Review Committee.

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CONFLICT OF INTEREST

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Declared none.

SUPPLEMENTARY MATERIAL

Supplementary material is available on the Publisher's website along with the published article.

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