





BMJ Open Arts for ageing well: a propensity score matching analysis of the effects of arts engagements on holistic well-being among older Asian adults above 50 years of age

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To cite: Ho AHY, Ma SHX, Ho M-HR, *et al.* Arts for ageing well: a propensity score matching analysis of the effects of arts engagements on holistic well-being among older Asian adults above 50 years of age. *BMJ Open* 2019;**9**:e029555. doi:10.1136/bmjopen-2019-029555

► Prepublication history and additional material for this paper are available online. To view please visit the journal (<http://dx.doi.org/10.1136/bmjopen-2019-029555>).

Received 31 January 2019
Revised 11 October 2019
Accepted 14 October 2019



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ABSTRACT

Objective To assess the frequency and intensity of arts engagement inclusive of active and passive engagements in arts, culture and heritage activities among Singaporean adults aged 50 and above, and examine the relationships between participatory art and holistic well-being.

Design Cross-sectional stratified household survey.

Setting All residential areas across Singapore's Central, East, North, North-East and West Regions.

Participants 1067 community-dwelling, Singaporean older adults between the ages of 50 and 95 years were recruited.

Primary and secondary outcome

measures Respondents completed a self-reported questionnaire, consisting of standardised ad hoc items assessing the frequencies and durations of active and passive participatory arts engagement, as well as validated psychometric assessments on psychosociospiritual health including the primary outcome measure on quality of life, and the secondary outcome measures on physical, psychological, emotional, spiritual, and social well-being. sociodemographic information, as well as frequency and intensity of physical activity were also collected.

Results Passive engagement (60%) and active engagement (17%) in the arts were associated with better holistic wellness and social support. Specifically, findings from the propensity score matching and independent t-test analyses revealed that adults aged 50 and above who passively engaged in arts and culture-related events experienced higher quality of life ($t(728)=3.35$, $p=0.0008$, $d=0.25$), perceived health ($t(728)=2.21$, $p=0.0277$, $d=0.16$) and sense of belonging ($t(728)=2.17$, $p=0.03$, $d=0.16$), as compared with those who did not. Moreover, those who actively engaged in participatory arts experienced greater quality of life ($t(442)=3.68$, $p=0.0003$, $d=0.36$), self-rated health ($t(442)=2.59$, $p=0.0099$, $d=0.25$), spiritual well-being ($t(442)=3.75$, $p=0.0002$, $d=0.37$), meaning in life ($t(442)=5.03$, $p<0.0001$, $d=0.50$) and sense of peace ($t(442)=3.72$, $p=0.0002$, $d=0.36$), as compared with those who did not actively engaged in the arts.

Conclusion This study provided robust evidence to support a significant causal relationship between arts engagements and holistic well-being. Recommendations

Strengths and limitations of this study

- First-ever empirical research to date that examined arts engagements and its impact on holistic well-being in Asia using naturalistic observational data.
- Sample was a large, representative older adult population in Singapore.
- Propensity score matching analysis was conducted to reduce selection bias and avoid issues of endogeneity, allowing for comparisons between art-active groups and non-art-active groups.
- A wide range of art forms were assessed, of which included active engagements and passive consumption of eight art forms—music, dance, theatre, literary arts, visual arts, heritage activities, film and craft events.
- The current study employed cross-sectional survey data that assessed participants at a single time point, and thus is not possible to rule out the potentiality of reverse causality.

for art-based public health and elderly care research, practice and policy are discussed.

INTRODUCTION

Asia is ageing at a much faster rate than anywhere else in the world.¹ In Singapore specifically, the proportion of adults aged 65 and above has more than doubled in the past two decades from 6% in 1990 to 13% in 2017. This trend will exponentially increase to approximately 25% by 2030.² Longevity, however, does not necessarily reflect better health at old age. According to recent statistics, 60% of Singaporeans aged 50 and above suffered from a chronic illness such as diabetes, heart disease and stroke, while 10% of adults aged 60 and above, as well as 50% of adults aged 85 and above were affected by dementia.^{3 4} Additionally, 51%



of Singaporeans above the age of 60 reported feelings of loneliness and were at a greater risk of mortality.⁵ These numbers reflect greater demands for health and social care services among the aged in the foreseeable future.

While traditional biomedical models have focused predominantly on supporting elderly health through curative interventions and rehabilitation services, contemporary public health approaches emphasise a health-promoting paradigm for maintaining and elevating holistic well-being, through cultivating personal autonomy, social participation and community involvement.⁶ One has to look no further than to the Arts to realise its vital significance in cultivating these goals, as engagements in the cultural heritage of music, dance, theatre, literature as well as the visual arts have been known to have tangible effects on health and quality of life, whereby the agents of creativity and imagination can help 'keep individual resilience, aid recovery and foster a flourishing society' (Bulter, p3).⁷ Despite the extensive use of the arts for its therapeutic properties across history, research investigating healthy and active ageing through arts engagement were fairly recent.⁸

To consolidate existing research that investigated the relationship between arts engagement, health, well-being and ageing, a literature search was conducted through PsycInfo, Web of Science, Social Science Citation Index, PubMed and Medline. Relevant reports and studies published by governments and related organisations were also examined. Overall, the research team found robust evidence to support the efficacy of the arts in promoting wellness. Most notably, the Creative Health inquiry report published in the UK, which examined over 1000 peer-reviewed and grey literature, concluded that not only can the arts bring various health and mental health benefits to people of all ages, it can also serve to address health and social care challenges in greater society such as ageing, longer-term conditions and loneliness.⁹ Among studies that focused on community dwelling older adults, multiple reviews of empirical research that studied the relationships between art-based interventions and healthy ageing revealed that active engagements in various forms of art produced positive cognitive, affective and quality of life outcomes.^{10 11} For instance, a randomised controlled trial on participatory singing activities reported its effectiveness in enhancing quality of life, and reducing anxiety and depression among older intervention participants.¹² Moreover, the Museums on Prescription Study showed that cultural heritage engagements were effective in improving psychological and social well-being.^{13 14} Moreover, the efficacy of the arts in the treatment of mental health conditions, as well as support for the treatment of various chronic health conditions were well documented.^{15 16} Numerous systematic reviews also suggested that various forms of participatory art activities were beneficial for persons with dementia living in residential care settings, serving to enhance cognitive processes, attention, mood and memory.^{17 18} Specifically, musical activities yielded better episodic memory and mood among

patients with early dementia in a recent randomised controlled trial.¹⁹ Finally, although limited, art and cultural heritage-based intervention studies with Asian populations have also shown similar positive results in psychological well-being.²⁰

Despite robust evidence on the benefits of art-based interventions applied in the above-mentioned settings, much less research has examined the impact of arts engagements in naturalistic settings.²¹ In fact, many studies employed simple pre-and-post intervention designs without control groups, while others employed relatively small sample sizes that prevented meaningful comparisons.¹¹ Often, participants of these studies were recruited via convenience sampling rather than random sampling, potentially resulting in response biases.¹⁵ With a rapidly ageing population around the globe and in Asia, there is a need to understand the landscape of arts engagement and to investigate the relationships between arts engagement and holistic well-being for advancing practices and policies that promote healthy and creative ageing. The 'Arts for Ageing Well' study was the first-ever attempt to critically address this important knowledge gap by utilising a holistic investigative approach with both quantitative and qualitative methodologies for exploring and understanding the notion of ageing well with the arts in Asia. This article reports the quantitative findings of the Arts for Ageing Well study.

Research objectives

The specific objectives of this study were to (1) assess the frequency and intensity of arts engagement inclusive of active and passive engagements in music, dance, theatre, literary arts, visual arts, film, heritage events and activities, and craft events among Singaporean adults aged 50 and above, and to (2) examine the relationships between participatory art and holistic well-being in terms quality of life, physical, psychological, emotional, spiritual and social well-being.

METHODS

Study design and participants

One thousand sixty-seven participants were recruited between July 2016 and February 2017 across all regions of Singapore via a cross-sectional stratified random household survey to ensure sample representativeness of the national population. Sample size calculation was based on power analysis; a sample size of 1067 allowed for $\pm 3\%$ accuracy at the 95% CI. A sampling frame comprising all residential dwelling units with at least one resident aged 50 and above, spanning across all geographical areas demarcated by the Urban Redevelopment Authority as residential areas that covered Singapore's Central, East, North, North-East and West Regions, was obtained from the Singapore Department of Statistics. Dwelling units were grouped into four non-overlapping strata according to age group, and were further stratified into gender, ethnicity and housing types. Based on the

resulting Master List, a fixed number of dwelling units were selected by a systematic sampling procedure with a random start. The inclusion criteria were community dwelling Singapore residents, who were able to communicate in either English, Malay, Mandarin, Tamil, Hokkien or Cantonese. The exclusion criteria were individuals who were visibly too ill or frail to participate or were unable to provide informed consent due to cognitive impairment as assessed by a screening question during recruitment and continuous observation throughout a face-to-face survey interview.

Procedures

Potential participants were selected from the master list in a sequential order and were contacted in-person through door-to-door home visits across Singapore. A minimum of three attempts were made to contact participants, before moving to the next participant in the master list. On initial contact, successfully engaged participants were informed of the study's background, rationale and details of their participation. Only one adult above the age of 50 was recruited from each randomly selected household. After informed consent, participants completed a standardised survey on arts engagement and holistic well-being via a 30–45 min structured face-to-face interview. Each survey was conducted at the home of the participant, and each participant received a cash voucher of Singapore \$20 on completion of the survey. The response rate for this study was 59%. One thousand seven hundred ninety-seven households with current or soon-to-be older adults were contacted to participate in the study; 68 interested individuals (4%) did not meet the inclusion criteria, 662 potentially eligible participants (37%) declined to participate in the study or dropped out, 1067 (59%) eligible and consenting participants were recruited and completed the survey.

Ethical considerations

All participants were briefed and interviewed by trained interviewers who received regular supervision. Individual written consent was obtained prior to data collection.

Patient and public involvement

Research participants were not involved in the development of the research question, design, recruitment processes and conduct of the study. The findings of the study were disseminated locally via press coverage, media interviews and conference presentations.

Study variables

Arts engagement

A series of standardised ad hoc items were developed to assess the frequency and duration of arts engagement among study participants, of which included active engagements and passive consumption of eight specific art forms—music, dance, theatre, literary arts, visual arts, heritage activities, film and handicraft.²² Arts engagement was measured in terms of active engagement and passive engagement. Active engagement was construed

as the active participation in art, heritage and cultural activities such as creating, while passive engagement referred to passive behaviours such as attending, viewing or listening.²³ Some examples of engagement in the study included attendance or participation in theatre events (eg, attending musicals, performance in traditional theatre), music activities (eg, listening to classical music, playing a musical instrument), dance performances (eg, watching a ballet performance, participating in line dancing classes), visual arts activities (eg, visiting art fairs, doing photography), heritage-related activities (eg, visiting heritage buildings and monuments, providing guided cultural tours to others), literary arts-related events (eg, attending a book launch, writing biographies), film-related events (eg, attending a film festival, participating in a local film production) and craft activities (eg, watching a handicraft demonstration, teaching embroidery classes). Participants were asked to recount their active engagements over the past 3 months and passive engagements over the past 6 months since the time of survey to facilitate accurate recall and comprehensive recording of all art activities. This difference in timeframe in assessing passive and active art engagement was due to the nature of engagement; existing research has shown that the frequency and duration for passive arts engagement were typically much sparser than active arts engagement,²⁴ and therefore a longer recall timeframe served to capture sufficient data for analysis. Overall scores of the total hours of active and passive arts engagement were calculated for each participant.

Covariates

To better understand the potential interplay between arts engagement and physical activity on well-being, a series of standardised items based on Singapore's National Physical Activities Guidelines,²⁵ was developed to assess the frequency and intensity of physical activity engagement among study participants. These items reflect light-intensity lifestyle activities such as walking, moderate-intensity physical activities (eg, low-impact aerobics), vigorous-intensity physical activity (eg, jogging) and strength and balance activities (eg, Tai Chi). To determine whether medical and demographic variables were potential confounding factors, participant's clinical health information were assessed via self-reported presence of chronic illness and time since diagnosis. Demographic data including age, gender, marital status, family composition, socioeconomic status and religion were also collected.

Outcome variables

Outcome variables measured and reported in the current study included quality of life and holistic well-being inclusive of the physical, mental, spiritual and social domains. Quality of life was assessed using the 8-item WHO Quality of Life Instrument (WHOQoL-8).²⁶ The WHOQoL-8 is a highly reliable 8-item scale ($\alpha=0.86$) that measured participants' perceived quality of life domains including

health, energy for everyday life, ability to perform daily activities, satisfaction with self, satisfaction with relationships, personal finances, living conditions and overall quality of life. Scores ranged from 8 to 40, with higher values representing better quality of life. Physical and mental well-being were assessed using the Short Form 20 (SF-20) Health Survey.²⁷ The SF-20 comprised 20 items that measured six health domains including the subscales of health perceptions, physical role functioning, presence of bodily pain, perceived social functioning, physical functioning and mental health. Item scores were transformed individually and linearly, and were averaged for final domain scores used for analyses. Higher values represented better self-reported health for all subscales, except for the bodily pain subscale, where higher values represented more reported bodily pain. Spiritual well-being was assessed using the 12-item Functional Assessment of Chronic Illness Therapy-Spiritual Wellbeing (FACIT-SP-12). The FACIT-SP-12 is a reliable scale ($\alpha=0.87$) which measured the three domains of meaning, peace and faith.²⁸ Possible scores ranged from 0 to 48, with higher scores indicating better spiritual well-being. Social well-being was assessed using the Interpersonal Support Evaluation List Short Form (ISEL-S).²⁹ The 12-item ISEL-S is a highly reliable scale ($\alpha=0.90$) which measured the three domains of appraisal support, belonging support and tangible support. Overall scores were calculated for the analyses, with higher scores representing better social well-being. As Singapore is a multilingual society, the questionnaire was prepared in English, Malay, Chinese and Tamil. The Chinese versions of the WHOQOL-8, ISEL-S, SF20 and FACIT-SP scales, as well as the Malay version of the WHOQOL-8 were adapted from past studies with Asian older adults.^{30–34} The other scales were translated to Malay and Tamil by a professional translator, back-translated, pilot-tested and verified by the research team.

Statistical analysis

Descriptive analyses were performed on all demographic, arts engagement, physical activity and outcome variables. Bivariate correlations and exploratory multiple linear regression analyses were conducted to understand the association between passive and active arts engagement, and various factors of holistic well-being. Sociodemographic variables including age, gender, marital status, number of children, highest education achieved, employment status, household income, housing type and presence of chronic illness were adjusted for in each model.

Propensity score matching (PSM) analysis was adopted to reduce selection bias and avoid issues of endogeneity.³⁵ To approach a random distribution and to reduce the effect of covariates on the results, a propensity score was used to transform all matching variables to a conditional probability for balancing the covariates between the arts engagement group and the control group.³⁶ A propensity score was calculated for active arts engagement and non-active arts engagement groups, as well as passive arts

engagement and non-passive arts engagement groups within the study period (ie, average treatment effect on the treated), using a logistic regression model. The covariates entered into the propensity score included demographic characteristics (age, sex, education, occupation, religion, income, house type) and physical activity variables (light-intensity, moderate-intensity, vigorous-intensity, strength and balance, as well as all physical activities). Covariate selection in the propensity model was based on the criterion suggested by Brookhart *et al.*³⁷ All meaningful covariates (associated to both exposure and outcomes, or to outcomes only) were decided a priori to get the optimised propensity score model to reduce bias.³⁸ Art-active and passive arts engagement groups were matched with the control group on the logit of the propensity score, with calipers widths equal to 0.2 of the SD.³⁹ The Stata 'psmatch2' module was adopted to conduct the nearest neighbour matching technique without replacement, and the model's ability to balance the cohorts was tested using standardised differences.⁴⁰ Successful matching was indicated when the absolute standardised mean difference after matching was less than 0.25.⁴¹ A matching ratio of 1:2 was used for active arts engagement (to get more appropriate comparators as the proportion of active arts engagement was smaller) and 1:1 was used for passive arts engagement. Model sensitivity was assessed by the Rosenbaum Bounds for Hodges-Lehmann Point Estimate which evaluated the robustness of findings to hidden biases as a result of unobserved covariates. The maximum Gamma (odds of differential assignment to treatment due to unobserved factors) was set to two, and increments of 0.1 were made to identify a point where the between-group differences were no longer robust.⁴² Subsequent analyses were conducted to estimate the impact of active or passive arts engagement with the matched samples using appropriate methods. Independent t-tests were used to assess the impact of active or passive art on well-being on participants, and effect size (d) was also reported between the treated and control group. All statistical analyses were performed by Stata for Windows V.14.2 (StataCorp). A two-sided p value of less than 0.05 was considered statistically significant.

RESULTS

Study participants' age ranged from 50 to 95 years ($M=64.2$, $SD=10.0$), with 45% males and 81% of Chinese ethnicity, of which were representative of Singapore's older population. 60% of participants reported attending at least one arts and culture activity within a time frame of 6 months (ie, passive arts engagements), while 17% of the respondents reported actively participating in at least one arts and culture event within a timeframe of 3 months (ie, active arts engagements). Overall, participants spent a median time of 6 hours attending arts events ($IQR=11.0$; range=0–258 hours) within a 6-month time period, and a median time of 11 hours actively engaged in the arts ($IQR=27.6$; range=0–1015 hours) within a 3-month

time period. Top reported art forms among passive arts attendees in this sample included film (28%), heritage-related events (23%) and theatre (25%). As for active arts

participants, engagements in visual arts (5%), music (4%) and craftwork (4%) were commonly reported. Detailed demographic information, physical activity levels and

Table 1 Characteristics of respondents

Demographic characteristic	N (%)	Variable information	N (%) / mean (SD)
Demographic background		Arts engagement frequency (n, %)	
Gender		Active arts engagement	178 (16.7)
Male	479 (44.9)	Top reported: visual art	49 (4.6)
Female	588 (55.1)	Top reported: music	43 (4.0)
Age at time of survey (years)		Top reported: craftwork	41 (3.8)
50–59	421 (39.5)	Passive arts engagement	645 (60.4)
60–69	372 (34.9)	Top reported: film	295 (27.6)
>70	274 (25.7)	Top reported: theatre	270 (25.3)
Marital status		Top reported: heritage-related events	244 (22.9)
Single/divorced/widowed	216 (20.2)	Physical activity levels (mean, SD)	
Married	851 (79.8)	Light intensity (range: 0–57)	5.3 (9.3)
Ethnicity		Moderate intensity (range: 0–60)	2.0 (6.1)
Chinese	859 (80.5)	Vigorous intensity (range: 0–10)	0.3 (1.0)
Malay	121 (11.3)	Strength and balance (range: 0–30)	0.7 (1.5)
Indian	78 (7.3)	Overall physical activity (range: 0–87)	8.2 (12.4)
Others (eg, Eurasian)	9 (0.8)	Well-being variables (mean, SD)	
Highest obtained education		Quality of life (WHOQOL-8) (range: 11–40)	31.4 (4.2)
Up to primary/elementary school	678 (63.5)	SF20—health perception (range: 0–100)	69.9 (19.6)
Secondary/high school or above	389 (36.5)	SF20—pain (range: 0–80)	17.4 (20.0)
Employment status		SF20—social functioning (range: 0–100)	90.8 (21.4)
Full-time/self-employed	309 (29.0)	SF20—role functioning (range: 0–100)	87.9 (29.3)
Part-time employed	148 (13.9)	SF20—physical functioning (range: 0–100)	86.1 (23.0)
Unemployed or retired	610 (57.2)	SF20—mental health (range: 0–100)	81.9 (14.7)
Monthly household income (SGD)		Interpersonal support (ISEL-S) (range: 12–48)	37.8 (6.6)
<2000	412 (38.6)	Appraisal Support Subscale (range: 4–16)	12.7 (2.4)
2000–3999	335 (31.4)	Belonging Support Subscale (range: 4–16)	12.3 (2.6)
≥4000	320 (30.0)	Tangible Support Subscale (range: 4–16)	12.9 (2.3)
Housing type		Spiritual well-being (FACIT-Sp-12) (range: 7–48)	34.0 (8.0)
1/2/3 room flat	308 (28.9)	Meaning Subscale (range: 1–16)	12.4 (2.9)
4-room flat	378 (35.4)	Peace Subscale (range: 2–16)	12.3 (2.8)
5-room/ 3-gen/executive/mansionette	277 (26.0)	Faith Subscale (range: 0–16)	9.3 (3.8)
Condominium and others	104 (9.7)		
Living arrangements			
Family (eg, spouse, children, siblings)	968 (90.7)		
Living alone	71 (6.7)		
Others (eg, friends, Tenants)	28 (2.6)		

N=1,067

*WHOQOL-8: World Health Organization Quality of Life Instrument (8-item).

FACIT-Sp-12, Functional Assessment of Chronic Illness Therapy - Spiritual Well-Being; ISEL-S, Interpersonal Support Evaluation List-Short Form; SF20, 20-Item Short Form Survey; SGD, Singapore dollar; WHOQOL-8, World Health Organization Quality of Life Instrument (8-item).

scores of all outcome variables are reported in [table 1](#). For subsequent analysis, four outliers were identified and removed due to overtly high arts engagement hours (who may be professional artists or art enthusiasts), hence data from 1063 participants were used for subsequent analyses. There were no missing data for the variables in this study.

Results from the correlational analyses indicated that passive arts engagement was associated with better well-being measures, specifically, quality of life ($r=0.233$, $p<0.0001$), perceived health ($r=0.174$, $p<0.0001$), social functioning ($r=0.106$, $p=0.001$), mental health ($r=0.124$, $p<0.0001$), spiritual well-being ($r=0.162$, $p<0.0001$) and interpersonal support ($r=0.172$, $p<0.0001$). Furthermore, active engagements in the arts were associated with better quality of life ($r=0.177$, $p<0.0001$), health perceptions ($r=0.130$, $p<0.0001$), role functioning ($r=0.078$, $p=0.011$), social functioning ($r=0.100$, $p=0.001$) and mental health ($r=0.154$, $p<0.0001$), as well as enhanced spiritual well-being ($r=0.201$, $p<0.0001$) and interpersonal support ($r=0.116$, $p<0.0001$). After adjusting for covariates in each model, findings from exploratory regression analyses indicated that passive engagement in the arts was a significant independent predictor of better quality of life ($\beta=0.166$, $SE=0.008$, $p<0.0001$), health perceptions ($\beta=0.146$, $SE=0.035$, $p<0.0001$), mental health ($\beta=0.095$, $SE=0.028$, $p=0.002$), spiritual well-being ($\beta=0.128$, $SE=0.014$, $p<0.0001$) and interpersonal support ($\beta=0.101$, $SE=0.012$, $p=0.0003$). Similarly, active engagement in the arts were also a significant predictor of quality of life ($\beta=0.139$, $SE=0.006$, $p<0.0001$), health perceptions ($\beta=0.078$, $SE=0.026$, $p=0.006$) and spiritual well-being ($\beta=0.065$, $SE=0.011$, $p=0.023$). Please refer to [table 2](#) for more details regarding the exploratory correlational and regression analyses.

Balancing information before and after PSM is presented in the [table 3](#). After matching, a total of 444 (treatment=176 and control=268) cohort participants were included in the analysis for active group and 730 (treatment=365 and control=365) were included in the analysis for passive group, respectively. All included covariates achieved balance after matching in the PSM analysis except for age and some physical activity components, however these differences were minimal. For the active engagement group, the median bias prior to matching was 22.8% and that was reduced to 1.4% after matching. The median bias prior to matching for the passive engagement group was 15.1% and was reduced to 8.6% after matching. The unmatched units were dropped as the propensity score model did not find any appropriate control with respect to the case. The characteristics of matching variables between matched and unmatched samples in both active and passive engagement groups were further compared. Descriptive analysis showed that propensity score model clearly distinguished the samples with similar characteristics in matched group compared with the unmatched group (see online supplementary table S1). Model sensitivity analysis showed these results were acceptable and robust as Gamma value did

not include zero in the lower and upper bounds when it increased to two.

Detailed findings of the t-tests conducted are presented in [table 4](#). Results from independent-samples t-tests revealed that participants who engaged in the arts scored significantly better in multiple measures of well-being. For the passive engagement group, participants reported a significantly higher quality of life ($t(728)=3.35$, $p=0.0008$, $d=0.25$) and perceived health scores ($t(728)=2.21$, $p=0.0277$, $d=0.16$) than matched controls. Although there were no significant differences in overall social well-being, arts attendees reported an enhanced sense of belonging ($t(728)=2.17$, $p=0.03$, $d=0.16$) in the social well-being subscale than non-arts attendees. Independent-sample t-tests conducted with the active arts engagement group also revealed significant mean differences in quality of life ($t(442)=3.68$, $p=0.0003$, $d=0.36$), perceived health ($t(442)=2.59$, $p=0.0099$, $d=0.25$) and overall spiritual well-being ($t(442)=3.75$, $p=0.0002$, $d=0.37$). Moreover, participants who actively participated in the arts also reported greater spiritual well-being subscale scores in meaning in life ($t(442)=5.03$, $p<0.0001$, $d=0.50$) as well as sense of peace ($t(442)=3.72$, $p=0.0002$, $d=0.36$) in comparison to matched controls. Finally, although marginally significant, active arts participants also reported better social functioning ($t(442)=1.68$, $p=0.0939$, $d=0.17$) and mental health ($t(442)=1.84$, $p=0.0668$, $d=0.18$).

DISCUSSION

This was the first-ever empirical research that examined arts engagements and its impact on holistic well-being among current and future elderly populations in Asia using naturalistic observational data with PSM analysis. This study established significantly strong causal relationships between arts engagements (both passive and active engagements) and numerous domains of holistic well-being in a naturalistic sample of older adults in Singapore. The results revealed that by passively engaging in the arts, older adults experienced significantly higher quality of life, better perceived health and greater social connectedness as compared with non-art attendees. The results further showed that older adults who actively engaged in the arts experienced significantly enhanced quality of life, better perceived health, stronger spiritual wellness, life meaning and peace with a medium effect size, as compared with non-art participants. These findings support that varying depths of arts engagements could impact different domains of holistic wellness among older adults, where both passive exposures to and active engagements in the arts could bring about quality of life and subjective health benefits.

The findings from this study also supported past literature,^{43–45} and provided novel contributions to the growing research on arts, health and wellness. First, the present study adopted a holistic view and assessed multiple domains of well-being including quality of life, perceived health and mental health, social support and

Table 2 Spearman correlations and multiple regression analyses predicting well-being

Well-being measures	Passive arts engagement						Active arts engagement					
	Spearman correlation			Multiple regression			Spearman correlation			Multiple regression		
	R	P value	β	SE	P value	Adj. R ²	R	P value	β	SE	P value	Adj. R ²
Quality of life (WHOQOL-8)	0.233	<0.0001*	0.166	0.008	<0.0001*	0.150	0.177	<0.0001*	0.139	0.006	<0.0001*	0.142
Holistic health (SF20)												
SF20—health perception	0.174	<0.0001*	0.146	0.035	<0.0001*	0.179	0.130	<0.0001*	0.078	0.026	0.006*	0.163
SF20—role functioning	0.050	0.101	...	...	...	...	0.078	0.011*	...	...	...	...
SF20—pain domain	-0.010	0.750	...	...	...	...	-0.024	0.430	...	...	...	...
SF20—social functioning	0.106	0.0001*	...	...	...	...	0.100	0.0001*	...	...	...	...
SF20—physical function	0.050	0.103	...	...	...	...	0.027	0.373	...	...	...	...
SF20—mental health	0.124	<0.0001*	0.095	0.028	0.002*	0.069	0.154	<0.0001*	0.057	0.021	0.058	0.063
Spiritual well-being (FACIT-SP-12)	0.162	<0.0001*	0.128	0.014	<0.0001*	0.177	0.201	<0.0001*	0.065	0.011	0.023*	0.164
Meaning Subscale	0.164	<0.0001*	0.121	0.005	<0.0001*	0.191	0.244	<0.0001*	0.081	0.004	0.004*	0.183
Peace Subscale	0.153	<0.0001*	0.123	0.005	<0.0001*	0.144	0.205	<0.0001*	0.094	0.004	0.001*	0.138
Faith Subscale	0.096	0.002*	0.084	0.007	0.003*	0.171	0.095	0.002*	0.004	0.005	0.896	0.164
Interpersonal support (ISEL-S)	0.172	<0.0001*	0.101	0.012	0.0003*	0.180	0.116	<0.0001*	0.036	0.009	0.205	0.172
Appraisal Subscale	0.126	<0.0001*	0.086	0.004	0.003*	0.133	0.096	0.002*	0.030	0.003	0.299	0.127
Belonging Subscale	0.190	<0.0001*	0.123	0.005	<0.0001*	0.163	0.117	<0.0001*	0.043	0.003	0.134	0.150
Tangible Subscale	0.135	<0.0001*	0.059	0.004	0.039*	0.144	0.106	0.001*	0.022	0.003	0.439	0.141

n=1063.

Multiple regression: Variables which satisfied the normality tests are reported in the table; covariates entered: age, gender, marital status, number of children, education, presence of religious belief, employment status, monthly household income, housing type, presence of chronic illness.

*P<0.05.

FACIT-SP-12, 12-item Functional Assessment of Chronic Illness Therapy-Spiritual Wellbeing; ISEL-S, Interpersonal Support Evaluation List Short Form; SF20, Short Form-20.

Table 3 Distribution of balance for covariates before and after matching by propensity score matching (PSM) in passive and active engagement groups

Balance variables	Passive engagement				Active engagement				
	Before matching (n=1063)		After matching (n=730)		Before matching (n=1063)		After matching (n=444)		
	Passive group (n=642)	Non-passive group (n=421)	Passive group (n=365)	Non-passive group (n=365)	Active group (n=176)	Non-active group (n=887)	Active group (n=176)	Non-active group (n=268)	
Age (years)	62.57	66.73	66.47	65.02	61.60	64.74	61.60	61.63	0.004
Sex									
Male respondents	0.42	0.49	0.52	0.47	0.38	0.46	0.38	0.37	0.01
Marital status									
Married	0.81	0.77	0.77	0.79	0.86	0.79	0.86	0.84	-0.06
Highest obtained education									
Elementary school	0.49	0.56	0.64	0.58	0.43	0.54	0.43	0.48	0.11
High school or higher	0.43	0.27	0.23	0.31	0.53	0.33	0.53	0.47	-0.14
Ethnicity									
Chinese ethnic group	0.81	0.79	0.78	0.80	0.84	0.80	0.84	0.85	0.03
Religious belief									
Have religious belief	0.88	0.86	0.86	0.86	0.88	0.87	0.88	0.88	0.02
Employment status									
Part-time employed	0.16	0.11	0.10	0.13	0.20	0.13	0.20	0.19	-0.05
Full-time or self-employed	0.32	0.25	0.25	0.27	0.32	0.29	0.32	0.31	-0.02
Monthly household income (SGD)									
1000–2999	0.29	0.32	0.36	0.32	0.24	0.31	0.24	0.27	0.08
>3000	0.51	0.39	0.37	0.42	0.54	0.45	0.54	0.51	-0.07
Housing type									
3–4-room HDB flat	0.55	0.62	0.65	0.62	0.47	0.60	0.47	0.50	0.07
5-room HDB flat and others	0.38	0.31	0.28	0.32	0.49	0.33	0.49	0.45	-0.09
Physical activity levels (hours)									
Light intensity	6.49	3.43	2.52	3.69	9.09	4.52	9.09	7.23	-0.16
Moderate intensity	2.46	1.42	1.02	1.59	3.30	1.80	3.30	3.27	-0.004
Vigorous intensity	0.32	0.16	0.11	0.16	0.51	0.20	0.51	0.36	-0.11
Strength and balance	0.78	0.51	0.46	0.56	1.00	0.61	1.00	0.72	-0.18
All physical activities	10.05	5.52	4.11	6.01	13.91	7.13	13.91	11.57	-0.15

*Standardised difference= difference in means or proportions divided by SE are shown; balance defined as absolute value less than 0.25 (small effect size). SGD, Singapore dollar.

Table 4 Group differences in well-being scores

Well-being	Passive arts engagement†				Active arts engagement‡					
	Passive		Control		Active		Control			
	(mean±SD)	(mean±SD)	T(728)	P value	Effect size(d)	(mean±SD)	(mean±SD)	T(442)	P value	Effect size(d)
Quality of Life (WHOQOL-8)	31.5±4.15	30.5±4.2	3.35	0.0008*	0.25	33.0±4.16	31.5±4.14	3.68	0.0003*	0.36
Short Form Health Survey (SF-20)										
SF20-Health Perception	69.6±19.9	66.3±21.1	2.21	0.028*	0.16	75.5±18.2	70.7±19.3	2.59	0.0099*	0.25
SF20-Role Functioning	85.4±31.2	86.4±31.7	0.44	0.659	0.03	92.8±24.2	91.1±26.1	0.66	0.512	0.06
SF20-Pain Domain	18.1±20.9	17.8±20.7	0.18	0.859	0.01	16.7±20.6	17.9±19.6	0.62	0.538	0.06
SF20-Social Functioning	90.9±19.6	88.9±24.5	1.20	0.230	0.09	95.6±14.7	92.8±18.7	1.68	0.094	0.17
SF20-Physical Function	84.9±22.2	84.4±25.2	0.27	0.785	0.02	89.2±18.6	88.5±20.9	0.37	0.715	0.04
SF20-Mental Health	81.2±14.8	80.5±15.4	0.63	0.532	0.05	86.0±13.1	83.6±14.0	1.84	0.067	0.18
Interpersonal Support (ISEL-S)	37.4±6.3	36.8±6.4	1.14	0.253	0.08	39.4±6.9	38.7±6.4	1.10	0.273	0.11
Appraisal Subscale	12.4±2.3	12.4±2.4	0.32	0.751	0.02	13.1±2.6	12.9±2.4	0.70	0.483	0.07
Belonging Subscale	12.2±2.5	11.8±2.6	2.17	0.030*	0.16	12.9±2.6	12.6±2.4	1.16	0.246	0.11
Tangible Subscale	12.7±2.2	12.6±2.3	0.44	0.658	0.03	13.4±2.5	13.1±2.2	1.12	0.262	0.11
Spiritual Well-being (FACIT-Sp-12)	33.5±8.0	33.1±8.1	0.68	0.496	0.05	37.5±7.2	34.7±7.7	3.75	0.0002*	0.37
Meaning Subscale	12.2±2.8	12.1±3.0	0.12	0.908	0.01	13.9±2.3	12.6±2.8	5.03	<0.0001*	0.50
Peace Subscale	12.1±2.7	11.9±3.0	0.81	0.419	0.06	13.5±2.6	12.5±2.7	3.72	0.0002*	0.36
Faith Subscale	9.3±3.9	9.0±3.9	0.73	0.464	0.05	10.1±4.0	9.6±3.8	1.25	0.211	0.12

*P<0.05.

†n= 730.

‡n=444.

spiritual wellness, whereas past studies only examined the effects of the arts on one or a very selected few facets of well-being.^{10 11 43–45} Second, the present study included an extensive range of art forms with specific cultural genres (eg, ‘angklung’—bamboo flute, ‘wayang kulit’—shadow puppets and Chinese operas) to investigate its effects on health and wellness among a specific cohort of current and soon-to-be older adults between the ages of 50 and 95, as well as employed a stratified random survey method to recruit a sizeable sample that was highly representative of Singapore’s elderly population. Thus, the results generated had strong generalisability to local populations and provided policy makers, practitioners and researchers with age and cultural-specific insights on programme development.⁴⁶ The results could also serve as a frame of reference for the advancement of other Asian societies that share similar sociocultural demographics and structures such as Hong Kong, Malaysia and other major cities in China. Finally, through PSM, participants engaged in the arts were systematically matched on multiple covariates with respondents who did not engage in the arts. This allowed for meaningful comparisons between groups in a naturalistic sample, of which is greatly lacking in the literature on arts, health and wellness. To our knowledge, this is the first arts and health study that employed this analytical method.

One can connect to literature on creativity, self-mastery, relational aesthetics and neurological sciences for the inner workings of arts and wellness. Arts engagement fosters an empowering process of creativity and autonomy that cultivates mindful-awareness, self-understanding and new insights.⁴⁷ This in turn facilitates motivation for narrative identity processing,⁴⁸ a constructive reflection process of character building that fosters life meaning and self-affirmation, leading to the development of self-mastery.^{49 50} Through arts engagements, individuals would also encounter relational aesthetics, an experience of emotional connections via metaphoric dialogue with the arts and the artists that broadens perspectives and nurtures diversity, while inspiring human connections, empathy and compassionate citizenry.^{51 52} Arts engagement may also have a role to play in stimulating the parasympathetic nervous system, leading to a greater sense of peace and relaxation.⁵³ Finally, neurological literature has illustrated the effects of arts as a means for stimulating neuroplasticity and building cognitive reserve.^{54 55} As such, it is evident that the arts can positively impact various domains of well-being through numerous psychosocial processes, particularly for older adults whose sense of identity and personhood progressively decline with the onset of old age, worsening health and diminishing social networks.⁵⁶

Future arts-based elderly care programmes may target these avenues and pathways for wellness promotion. The findings show that attending art events could reap social and relational benefits for tackling social isolation, while creating art could harness intrinsic benefits that lead to spiritual fulfilment and growth. From a policy perspective,

this translates into multiple entry points for attracting and maintaining arts participation among older populations. Thus, considerations for a formal and sustainable structure that incorporates participatory art initiatives and programmes into aged care services, while ensuring proficient training of more community art workers to support these works could be made as this would be a cost-effective way to promote healthy, creative and meaningful ageing. Despite the positive effects of creative arts engagement on health, it has been repeatedly found that promoting engagement in the arts among the elderly is difficult, as participation in the arts generally declines with age, most progressively among individuals reaching the age of 65, and most markedly for those aged 75 and above.⁵⁷ Similar findings have also been reported in Singapore, where older adults aged 60 and above had the lowest art attendance and art participation rates among all age cohorts.⁵⁸ Within this sample, art participation rates among adults aged 50 and above was 17%. This trend is disconcerting given the fact that the arts could play a significant role in supporting well-being in old age. From a practice perspective, participatory arts programmes and initiatives could include public education and advocacy campaigns to promote arts engagements, art-based psychosocial care programming designed for community and residential care settings, as well as collaboration with arts and cultural heritage intuitions in developing arts programmes that are fitting to the needs and interests of older adults. Practitioners and healthcare providers could consider the arts as a non-medical, non-pharmaceutical agent for mental health and quality of life enhancement, and may also consider integrating passive art activities to enhance social programmes for older adults. Finally, the arts may also be considered as a gateway to support stronger social networks for tackling the public health problem of loneliness through programmes that use the arts as platforms for outreach, relational bonding and community building.

The results of this study, although theoretically and practically appealing, were not without its limitations. First, potential confounders were balanced in the PSM except for age and frequency of light intensity physical activity, hence caution must be exercised when interpreting the results. Moreover, despite having model sensitivity analyses conducted for unobserved covariates, the presence of other potential confounding variables in this study such as the presence competing social activities, recreational and religious activities, as well as living arrangements should be assessed and controlled for in future research. Second, the arts engagement assessment items required the accuracy of memory recall (3–6 months prior to data collection) from the participants and the psychometric measures were self-reported. Future research could consider administering objective measures of arts engagement such as clinical observations and activity journals, as well as health service utilisation and functional MRI to assess the objective health and well-being outcomes. Finally, the current study employed cross-sectional survey

data that assessed participants at a single time point, and thus was not possible to rule out the potentiality of reverse causality. For example, while our findings reveal that art attendance enhances one's sense of belonging, the opposite may hold true where a sense of belonging could be a precursor to art attendance, implying that programme design and implementation would need to target both enablers, namely to facilitate belonging and making art appealing. In order to obtain a deeper understanding of the causal and directional effects of arts engagement, future studies should consider implementing a robust experimental or longitudinal research design. Despite these limitations, the findings generated from this study are important starting points for future empirical research in Singapore and neighbouring regions, as they provide a critical crosscultural understanding on the relationship between arts and wellness in greater Asia, while contributing to the growing literature on the subject matter internationally.

In conclusion, the arts can play a significant role in sustaining a healthy, active and resilient elderly populace with greater cost-efficiency than traditional medicine and health service models. Under the rubric of rapid population ageing, the need for more evidence-driven arts promotion initiatives to foster active and creative ageing, as well as greater art-based psychosocial care for the elderly is urgently warranted in Asia and around the globe.

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Contributors In terms of author contributions, AHYH, M-HRH, JSMP and EO designed the study and obtained funding, SHXM carried out literature search and data collection, RB carried out data analysis, all authors contributed to data interpretation, as well as the writing and revision of the manuscript.

Funding This study is funded by the National Arts Council, Singapore [Grant No: 012.012.003].

Disclaimer The funder of the study had no role in study design, data collection, data analysis, data interpretation or writing of the report. The corresponding author had full access to all the data in the study and had final responsibility for the decision to submit for publication.

Competing interests The authors received grants from the National Arts Council Singapore to conduct this study.

Patient consent for publication Not required.

Ethics approval Ethical approval was obtained through Nanyang Technological University's Institutional Review Board before study commencement (IRB-2016-05-027).

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement No data are available.

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