DISCURSIVE PAPER

Group-based instrumental musical training to enhance resilience among school-aged children from low-income families: A pilot randomised waitlist controlled trial

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Abstract

Aim: To evaluate the acceptability, feasibility and potential effectiveness of a group-based instrumental musical training programme in improving resilience, depressive symptoms, self-esteem and quality of life among school-aged children from low-income families.

Design: Assessor-blinded pilot randomised waitlist controlled trial with process evaluation.

Methods: This study was conducted in the community from January 2022 to July 2023. Sixty-four children from low-income families (aged 8–12 years) were randomised (1:1) to intervention and waitlist control groups. The intervention group ($n=32$) received weekly 1-hour instrumental musical training for 6 months in groups of four to five from professionally qualified musicians at a music centre. The participants in the waitlist control group ($n=32$) received the same intervention as the participants in the intervention group after the completion of all outcome assessments. The primary outcome was the children's levels of resilience, measured using the Resilience Scale for Children – 10. The secondary outcomes were depressive symptoms, self-esteem and quality of life. Assessments were conducted at baseline (T0) and immediately post-intervention (T1). An intention-to-treat analysis was performed.

Results: The 64 participants had a mean (SD) age of 9.5 (1.44) years, and 37 (57.8%) were boys. Compared with the waitlist control group, participants in the intervention group showed significantly greater improvements in resilience levels from baseline to T0 (group-by-time interaction coefficient $\beta=4.41$; 95% CI, 1.82–6.99; $p=0.001$), depressive symptoms ($\beta=-6.42$; 95% CI, −11.12 to −1.71; $p=0.008$), self-esteem ($\beta=-2.60$; 95% CI, 0.28–4.92; $p=0.028$) and quality of life ($\beta=6.69$; 95% CI, 0.18–13.2; $p=0.044$).

Conclusion: The group-based instrumental musical training programme was feasible and acceptable for school-aged underprivileged children and showed the potential to improve the resilience and quality of life of this vulnerable population.

KEYWORDS
children, depression, instrumental musical training, low-income families, nursing, poverty, quality of life, resilience

1 | INTRODUCTION

Child poverty is a prominent and ubiquitous health issue. Globally, approximately 1.2 billion children are living in multidimensional poverty (UNICEF, 2020). The economic consequences of the COVID-19 pandemic have culminated in an increase of 120 million children living in poverty (Magill et al., 2018). Child poverty is alarmingly prevalent in many high-income countries and regions, including Hong Kong. There are 274,900 Hong Kong Chinese children (aged under 18 years) living in poverty—one in every four children (Government of the Hong Kong Special Administrative Region, 2020). Poverty is not simply a lack of monetary means; it also has a long-term detrimental impact on children's physical and psychosocial well-being (Evans & De France, 2022; Haft & Hoeft, 2017), jeopardising their growth and development (Evans & De France, 2022; Francis et al., 2018; Haft & Hoeft, 2017). Owing to the multifactorial and chronic nature of poverty, children from low-income families are more prone to developing mental health problems. A study found that children from low-income families experienced considerably higher levels of depression, lower levels of self-esteem, and poorer quality of life (QoL) than children from affluent families (Ho et al., 2015). The Millennium Cohort Study involving 19,244 low-income families found that children who grew up impoverished had an approximately four times greater risk of developing depression and anxiety than children from affluent families (Gutman et al., 2015). Childhood poverty was found to be the strongest predictor of the risk of developing depression at 12- and 21-year follow-ups among 2609 adolescents and youths in another prospective birth cohort study (Barch et al., 2016). These results imply that poverty not only poses an immediate impact on children but also extends into adulthood.

Given the profound effect of poverty on children's psychological health, it is of paramount importance to provide immediate psychosocial support to children from low-income families. A growing body of evidence highlights the importance of fostering resilience in impoverished children, empowering them to cope with adversity and overcome threats to their healthy development (De France et al., 2022; Fletcher & Sarkar, 2013). 'Resilience' refers to an individual's strength and capacity to mitigate the negative consequences of stress, adapt and maintain psychological well-being in the face of adversity, threats or significant sources of stress (Fletcher & Sarkar, 2013). According to a review of resilience theory, the role of resilience in promoting adaptive outcomes when faced with adversity involves three essential components: adversity, mediating processes and outcomes (Fossion et al., 2013). 'Adversity' refers to the experience of hardship/a difficult situation (e.g. poverty), and given that adversity is not always avoidable, such as in the case of poverty, building resilience is crucial to help children manage and respond to psychological distress in a positive way when exposed to such adversity. In particular, research found that resilience is positively associated with the QoL, while negatively associated with the psychological distress (i.e. depression/anxiety) of children facing adversity (Wu et al., 2020). Resilience has been conceptualised as a mediating process that evolves over time in response to specific family adversity and is malleable through appropriate interventions aiming to instil resilience and achieve adaptive outcomes (Conger & Conger, 2002). It has been found that resilience is greatly affected by the sources of support and resources available to individuals (Ungar & Theron, 2020). This highlights the pressing need to offer psychosocial support and resources via appropriate strategies, with a particular focus on instilling resilience in children from low-income families to achieve adaptive outcomes. However, very few intervention studies have targeted improving the psychological well-being of children from low-income families and most of them have solely focused on preschool children (Bierman et al., 2021; Cheung et al., 2019; Jordan et al., 2014). There is a lack of promising intervention for school-aged underprivileged children, who are liable to develop mental health problems.

Music-based interventions, as an inexpensive, accessible and transformative approach, have been increasingly used to improve resilience and psychosocial outcomes among different paediatric populations, including paediatric cancer survivors (Cheung et al., 2019), children and adolescents with attention-deficit hyperactivity disorder (Martin-Moratinos et al., 2023) and autism spectrum disorder (Mayer-Benarous et al., 2021), and hospitalised paediatric patients (Goren et al., 2023). Music-based interventions have been found to have positive effects on psychosocial outcomes. However, it remains unclear whether instrumental musical training is feasible and effective in improving resilience in school-aged children from low-income families.

Owing to Hong Kong's competitive education system, researchers have proposed that learning to play a musical instrument is important for children living in Hong Kong (Watkins, 2010). Most importantly, the acquisition of musical skills may strengthen the personal capabilities of impoverished children, fostering their ability to overcome adversity and empowering them to break the poverty cycle. Therefore, instrumental musical training may be

an appropriate form of music-based intervention that provides opportunities for school-aged impoverished children to access educational resources and hence improve their resilience and health-related QoL.

2 | METHODS

2.1 | Aims

This pilot trial aimed to (1) evaluate the feasibility and acceptability of a group-based instrumental musical training programme among school-aged children from low-income families and (2) preliminarily test the effects of the group-based instrumental musical training programme in improving resilience (primary outcome) and depressive symptoms, self-esteem and QoL (secondary outcomes).

2.2 | Study design

The trial was an assessor-blinded randomised waitlist controlled pilot trial with pre-test and post-test measures conducted between 16 May 2022 and 3 July 2023 in Hong Kong. The study was conducted in accordance with the Declaration of Helsinki. It was also registered at ClinicalTrials.gov (identifier: NCT05346965; registration date: 25 April 2022).

2.3 | Setting and participants

Eligible children were proactively recruited by a trained research assistant in the community of Shum Shui Po, a district with the highest poverty rate in Hong Kong (n.d.). In addition, advertising posters were posted on the noticeboards of two non-governmental organisations. Interested children were screened for eligibility and referred to the research team. Children were included if they were (i) Chinese children aged 8–12 years, (ii) capable to read Chinese and communicate in Chinese and (iii) from low-income families, that is, the family received less than half the median monthly income of household or received Comprehensive Social Security Assistance (Government of the Hong Kong Special Administrative Region, 2020). Children were excluded if they were currently receiving instrumental musical training had received such training before the study or had a chronic disease or a cognitive or learning difficulty.

2.4 | Randomisation, allocation concealment and blinding

Informed written consent from the parents and assent from the children were obtained, and a baseline assessment was then conducted by a trained research assistant. The participants were randomly assigned to either the intervention or the waitlist control group at a

1:1 ratio by an independent research assistant. A randomisation sequence list was generated by an independent researcher using an online randomiser (https://www.sealedenvelope.com/simple-randomiser/v1/lists). Labelled cards indicating group allocation were placed in separate, sequentially numbered, sealed, opaque envelopes. Allocation concealment was ensured until the envelopes were opened. To ensure privacy and to prevent the possibility of interactions between the two groups, the participants received detailed information by phone about the intervention in which they were participating. The outcome assessor was blinded to the intervention allocation.

2.5 | Sample size planning

A stepped rule of thumb for pilot studies based on the anticipated effect size of a future main trial (Whitehead et al., 2016) was adopted to guide the sample size planning for the present pilot study. Allowing for a moderate effect size (Cohen's $d=0.5$) with a study power of 80% at a significance level of 5% (two-tailed) in the future main trial, a sample of at least 50 participants (25 participants per arm) was considered adequate. Further accounting for an attrition rate of 15%, it was necessary to recruit at least 60 participants (30 participants per arm).

2.6 | Group-based instrumental musical training

The participants in the intervention group received weekly 1-hour instrumental musical training for 6 months delivered by professionally qualified musicians who had extensive experience of delivering musical training to vulnerable children. The intervention was implemented in small groups of four or five children at a music centre adopting an intervention protocol (Appendix A). Small-group teaching has been shown to have advantages in facilitating learning conditions and outcomes for school-aged children (Ledford & Wolery, 2015). The participants were assigned a particular musical instrument to learn on the basis of their interests and capabilities (i.e. fine motor skills), which were assessed by a qualified musician. The musical instruments were the keyboard, ukulele and guitar. The training began at the lowest level (i.e. playing simple notes) and ended at the highest level (i.e. playing an entire song). The participants continued to the next level if they passed a music test; those who did not pass the test were encouraged to repeat the test.

To incorporate the core concepts of resilience, a range of music activities that facilitate (i) reflective ability, (ii) self-confidence and (iii) social support were included in the training process. For example, to facilitate the participants' ability to reflect, weekly music challenges were held to empower the participants to challenge themselves. The intervener then reviewed the participants' experience and assisted them in exploring alternative approaches to overcome challenges that they had encountered. To enhance self-confidence, the participants were encouraged to freely create music such that they experienced

a sense of accomplishment in their music exploration journey. For social support, group interaction through music and movement was facilitated to offer a chance for the participants to establish a social support network among their peers and the intervener. To stimulate group interaction, the instrumental musical training intervention included group activities related to songs, rhythm, and visual creativity.

2.6.1 | Conceptual framework of the instrumental musical training

Ample evidence shows the influential power of music in positive psychology (Koelsch, 2015). Music acts as a potent stimulus in modulating activity in brain structures, the hippocampal and amygdala connectivity, that are involved in emotional processes (Koelsch, 2015). Playing a musical instrument is an enjoyable yet highly complex experience, as it calls upon the involvement of a range of sensory and motor skills, thereby activating different regions of the limbic system (Wan & Schlaug, 2010). Dopamine, a neurotransmitter that controls reward and pleasure centres in the brain will be released when engaging in a musical activity, mediating positive mood changes and relaxation (Wan & Schlaug, 2010). In addition, the development and acquisition of musical skills from instrumental musical training is a significant personal accomplishment (Patel, 2011). Children can experience an intense sense of achievement throughout the learning process, hence significantly increasing their self-esteem (Fu & Tu, 2023). Furthermore, music not only promotes emotional changes but also mobilises children's inner psychological resources that enable the children to focus on their stressful situation, re-experience adversity and immerse themselves in a sense of security, nurturing and vitality, thereby leading to improvements in resilience (Nijs & Nicolaou, 2021). Thus, it is anticipated that the instrumental musical training programme may potentially be beneficial to counteract the negative effects of childhood poverty on school-aged children's psychological well-being.

2.6.2 | Intervention fidelity

To ensure the fidelity of the intervention, the research team members (mainly A.T.C. and L.L.K.H.) randomly attended at least one instrumental musical training session conducted by each of the qualified musician to ensure protocol adherence. In addition, monthly meetings were held to regularly monitor the quality of the intervention implementation and resolve emerging issues.

2.7 | Waitlist control group

To ensure equity of access to the potentially effective intervention (i.e. the group-based instrumental musical training programme), the participants in the waitlist control group received the same intervention as the participants in the intervention group after the completion of all assessments.

2.8 | Data collection and outcomes

Data were collected at baseline (T0) and immediately post-intervention (i.e. after 6 months; T1). The primary outcome measure was resilience. The secondary outcomes were depressive symptoms, self-esteem and QoL. The study instruments were administered to the participants face-to-face by the trained research assistant, who was blinded to the intervention assignment. Each participant received a musical instrument upon completion of the study as a token of appreciation for their participation.

2.8.1 | Sociodemographic characteristics

Sociodemographic data, including the children's age, gender, place of birth and type of housing and the parents' age, gender, marital status and employment status, were collected at baseline before randomisation.

2.8.2 | Resilience

The Chinese version of the Resilience Scale for Children – 10 (RS10) was used to assess the participants' levels of resilience. RS10 is a 10-item scale of a child's resilience in reacting to life challenges which consists of five core elements: (1) a sense of purpose and meaning, (2) authenticity, (3) equanimity, (4) self-reliance and (5) perseverance. RS10 is constructed at a 2.4 Flesch–Kincaid reading level (Chung et al., 2021), which is appropriate for and facilitates the comprehension of children aged 7 years and above. Items are evaluated on a 4-point Likert scale (from 1 to 4). Total possible scores range from 10 to 40. Higher scores indicating higher levels of resilience. RS10 has been validated and demonstrated to have satisfactory internal consistency (Cronbach's $\alpha = 0.83$) and good content equivalence and adequate discriminant validity for Chinese paediatric populations (Chung et al., 2021).

2.8.3 | Depressive symptoms

The Chinese version of the Center for Epidemiological Studies Depression Scale for Children (CES-DC) was used to evaluate the participants' depressive symptoms. The CES-DC is a tool used to assess the number of depressive symptoms in children and adolescents (William Li et al., 2010). It comprises 20 items regarding the participants' feelings and experiences in the previous week, which are rated on a 4-point Likert scale from 0 to 3. The total score ranges from 0 to 60, with a higher score indicating a higher level of depression. A cut-off score of 16 on this scale indicates that the child or adolescent is currently experiencing a significant level of depressive symptoms. The translated Chinese version of the CES-DC has been found to have good internal consistency (Cronbach's $\alpha = 0.82$), satisfactory convergence and discriminant validity (William Li et al., 2010).

2.8.4 | Self-esteem

The Chinese version of the Rosenberg Self-esteem Scale (RSES) was used to assess the participants' levels of self-esteem. The scale contains 10 items, which are rated on a 4-point Likert scale with scores of 1 (1=strongly disagree) to 4 (4=strongly agree). Total possible scores ranging from 10 to 40, with higher scores indicate higher levels of self-esteem. The results of a psychometric properties test of the Chinese version of the RSES showed that it has good internal consistency (Cronbach's α=0.84) for the Chinese population (Lo et al., 2018).

2.8.5 | QoL

The Chinese version of the Paediatric Quality of Life Inventory 4.0 Generic Core Scale (PedsQL 4.0) was used to assess the participants' QoL. This scale comprises 23 items that are categorised into four domains: (i) physical functioning, (ii) emotional functioning, (iii) social functioning, and (iv) school functioning. All items are rated on a 5-point Likert scale, with the participants asked about problems experienced over the last month. A total possible score ranging from 0 to 100 is obtained, with a higher score implying a better health-related QoL (Chan et al., 2005). The psychometric properties of this scale have been empirically tested and shown to have satisfactory internal consistency (Cronbach's α=0.86) and test–retest reliability (r=0.65–0.81).

2.8.6 | Feasibility outcomes

To assess feasibility, we calculated the rates of recruitment (i.e. the number of participants consenting to join the study divided by the number of eligible participants), retention (i.e. the number of participants who completed the study divided by the number of participants randomised; reasons for withdrawal were also recorded) and attendance. Adverse events related to the study (of which there were none) were to be recorded by the intervenor and research assistant.

2.8.7 | Acceptability—process evaluation

To explore the perceptions and experiences of the musical training programme of the children in the intervention group and their parents, semi-structured interviews were conducted with 20 parent–child dyads purposively selected from the intervention group upon the completion of the intervention. Both the children and their parents were invited to comment on their experiences and perceptions of the programme and to recommend improvements to the programme. The interviews were conducted by A.T.C. in private rooms at the music centre or in the participants' homes. An interview guide (Appendix B) was developed to provide a tentative agenda for the interviews.

2.9 | Data analysis

Quantitative data were analysed using IBM SPSS 27 (IBM Crop. Armonk, NY) with a level of significance set at 0.05, and all significance tests were 2-sided. The intention-to-treat principle was followed in the data analysis. The normality of continuous variables was assessed using skewness statistics and a normal probability plot. No continuous variable was found to deviate from a normal distribution. The participants' baseline characteristics and outcome measures across the study time points were presented using means (standard deviations) and frequencies (percentages). The homogeneity of baseline characteristics between the control and intervention groups was assessed by conducting an independent t, chi-square or Fisher's exact test, as appropriate. A generalised estimating equation (GEE) model was used to compare the differential change in each outcome at T1 (immediately post-intervention; i.e., at a 6-month follow-up) with respect to T0 (baseline) between the control and intervention groups. Specifically, a group-by-time point interaction term (Group×T1) was included in each model to assess the differential change. The SPSS built-in quasi-likelihood method for parameter estimation was adopted to handle missing data in the GEE model. This method provides unbiased estimates even in the presence of missing data, provided that the data are missing completely at random. Hedges' g effect sizes based on the change scores of the outcomes from T0 to T1 were calculated to quantify the effects of the intervention on the outcomes.

In terms of qualitative data, all of the interviews were audio-recorded and transcribed verbatim. Two investigators (A.T.C. and L.L.K.H.) independently analysed the transcribed interviews using content analysis (Graneheim & Lundman, 2004). The investigators first familiarised themselves with the transcripts repeatedly to generate initial ideas about the data. Units of meaning were then extracted, and a set of rules for coding was developed. Different codes were sorted into appropriate subcategories and categories on the basis of their similarities and differences. Discrepancies in the coding process were resolved by reanalysing the transcripts and discussing the coding process with a third investigator (W.H.C.L.) until an agreement was reached. Representative quotations were translated into English.

2.10 | Ethical considerations

To ensure the protection of the rights of the participants in this study, some of whom were children and adolescents and thus considered vulnerable subjects, the Declaration of Helsinki was strictly adhered to. Ethical approval was sought from the Joint Chinese University of Hong Kong - New Territories East Cluster Clinical Research Ethics Committtee (ref no.: 2021.590-T). Eligible school-aged children from low-income families were proactively recruited by the research assistant in the Sham Shui Po community. Children and their parents were asked to indicate their willingness to join this study after they were informed of the study's purpose, procedures, and potential

harms and benefits. Informed consent was sought from each child's parents, and the children were invited to write their names on a child assent form. Both the parents and the children were informed that participation was voluntary, and that confidentiality was guaranteed.

3 | RESULTS

3.1 | Feasibility

The study commenced in January 2022 and finished in July 2023, with the recruitment process ending in May 2022. As shown in Figure 1, a total of 69 children were assessed for eligibility, with 64 consenting to participate in the study (a recruitment rate of 92.8%). The participants were randomised to the intervention ($n = 32$) or waitlist control ($n = 32$) group. Among the participants, 62.5% (20 from each group), 12.5% (8 from each group) and 12.5% (8 from each group) learnt the ukulele, guitar and keyboard respectively. One from each group withdrew from the study owing to a lack of time (a retention rate of 96.9%). No adverse events were reported. Sixty-two participants had an attendance rate exceeding 85% (i.e. more than 22 sessions), of whom 42 (64.5%) attended all the sessions, 12 (19.4%) were absent from one session, 7 (11.3%) were absent from two sessions, and 1 (1.6%) was absent from three sessions.

3.2 | Baseline characteristics

The baseline sociodemographic characteristics of the participants are summarised in Table 1.

The children had a mean (SD) age of 9.4 (1.4) years (range: 8–12 years), 37 (57.8%) of the children were boys and 64.1% of the children were born in Hong Kong. Most of the children (60.9%) lived in a subdivided room. Among the accompanying parents, the mean (SD) age was 41.1 (6.2) years (range: 31–60 years) and 81.2% of the parents were female. The majority of the parents (81.3%) had received secondary education and were married (75%). At baseline, 87.5% of the children had CES-DC scores of 16 or above, indicating that they had experienced a significant number of depressive symptoms in the previous week. No significant baseline differences in the sociodemographic characteristics or the outcome measures were noted between the two groups.

3.3 | Intervention effects

3.3.1 | Primary outcome

Table 2 summarises the primary and secondary outcomes across the study points and the effect sizes. Table 3 reports the results of the GEE analysis for the effects of the intervention on the primary and secondary outcomes. For the primary outcome (i.e., level of resilience), a large effect size was observed immediately post-intervention (T1; 6-month follow-up) in terms of improving the participants' resilience (Hedges' $g = 0.80$; 95% CI, 0.28–1.32) (Table 2). The GEE results showed that compared with the participants in the waitlist control group, the instrumental musical training group showed a significantly greater improvement in resilience at T1 (group-by-time interaction coefficient $\beta = 4.41$; 95% CI, 1.82–6.99; $p = 0.001$) (Table 3).
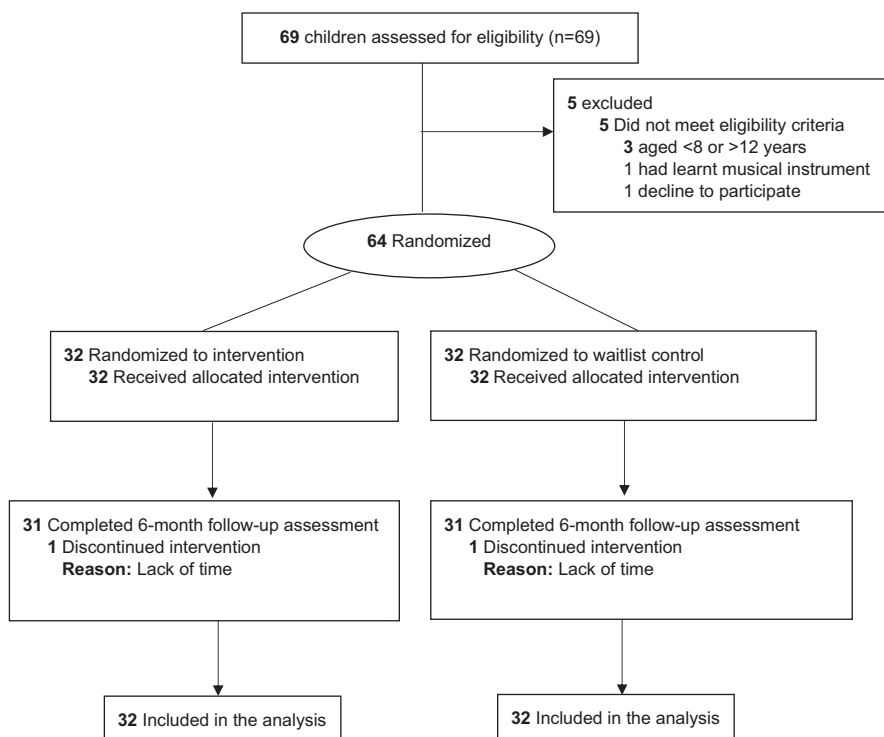

FIGURE 1 CONSORT flow diagram.

TABLE 1 Baseline characteristics of the participants and their parents (N=64).

Characteristics	All (N = 64)	Intervention (n = 32)	Waitlist control (n = 32)	p Value
Children				
Child age (years)[†]	9.4 (1.4)	9.6 (1.6)	9.4 (1.3)	0.605[a]
Child sex				
Male	37 (57.8%)	20 (62.5%)	17 (53.1%)	0.448[b]
Female	27 (42.2%)	12 (37.5%)	15 (46.9%)	
Born in Hong Kong				
Yes	41 (64.1%)	24 (75.0%)	17 (53.1%)	0.068[b]
No	23 (35.9%)	8 (25.0%)	15 (46.9%)	
Type of housing				
Public housing	22 (34.4%)	13 (40.6%)	9 (28.1%)	0.461[c]
Private housing	3 (4.7%)	2 (6.3%)	1 (3.1%)	
Subdivided room	39 (60.9%)	17 (53.1%)	22 (68.8%)	
Family income (HK$)				
<6000	6 (9.4%)	4 (12.5%)	2 (6.3%)	0.836[c]
6000–9999	14 (21.9%)	6 (18.8%)	8 (25.0%)	
10,000–19,999	33 (51.6%)	16 (50.0%)	17 (53.1%)	
20,000–29,999	11 (17.2%)	6 (18.8%)	5 (15.6%)	
Household size				
2	12 (18.8%)	6 (18.8%)	6 (18.8%)	0.820[b]
3	13 (20.3%)	8 (25.0%)	5 (15.6%)	
4	26 (40.6%)	12 (37.5%)	14 (43.8%)	
≥5	13 (20.3%)	6 (18.8%)	7 (21.9%)	
Religious belief				
No	59 (92.2%)	30 (93.8%)	29 (90.6%)	0.999[c]
Yes	5 (7.8%)	2 (6.3%)	3 (9.4%)	
Parents				
Age (years)[†]	41.1 (6.2)	40.9 (4.9)	41.2 (7.4)	0.854[a]
Sex				
Female	52 (81.2%)	24 (75.0%)	28 (82.4%)	0.222[b]
Male	12 (18.8%)	8 (25.0%)	4 (12.5%)	
Education level				
Primary or below	8 (12.5%)	3 (9.4%)	5 (15.6%)	0.565[c]
Secondary	52 (81.3%)	26 (81.3%)	26 (81.3%)	
Tertiary or above	4 (6.2%)	3 (9.4%)	1 (3.1%)	
Marital status				
Married	48 (75.0%)	25 (78.1%)	23 (71.9%)	0.564[b]
Single/divorced/ separated	16 (25.0%)	7 (21.9%)	9 (28.1%)	
Outcomes				
Resilience[†]	28.6 (4.0)	28.3 (4.3)	29.0 (3.7)	0.439
Depressive symptoms[†]	22.9 (8.6)	22.5 (8.9)	23.3 (8.4)	0.697
Self-esteem[†]	27.0 (3.2)	27.3 (4.0)	26.7 (2.2)	0.486
Quality of life[†]	77.6 (13.9)	78.2 (10.7)	77.0 (16.6)	0.720

Note: Data marked with † are presented as mean (standard deviation), others are presented as frequency (%).

[a]Independent *t*-test.

[b]Pearson chi-square test.

[c]Fisher's exact test.

3.3.2 | Secondary outcomes

Relative to the results for the waitlist control group, the instrumental musical training had a moderate effect size in reducing depressive symptoms (Hedges' $g = 0.67$; 95% CI, 0.16–1.19), a moderate effect size in enhancing self-esteem (Hedges' $g = 0.52$; 95% CI, 0.01–1.03), and a small-to-moderate effect size in improving QoL (Hedges' $g = 0.48$; 95% CI, −0.03 to 0.99) (Table 2).

The GEE analysis showed that the intervention group had a significantly greater improvement in depressive symptoms ($\beta = −6.42$; 95% CI, −11.12 to −1.71; $p = 0.008$), self-esteem ($\beta = −2.60$; 95% CI, 0.28–4.92; $p = 0.028$) and QoL ($\beta = 6.69$; 95% CI, 0.18–13.2; $p = 0.044$) (Table 3).

3.3.3 | Acceptability

All of the interviews were conducted between December 2022 and July 2023. Among the 32 participants in the intervention group, 20 children (mean age = 9.8 years; 12 boys) and 20 parents (mean age = 42.3 years; 17 mothers) were purposively selected to attend the semi-structured interviews. Table 4 presents the categories,

TABLE 2 Resilience, depressive symptoms, self-esteem and quality of life outcomes across the study time points between the two groups.

		Intervention (n = 32) Mean (SD)	Waitlist control (n = 32) Mean (SD)	Hedges' g (95% CI)[a]
Primary outcome				
Resilience	T0	28.3 (4.3)	29.0 (3.7)	
RS10 score [possible range: 10–40]	T1	34.5 (3.9)	30.9 (4.0)	
	Ch	6.1 (5.0)	1.9 (5.6)	0.80 (0.28, 1.32)
Secondary outcomes				
Depressive symptoms	T0	22.5 (8.9)	23.3 (8.4)	
CES-DC score [possible range: 0–60]	T1	15.3 (9.2)	22.4 (10.7)	
	Ch	−7.2 (9.5)	−0.7 (9.8)	0.67 (0.16, 1.19)
Self-esteem	T0	27.3 (4.0)	26.7 (2.2)	
RSES score [possible range: 10–40]	T1	31.6 (4.0)	28.4 (3.8)	
	Ch	4.2 (5.9)	1.7 (3.2)	0.52 (0.01, 1.03)
Quality of life	T0	78.2 (10.7)	77.0 (16.6)	
PedsQL 4.0 score [possible range: 0–100]	T1	87.9 (8.9)	79.7 (13.6)	
	Ch	9.0 (12.3)	2.6 (14.4)	0.48 (−0.03, 0.99)
Physical functioning (eight items), (five items), social functioning (five items), and school functioning				
Emotional functioning				
Social functioning				
School functioning				

Note: Data are presented as mean (standard deviation).

Abbreviations: CES-DC, The Chinese version of the Center for Epidemiological Studies Depression Scale for Children; Ch, Change (T1–T0); CI, confidence interval; PedsQL 4.0, The Chinese version of the Paediatric Quality of Life Inventory 4.0 Generic Core Scale; RS10, The Chinese version of the Resilience Scale for Children-10; RSES, The Chinese version of the Rosenberg self-esteem scale; T0, baseline; T1, immediately post-intervention, i.e., 6-month follow-up.

[a]Hedges' g effect size which corresponds to the standardised mean difference of the mean changes at T1 with respect to T0 between the intervention and control groups.

TABLE 3 Generalised estimating equations analysis for the intervention effects on primary and secondary outcomes.

Outcomes	Group coefficient		Time coefficient		Group × time coefficient	
	β (95% CI)	p Value	β (95% CI)	p Value	β (95% CI)	p Value
Primary outcome						
Resilience—RS10						
T0	−0.78 (−2.72, 1.16)	0.429	—	—	—	—
T1			1.87 (−0.04, 3.78)	0.055	4.41 (1.82, 6.99)	0.001
Secondary outcomes						
Depressive symptoms – CES-DC						
T0	−0.84 (−5.00, 3.32)	0.691	—	—	—	—
T1			−0.80 (−4.20, 2.60)	0.643	−6.42 (−11.12, −1.71)	0.008
Self-esteem—RSES						
T0	0.56 (−0.99, 2.11)	0.476	—	—	—	—
T1			1.68 (0.55, 2.82)	0.004	2.60 (0.28, 4.92)	0.028
Quality of life—PedsQL 4.0						
T0	1.26 (−5.49, 8.00)	0.715	—	—	—	—
T1			2.65 (−2.28, 7.57)	0.293	6.69 (0.18, 13.20)	0.044

Abbreviations: CES-DC, The Chinese version of the Center for Epidemiological Studies Depression Scale for Children; PedsQL 4.0, The Chinese version of the Paediatric Quality of Life Inventory 4.0 Generic Core Scale; RS10, The Chinese version of the Resilience Scale for Children-10; RSES, The Chinese version of the Rosenberg self-esteem scale; T0, baseline; T1, immediately post-intervention, that is, 6-month follow-up.

subcategories and examples of quotations from the interviews. Three categories emerged from the interviews, namely (i) overall satisfaction with and perceptions of the intervention, (ii) perceived benefits of the intervention and (iii) recommendations for improving the intervention. These themes are summarised below.

(i) **Overall satisfaction with and perceptions of the intervention**

In general, almost all of the children and parents were satisfied with the group-based instrumental musical training and had positive perceptions of the intervention. Most of the children expressed intense interest in attending the weekly musical training sessions, as they could thereby acquire musical skills and interact with classmates and the interveners. Both the children and the parents expressed that they valued the opportunity to learn a musical instrument. Many of the parents stated that they were unable to support their children by enrolling them in an instrumental learning course outside the study owing to financial constraints. The children indicated that the interveners facilitated a conducive learning environment that empowered the children to overcome difficulties and strengthen their motivation to learn throughout the learning process.

(ii) **Perceived benefits**

Most of the children and parents reported that the instrumental musical training programme had several positive effects on the children's psychosocial well-being. Such benefits comprised flourishing resilience (many of the children were empowered to cope with and overcome difficulties encountered in the learning process),

cultivating positive emotions, improving self-esteem (many of the children perceived the acquisition of a musical instrument to be a personal accomplishment), enhancing communication and social skills through group interaction and fostering the parent–child relationship through increased communication via the sharing of music. Some of the parents reported that the programme somewhat reduced their parental distress, as they noted their children's personal growth and an improved parent–child relationship.

(iii) **Recommendations for improvement**

In recommending improvements to the instrumental musical training programme, some of the children suggested increasing the group size from 4 to 8–10 children to enhance active and collaborative learning. In addition, some of the children suggested including more group-based musical activities to facilitate peer interactions during their learning. Both the children and the parents recommended that a group graduation performance be organised upon completion of the programme to provide a platform for the children to demonstrate their learning outcomes.

4 | DISCUSSION

We report a pilot trial of a group-based instrumental musical training intervention designed to enhance the resilience and psychological outcomes of Chinese school-aged children from low-income families. Both the recruitment rate (92.8%) and the retention rate at 6 months (a post-intervention retention rate of

TABLE 4 A full table of categories, subcategories and examples of quotes from the process evaluation.

Category	Subcategory	Examples of responses
Overall satisfaction and perception of the intervention		'I like to attend the class [instrumental music training]... I don't have to stay at my tiny home on Saturdays, as I have a chance to go out to learn music and meet my friends'. Child 2 'My son really loves music a lot, yet unfortunately, we could not afford for him to learn guitar before owing to financial problems. We treasure this opportunity so much'. Parent 4 'She is very excited before each class, and always asks me when the next session will be'. Parent 10
Perceived benefits	Flourishing resilience	'I think the programme somewhat empowered my daughter to cope with difficulties/adversity in her daily life; for example, she's much more willing to fix problems than before. I can see her determination... not giving up easily'. Parent 6
	Cultivating positive emotions	'I have become happier and more optimistic since learning the ukulele...I like the calming effect (less anxious) when playing the musical instrument'. Child 4
	Improving self-esteem	'I'm more talkative and braver now...I was shy but now I always want to share my learning experience with my classmates or friends. I'm so proud of myself that I know how to play a keyboard'. Child 12
	Enhancing communication and social skills	'After joining the programme, I met more new friends. I like interacting with them during the class, chatting with them during the break time and after the class'. Child 1 'Somewhat, the programme provided a chance for us to make new friends and meet other low-income families. We can share our experiences and life stories before and after the class [when dropping off and picking up children from class] to a certain extent. It provides a source of social support for us'. Parent 8
	Fostering the parent–child relationship	'My son communicates more with us since participating in this programme. He used to do homework quietly after getting back from school before, whereas he is now actively sharing the funny things that happened during music class with us. Sometimes, he takes the ukulele out and plays a simple melody for us. Our relationship has improved a lot'. Parent 18
	Reducing parental distress	'Both my husband and I are in great distress owing to our poor financial status and multiple family roles. I think the programme benefits not only the children but also us parents. Our parental distress has been reduced as we have observed the significant personal growth of our daughter. She is more resilient and self-motivated now'. Parent 12
Recommendations for improvement	Increasing the group size	'I wish I could learn with more peers; four is fine but more would be better, like eight... learning a musical instrument with more classmates would be more enjoyable'. Child 3
	Facilitating peer interactions	'During break times, some musical games could be designed for us to play and interact with our friends'. Child 11
	Organising a group graduation performance at the end of the programme	'I think a mini concert could be organised at the end of the programme to group all the classes together and show the parents our learning achievements'. Child 6

96.9%) were high, indicating that the intervention is feasible for the focal underserved population. The high retention and attendance rates might be attributable to the positive perceptions of the intervention reported by both the children and their parents. In addition, the qualitative findings of the process evaluation revealed that the intervention was acceptable to both the children and their parents. Overall, the results suggested that the intervention effectively enhanced the resilience and improved the depressive symptoms, self-esteem, and QoL of children from low-income families. The findings are in line with the results of previous studies on the effects of music-based interventions in terms of improving psychological outcomes (da Silva Santa et al., 2021; Martin-Moratinos et al., 2023; Mayer-Benarous et al., 2021). Previous music-based interventions are mainly active or passive music therapy focusing on music listening or improvisation (da Silva Santa et al., 2021; Martin-Moratinos et al., 2023) but not instrumental musical training. This is the first study using the group-based instrumental musical training approach to improve the resilience and QoL of school-aged children from low-income families. Instrumental musical training in the current study was largely different from conventional music education as it emphasised the training on the rhyme, melody, harmony and timbre with

the use of any type of musical instrument. It is worth noting that the core components of resilience have been integrated into the programme to mobilise children's inner psychological resources and hence effectively enhance their levels of resilience. However, given the small sample size, the evidence obtained in the present pilot trial is preliminary in nature. To ascertain the effectiveness of the intervention, larger scale, fully powered studies are warranted. The present pilot trial provides estimates of the effect sizes for determination of the sample sizes in future studies.

The group-based instrumental musical training programme provided substantial benefits in terms of the resilience outcome (a large effect size of 0.80) for the underprivileged children after the 6-month intervention period. Unlike a typical instrumental music class that merely teaches basic musical skills, our programme incorporated core concepts of resilience, including reflective ability, self-confidence and social support. These core components of resilience may assist the underserved population in adapting positively to difficult circumstances—not only during the learning process but also in their daily lives. Qualitative feedback revealed that social bonding and support were established among the participants when learning music in a group format. It has been shown that social bonding and support are crucial elements in building resilience (Qi et al., 2022).

Our results further suggested that the programme was effective in reducing depressive symptoms and enhancing self-esteem among school-aged children from low-income families. Possible reasons for this are the protective effect of resilience on the psychological well-being of individuals experiencing adversity, including individuals exposed to poverty (De France et al., 2022). A previous systematic review found that higher levels of resilience were associated with fewer mental health problems, including depression and anxiety, among the paediatric population (Barry et al., 2013). There is growing evidence of the power of music to yield positive psychological outcomes (Dukić, 2018). Neuroscientific studies have shown that music acts as a potent stimulus in modulating activity in brain structures and the connectivity of the hippocampus and amygdala, which are involved in emotional processes (Dukić, 2018). Playing a musical instrument is an enjoyable yet highly complex experience, as it calls upon a range of sensory and motor skills and thereby activates different regions of the limbic system. Importantly, dopamine, a neurotransmitter that controls reward and pleasure centres in the brain, is released when a person engages in a musical activity, mediating positive mood changes and relaxation. Furthermore, as the process of learning a musical instrument is considered challenging by most children, children may gain a sense of achievement and control through the acquisition of necessary skills, ultimately enhancing their self-esteem. Overall, the intervention has the potential to attenuate the detrimental impacts of poverty on children's psychological well-being and thus improve their QoL.

Modifications could be made to the intervention design and content in response to the participants' qualitative recommendations. In a future trial, we may consider increasing the group size from 4 to 8–10 participants per group, facilitating more peer/group interactions by designing musical games during the break time of each session, and organising a group graduation performance at the end of the programme for the children to demonstrate their learning achievements to their parents and the public.

4.1 | Limitations

The present study has some limitations. First, although the participants were recruited from the district with the highest poverty rate in Hong Kong, the small samples and single-site recruitment may limit the generalisability of the study findings. Future studies could consider adopting a multi-centre approach to achieve larger sample size to ascertain the effectiveness of the intervention. Second, only the children's outcomes were assessed using self-reporting in this pilot trial, which may introduce response bias. Based on the qualitative findings, some of the parents experienced reduced parental distress and an improved parent–child relationship. Such outcomes could be assessed in a future trial to evaluate the effects of the instrumental musical training on family outcomes. Third, adopting a waitlist control group design may not identify the specific effectiveness of the group-based instrumental musical training. Hence, future studies should use an active control group that isolates the effects of the instrumental musical training. Another limitation is that it is unclear whether the intervention effect was determined by the choice of musical instrument, as the learning curves for some musical instruments are steeper than those for other instruments. We may consider standardising the musical instrument (i.e. using a single musical instrument) to account for instrument-type differences. Besides, we only explored the experiences and perceptions of the children and parents in the intervention. Interviewing the interveners would provide additional insights into the implementation and design of the intervention. Finally, follow-up was conducted immediately post-intervention (i.e. at 6-month follow-up), the longer term effects of the intervention was not evaluated in this pilot study. Future larger scale studies that examine the long-term and sustainability effect of the intervention are warranted.

4.2 | Practice implications

There is ample evidence that underprivileged children are highly vulnerable to developing mental health problems owing to the multidimensional nature of poverty. The findings of the present trial provide evidence that instrumental musical training promotes resilience and increases QoL within this underserved population. In addition, this trial provides guidance for the design of a fully powered randomised controlled trial. Most importantly, the findings of the trial may alert healthcare professionals, particularly nurses working in a primary care setting, to the immediate need to

advocate for and address the psychological needs of underprivileged children. This research can inform nurses of the positive effects of instrumental musical training in terms of improving the resilience, psychological well-being and QoL of this underserved population. Primary healthcare nurses, particularly community nurses, can play a pivotal role in meeting psychosocial needs by integrating such a music-based approach into community health services. Community nurses could actively make referrals and promote the programme to underprivileged families. Collaboration between healthcare professionals, non-governmental organisations and academics is required to increase the number of beneficiaries and facilitate the provision of community health services to underprivileged children. More resources and support should be offered to support the resilience and well-being of the underserved population.

5 | CONCLUSION

Overall, the group-based instrumental musical training appeared to be acceptable and feasible in terms of improving the resilience and psychological outcomes of Chinese school-aged children from low-income families. The intervention is a promising strategy for improving children's resilience, depressive symptoms, self-esteem and QoL. Further full-scale research is needed for rigorous empirical scrutiny of the effects of this innovative strategy.

AUTHOR CONTRIBUTIONS

Ankie Tan Cheung: Conceptualisation, Methodology, Data curation, Formal analysis, Funding acquisition, Investigation, Project administration, Writing—original draft. Laurie Long Kwan Ho: Methodology, Data curation, Formal analysis, Writing—review and editing. William Ho Cheung Li: Conceptualisation, Formal analysis, Resources, Writing—review and editing. Godfrey Chi Fung Chan: Supervision, Writing—review and editing. Kai Chow Choi: Methodology, Formal analysis, Writing—review and editing. Joyce Oi Kwan Chung: Conceptualisation, Supervision, Writing—review and editing. Carmen Yip Wing Han Chan: Conceptualisation, Supervision, Writing—review and editing.

CONFLICT OF INTEREST STATEMENT
None of the authors have any conflicts of interest to declare.

DATA AVAILABILITY STATEMENT
The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

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APPENDIX A

Intervention protocol

Types of musical instruments were assigned to the participants based on their preferences and capabilities will include keyboard, ukulele and guitar.

Week	Content	Objectives
1–4	Participants will play fundamental notes (e.g. Do, Re, Mi, Fa, So, La) by one hand	• Learn some basic knowledge about music • Increase the technical facility of participants, thus making them adept in executing accompaniment patterns by two hands
5–9	Participants will learn and practice rhythm	• Use the technique of hitting and pause to make a simple rhythm by musical instruments
10–14	Participants will play fundamental notes by two hands	• Play a simple melody by increasing the technical facility of participants' both hands
15–19	Participants will perform different musical phrases	• Play different musical phrases by both hands through extensive practice
20–24	Participants will combine different musical phrases, consequently playing a simple song by two hands	• Play a simple song by integrating the skills learned from previous training

Quality assurance mechanism

An advisory committee was set up to develop the intervention protocol to ensure the integrity of implementation and to determine the intervention dosage (in terms of frequency, duration and breadth) that would adequately assess the measured outcomes. To ensure treatment fidelity, an intervention protocol was developed and strictly adhered to. In addition, the musicians who provided the musical training were given log sheets to record the content of every session, which were sent to the research team for close monitoring and reviewing. Moreover, the research team provided ongoing monitoring and supervision to further ensure adherence to the protocol. In addition, monthly research team meetings were held to discuss and provide feedback on the musicians' adherence to the protocol.

APPENDIX B

An interview guide

(i) *Interview guide for children*

- What is your experience of participating in the musical training programme? Please describe.
- What do you think of this programme?
- Are you satisfied with the programme?
- Could you tell me about your changes (if any) after participating in this programme?
- What knowledge have you gained from our program? Why do you think so?
- How could the knowledge learnt from our program benefit you in your daily life? Why do you think so?
- Do you have any suggestions on how to improve this programme?

(ii) *Interview guide for parents*

- What do you think of this programme?
- Are you satisfied with the programme?
- Is it worth your child's time?
- If there any changes (e.g. on psychological well-being) in your child that you have observed following the programme?
- Do you have any suggestions for improvements to the programme?