

RESEARCH | PEER REVIEWED

## Quality of Life for People who Sing : An Exploration of Participant Experiences Singing in Neurological and Community Choirs Across New Zealand

Jordyn Danielle Thompson<sup>1\*</sup>, Alison Talmage<sup>2</sup>, Brieonie Jenkins<sup>1</sup>, Suzanne Purdy<sup>1</sup>

<sup>1</sup> School of Psychology, Faculty of Science, and Centre for Brain Research, The University of Auckland, New Zealand

<sup>2</sup> School of Music, Faculty of Creative Arts and Industries, and Centre for Brain Research, The University of Auckland, New Zealand

\*[jordyn\\_thompson@hotmail.com](mailto:jordyn_thompson@hotmail.com)

Received: 29 October 2020 Accepted: 9 March 2022 Published: 1 July 2022

Editors: Michael Viega, Claire Ghetti Reviewers: Brigette Sutton, Gabriela Asch-Ortiz, Lucy Bolger

### Abstract

**Background:** A growing ageing population in New Zealand and worldwide poses a number of challenges, including the predicted strain on public health services due to a consequential increase in neurological conditions, which tend to occur later in life. Diagnosis with a neurological condition is associated with negative psychosocial and quality of life (QOL) outcomes, which medical interventions do not address. There is growing interest in the role of music and singing in improving some of these negative outcomes that provides a rationale for the present research.

**Methods:** This mixed methods research explores the health-related quality of life (HRQOL) of 90 choir singers who sing in neurological choirs (social singing groups offering choral singing therapy) and community choirs in New Zealand. HRQOL data were obtained using the NZ WHOQOL-BREF and choir involvement perspectives were obtained using a choir participation questionnaire (CPQ). Non-parametric statistical tests were used to explore the NZ WHOQOL-BREF and visual analogue scale (VAS) responses in the CPQ. Qualitative measures were used to explore open-ended responses in the CPQ.

**Results:** HRQOL was similar across participants on the psychological, social relationships, and environmental domains, and lower for neurological choir members on the physical domain. Choir involvement perspectives showed that choir members perceived several positive benefits associated with choral singing that were often identified under the psychological, social relationships, and environmental domains.

**Keywords:** *choral singing, Quality of Life (QOL), neurological condition, community choir*

## Introduction

This mixed methods research focused on the health-related quality of life (HRQOL) of participants who sing in neurological choirs (social singing groups offering choral singing therapy [CST]) and community choirs in New Zealand. The mixed methods paradigm values both quantitative and qualitative methods and aligns well with the holistic philosophies that underpin several approaches to music therapy (Edwards, 2016) and community singing (Lee et al., 2018). When practice values a biopsychosocial (and sometimes also spiritual) approach, it is important to value both objective measures and participant reflections on lived experience. The present research builds on an earlier phase of HRQOL research (Jenkins et al., 2017). The present research combines raw data collected in this earlier phase with current data to explore the benefits of choral singing for people with neurological conditions and for the general population. Stroke and Parkinson's disease are the most common health conditions affecting the neurological choir participants in this sample, the characteristics of which will be highlighted in the following section along with HRQOL following diagnosis with a neurological condition, and the aims of choral singing.

The authors of the present research are influenced through their research backgrounds in psychology, speech science, and music therapy. Authors Jordyn Thompson and Brieonie Jenkins were psychology honours students at the time the present research was carried out; author Alison Talmage is a registered music therapist with more than ten years' experience leading neurological choirs; author Suzanne Purdy has a background in neuropsychology and communication disorders and has collaborated with author Alison Talmage for over ten years.

## Stroke and Parkinson's Disease: Prevalence and Prognosis

A growing ageing population in New Zealand and worldwide poses a number of challenges, including the predicted strain on public health services due to a consequential increase in neurological conditions, which tend to occur later in life (Statistics New Zealand, 2020). A stroke is a serious health condition and is caused through a blocked or burst blood vessel that interrupts blood flow to the brain and can result in brain damage or death (World Health Organization, 2021). Risk of stroke increases with age with 75% of all strokes occurring after age 65. Stroke is the third leading cause of death in New Zealand and a leading cause of serious adult disability (New Zealand Institute of Economic Research, 2020). The most common intervention following a stroke is a combination of occupational, physio- and speech-language therapies (Hoffmann et al., 2010; Kelly et al., 2010). Parkinson's disease (Parkinson's) is a progressive neurodegenerative disorder, which affects neurons within the brain's basal ganglia and substantia nigra (World Health Organization, 2006). The onset of Parkinson's is slow and difficult to diagnose as there are no detectable symptoms until after significant deterioration has occurred. Parkinson's results in a gradual deterioration of motor functioning, including slowed movement, frozen gait, rest tremor, and impaired balance, posture, and coordination (Jankovic, 2008). Speech and swallowing difficulties, sleep disturbances, and mood changes are also common. Risk of Parkinson's increases with age, with the average age at diagnosis in New Zealand being 59 years (Parkinson's New Zealand, 2021). Parkinson's is the second leading neurodegenerative disease worldwide after Alzheimer's disease (Bertram & Tanzi, 2005). While there is no cure, pharmaceutical interventions can help to slow progression (Connolly & Lang, 2014).

## Life After Diagnosis

Research shows that diagnosis with a neurological condition is associated with worse HRQOL outcomes compared to well people (Carod-Artal & Egidio, 2009; Mutai et al., 2016; Rahman et al., 2008) and mental health issues can be comorbid (Campbell Burton et al., 2013; Dissanayaka et al., 2010; Dissanayaka et al., 2011; Haddad, 2009; Jasinska-Myga et al., 2010; Jørgensen et al., 2016). HRQOL refers to a person's phys-

ical, psychological, social, and environmental functioning. It focuses on the impact of a person's health status on their quality of life (QOL). Wellbeing, which explores the positive aspects of a person's life, is also linked to QOL (Office of Disease Prevention and Health Promotion, 2010). HRQOL measures are ideal to use within unwell populations due to their holistic approach to explore wellbeing in light of a person's health condition. An important demographic factor associated with the onset of neurological conditions is ageing (Anderson et al., 2005; Ascherio & Schwarzschild, 2016), which is also associated with a number of negative psychosocial and QOL outcomes (World Health Organization, 2017). Stressful life events such as the loss of a significant other, a perceived loss of purpose (due to retirement), and a loss of social support can have harmful effects on wellbeing, including depression (Patel & Prince, 2001; Unützer, 2007; Valvanne et al., 1996) and loneliness (Golden et al., 2009). There is evidence to suggest that diagnosis with a neurological condition intensifies existing challenges for older adults (Hornsten et al., 2012).

### Singing for Health and in Neurorehabilitation

There is growing interest in the outcomes of music-based approaches to neurorehabilitation (Kern & Tague, 2017; Schlaug et al., 2010; Thaut et al., 2015; Wan et al., 2010). Community music therapy (CoMT) provides opportunities for groups and communities to partake in musical activities designed to benefit the group as a whole. CoMT approaches take inspiration from communities and seek to address issues of social exclusion and disadvantage where present (Ansdell, 2002). One CoMT approach thought to be beneficial for people with neurological conditions is choral singing therapy (CST), which is an eclectic, music-centred approach to addressing some of the negative outcomes associated with a neurological condition diagnosis, including acquired communication challenges, and social isolation (Talmage, 2022; Talmage et al., 2013; Talmage & Purdy, 2021). The aim of CST is to be an inclusive rather than diagnostic-specific approach, which often results in a diverse choir group. There is a social aspect to choral singing (Fogg & Talmage, 2011), which can help with feelings of social isolation sometimes experienced in older adults and those with neurological and other health conditions. Research in this area tends to focus on the relationship between CST and physical symptoms (Matthews, 2018; Tamplin et al., 2019).

However, growing evidence supports additional psychosocial and QOL benefits (Irons et al., 2021; Johnson et al., 2013; Moss et al., 2018). Mixed methods research investigating the "Sing to Beat Parkinson's" programme identified significant improvements on several HRQOL domains for participants, and self-report data identified both physical (speech, voice, and breathing) and psychosocial benefits, including a sense of wellbeing, improved mood, and peer support (Irons et al., 2021). Moss et al. (2018) identified six themes as contributing to the relationship between choral singing and wellbeing: social connection, physical and psychological benefits, cognitive stimulation, improved mental health, enjoyment, and transcendence. Female participants rated physical, emotional, and social factors higher than male participants, and participants who were also professional singers reported greater physical, spiritual, and social experiences following choral singing. Johnson et al. (2013) used the WHOQOL-BREF (a QOL instrument developed through the World Health Organization) to explore HRQOL in older adult choir singers in Finland ( $N = 117$ ). Each WHOQOL-BREF question corresponds to HRQOL on one of four domains: physical, psychological, social relationships, or environmental. Johnson et al.'s findings showed that choral singing was associated with higher HRQOL on three out of four HRQOL domains (psychological, social relationships, and environmental). Both Moss et al. (2018) and Johnson et al. (2013) acknowledged the limitations of their research designs, including the use of a convenience sample and self-report data (Moss et al., 2018). Meanwhile, Johnson et al. (2013) acknowledged the cross-sectional nature of their research and noted that cause and effect cannot be established as the research design was not a randomised controlled trial.

In a review paper, Gick (2011) found evidence in support of group singing and highlighted a need for more robust research designs (that include both quantitative and qualitative research methods) to investigate potential benefits (and potential contraindications) for singing interventions within a biopsychosocial context. Similar positive findings and recommendations for more rigorous methodologies were found in research exploring singing interventions for people with stroke (Hurkmans et al., 2012; Tamplin et al., 2013) and Parkinson's (Di Benedetto et al., 2009; Elefant et al., 2012, Yinger & Lapointe, 2012). Research from an inter-professional research group (Dingle et al., 2019) identified several limitations of the current literature and recommended that future studies consider negative voice and psychosocial outcomes, increase participant diversity, strengthen research designs, investigate choir leader perspectives, and encourage inter-professional collaboration. Consistent with these recommendations, Pongan et al. (2017) compared a musical intervention against a painting intervention for French Alzheimer's disease patients, while Zumbansen et al. (2017) compared a choir group, a drama group, and a waitlist group for Canadian stroke patients. Both studies were randomised controlled trials and found therapeutic benefits as a direct result of choral singing.

## Neurological Choirs in New Zealand

While the literature highlights choir or group singing for wellbeing within both general and discrete clinical populations, New Zealand has witnessed an evolution of neurological choirs catering to a mixed clinical population of people with communication difficulties resulting from a number of conditions including post-stroke aphasia and Parkinson's. The first such choir, the music therapist-led CeleBRation Choir was established in 2009 with The University of Auckland's Centre for Brain Research (CBR). The CeleBRation Choir sessions are music therapist-led and include vocal warm-ups and singing a range of new and familiar songs. The CeleBRation Choir aims to improve physical symptoms (posture, breathing, and oromotor skills) for choir members as well as psychosocial and QOL outcomes. Choir member's families and carers are also invited to attend choir sessions (Talmage et al., 2013).

A mixed methods feasibility study carried out with The CeleBRation Choir identified several therapeutic benefits of choral singing. Fogg-Rogers et al. (2015) met with members of The CeleBRation Choir who had Parkinson's or stroke ( $N = 23$ ) and asked them about their experience with a neurological condition as well as their thoughts on choral singing and its perceived therapeutic benefits. Participants identified the following therapeutic benefits of choral singing: voice, breath, movement, language, and mood improvements, new abilities and connections, and a shared interest with others. In a separate paper, the experience of one participant from the same sample was highlighted. Talmage et al. (2014) observed the physical, psychosocial, and HRQOL changes for Don, a 69-year-old man diagnosed with Parkinson's as he participated in choral singing with The CeleBRation Choir. Don observed physical improvements (voice and speech) and his voice-related quality of life (V-RQOL) and HRQOL was higher than members of a comparison sample of people with disabilities.

## The Present Research

The present research aims to build on the findings from Jenkins et al. (2017) and other studies that have found benefits of CST for people with neurological conditions, including physical (Lee et al., 2018), psychosocial (Lee et al., 2018; Moss et al., 2018), and QOL (Johnson et al., 2013). The present research aims to explore HRQOL among New Zealanders who sing in choirs to find out whether their choir involvement perspectives reflect benefits of group singing similar to those identified in the literature, and to explore whether neurological and community choir members report similar experiences of group singing. The present research combines historical data from an earlier phase of HRQOL research (Jenkins et al., 2017) with current data. In the earlier phase, the researchers explored HRQOL using the NZ WHOQOL-BREF (a version of

the WHOQOL-100, a QOL instrument developed through the World Health Organization) (World Health Organization, 1994). In the earlier phase, all of the participants ( $N = 38$ ) were neurological choir members and their HRQOL scores were compared against an existing sample of baseline HRQOL data called the world disabilities sample (Power et al., 2010), obtained through the WHOQOL-DIS Group. The WHOQOL-DIS Group were interested in whether the WHOQOL-BREF would be a suitable HRQOL tool for people with disabilities and in their research recruited 1,400 adult participants with intellectual or physical disabilities from 15 World Health Organization collaborating centres worldwide. Participants completed the WHOQOL-BREF to provide baseline HRQOL data for people with disabilities.

In the earlier phase of the present research, the researchers felt that the world disabilities sample would be a good comparison sample for their participants, all of whom had an acquired neurological condition. Research outputs from the earlier phase showed that HRQOL for neurological choir members was higher than for members of the world disabilities sample. The researchers also explored choir involvement perspectives using a choir participation questionnaire (CPQ) and found that neurological choir members perceived a number of positive benefits of choir involvement. While the earlier phase was open for neurological choir members to participate, the current phase invited community choir members to participate as well. In the present research, raw data from the earlier phase is combined with current data to compare the benefits of choral singing for people with neurological conditions and for the general population.

## Method

### Design

Quantitative and qualitative data were collected from participants using two written questionnaires (the NZ WHOQOL-BREF and the CPQ). The researchers utilised a convergent, parallel, mixed methods design to examine participants' HRQOL and choir involvement perspectives (Creswell & Poth, 2018). Whilst the researchers conducted separate analyses for the quantitative data (obtained from the NZ WHOQOL-BREF and the CPQ VAS responses) and the qualitative data (obtained from the CPQ open-ended responses), the quantitative and qualitative findings are intended to complement each other and confirm the HRQOL benefits of choral singing.

### Materials

#### World Health Organization Quality of Life Instruments (NZ WHOQOL-BREF)

The NZ WHOQOL-BREF is the New Zealand version of the WHOQOL-BREF, which is a condensed version of the original WHOQOL-100. The WHOQOL tools measure HRQOL on four domains: physical, psychological, social relationships, and environmental (World Health Organization, 1994). The original WHOQOL-100 was developed using a cross-cultural approach, and all WHOQOL tools have undergone rigorous testing that has proven them to be both valid and reliable (Power, 2003; Skevington et al., 2004; World Health Organization, 1998). The NZ WHOQOL-BREF contains the same 26-items as the WHOQOL-BREF, plus five additional items (Q27 to Q31), the New Zealand national questions, which Billington et al. (2010) identified as being specific to the HRQOL of New Zealanders. The WHOQOL-BREF has been validated for use within the New Zealand population (Krägeloh et al., 2010). Q1 and Q2 of the NZ WHOQOL-BREF are generic items measuring "overall QOL" (Q1) and "overall physical health satisfaction" (Q2). Questions 3 to 26 measure HRQOL on one of four domains: physical, psychological, social relationships, and environmental. Questions 27 to 31 are the New Zealand national questions and measure the following individual facets: "meets expectations" (Q27), "respected by others" (Q28), "manages personal difficulties" (Q29), "feelings of belonging" (Q30), and "control over life" (Q31). The

**Table 1**  
NZ WHOQOL-BREF Items and Respective Domains/ Facets

Domain	Item	Facet
Physical	1	Overall QOL
	2	Overall physical health
	3	Pain
	4	Medication
	10	Energy
	15	Mobility
	16	Sleep
	17	Ability to perform daily activities
Psychological	18	Work
	5	Positive feelings
	6	Spirituality
	7	Concentration
	11	Body image
	19	Self-esteem
Social Relationships	26	Negative feelings
	20	Personal relationships
	21	Sex life
Environmental	22	Friendships
	8	Safety
	9	Physical environment
	12	Finances
	13	Access to information
	14	Leisure opportunities
	23	Living conditions
	24	Access to health services
	25	Access to transport
	New Zealand National Questions	27
28		Respected by others
29		Manages personal difficulties
30		Feelings of belonging
31		Control over life

WHOQOL-BREF scoring manual (World Health Organization, 1998) is used to calculate domain scores (out of 20) and transformed domain scores (out of 100) for questions 3 to 26. Q1, Q2, and the New Zealand national questions do not contribute to the domain scores and are considered on their own. Prior to completing the NZ WHOQOL-BREF, participants are asked to reflect on their lives over the past two weeks. Questions are scored on a five-point Likert scale with “1” indicating lower HRQOL, and “5” indicating higher HRQOL. The NZ WHOQOL-BREF also includes an “About Me” section (seven-items) with demographic questions. The NZ WHOQOL-BREF was presented in English. The NZ WHOQOL-BREF questions and their corresponding domains and facets are presented in Table 1.

## Choir Participation Questionnaire (CPQ)

The CPQ is a 16-item questionnaire, which explores choir involvement perspectives. The CPQ includes three demographic questions, eight questions scored on a visual analogue scale (VAS), and five open-ended questions (see Table 2). The CPQ is a non-standardised questionnaire that was developed for the present research based on earlier studies carried out with the CeleBRation Choir. To score the VAS questions, a visual scale is presented after each question as a 10-centimetre line (on A4 paper). For bipolar questions (Q5, Q6, and Q10), centre-oriented responses indicate higher satisfaction, and left- or right-oriented responses indicate lower satisfaction (either “not enough” or “too much” of something). For unipolar questions (Q4, Q7, Q9, Q11, and Q12), left-oriented responses indicate lower satisfaction and right-oriented responses indicate higher satisfaction. Each VAS response is scored from 0 to 1 with a higher score indicating higher satisfaction. The CPQ was presented in English.

## Participants

Members of four neurological choirs (NC 1, NC 2, NC 3, and NC 4) and two secular community choirs (CC 1 and CC2) throughout New Zealand were invited to participate in the present research. To differentiate between the two choir categories, the term NC refers to the four neurological choirs in this sample and the term CC refers to the two community choirs in this sample. Music therapists and choir leaders were sent an initial email inviting their choir members to participate in the present research. For NC members, companions supporting their choir attendance (for instance, professional/ personal carers or partners) were also invited to participate. Choir members expressed initial interest in the research with their music therapist or choir leader. The researchers then visited the choirs to explain the research project in greater detail, observe a choir session, and hand out consent forms and questionnaire packs to interested choir members. The researchers did not control the choir programmes, which continued as usual practice. Two of the NCs in this sample were led by the same music therapist (who is also one of the co-authors) (NC 1 and NC 4), one was co-led by two music therapists (NC 3), and the other was co-led by a music therapist and a speech-language therapist (NC 2). Both of the CCs in this sample were led by the same choir leader (CC 1 and CC 2).

Demographic information for the current sample is presented in Table 3. Most participants identified as New Zealand European (81.3%). Just over half identified as female (57.8%). Participant ages ranged from 30 to 60+ with more than half falling into the 60+ age group (65.6%). Two-thirds of all participants (69.7%) had a tertiary level education. Almost half of all participants were married (45.6%) and this increased to 68.9% when those who identified as “living as married” were included. On average, CC members were younger ( $M = 60.6$ ,  $SD = 9.6$ ) than NC members ( $M = 68.8$ ,  $SD = 11.7$ ), and while most NC members were retired (72.9%), 61.9% of CC members were working.

## Choir Approaches

The NCs in this sample were independent from each other. Whilst two of the NCs were led by the same music therapist (NC 1 and NC 4), the choirs operated independent from each other. This was also true for the two CCs who were led by the same choir leader. For all of the choirs in this sample, the music therapists and/ or choir leaders selected the exercises and repertoire in consultation with choir members. The choir programmes consisted of physical, respiratory, and vocal warm-ups and exercises, followed with song repertoire. For the NCs, more attention was given to exercises related to vowel and consonant production and rhythmic speech (Matthews et al., 2019; Talmage et al., 2013). In selecting, adapting, and leading songs, choir leaders and music therapists consider all music elements, including vocal range, metre, tempo, song structure (repetition, refrains, and cognitive load), and the supportive function of har-

**Table 2**  
Choir Participation Questionnaire

Item	Question
<i>Demographic questions (multi-choice)</i>	
Q1	Please tick a box to indicate your age
Q2	Health (tick as many as you need)
Q3	Which choir do you attend?
<i>Visual analogue scale (VAS) questions</i>	
Q4	How would you rate the time of day of the choir sessions, from inconvenient, to perfectly timed?
Q5	How would you rate the length of the choir sessions, from too long, to too short?
Q6	The choir currently runs weekly. How would you rate the frequency of the weekly sessions, from too infrequent, to too often?
Q7	How would you rate the location of the choir sessions, from inconvenient, to perfectly located?
Q9	How would you rate the choir overall, from boring to very enjoyable?
Q10	How would you rate the difficulty of the music sung at the choir, from too hard to too easy?
Q11	How would you rate the choir for your mood, from having no benefit to a huge improvement?
Q12	If you have a neurological condition, how would you rate the impact of the choir on your condition, from being no benefit to a huge improvement? If you do not have a neurological condition, skip to the next question.
<i>Open-ended questions</i>	
Q8	Please include here any comments you may have about how we can improve the timing, location and frequency of the choir sessions.
Q13	If you have felt any changes as a result of the choir, what do you think they are?
Q14	Please tell us what makes an excellent choir session for you.
Q15	Please tell us anything else you like about the choir.
Q16	Please let us know any other comments or suggestions for improving the choir in the future.

monic and rhythmic accompaniment (Buetow et al., 2013; Matthews et al., 2019; Talmage et al., 2013; Thompson et al., 2016). Music resources and materials were either purchased for the choirs or belonged to the music therapists and/ or choir leaders who adapted them for their choirs and printed or projected material for choir members to view. All choir programmes included a refreshment interval.

For the NCs, song repertoire included familiar unison and simple-part songs, with most in English, some in New Zealand Māori, and some simple songs in other languages. Song choices were a range of popular songs (most taken from the 1950s, to 1970s), traditional and cultural songs, show tunes, seasonal material, and songs with a positive or humorous tone. Most singing was done in unison, together with rounds, echo songs and simple harmonies (Matthews et al., 2019; Talmage et al., 2013; Waterhouse & Waterhouse, 2016). For the CCs, song repertoire included varied traditional, world, new composed and popular music, in three- to four-part harmonies, often taught using rote and sometimes incorporating improvisation (Backhouse, 2010; Jansen, 2019) with more challenging part-singing, both in English and in other languages. The CCs in this sample were non-auditioned all-comers choirs with a “natural voice philosophy”.

**Table 3**  
Demographic Information

Participants	Neurological Choirs		Community Choirs	
	Number	% of Sample	Number	% of Sample
<i>Total</i>	48	53.3%	42	46.7%
<i>Age</i>				
30-44	3	6.3%	1	2.4%
45-59	7	14.6%	20	47.6%
60+	38	38.0%	21	50.0%
<i>Sex</i>				
Male	28	58.3%	7	16.7%
Female	17	35.4%	35	83.3%
<i>Ethnic group</i>				
New Zealand European	39	81.3%	32	76.2%
Māori	1	2.1%	0	0%
Asian	2	4.2%	1	2.4%
Other European	4	8.3%	7	16.7%
Other New Zealander	2	4.2%	2	4.8%
<i>Highest education level</i>				
Primary	2	4.2%	0	0%
Secondary	21	43.8%	5	11.9%
Tertiary	25	52.1%	37	88.1%
<i>Work status</i>				
Full-time	0	0%	8	19.0%
Part-time	3	6.3%	18	42.9%
Retired	35	72.9%	9	21.4%
Unemployed	7	14.6%	2	4.8%
Other	3	6.3%	4	9.5%
<i>Health status</i>				
Parkinson's disease	18	37.5%	0	0%
Stroke	13	27.1%	2	4.8%
Other medical condition	9	18.8%	15	35.7%
No medical condition	1	2.1%	22	52.4%
Carer	7	14.6%	2	4.8%
<i>Marital status</i>				
Single	4	8.3%	2	4.8%
Married	31	64.6%	10	23.8%
Living as married	4	8.3%	17	40.5%
Separated	2	4.2%	0	0%
Divorced	6	12.5%	6	14.3%
Widowed	1	2.1%	6	14.3%

## Ethics Approval

Ethics approval for this research was received on 13 July 2016 from the University of Auckland Human Participants Ethics Committee (approval given for three years, reference number: 01689, 1). Participants were able to request a summarised report of the research findings.

## Procedure

### Data Collection

Data collection for choir groups NC 1 and NC 2 occurred in 2016 (Jenkins et al., 2017). Data collection for choir groups NC 3, NC 4, CC 1, and CC 2 occurred in 2017. Each participant received an information sheet, a consent form, the two written questionnaires, and a return-addressed, postage-paid envelope at one of their regular choir sessions. The researchers requested that choir members take the documents home, to complete in their own time and return within two weeks. To protect participants and ensure that their data remained confidential, hard copies of participant data were stored in locked cabinets, while digital data was stored within password protected files on a password protected computer. Historical data from Jenkins et al. (2017) were combined with data from the current data collection phase to form the current research sample.

**Exclusion Criteria.** Participants were required to complete the information sheet and consent form, along with both written questionnaires. Three participants (CEL 5, CEL 15, and CEL 16) completed just one questionnaire, therefore their data was excluded. The WHOQOL-BREF scoring manual requires participants to complete at least 20% of the questionnaire to calculate their HRQOL score (World Health Organization, 1998). All participants met this criterion. In total, 90 choir members participated in this research, 48 from NCs and 42 from CCs.

**Quantitative Data.** The WHOQOL-BREF scoring manual (World Health Organization, 1998) was used to calculate domain scores (out of 20) and transformed domain scores (out of 100) for Q3 to Q26 of the NZ WHOQOL-BREF and to reverse-score three negative-coded questions (Q3, Q4, and Q26). Q1, Q2, and the New Zealand national questions did not contribute to the domain scores and were considered on their own. Quantitative data from the NZ WHOQOL-BREF and the CPQ were entered into Microsoft Excel (Office 2013) and checked before being imported into IBM SPSS Statistics Version 23 for analysis.

Kolmogorov-Smirnov tests (Massey, 1951) were used to determine the distributions of NZ WHOQOL-BREF and CPQ VAS responses. Both showed non-normal distributions ( $p < .001$ ). Therefore, non-parametric statistical tests were used. To explore agreement between the two choir groups, Mann-Whitney U tests (Zimmerman, 1987) were used to test for significant group differences in NZ WHOQOL-BREF and the CPQ VAS responses. Tests were run for individual questions Q1 to Q31 of the NZ WHOQOL-BREF, transformed domain scores, and the CPQ VAS questions, except for Q12, which was excluded as it was relevant to just one of the choir groups (NC members). Due to multiple comparisons being conducted, follow up tests were pairwise comparisons with statistical significance based on Bonferroni-adjusted  $p$ -values. Effect sizes ( $r$ ) were calculated for significant differences (Tomczak & Tomczak, 2014). To explore agreement between the NZ WHOQOL-BREF and the CPQ, Spearman's correlation coefficients (Zar, 1972) were used to determine associations between Q1 and Q2 of the NZ WHOQOL-BREF and the CPQ VAS questions.

**Qualitative Data.** For the CPQ open-ended questions (Q8 and Q13 to Q16), manifest content was explored using an open coding process where individual items (participant comments) were mapped under overarching headings. To explore agreement between the NZ WHOQOL-BREF and the CPQ, participant comments were mapped under the NZ WHOQOL-BREF HRQOL domains where possible. The process for recruitment, procedure, and data analysis for the current sample is depicted in Figure 1.

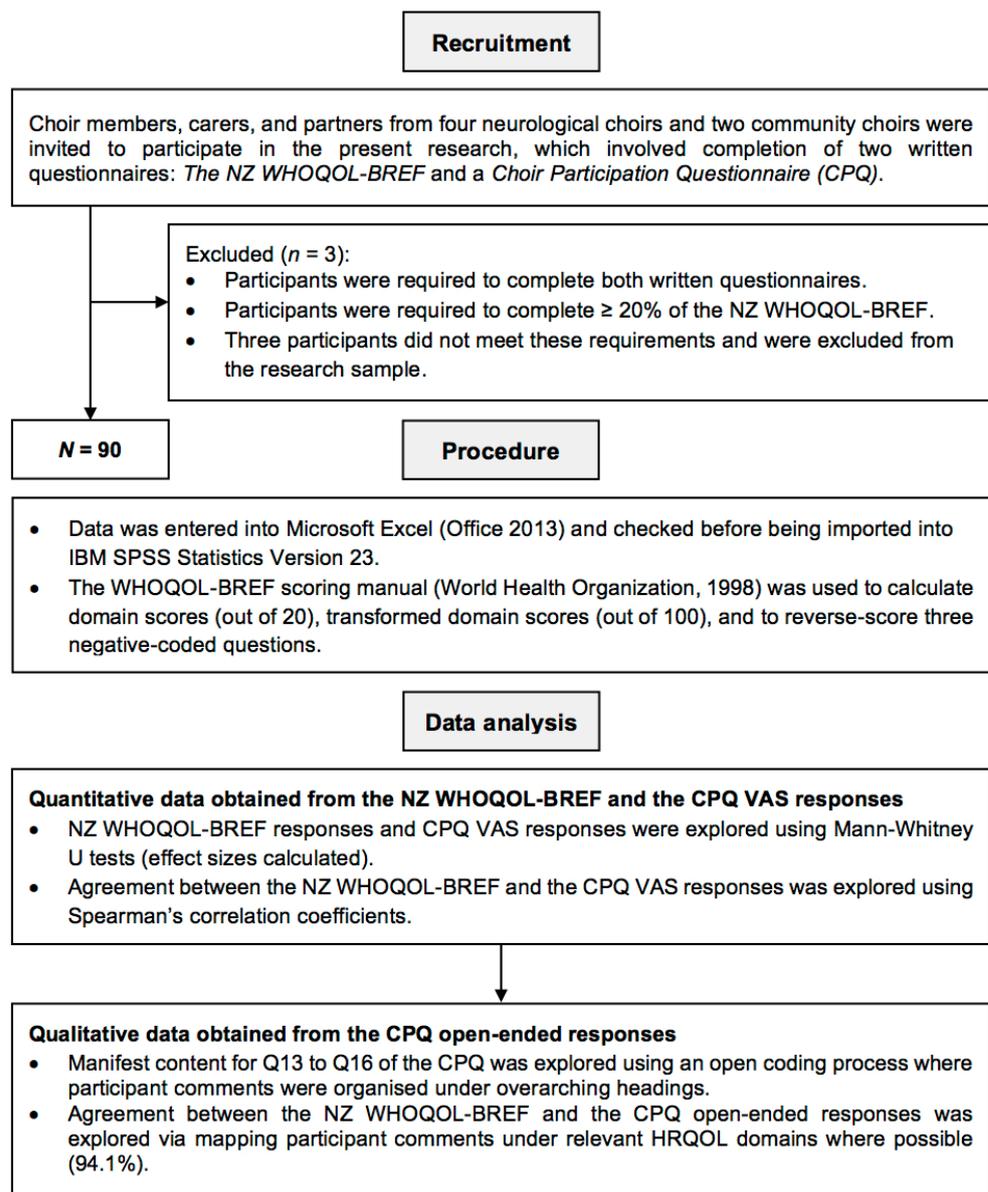


Figure 1  
Process for Recruitment, Procedure, and Data Analysis.

### Comparison with the World Disabilities Sample

As mentioned, in the earlier phase of this research (Jenkins et al., 2017), NC members' HRQOL scores were compared against an existing sample of HRQOL data taken from the world disabilities sample (Power et al., 2010) and research outputs from this historical data showed that HRQOL for NC members was higher than for members of the world disabilities sample. The researchers in the current phase did not use the world disabilities sample as a comparison sample. Therefore, the present research provides a visual comparison of HRQOL scores for NC members, CC members, and the world disabilities sample. Items 1 to 26 of the WHOQOL-BREF are included in this comparison. Items 27 to 31 (the New Zealand national questions) are not included as Power et al. (2010) did not utilise the New Zealand version of the WHOQOL-BREF.

**Table 4**  
Significant Group Differences in NZ WHOQOL-BREF Scores

Item	Domain/ Facet	U	Std. Test Statistic	Effect Size, <i>r</i>
	<i>Physical</i>			
4	Medication	1,603.50	4.99	.53
15	Mobility	1,385.00	3.32	.35
18	Work	1,481.50	4.72	.50
	<i>Psychological</i>			
7	Concentration	1,423.00	3.65	.38
	<i>Physical (Transformed)</i>	1,521.00	4.40	.47

Note. Mann-Whitney U test results showing a significant difference ( $p < .05$ ) between the two choir groups after Bonferroni corrections for multiple comparisons.

## Results

### NZ WHOQOL-BREF

#### Overall QOL and Overall Physical Health Satisfaction

There were no significant differences between the two choir groups for Q1 and Q2, indicating that overall QOL and overall physical health satisfaction were similar ( $p > .05$ ). For Q1 and Q2, both choir groups had a median HRQOL score of 4, indicating that participants rated their overall QOL as “good” and were “satisfied” with their physical health.

#### Individual Items, Domain Scores, and Transformed Domain Scores (Q3 to Q31)

Four individual HRQOL items showed significant differences between the two choir groups after Bonferroni corrections for multiple comparisons (see Table 4). Three items, Q4 (“medication”,  $p < .001$ ,  $r \approx .5$ ), Q15 (“mobility”,  $p < .001$ ,  $r \approx .4$ ), and Q18 (“work”,  $p < .001$ ,  $r \approx .5$ ) were in the physical domain, indicating that NC members required more medical treatment to function, found it more difficult to get around, and felt less satisfied with their work capabilities. One item, Q7 (“concentration”,  $p < .001$ ,  $r \approx .4$ ) was on the psychological domain, indicating that NC members felt less satisfied with their concentration abilities. Transformed domain scores showed a significant difference between the two choir groups on the physical domain ( $p < .001$ ,  $r \approx .5$ ), indicating that NC members felt less satisfied with their physical HRQOL.

#### Comparison with the World Disabilities Sample

Figure 2 shows a visual comparison of HRQOL between the current sample and the world disabilities sample. The visual comparison indicates overall higher HRQOL for participants in the current sample (both NC and CC members) than for participants in the world disabilities sample (Powers et al., 2010). Figure 2 highlights similarities between NC and CC members for individual items 5 (“positive feelings”), 6 (“spirituality”), 11 (“body image”), 22 (“friendships”), 9 (“physical environment”), 14 (“leisure opportunities”), and 24 (“access to health services”). Figure 2 also highlights similarities between NC members and the world disabilities sample for individual items 4 (“medication”), 18 (“work”), 7 (“concentration”), and 21 (“sex life”).

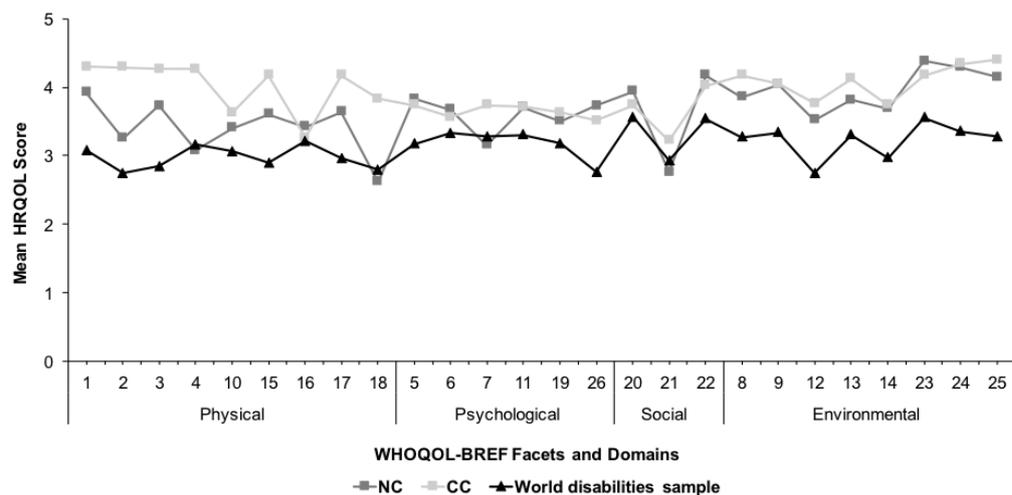


Figure 2

Visual Comparison of HRQOL for the Current Sample and the World Disabilities Sample.

## Choir Participation Questionnaire

### Visual Analogue Scale Items

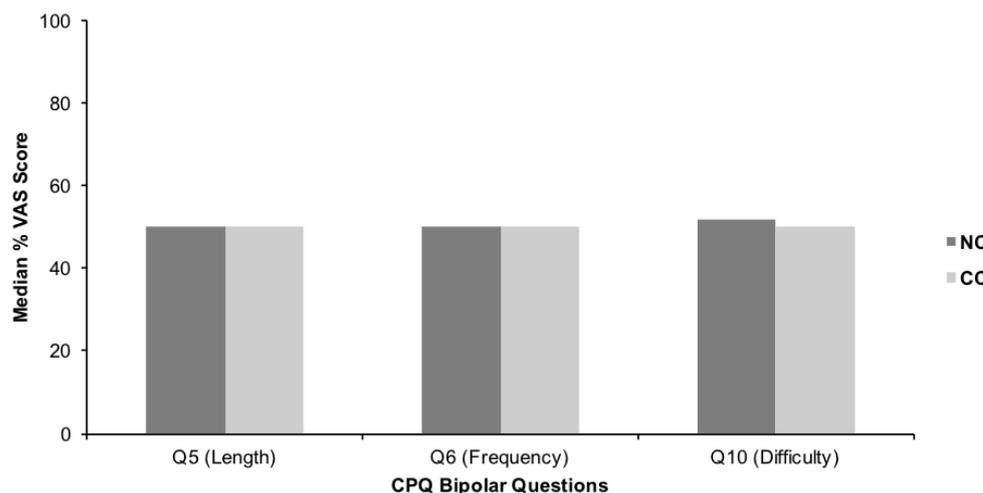
Figure 3 shows median VAS scores (%) for bipolar questions in the CPQ for the current sample. One of the three items showed a significant difference between the two choir groups after Bonferroni corrections for multiple comparisons, ( $U = 576.50$ ,  $z = -3.60$ ,  $p < .001$ ,  $r \approx -.4$ ). This was Q10 (“difficulty of the music sung at choir”). While the scores were close to 50 percent for both NC members (55%) and CC members (48%), indicating that the difficulty of the music sung at choir was “about right”, the significant difference between the two choir groups indicates that NC members found the music sung at choir to be easier than CC members. Figure 4 shows median VAS scores (%) for unipolar questions in the CPQ for the current sample. None of the items showed a significant difference between the two choir groups. Q12 (“impact of choir on your neurological condition”) was excluded from these comparisons as it was relevant to just one of the choir groups (NC members). For this item, the mean VAS score for NC members was 70% ( $SD = 23\%$ ), indicating that participants felt that choir had a positive impact on their neurological condition.

### Open-ended Items

Coding of manifest content from the CPQ open-ended responses is summarised in Tables 5 to 10. To explore agreement between the NZ WHOQOL-BREF and the CPQ, manifest content from the CPQ was mapped under NZ WHOQOL-BREF HRQOL domains where possible. Most manifest content (94.1%) was consistent with the HRQOL domains and is presented in Tables 5 to 9 with individual examples provided to illustrate this mapping of content. Content not consistent with the HRQOL domains (5.9%) is organised as “other” and is presented in Table 10. Participant responses to Q16 accounted for most of the content not consistent with the HRQOL domains (84.6%).

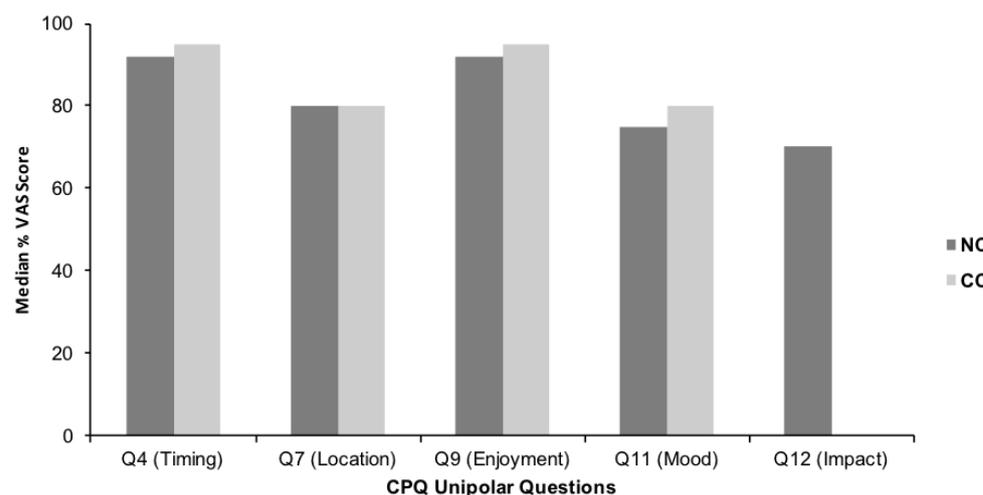
**Timing, Location, and Frequency of Choir Sessions (Q8).** Responses to Q8 did not relate to HRQOL as such and were quite specific to the question being asked. Therefore, responses to Q8 were mapped under “timing”, “location”, and “frequency” headings (see Table 5). Responses were positive and constructive ( $n = 25$ ). Most comments related to location where participants talked about the changing the choir venue location to better suit their needs ( $n = 13$ ).

**Changes Felt as a Result of Choir (Q13).** Responses were positive ( $n = 112$ ) (see Table 6). Comments mapped on the psychological domain ( $n = 50$ ) were under “positive feelings”, “spirituality”, “concentration”, “self-esteem”, and “negative feelings”,



**Figure 3**  
CPQ Bipolar Questions: Median VAS Scores.

*Note.* Lower percentages indicate not enough of, while higher percentages indicate too much of, a particular aspect. Percentages close to 50 indicate contentment with a particular aspect.



**Figure 4**  
CPQ Unipolar Questions: Median VAS Scores.

*Note.* Higher percentages indicate positive responses.

where participants talked about positive mood, happiness, concentration, and confidence. Comments mapped on the New Zealand national domain ( $n = 28$ ) were under “meets expectations”, “manages personal difficulties”, and “feelings of belonging”, where participants talked about singing, speech and communication, and feelings of belonging. Comments mapped on the social relationships domain ( $n = 17$ ) were under “friendships”, where participants talked about friendships and socialising. Comments mapped on the physical domain ( $n = 16$ ) were under “pain” and “energy”, where participants talked about breathing, energy, and relaxation.

**What Makes an Excellent Choir Session? (Q14).** Participants’ responses were positive and constructive ( $n = 179$ ) (see Table 7). Comments mapped on the environmental domain ( $n = 69$ ) were under “leisure opportunities”, where participants talked about singing, songs, and music, positive attendance and participation, and aspects

**Table 5**  
CPQ Q8: Participant Responses

Response Topic	n	Examples
Timing	8	“Time and date is good – 1.30pm” (NC 1, member 11). “I prefer 7:00pm start for our choir rather than 7:30pm then finish at 8:45pm” (CC 1, member 3).
Location	13	“There's great parking on campus which is essential” (NC 2, member 6). “More central location” (NC 1, member 10). “Perhaps a more central or convenient location that may help many choir members that may have a 'condition'” (NC 1, member 17).
Frequency	4	“Good to have a regular, set day as it's a routine part of the weekly calendar” (NC 2, member 20). “Once a week is perfect. Have other things to do” (CC 1, member 21).
<b>Total N</b>	<b>25</b>	

of session content, timing, and pace. Comments mapped on the social relationships domain ( $n = 37$ ) were under “friendships”, where participants talked about friendships and socialising and their choir leader relationship. Comments mapped on the New Zealand national domain ( $n = 35$ ) were under “meets expectations”, “respected by others”, “feelings of belonging”, and “control over life”, where participants talked about a positive challenge, and feelings of belonging. Comments mapped on the psychological domain were under “positive feelings” ( $n = 37$ ), where participants talked about fun and laughter, and singing and harmonising together.

**Other Positive Aspects of Choir Involvement (Q15).** Responses were positive ( $n = 112$ ) (see Table 8). Comments mapped on the social relationships domain ( $n = 51$ ) were under “friendships” and “personal relationships”, where participants talked about friendships and socialising and their choir leader relationship. Comments mapped on the New Zealand national domain ( $n = 30$ ) were under “meets expectations”, “respected by others”, “feelings of belonging”, and “control over life”, where participants talked about a shared interest, the no pressure environment, inclusiveness, and achievement/ accomplishment. Comments mapped on the environmental domain ( $n = 18$ ) were under “leisure opportunities”, where participants talked about singing, songs, and music, and concerts, events, and performances ( $n = 4$ ). Comments mapped on the psychological domain ( $n = 11$ ) were under “positive feelings”, “spirituality”, “concentration”, and “self-esteem”, where participants talked about some of the positive feelings that choir singing invoked.

**Comments or Suggestions for Improvement (Q16).** Responses were constructive. Comments were mapped on the environmental domain ( $n = 8$ ) under “leisure opportunities” and on the social relationships domain ( $n = 1$ ) under “friendships” (see Table 9).

**Comments that Did Not Align with NZ WHOQOL-BREF Domains.** A small number ( $n = 26$ ) of responses did not correspond to an HRQOL domain and were organised as “other” (see Table 10). Here, participants talked about various topics, including song and music choice, preparedness, funding, and aspects of session content, structure, timing, and pace.

### Summarised Results

The NZ WHOQOL-BREF findings show that HRQOL was similar between the two choir groups on the psychological, social relationships, and environmental domains, and lower for NC members on the physical domain. VAS scores from the CPQ show similar responses across participants and that both NC and CC members reported similar

**Table 6**  
CPQ Q13: Participant Responses Aligned with the NZ WHOQOL-BREF

Item	Domain/ Facet	n	Examples
<i>Physical</i>			
3	Pain	6	<b>Breathing (n = 6):</b> “My breathing has improved” (NC 2, member 6); “Lung – good” (NC 1, member 12).
10	Energy	10	<b>Energy (n = 5):</b> “Zest for living” (NC 2, member 2); “Stamina improved” (CC 1, member 9). <b>Relaxation (n = 5):</b> “More relaxed and calm. Lasts all week” (CC 1, member 17); “Physically relaxation” (CC 1, member 24).
<i>Psychological</i>			
5	Positive feelings	27	<b>Positive mood (n = 17):</b> “Elevated mood after choir session” (NC 1, member 9); “Choir sessions lift spirits” (CC 1, member 19). <b>Happiness (n = 8):</b> “Feel happy to sing” (NC 1, member 2); “Makes me feel happy” (NC 3, member 4). <b>Motivation (n = 2):</b> “Encouraged me to listen to my iPad and enjoy my music more often” (NC 1, member 3).
6	Spirituality	3	<b>Spirituality (n = 3):</b> “Singing feeds the soul – it’s wonderful for work/ life balance and feeling of wellbeing” (CC 1, member 25).
7	Concentration	6	<b>Concentration (n = 6):</b> “Think better. Concentrate better. Remember better” (NC 1, member 8); “The act of concentrating on learning new songs and harmonies allows me to focus and be in the moment” (CC 2, member 1).
19	Self-esteem	11	<b>Confidence (n = 10):</b> “Brings me out of myself” (NC 1, member 8); “Confidence, I found my voice. I participate in other things now because choir has bought me out of myself” (NC 2, member 20). <b>Self-esteem (n = 1):</b> “It has given me a sense of self-worth” (CC 2, member 1).
26	Negative feelings	3	<b>Depression and anxiety (n = 3):</b> “Less anxious. Able to cope better in life” (CC 2, member 7); “The choir has huge psychological benefits for me – improves my mood, helps when I feel depressed” (CC 2, member 2).
<i>Social Relationships</i>			
22	Friendships	17	<b>Friendships and socialising (n = 17):</b> “Companionship” (CC 1, member 24); “The social interaction is a major benefit, with people with a similar handicap or similar life changes/ day to day issues” (NC 2, member 6).
<i>Environmental</i>			
14	Leisure opportunities	5	<b>New learning (n = 4):</b> “Tone and pitch have improved so has my musical range” (NC 2, member 15); “Slowly improving singing. Voice” (CC 1, member 7). <b>Other leisure opportunities (n = 1):</b> “Artistically stimulated” (CC 2, member 15).
<i>New Zealand National Questions</i>			
29	Manages personal difficulties	16	<b>Speech and communication (n = 16):</b> “Help with speech. Have seen others that come in unable to talk but start singing and it helps their speech” (NC 1, member 14); “Hold conversations better” (NC 1, member 8).
30	Feelings of belonging	8	<b>Feelings of belonging (n = 8):</b> “Sense of belonging” (NC 2, member 24); “A sense of belonging and companionship” (CC 1, member 8).
<b>Total N</b>		112	

satisfaction with the timing, duration, frequency, and location of their choir sessions. NC and CC members also reported similar enjoyment of choir and felt that choir had a positive impact on their mood. Q10 showed a difference between the two choir groups

**Table 7**  
CPQ Q14: Participant Responses Aligned with the NZ WHOQOL-BREF

Item	Domain/Facet	n	Examples
<i>Physical</i>			
10	Energy	1	<b>Relaxation (n = 1):</b> "You can relax and let go all inhibitions. Relax with friends" (NC 2, member 3).
<i>Psychological</i>			
5	Positive feelings	37	<b>Fun and laughter (n = 16):</b> "Singing for the joy of it" (CC 1, member 21); "The fun and laughs during the sessions" (NC 2, member 24). <b>Singing and harmonising (n = 18):</b> "Singing creating a lovely sound" (VS 14); "End result of whole choir's singing pleasant and pleasurable to listen to" (VS 12). <b>Positive experience (n = 3):</b> "A warm room!" (SUR 2).
7	Concentration	1	<b>Concentration (n = 1):</b> "Consideration – while singing or listening – not good people talking during this" (NC 1, member 17).
<i>Social Relationships</i>			
22	Friendships	37	<b>Friendships and socialising (n = 21):</b> "Making and seeing my friends" (NC 2, member 6); "Fellowship with other singers" (CC 1, member 14). <b>Choir leader relationship (n = 16):</b> "Friendly, personable, empathetic [music therapist]" (NC 4, member 2); "Upbeat, kind, intelligent, friendly choir [leader]" (CC 1, member 4).
<i>Environmental</i>			
14	Leisure opportunities	69	<b>Singing, songs, and music (n = 45):</b> "Plenty of singing, not too much talking" (NC 1, member 10); "A mix of styles/ types of music" (CC 1, member 25). <b>Positive attendance and participation (n = 13):</b> "Enthusiastic participation" (CC 1, member 27); "Full involvement in the activities" (NC 4, member 7). <b>Session content, timing, and pace (n = 11):</b> "Enjoy the warm ups" (NC 1, member 8); "Organised programme" (CC 1, member 27).
<i>New Zealand National Questions</i>			
27	Meets expectations	22	<b>A positive challenge (n = 22):</b> "We overcome a new piece of music and lift our standards a little" (CC 1, member 22); "The challenge of learning (and retaining) new song material" (CC 1, member 9).
28	Respected by others	1	<b>Respected by others (n = 1):</b> "Always using my name" (NC 3, member 5).
30	Feelings of belonging	9	<b>Feelings of belonging (n = 5):</b> "Being accepted in the group" (NC 2, member 17); "The fun of being in a group of like-minded people who are friendly and share the learning experience" (CC 1, member 9).
31	Control over life	3	<b>Control over life (n = 3):</b> "I enjoy singing. It makes me feel good and it's something I am able to do" (NC 3, member 1).
<b>Total N</b>		180	

in that NC members found the songs sung at choir to be easier than was reported by CC members. Q12 was only relevant to NC members and indicated that NC members felt that choir had a positive impact on their neurological condition. Mapped manifest content from the CPQ indicated that all participants perceived a range of positive benefits associated with choral singing. Most manifest content was consistent with the HRQOL domains, indicating good mapping of the qualitative data into the HRQOL domains. When asked to reflect on changes felt as a result of choir (Q13), most comments were mapped on the psychological domain (44.6%) where most participants talked about "positive feelings". When asked to reflect on what makes an excellent choir session (Q14), most comments were mapped on the environmental domain (38.3%) under "leisure opportunities". When asked to reflect on other positive aspects of choir

**Table 8**  
CPQ Q15: Participant Responses Aligned with the NZ WHOQOL-BREF

Item	Domain/Facet	n	Examples
<i>Physical</i>			
10	Energy	2	<b>Energy (n = 1):</b> “Energising. Always feels better at the end of the session, even if I’m tired” (CC 1, member 11). <b>Relaxation (n = 1):</b> “You can relax. Let go of inhibitions” (NC 2, member 3).
<i>Psychological</i>			
5	Positive feelings	10	<b>Positive feelings (n = 7):</b> “Warm. Easy-going... Uplifting” (CC 2, member 9); “There are a lot of other positive people and you can feel it in the atmosphere” (NC 2, member 10). <b>Positive experience (n = 3):</b> “Lovely morning teas!” (NC 4, member 1); “I would like to see more choirs” (NC 2, member 15); “Well organised” (NC 2, member 16).
6	Spirituality	1	<b>Spirituality (n = 1):</b> “Something I do just for me” (CC 1, member 3).
7	Concentration	1	<b>Concentration (n = 1):</b> “Testing the memory by learning songs” (NC 2, member 23).
19	Self-esteem	2	<b>Self-esteem (n = 2):</b> “Choir has brought me out of myself” (NC 2, member 20); “Encouraged to push one’s comfort zone” (NC 2, member 2).
<i>Social Relationships</i>			
20	Personal relationships	2	<b>Personal relationships (n = 2):</b> “Choir is something I can share with my partner, who is also a member. It’s an important part of strengthening our relationship” (CC 2, member 2).
22	Friendships	49	<b>Friendships and socialising (n = 32):</b> “Friendliness, friendship and caring” (NC 1, member 11); “There are a lot of other positive people and you can feel it in the atmosphere” (NC 2, member 10). <b>Choir leader relationship (n = 17):</b> “[Choir leader’s] style and personality is contagious” (CC 1, member 10); “We are very fortunate to have two very capable music therapists” (NC 3, member 6).
<i>Environmental</i>			
14	Leisure opportunities	20	<b>Singing, songs, and music (n = 12):</b> “Singing and learning pop songs from past, folk songs (different nationalities), different genres” (CC 1, member 21); “Music” (NC 2, member 21). <b>Concerts, events, and performances (n = 4):</b> “Good to have concerts” (NC 3, member 2); “Performance is a good thing. It keeps us in the real world – not an enclave” (NC 3, member 3). <b>Positive attendance and participation (n = 2):</b> “Being involved” (NC 2, member 2). <b>New learning (n = 2):</b> “Learning about breathing techniques and warm up exercises” (CC 1, member 18).
<i>New Zealand National Questions</i>			
27	Meets expectations	1	<b>A positive challenge (n = 1):</b> “The challenge” (CC 1, member 26).
28	Respected by others	2	<b>Respected by others (n = 2):</b> “I like the way I’m treated as an individual but at the same time I’m an integral part of a successful choir” (NC 2, member 20).
30	Feelings of belonging	21	<b>Shared interest (n = 9):</b> “Choir = an outing with a group of like-minded souls” (CC 1, member 21); “I like afternoon tea and the chance to talk to other people with similar issues” (NC 1, member 7). <b>No pressure environment (n = 5):</b> “Singing with no pressure” (NC 2, member 21); “You don’t have to be a good singer to sing in a choir” (CC 2, member 7). <b>Inclusiveness (n = 4):</b> “The friendly informal, inclusive tone” (NC 4, member 1); “I like the way I’m treated as an individual but at the same time I’m an integral part of a

Item	Domain/Facet	n	Examples
			successful choir” (NC 2, member 20). <b>Volunteer and staff support (n = 3):</b> “Volunteers are excellent, they make us feel welcome” (NC 1, member 6).
31	Control over life	4	<b>Achievement/ accomplishment (n = 4):</b> “I feel I’ve accomplished something” (NC 2, member 20); “The feeling of achievement” (CC 1, member 26).
<b>Total N</b>		115	

**Table 9**  
CPQ Q16: Participant Responses Aligned with the NZ WHOQOL-BREF

Item	Domain/Facet	n	Examples
	<i>Social Relationships</i>		
22	Friendships	1	<b>Friendships (n = 1):</b> “Maybe the occasional lunch (voluntary) get together after the choir session would help closer socialisation i.e. give longer times for conversations among the singers” (NC 3, member 2).
	<i>Environmental</i>		
14	Leisure opportunities	8	<b>Concerts, events, and performances:</b> “More concerts” (NC 2, member 18); “Keep new... performance opportunities coming” (CC 1, member 8).
<b>Total N</b>		9	

**Table 10**  
“Other”: Participant Responses not Aligned with the NZ WHOQOL-BREF

CPQ Question	n	Examples
Q13	1	<b>Response to change (n = 1):</b> “Observation: would not like the choir to bring in PC (political correctness)” (NC 1, member 17).
Q14	3	<b>Preparedness (n = 3):</b> “Because of my unexplained illness, the session will be far more enjoyable if I have had a sleep only 2 or 3 hours beforehand” (CC 1, member 24); “Members practicing their parts outside choir time so they know their parts” (CC 2, member 2); “Printed song book. Name labels” (NC 4, member 2).
Q16	22	<b>Song and music choice (n = 10):</b> “More exciting range of music. Sometimes the songs are not to my taste. I love more world music” (CC 2, member 9); “Keep new songs... coming” (CC 1, member 8). <b>Session content, structure, timing, and pace (n = 9):</b> “The warm up sessions should be no more than ten minutes and kept to the warm up sheet (instructions)” (NC 2, member 20); “Start on time” (NC 2, member 2). <b>Funding (n = 2):</b> “More Government funding” (NC 2, member 14). <b>Gender balance (n = 1):</b> “We are heavily female dominant, more guys would be good” (CC 2, member 10).
<b>Total N</b>	26	

involvement (Q15), most comments were mapped on the social relationships domain (44.3%) under “friendships”. When asked to provide comments or suggestions for improvement (Q16), most responses were constructive comments about song and music choice (71.0%).

### Discussion

Diagnosis with a neurological condition is associated with negative HRQOL outcomes, which medical interventions alone are unable to address (Carod-Artal & Egidio, 2009; Golden et al., 2009; Mutai et al., 2016; Rahman et al., 2008). This has identified a

need for holistic interventions to help alleviate some of these negative outcomes for people diagnosed with a neurological condition. There is evidence to suggest that CST is associated with QOL and HRQOL benefits for people who have been diagnosed with a neurological condition (Irons et al., 2021; Johnson et al., 2013; Moss et al., 2018).

### Differences Between the Choir Groups

Transformed domain scores from the NZ WHOQOL-BREF indicate that HRQOL differed between the two choir groups on the physical domain. Individual NZ WHOQOL-BREF item scores indicate that HRQOL for NC members was lower on the “medication”, “mobility”, “work”, and “concentration” facets. This finding is not unexpected given some of the challenges associated with a neurological condition diagnosis, including new medication requirements, impacted cognition and physical functioning, and in some cases impacted work capabilities or loss of job. VAS scores from the CPQ indicate that NC members found their song choices to be easier than CC members. This could have been due to the selection of simpler arrangements for the NCs versus more complex and challenging choir repertoire for the CCs.

### Similarities Between the Choir Groups

Transformed domain scores from the NZ WHOQOL-BREF indicate that HRQOL was similar between the two choir groups on the psychological, social relationships, and environmental domains, which is an unexpected finding. Whilst existing research highlights negative HRQOL outcomes for people with neurological conditions (Carod-Artal & Egido, 2009; Rahman et al., 2008), the present research found that HRQOL for NC members is in fact similar to that of well people (CC members). This finding provides a rationale for future research to continue to explore the potential connection between choral singing and HRQOL for people with neurological conditions.

VAS scores from the CPQ indicate that choir members reported similar satisfaction with the timing, duration, frequency, and location of their choir sessions. Choir members also reported similar enjoyment of choir and felt that choir had a positive impact on their mood. Manifest content from the CPQ indicates that choir members perceived a number of positive benefits associated with choral singing, most of which were consistent with the four HRQOL domains. In the psychological domain, most comments were mapped under “positive feelings”; in the social relationships domain, most comments were mapped under “friendships”; and in the environmental domain most comments were mapped under “leisure opportunities”. The outcome of this mapping is consistent with the NZ WHOQOL-BREF findings that HRQOL was similar between the two choir groups on these three domains.

The visual comparison of HRQOL for the current sample and the world disabilities sample (Figure 2) highlights similarities between NC and CC members on several individual facets, including “positive feelings”, spirituality”, “body image”, “friendships”, “physical environment”, “leisure opportunities”, and “access to health services”. The visual depiction also highlights some similarities between NC members and the world disabilities sample on the “medication”, “work”, “concentration”, and “sex life” facets, which as mentioned earlier, is not unexpected given some of the challenges associated with a neurological condition diagnosis.

### Links Between the Present Research and the Existing Literature

The present research suggests that choral singing is associated with positive HRQOL for people with and without neurological conditions. This finding has been documented in other research exploring choral singing and QOL (Irons et al., 2021; Johnson et al., 2013; Moss et al., 2018). Participants in the current sample reported benefits of choral singing that align with earlier randomised controlled trial studies demonstrating therapeutic benefits of choir participation (Pongan et al., 2017; Zumbansen et al., 2017). Also consistent with earlier studies (Fogg-Rogers et al., 2015; Moss et al., 2018;

Lee et al., 2018), participants in the current sample reported improved mood, a sense of wellbeing, peer support, social connections, and a shared interest with others.

There has been limited use of the WHOQOL-BREF tools in research exploring choral singing and HRQOL. One known example is Johnson et al. (2013) who found that choral singing was associated with positive HRQOL on three out of the four WHOQOL-BREF domains (psychological, social relationships, and environmental). In the current sample, participants from both choir groups reported similar HRQOL on these three domains, but NC and CC groups differed on the physical domain. Thus, although the results of the present research support HRQOL benefits of choral singing, it is clear that physical challenges remain for people with neurological conditions.

## Implications for Neurological Choirs in New Zealand

The findings from the present research suggest that NC members value choir for a number of reasons, including mood improvements, speech, communication, and breathing improvements, friendship and social interaction, the no pressure environment, and the positive challenge that choir provides. At present, NC provision is limited across New Zealand due to a lack of available facilitators and funding issues, although skill-sharing initiatives have encouraged some local musicians to support group singing initiatives for this population (Talmage, 2017). The researchers have also completed interview research with current and potential choir leaders to give a clearer picture of facilitator availability and training needs (Talmage & Purdy, 2021). Further research is required to investigate specific facilitation strategies within different models of neurological choir leadership in New Zealand, including single facilitator versus co-therapist approaches and music therapist, speech-language therapist or other interprofessional approaches observed in the present research, as well as the role of volunteers and partners/ carers. Seven carers who supported NC members participated in the present research and whilst this was not a large enough group from which to obtain sufficient data, future studies should consider exploring partner and carer perspectives in greater detail.

## Study Limitations and Future Directions

While the CPQ was able to capture valuable information about the perceived benefits of CST, responses were sometimes repetitive. Future research utilising the CPQ should consider reviewing some of the open-ended questions in order to obtain more diverse responses. For instance, Q14 (“Please tell us what makes an excellent choir session for you”) and Q15 (“Please tell us anything else you like about the choir”) are similar and as a result responses to these two questions were often repetitive. Q14 and Q15 are also positive-framed, which could have resulted in a potential bias towards positive-framed responses. Framing questions in a neutral manner would support more objective responses. In addition, questions about negative aspects of choir as well as other factors in participants’ lives that bring them happiness would also help to achieve a more holistic understanding of their HRQOL. Two of the NCs in this sample were led by the same music therapist (NC 1 and NC 4), and both of the CCs in this sample were led by the same choir leader (CC 1 and CC 2), which could have resulted in skewed responses. Most of the choir members in the current sample identified as New Zealand European. Future research should explore the present findings with choir members from more diverse backgrounds and cultures to provide a more inclusive representation of the benefits of CST in New Zealand.

Choral singing is associated with a number of potential covariates that makes it difficult to distinguish the impact of CST on HRQOL without the use of a randomised controlled trial research design. For instance, given that choral singing is a social occasion, perhaps choral singing provides choir members with opportunities for social connectedness, which is responsible for the positive impact on their HRQOL. If so, then other social activities (not just CST) might also suffice to meet this need. To help control for potential covariates, future studies should aim to explore the association be-

tween CST and HRQOL using randomised controlled trials where possible. Researchers should also explore the potential association between CST and other shared activities with HRQOL for people with neurological conditions. A potential covariate in choral singing research that was not considered in the current study is culture. Choral singing in particular is sometimes also tied to religion and culture (Brandt et al., 2012; Conrad, 2010; Cross, 2001; Cross & Morley, 2002). Although this feels important to consider, studies exploring the importance of culture and singing are limited (Gick, 2011). To aid this, future research on this topic should recruit from a range of choirs, including church, cultural, and professional choirs.

## About the Authors

Jordyn Thompson (she/her) completed her BA (Hons) in Psychology at the University of Auckland – Waipapa Taumata Rau, Aotearoa New Zealand in 2018. Her research explored quality of life for people who sing in neurological and community choirs in Aotearoa, New Zealand. She is currently completing a Master of Arts at the University of Auckland – Waipapa Taumata Rau, Aotearoa New Zealand with research in the field of child and adolescent wellbeing exploring school-wide strategies that support positive mental health outcomes in adulthood and reduce the impact of childhood trauma and adverse childhood experiences. Jordyn has an interest in holistic, person-centred approaches to mental health and wellbeing.

Alison Talmage (she/her) is a music therapist, teacher, and doctoral candidate at the University of Auckland – Waipapa Taumata Rau, Aotearoa New Zealand. She has worked with people with diverse needs across the lifespan. She co-founded the Celebration Choir at the University's Centre for Brain Research (2009), and the Sing Up Rodney community music therapy group (2017). Her current action research study focuses on neurological choirs, that address the social and communication needs of adults with acquired neurogenic communication difficulties.

Brieonie Jenkins (she/her) completed her BA (Hons) in Psychology at the University of Auckland – Waipapa Taumata Rau, Aotearoa New Zealand in 2017. Her research focussed on choir participation for people with neurological conditions. She is currently a doctoral candidate at Massey University – Te Kunenga ki Pūehuroa, Aotearoa New Zealand. Her current research centres on people who care for loved ones with dementia and how aspects of this caregiving role may contribute to quality of life outcomes.

Suzanne Purdy (she/her) is Head of School of Psychology at the University of Auckland – Waipapa Taumata Rau, Aotearoa New Zealand. She has a background in neuroscience, clinical audiology and hearing and speech sciences. Her research interests include community-based therapies for people with neurological conditions and communication disorders. She is a Principal Investigator with the University's Centre for Brain Research which supports the Celebration Choir.

## Acknowledgements

Thank you to the choir leaders, music therapists, and research participants who donated their precious time to take part in this research. We also acknowledge the support of the University of Auckland Centre for Brain Research, led by Distinguished Professor Sir Richard Faull, and the University of Auckland Discipline of Speech Science, particularly Dr Clare McCann, Dr Anna Miles and Ms Adeline Fung.

## References

- Anderson, C. S., Carter, K. N., Hackett, M. L., Feigin, V., Barber, P. A., Broad, J. B., & Bonita, R. (2005). Trends in stroke incidence in Auckland, New Zealand, during 1981 to 2003. *Stroke*, 36(10), 2087-2093. <https://doi.org/10.1161/01.STR.0000181079.42690.bf>
- Ansdell, G. (2002). Community Music Therapy and the winds of change. *Voices: A World Forum for Music Therapy*, 2(2). <https://doi.org/10.15845/voices.v2i2.83>

- Ascherio, A., & Schwarzschild, M. A. (2016). The epidemiology of Parkinson's disease: Risk factors and prevention. *The Lancet Neurology*, 15(12), 1257-1272. [https://doi.org/10.1016/S1474-4422\(16\)30230-7](https://doi.org/10.1016/S1474-4422(16)30230-7)
- Backhouse, T. (2010). *Freeing the song: An approach to directing vocal groups*. École de Fromage.
- Bertram, L., & Tanzi, R. E. (2005). The genetic epidemiology of neurodegenerative disease. *The Journal of Clinical Investigation*, 115(6), 1449-1457. <https://doi.org/10.1172/JCI24761>
- Billington, R., Landon, J., Krägeloh, C. U., & Shepherd, D. (2010). The New Zealand World Health Organization Quality of Life (WHOQOL) Group. *The New Zealand Medical Journal*, 123(1315), 65-70. PMID: 20581932
- Brandt, A., Gebrian, M., & Slevc, R. L. (2012). Music and early language acquisition. *Frontiers in Psychology*, 3(327), 1-17. <https://doi.org/10.3389/fpsyg.2012.00327>
- Buetow, S. A., Talmage, A., McCann, C., Fogg, L., & Purdy, S. (2013). Conceptualizing how group singing may enhance quality of life with Parkinson's disease. *Disability and Rehabilitation*, 36(5), 430-433. <https://doi.org/10.3109/09638288.2013.793749>
- Campbell Burton, C. A., Murray, J., Holmes, J., Astin, F., Greenwood, D., & Knapp, P. (2013). Frequency of anxiety after stroke: A systematic review and meta-analysis of observational studies. *International Journal of Stroke*, 8(7), 545-559. <https://doi.org/10.1111/j.1747-4949.2012.00906.x><https://doi.org/10.1159/000200461>
- Carod-Artal, F. J., & Egido, J. A. (2009). Quality of life after stroke: The importance of a good recovery. *Cerebrovascular Diseases*, 27(1), 204-214. <https://doi.org/10.1159/000200461>
- Connolly, B. S., & Lang, A. E. (2014). Pharmacological treatment of Parkinson disease: A review. *JAMA*, 311(16), 1670-1683. <https://doi.org/10.1001/jama.2014.3654>
- Conrad, C. (2010). Music for healing: From magic to medicine. *Lancet*, 376(9757), 1980-1981. [https://doi.org/10.1016/s0140-6736\(10\)62251-9](https://doi.org/10.1016/s0140-6736(10)62251-9)
- Creswell, J. W. & Poth, C. N. (2018). *Qualitative inquiry and research design: Choosing among five approaches* (4th ed.). Sage.
- Cross, I. (2001). Music, cognition, culture and evolution. *Annals of the New York Academy of Sciences*, 930(1), 28-42. <https://doi.org/10.1111/j.1749-6632.2001.tb05723.x>
- Cross, I., & Morley, I. (2002). Music and evolution: The nature of the evidence. *Proceedings of the 7th International Conference on Music Perception and Cognition*, 416-419. [https://www.academia.edu/16654426/Music\\_and\\_evolution\\_the\\_nature\\_of\\_the\\_evidence](https://www.academia.edu/16654426/Music_and_evolution_the_nature_of_the_evidence)
- Di Benedetto, P., Cavazzon, M., Mondolo, F., Rugiu, G., Peratoner, A., & Biasutti, E. (2009). Voice and choral singing treatment: A new approach for speech and voice disorders in Parkinson's disease. *European Journal of Physical and Rehabilitation Medicine*, 45(1), 13-19. PMID: 18987565.
- Dingle, G. A., Clift, S., Finn, S., Gilbert, R., Groarke, J. M., Irons, Y. J., Bartoli, A. J., Lamont, A., Launay, J., Martin, E. S., Moss, H., Sanfilippo, K. R., Shipton, M., Stewart, L., Talbot, S., Tarrant, M., Tip, L., & Williams, E. J. (2019). An agenda for best practice research on group singing, health, and well-being. *Music and Science*, 2, 1-5. <https://doi.org/10.1177/2059204319861719>
- Dissanayaka, N. N. W., Sellbach, A., Matheson, S., O'Sullivan, J. D., Silburn, P. A., Byrne, G. J., Marsh, R., & Mellick, G. D. (2010). Anxiety disorders in Parkinson's disease: Prevalence and risk factors. *Movement Disorders*, 25(7), 838-845. <https://doi.org/10.1002/mds.22833>
- Dissanayaka, N. N. W., Sellbach, A., Silburn, P. A., O'Sullivan, J. D., Marsh, R., & Mellick, G. D. (2011). Factors associated with depression in Parkinson's disease. *Journal of Affective Disorders*, 132(1), 82-88. <https://psycnet.apa.org/doi/10.1016/j.jad.2011.01.021>
- Edwards, J. (2016). *Conceptualizing music therapy: Five areas that frame the field*. Oxford University Press. <https://doi.org/10.1093/oxfordhb/9780199639755.013.32>
- Elefant, C., Baker, F. A., Lotan, M., Lagesen, S. K., & Skeie, G. O. (2012). The effect of group music therapy on mood, speech, and singing in individuals with Parkinson's disease: A feasibility study. *Journal of Music Therapy*, 49(3), 278-302. <https://doi.org/10.1093/jmt/49.3.278>

- Fogg, L., & Talmage, A. (2011). The CeleBRation Choir: Establishing community group choral singing for people living with neurological conditions. *Psychomusicology: Music, Mind and Brain*, 21(1-2), 264-267. <https://doi.org/10.1037/h0094030>
- Fogg-Rogers, L., Buetow, S., Talmage, A., McCann, C. M., Leão, S. H. S., Tippett, L., Leung, J., McPherson, K. M., & Purdy, S. C. (2015). Choral singing therapy following stroke or Parkinson's disease: An exploration of participants' experiences. *Disability and Rehabilitation*, 38(10), 952-962. <https://doi.org/10.3109/09638288.2015.1068875>
- Gick, M. L. (2011). Singing, health and well-being: A health psychologist's review. *Psychomusicology: Music, Mind and Brain*, 21(1-2), 176-207. <https://doi.org/10.1037/h0094011>
- Golden, J., Conroy, R. M., Bruce, I., Denihan, A., Greene, E., Kirby, M., & Lawlor, B. A. (2009). Loneliness, social support networks, mood and wellbeing in community-dwelling elderly. *International Journal of Geriatric Psychiatry*, 24(7), 694-700. <https://doi.org/10.1002/gps.2181>
- Haddad, M. (2009). Depression in adults with a chronic physical health problem: Treatment and management. *International Journal of Nursing Studies*, 46(11), 1411-1414. <https://doi.org/10.1016/j.ijnurstu.2009.08.007>
- Hoffmann, T., Bennett, S., Koh, C. L., & McKenna, K. T. (2010). Occupational therapy for cognitive impairment in stroke patients. *Cochrane Database of Systematic Reviews*, 9, CD006430. <https://doi.org/10.1002/14651858.CD006430.pub2>
- Hornsten, C., Molander, L., & Gustafson, Y. (2012). The prevalence of stroke and the association between stroke and depression among a very old population. *Archives of Gerontology and Geriatrics*, 55(3), 555-559. <https://doi.org/10.1016/j.archger.2012.04.012>
- Hurkmans, J., de Bruijn, M., Boonstra, A. M., Jonkers, R., Bastiaanse, R., Arendzen, H., & Reinders-Messelink, H. A. (2012). Music in the treatment of neurological language and speech disorders: A systematic review. *Aphasiology*, 26(1), 1-19. <https://doi.org/10.1080/02687038.2011.602514>
- Irons, J. Y., Hancox, G., Vella-Burrows, T., Han, E.-Y., Chong, H.-J., Sheffield, D., & Stewart, D. E. (2021). Group singing improves quality of life for people with Parkinson's: An international study. *Aging & Mental Health*, 25(4), 650-656. <https://doi.org/10.1080/13607863.2020.1720599>
- Jankovic, J. (2008). Parkinson's disease: Clinical features and diagnosis. *Journal of Neurology, Neurosurgery and Psychiatry*, 79(4), 368-376. <https://jnnp.bmj.com/content/79/4/368>
- Jansen, G. (2019). *Sing New Zealand: The story of choral music in Aotearoa*. Massey University Press.
- Jasinska-Myga, B., Putzke, J. D., Wider, C., Wszolek, Z. K., & Uitti, R. J. (2010). Depression in Parkinson's disease. *The Canadian Journal of Neurological Sciences*, 37(1), 61-66. PMID:<https://www.ncbi.nlm.nih.gov/pubmed/20169775>
- Jenkins, B., Storie, S., & Purdy, S. (2017). Quality of life for individuals with a neurological condition who participate in social/therapeutic choirs. *New Zealand Journal of Music Therapy*, 15, 59-94. <https://www.musictherapy.org.nz/journal/2017-2>
- Johnson, J. K., Louhivuori, J., Stewart, A. L., Tolvanen, A., Ross, L., & Era, P. (2013). Quality of life (QOL) of older adult community choral singers in Finland. *International Psychogeriatrics*, 25(7), 1055-64. <http://doi.org/10.1017/S1041610213000422>
- Jørgensen, T. S., Wium-Andersen, I. K., Wium-Andersen, M. K., Jørgensen, M. B., Prescott, E., Maartensson, S., Kragh-Andersen, P., & Osler, M. (2016). Incidence of depression after stroke, and associated risk factors and mortality outcomes, in a large cohort of Danish patients. *JAMA Psychiatry*, 73(10), 1032-1040. <https://doi.org/10.1001/jamapsychiatry.2016.1932>
- Kelly, H., Brady, M. C., & Enderby, P. S. (2010). Speech and language therapy for aphasia following stroke. *Cochrane Database of Systematic Reviews*, 5, CD000425. <https://doi.org/10.1002/14651858.CD000425.pub2>

- Kern, P., & Tague, D. (2017). Music therapy practice status and trends worldwide: An international survey study. *Journal of Music Therapy*, 54(3), 255-286. <https://doi.org/10.1093/jmt/thx011>
- Krägeloh, C. U., Kersten, P., Billington, D. R., Hsu, P. H.-C., Shepherd, D., Landon, J., & Feng, X. J. (2010). The New Zealand version of the WHOQOL-BREF: Confirming the factor structure and making multi-group comparisons. *Quality of Life Research*, 19, 68-68. <https://doi.org/10.1007/s11136-012-0265-9>
- Lee, P., Stewart, D., & Clift, S. (2018). Group singing and quality of life. In B. L. Bartleet, & L. Higgins (Eds.), *The Oxford handbook of community music*. (pp. 503-524). Oxford University Press. <https://doi.org/10.1093/oxfordhb/9780190219505.013.22>
- Massey, F. J. J. (1951). The Kolmogorov-Smirnov test for goodness of fit. *Journal of the American Statistical Association*, 46(253), 68-78. <https://doi.org/10.1080/01621459.1951.10500769>
- Matthews, R. (2018). *Acoustic, respiratory, cognitive and wellbeing comparisons of two groups of people with Parkinson's disease participating in voice and choral singing group therapy (VCST) versus a music appreciation activity* [Unpublished Doctoral Thesis]. The University of Auckland. <http://hdl.handle.net/2292/37599>
- Matthews, R., Purdy, S. C., & Tippett, L. J. (2019). Song choice and vocal exercises in group singing for people with Parkinson's disease: The perspective of a speech-language therapist/musician. *New Zealand Journal of Music Therapy*, 17, 25-41. <https://www.musictherapy.org.nz/journal/2019-2>
- Moss, H., Lynch, J., & O'Donoghue, J. (2018). Exploring the perceived health benefits of singing in a choir: An international cross-sectional mixed-methods study. *Perspectives in Public Health*, 138, 160-168. <https://doi.org/10.1177/1757913917739652>
- Mutai, H., Furukawa, T., Nakanishi, K., & Hanihara, T. (2016). Longitudinal functional changes, depression, and health-related quality of life among stroke survivors living at home after inpatient rehabilitation. *Psychogeriatrics*, 16, 185-190. <https://doi.org/10.1111/psyg.12137>
- New Zealand Institute of Economic Research. (2020). *The social and economic costs of stroke in New Zealand – 2020 update NZIER report to the Stroke Foundation*. [https://nzier.org.nz/static/media/filer\\_public/b4/6f/b46f7e92-be19-477d-b23c-7ba042d7cccd/social\\_and\\_economic\\_costs\\_of\\_stroke\\_-\\_2020\\_update.pdf](https://nzier.org.nz/static/media/filer_public/b4/6f/b46f7e92-be19-477d-b23c-7ba042d7cccd/social_and_economic_costs_of_stroke_-_2020_update.pdf)
- Office of Disease Prevention and Health Promotion. (2010). *Health-related quality of life and wellbeing*. <https://www.healthypeople.gov/2020/about/qolwabout.aspx>
- Parkinson's New Zealand. (2021). *What is Parkinson's?* <https://www.parkinsons.org.nz/understanding-parkinsons/what-parkinsons>
- Patel, V., & Prince, M. (2001). Ageing and mental health in a developing country: Who cares? Qualitative studies from Goa, India. *Psychological Medicine*, 31(1), 29-38. <https://doi.org/10.1017/s0033291799003098>
- Pongan, E., Tillmann, B., Leveque, Y., Trombert, B., Getenet, J. C., Auguste, N., Dauphinot, V., Haouari, H. E., Navez, M., Dorey, J.-M., Krolak-Salmon, P., The LACMé Group, Laurent, B., & Rouch, I. (2017). Can musical or painting interventions improve chronic pain, mood, quality of life, and cognition in patients with mild Alzheimer's disease? Evidence from a randomized controlled trial. *Journal of Alzheimer's Disease*, 60, 663-667. <https://doi.org/10.3233/JAD-170410>
- Power, M. J. (2003). Quality of life. In S. J. Lopez & C. R. Snyder (Eds.), *Positive psychological assessment: A handbook of models and measures* (pp. 427-441). American Psychological Association. <https://doi.org/10.1037/10612-027>
- Power, M. J., Green, A. M., & The WHOQOL-Dis Group. (2010). Development of the WHOQOL disabilities module. *Quality of Life Research*, 19, 571-584. <https://doi.org/10.1007/s11136-010-9616-6>

- Rahman, S., Griffin, H. J., Quinn, N. P., & Jahanshahi, M. (2008). Quality of life in Parkinson's disease: The relative importance of the symptoms. *Movement Disorders*, 23(10), 1428-1434. <https://doi.org/10.1002/mds.21667>
- Schlaug, G., Altenmüller, E., & Thaut, M. (2010). Music listening and music making in the treatment of neurological disorders and impairments. *Music Perception: An Interdisciplinary Journal*, 27(4), 249-250. <https://doi.org/10.1525/MP.2010.27.4.249>
- Skevington, S. M., Lotfy, M., & O'Connell, K. A. (2004). The World Health Organization's WHOQOLBREF quality of life assessment: Psychometric properties and results of the international field trial. A Report from the WHOQOL Group. *Quality of Life Research*, 13(2), 299-310. <https://doi.org/10.1023/B:QURE.0000018486.91360.00>
- Statistics New Zealand. (2020). *National population projections: 2020 (base) – 2073*. <https://www.stats.govt.nz/information-releases/national-population-projections-2020base2073>
- Talmage, A. (2017). *CBR Music Therapy Week Neurological Choirs Workshop* [Report]. The University of Auckland Centre for Brain Research.
- Talmage, A. (2022). Singing all together in the CeleBRation Choir: A music therapist's perspective on community singing for adults who have neurogenic communication difficulties. In C. Miller & M. Torkington (Eds.), *Arts therapists in international practice: Exploring the behavioural and neurological benefits of therapy* (pp. 138-151). Routledge.
- Talmage, A., Fogg-Rogers, L., Leão, S. H. S., & Purdy, S. (2014). Choral singing therapy for a client with Parkinson's disease. In C. Miller (Ed.), *Assessment and outcomes in the arts therapies: A person-centred approach*. (pp. 54-66). Jessica Kingsley Publishers.
- Talmage, A., Ludlam, A., Leão, S., Fogg-Rogers, L. A., Purdy, S. C. (2013). Leading the CeleBRation choir: The choral singing therapy protocol and the role of the music therapist in a social singing group for adults with neurological conditions. *The New Zealand Journal of Music Therapy*, 11, 7-50.
- Talmage, A., & Purdy, S. C. (2021). Leading choirs and singing groups for adults living with neurogenic communication difficulties: Semi-structured interviews with current and potential facilitators in New Zealand. *New Zealand Journal of Music Therapy*, 19, 54-85. <https://www.musictherapy.org.nz/journal/2021-2>
- Tamplin, J., Baker, F. A., Jones, B., Way, A., & Lee, S. (2013). 'Stroke a chord': The effect of singing in a community choir on mood and social engagement for people living with aphasia following a stroke. *Neurorehabilitation*, 32(4), 929-941. <https://doi.org/10.3233/NRE-130916>
- Tamplin, J., Morris, M., Marigliani, C., Baker, F., & Vogel, A. (2019). ParkinSong: A controlled trial of singing-based therapy for Parkinson's disease. *Neurorehabilitation and Neural Repair*, 33(6), 453-463. <https://doi.org/10.1177/1545968319847948>
- Thaut, M. H., McIntosh, G. C., & Hoemberg, V. (2015). Neurobiological foundations of neurologic music therapy: Rhythmic entrainment and the motor system. *Frontiers in Psychology*, 5, 1185. <https://doi.org/10.3389/fpsyg.2014.01185>
- Thompson, N., Storie, S., & Purdy, S. (2016). "Catching the tune or channelling the beat": A pilot study investigating the role of rhythm in therapeutic singing for aphasia. *New Zealand Journal of Music Therapy*, 14, 122-161. <https://www.musictherapy.org.nz/journal/2016-2>
- Tomczak, M., & Tomczak, E. (2014). The need to report effect size estimates revisited. An overview of some recommended measures of effect size. *Trends in Sport Science*, 1(21), 19-25. [http://www.wbc.poznan.pl/Content/325867/5\\_Trends\\_Vol21\\_2014\\_%20no1\\_20.pdf](http://www.wbc.poznan.pl/Content/325867/5_Trends_Vol21_2014_%20no1_20.pdf)
- Unützer, J. (2007). Late-life depression. *New England Journal of Medicine*, 357(22), 2269-2276. <https://psycnet.apa.org/doi/10.1056/NEJMc073754>
- Valvanne, J., Juva, K., Erkinjuntti, T., & Tilvis, R. (1996). Major depression in the elderly: A population study in Helsinki. *International Psychogeriatrics*, 8(03), 437-443. <https://psycnet.apa.org/doi/10.1017/S1041610296002797>

- Wan, C. Y., Rüber, T., Hohmann, A., & Schlaug, G. (2010). The therapeutic effects of singing in neurological disorders. *Music Perception: An Interdisciplinary Journal*, 27(4), 287-295. <https://doi.org/10.1525/mp.2010.27.4.287>
- Waterhouse, D., & Waterhouse, S. (Directors). (2016). *A therapeutic choir* [Video] Christchurch, New Zealand: Cantabrainers Choir and Therapy Professionals Inc. <https://vimeo.com/145326646>
- World Health Organization. (1994). Development of the WHOQOL: Rationale and current status. *International Journal of Mental Health*, 23(3), 24-56. <https://doi.org/10.1080/00207411.1994.11449286>
- World Health Organization. (1998). *Programme on mental health: WHOQOL user manual, 2012 revision*. <https://apps.who.int/iris/handle/10665/77932>
- World Health Organization. (2006). *Neurological disorders: Public health challenges*. <https://www.who.int/publications/i/item/9789241563369>
- World Health Organization. (2017). *Mental health of older adults*. <https://www.who.int/en/news-room/fact-sheets/detail/mental-health-of-older-adults>
- World Health Organization. (2021). *Stroke, cerebrovascular accident*. <http://www.emro.who.int/health-topics/stroke-cerebrovascular-accident/index.html>
- Yinger, O. S., & Lapointe, L. L. (2012). The effects of participation in a group music therapy voice protocol (G-MTVP) on the speech of individuals with Parkinson's disease. *Music Therapy Perspectives*, 30(1), 25-31. <https://doi.org/10.1093/mtp/30.1.25>
- Zar, J. H. (1972). Significance testing of the Spearman Rank Correlation Coefficient. *Journal of the American Statistical Association*, 67(339), 578-580. <https://doi.org/10.2307/2284441>
- Zimmerman, D. W. (1987). Comparative power of Student T test and Mann-Whitney U test for unequal sample sizes and variances. *The Journal of Experimental Education*, 55(3), 171-174. <https://doi.org/10.1080/00220973.1987.10806451>
- Zumbansen, A., Peretz, I., Anglade, C., Bilodeau, J., Génereux, S., Hubert, M., & Hébert, S. (2017). Effect of choir activity in the rehabilitation of aphasia: A blind, randomised, controlled pilot study. *Aphasiology*, 31(8), 879-900. <https://doi.org/10.1080/02687038.2016.1227424>