

Cross-sectional and longitudinal associations between arts engagement, loneliness, and social support in adolescence

*Jessica K. Bone^a, Daisy Fancourt^a, Meg E. Fluharty^a, Elise Paul^a, Jill K. Sonke^b, Feifei Bu^a

a Research Department of Behavioural Science and Health, Institute of Epidemiology & Health, University College London, London, UK

b Center for Arts in Medicine, University of Florida, Gainesville, Florida, US

*Corresponding author

Address: Research Department of Behavioural Science and Health, 1-19 Torrington Place, London WC1E 7HB, UK

Email: jessica.bone@ucl.ac.uk

Abstract

Objective Although arts engagement holds promise for reducing loneliness and enhancing social support, previous research has focussed on older adults. We investigated whether arts engagement was associated with loneliness and social support during adolescence.

Method We included 11,060 adolescents aged 11-21 years from the National Longitudinal Study of Adolescent to Adult Health. The number of school-based arts activities engaged in (band, book club, chorus/choir, cheerleading/dance, drama club, newspaper, orchestra) was measured at wave one (1994-1995) and loneliness and perceived social support were measured at waves one and two (1996). We used logistic and linear regression to test whether engagement was associated with concurrent and subsequent loneliness and social support.

Results Arts engagement was not associated with concurrent or subsequent loneliness. In contrast, each additional arts activity engaged in was associated with an increase of 0.20 points in social support, concurrently (coef=0.20, 95% CI=0.02-0.38, p=0.03) and longitudinally (coef=0.20, 95% CI=0.02-0.38, p=0.03), independent of confounders. However, evidence for the longitudinal association was attenuated after adjusting for previous social support (coef=0.08, 95% CI=-0.07-0.23, p=0.30). This was likely due to the consistency of social support scores between waves one and two.

Conclusion Extracurricular arts activities are associated with higher social support, which may be because they provide opportunities for social engagement, developing friendships, and building a sense of community. However, given the lack of association with changes in social support over time, exploring these associations in more detail should be a priority, enabling better understanding of this strategy for enhancing social ties during adolescence.

Keywords loneliness, social support, arts, culture, extracurricular activities

Introduction

The importance of social relationships for health is widely recognised, with both loneliness and social support a key focus of research. Loneliness is a subjective negative feeling arising from a mismatch between a person's desired level of meaningful social relationships and what they perceive they actually have.¹ It is distinct from, but strongly related to, perceived social support. Perceived social support refers to beliefs about the quantity and quality of support that is potentially available from a person's relationships and social contacts.² Although they are related, social support offers a more positive framing than the problem-focussed language of loneliness and may provide an easier target for interventions to improve social outcomes.³⁻⁵

Adolescents and young adults are at particular risk of feeling lonely and lacking social support.⁶⁻⁸ During adolescence, the period of physical, psychological, and social transition between childhood and adulthood, individuals spend increasing amounts of time with their peers and become more dependent on peers for social support.⁹⁻¹¹ The quality of one's social ties is therefore a particularly important risk factor for the development of health problems in adolescence.¹²⁻¹⁴ Loneliness and lack of social support are associated with higher rates of depression and anxiety, social withdrawal, suicidal ideation and attempts, metabolic risk factors related to cardiovascular disease, and poorer general health both during adolescence and into adulthood.¹⁵⁻¹⁸

Extracurricular arts activities (e.g., dance, drama, music, and book clubs) present a potential strategy for reducing loneliness and enhancing social support during adolescence. The United Kingdom (UK) government's strategy for reducing loneliness emphasised the importance of the arts, museums, and creativity to help people become more connected.¹⁹ Artistic and creative activities may provide opportunities for safe social interactions and addressing maladaptive cognitions, which are the most effective elements of interventions targeting loneliness.^{20,21} In a large qualitative study of adults who engaged in the arts, 82% reported that arts engagement helped them feel connected to other people at least some of the time.²² Arts engagement can also lead to increases in social wellbeing, as well as chances to form new relationships and social identities and increase self-esteem, empathy, and motivation.^{23,24}

Although arts engagement holds promise for reducing loneliness and enhancing social support during adolescence, most research to date has focussed on older adults (aged 50 and above). Reviews have identified that participatory arts interventions can reduce loneliness and social isolation in older adults.^{25,26} For example, choir groups, making music, and creative arts and crafts programmes can decrease loneliness, facilitate new social relationships, and increase perceptions of closeness among participants.²⁷⁻³⁰ There is also evidence that more frequent receptive arts engagement (experiencing the arts as a listener, audience member, or visitor, e.g., going to the theatre, concerts, museums, galleries, and the cinema) is associated with lower odds of loneliness, both cross-sectionally and ten years later.³¹ Another observational study, which included adults of all ages in the UK but tested only cross-sectional associations, found evidence that more receptive engagement was associated with less loneliness and more social support.³² In contrast, participatory arts activities (actively creating and participating in the arts, e.g., reading, painting, singing, and dancing) were not consistently associated with loneliness or social support.³²

To our knowledge, no studies have yet investigated whether engaging in extracurricular arts activities is associated with loneliness and social support during adolescence. Extracurricular arts activities are participatory, and generally do not include receptive arts engagement. There is some evidence that extracurricular activities help adolescents to develop new friendships, and arts activities (compared to sports or academic activities) may be most likely to lead to friendships.³³ For young adults, music, recreational dance, and theatre groups can promote social connectedness and

improve peer relationships.³⁴⁻³⁷ However, this evidence is mainly from small intervention studies that are prone to self-selection bias, often focus on specific diagnostic groups, only have short follow-up periods, and do not randomise participants or account for previous levels of social connectedness.

In this study, we aimed to investigate whether engagement in extracurricular arts activities (band, book club, chorus/choir, cheerleading/dance, drama club, newspaper, and orchestra) was associated with concurrent and subsequent loneliness and social support during adolescence. We included adolescents aged 11 to 21 years from the National Longitudinal Study of Adolescent to Adult Health (Add Health).³⁸ We hypothesised that engagement in more extracurricular activities would be associated with lower odds of loneliness and higher levels of social support, both concurrently and one year later.

Methods

Sample

Participants were drawn from the National Longitudinal Study of Adolescent to Adult Health (Add Health). Add Health is a longitudinal study that includes a nationally representative sample of adolescents who were in grades 7-12 (aged 12-18 years) during the 1994-1995 school year and have been followed for five waves.³⁸ The Add Health restricted-use school, in-home, and parental data were used for this study. Participants who completed waves one (1994-1995) and two (1996) of Add Health were eligible for inclusion; arts engagement, loneliness, and social support were measured only in these waves. A total of 13,568 adolescents completed interviews at waves one and two, 11,923 of whom also had complete parental data at wave one.³⁹ We then limited our sample to those with complete data on loneliness and social support at both waves one and two, resulting in a final sample of 11,060 adolescents.

Arts engagement

Engagement in 33 school-based extracurricular arts activities was measured at wave one. From this list of questions, we selected all items that were related to the arts, resulting in a total of seven activities. In these questions, adolescents were asked whether they were participating, or planned to participate, in any of the following clubs, organizations, or teams at school: band; book club; chorus/choir; cheerleading/dance; drama club; newspaper; or orchestra (all answered yes, no). We created a sum score of the total number of extracurricular arts activities engaged in, with higher scores indicating more arts engagement (range 0-7).

Outcomes

Loneliness was measured at waves one and two with one question "How often was the following true during the past week? You felt lonely." Response options were never or rarely, sometimes, a lot of the time, and most or all of the time. A binary indicator of loneliness was created by collapsing responses into not lonely (never or rarely) versus lonely (sometimes, a lot of the time, most or all of the time).

Social support was measured at waves one and two with eight questions developed for Add Health. Adolescents were asked how much they felt that adults and their teachers, parents, and friends cared about them. They were also asked how much they felt that: people in their family understood them, they wanted to leave home, they had fun together with their family, and their family pays attention to them. Response options were not at all, very little, somewhat, quite a bit, and very much. One item (wanting to leave home) was reverse coded, and a summary variable was created, describing the overall level of perceived social support. Higher scores indicate more social support (range 8-40).

Covariates

A range of sociodemographic and health-related factors, measured at wave one, were included as covariates. *Adolescent-reported covariates* were age (years), gender (male, female), race/ethnicity (White, Black/African American, Asian/Pacific Islander, Other [including Hispanic, American Indian/Native American, and Other]), first language spoken at home (English, non-English), and how often a health or emotional problem caused them to miss a social or recreational activity (never, a few times, once a week or more). *Parent-reported covariates* were highest level of parental education (less than high school, high school, some college, college graduate), parental marital status (married, unmarried [including divorced, separated, widowed, and never married]) and household income (quartiles: \$0-\$20,000, \$21,000-\$38,000, \$39,000-\$60,000, >\$60,000). Finally, *interviewers reported* the urbanicity of adolescents' home location (urban, suburban, rural).

Statistical analyses

We first investigated whether arts engagement was associated with concurrent loneliness and social support. We tested the association between arts engagement (exposure) and loneliness (binary outcome) measured simultaneously at wave one in a logistic regression model. We present this model before and after adjustment for covariates. We then repeated these analyses for our second outcome, social support, using linear regression models.

Next, we tested whether arts engagement was associated with subsequent loneliness and social support, measured at wave two. We first tested whether arts engagement at wave one was associated with loneliness at wave two, then adjusted this model for covariates, and finally additionally adjusted for loneliness at wave one. Adjusting longitudinal models for loneliness measured at wave one considers that loneliness at follow-up is not only related to arts engagement, but also to previous loneliness. The fully adjusted longitudinal models thus estimate the association between arts engagement and change in loneliness one year later. We then repeated this approach for social support. As in concurrent analyses, we used logistic regression for loneliness and linear regression for social support. All analyses were weighted to account for the complex survey design, non-response, and clustering of participants within schools.

For participants with missing data on arts engagement or covariates, we imputed data using multiple imputation by chained equations (MICE).⁴⁰ We used linear, logistic, ordinal, and multinomial regression and predictive mean matching according to variable type, generating 30 imputed data sets (maximum missing data 23%; Table S1). The imputation model included all variables used in analyses, auxiliary variables, and the survey weights. Auxiliary variables were grade and participants' rating of their general health. All variables were successfully imputed. The results of analyses did not vary between complete cases and imputed data sets (Table S2-S4), so findings from the imputed data are reported. All analyses were performed using Stata 16.⁴¹

Sensitivity analyses

To ensure creating a binary outcome did not obscure any associations between arts engagement and the frequency of feeling lonely, we performed a sensitivity analysis with the original categorical measure of loneliness. We tested the association between arts engagement and loneliness frequency (never or rarely, sometimes, a lot of the time, most or all of the time) using ordinal logistic regression.

Given that the total number of extracurricular arts activities engaged in was positively skewed, we performed a sensitivity analysis using a binary indicator of arts engagement. We tested whether engaging in one in more extracurricular arts activities (compared to none) was associated with

loneliness and social support, using logistic and linear regression models respectively, both concurrently and longitudinally.

Finally, we performed another sensitivity analysis investigating whether the associations between engaging in extracurricular arts activities, loneliness, and social support held after adjusting for engagement in other (non-arts) extracurricular activities. To do this, we used engagement in the 26 other activities measured in Add Health, including language clubs (e.g., French, German), academic clubs (e.g., history, math), sports clubs (e.g., football, track), and other clubs and societies (e.g., student council). To avoid multicollinearity between measures, we used two binary variables: engagement in extracurricular arts activities (yes, no), engagement in other (non-arts) extracurricular activities (yes, no). We included both variables in the same models, testing associations with loneliness and social support concurrently and longitudinally. For each sensitivity analysis, we generated another 30 imputed data sets including all relevant variables with MICE.

Results

After weighting of the 11,060 participants, 50% were female and 75% were White, whereas 15% were Black/African American, 3% were Asian/Pacific Islander, and 7% were of other races/ethnicities (including Hispanic, American Indian/Native American, and Other; Table 1). The mean (M) age was 14.94 years (standard deviation [SD]=1.57, range=11-21) at wave one, and 15.80 years (SD=1.59, range=11-21) at wave two. On average, adolescents engaged in 0.50 (SD=0.80, range=0-7) extracurricular arts activities. At both waves one and two, 33% of adolescents reported feeling lonely. At wave one, social support scores range from 11 to 40, with an average of 32.43 (SD=4.59; Figure S1). This remained similar at wave two (range=9-40, M=32.17, SD=4.72). Although there was evidence that perceived social support decreased across waves, the difference was small (mean difference=-0.26, 95% confidence interval [CI]=-0.39 to -0.12, $p<0.001$).

Concurrent associations

There was no evidence that arts engagement was associated with concurrent loneliness, before or after adjusting for confounders (Table 2). In contrast, there was evidence that arts engagement was positively associated with concurrent social support even after adjusting for confounders (Table 3). In the adjusted model, each additional arts activity engaged in was associated with an increase of 0.20 points (95% CI=0.02-0.38, $p=0.03$) in social support.

Longitudinal associations

As in the concurrent models, there was no evidence that arts engagement was associated with subsequent loneliness (Table 2). Also similar to the concurrent model, each additional arts activity engaged in was associated with a 0.31 point (95% CI=0.14-0.48, $p=0.001$; Table 3) increase in subsequent social support before adjusting for confounders. Although it was attenuated, there was still evidence for this association after adjustment for confounders (coefficient [coef]=0.20, 95% CI=0.02-0.38, $p=0.03$). However, after additionally adjusting for social support at wave one, there was no evidence for an association between arts engagement and subsequent social support (coef=0.08, 95% CI=-0.07-0.23, $p=0.30$).

Sensitivity analyses

At wave one, 67% of adolescents never or rarely felt lonely, 26% sometimes, 5% a lot of the time, and 2% felt lonely most or all of the time. Using the frequency of feeling lonely as the outcome, there was no evidence for an association between arts engagement and concurrent or subsequent loneliness, before or after adjusting for confounders and previous loneliness (fully adjusted longitudinal coef=0.99, 95% CI=0.91-1.08, $p=0.88$; Table S5).

Overall, 37% of adolescents reported engaging in an extracurricular arts activity. Repeating analyses using this binary exposure did not alter our findings. There was no evidence that engagement was associated with loneliness (Table S6). However, compared to not engaging, arts engagement was associated with higher social support both concurrently (adjusted coef=0.44, 95% CI=0.14-0.75, $p=0.01$; Table S7) and longitudinally (adjusted coef=0.43, 95% CI=0.11-0.75, $p=0.01$). As in the main analyses, this longitudinal association was attenuated after additionally adjusting for previous social support (coef=0.17, 95% CI=-0.08-0.43, $p=0.19$).

In total, 71% of adolescents reported engaging in a non-arts extracurricular activity. Engaging in these extracurricular activities was associated with lower odds of both concurrent (adjusted odds ratio [OR]=0.76, 95% CI=0.65-0.88, $p<0.001$; Table S8) and subsequent loneliness (adjusted OR=0.83, 95% CI=0.72-0.97, $p=0.02$). However, after additionally adjusting for loneliness at wave one, there was no evidence for an association between non-arts extracurricular engagement and subsequent loneliness (OR=0.89, 95% CI=0.76-1.05, $p=0.15$). In these models, there was still no evidence for an association between arts engagement and loneliness (Table S8). In contrast, engaging in both arts and non-arts extracurricular activities was associated with concurrent and subsequent social support (Table S9). Associations with arts engagement were very similar to the main analyses despite also including other (non-arts) extracurricular activities in the same model. As in the main analyses, there was no evidence for an association between arts engagement and subsequent social support after adjusting for wave one social support (coef=0.14, 95% CI=-0.12-0.40, $p=0.28$). However, the association between engagement in non-arts activities and subsequent social support survived adjustment for previous social support (coef=0.37, 95% CI=0.07-0.67, $p=0.02$).

Discussion

Using data from a large nationally representative longitudinal study, we explored whether extracurricular arts activities engagement was associated with loneliness and social support during adolescence. We found no evidence that arts engagement (in the form of band, book club, chorus/choir, cheerleading/dance, drama club, newspaper, or orchestra) was associated with loneliness measured concurrently or one year later. In contrast, engagement in more extracurricular arts activities was associated with higher levels of social support, both concurrently and one year later. This association was independent of a range of sociodemographic and health-related potential confounders. However, after adjusting for previous levels of social support, there was no longer evidence for this association. These findings were robust to a range of sensitivity analyses, including accounting for engagement in other (non-arts) extracurricular activities. This suggests that engagement in the arts is associated with higher levels of social support, regardless of whether adolescents are doing other extracurricular activities or not.

The lack of evidence for an association with loneliness is in contrast to previous research showing that participatory arts interventions can reduce loneliness in older adults.^{25,26} This could be a result of differences in the causes and subjective experience of loneliness between older adults and adolescents.⁸ However, it could also be due to limitations of the loneliness measure available in Add Health. Although assessing loneliness with a single item has previously been recommended for use in surveys,¹⁹ it is possible that this was not a sufficient measure of loneliness to detect associations with arts engagement. Loneliness is often divided into two components, emotional and social loneliness. Emotional loneliness results from the lack of a close emotional attachment or intimate relationship, such as a partner or best friend, whereas social loneliness results from the lack of an engaging social network or broader group of contacts, such as friends, peers, and neighbours.⁴² As arts activities are more likely to provide access to a group of peers than a partner or best friend for most young people, they may only reduce social loneliness, and not emotional loneliness. In a previous study in adults, participatory arts engagement was associated with lower social loneliness

but also higher emotional loneliness.³² This may not be apparent when using a measure that does not distinguish between these two subtypes of loneliness. In a sensitivity analysis, we found preliminary evidence that engaging in other (non-arts) extracurricular activities was associated with less loneliness. Why participation in a broad range of clubs (from academic to sports), but not arts activities, is associated with loneliness requires further investigation. Additionally, given that receptive arts engagement is more strongly associated with loneliness than participatory arts engagement in adults,^{31,32} future research should also examine the potential of receptive arts engagement to reduce loneliness in young people.

In this study, engagement in more extracurricular arts activities was associated with higher levels of concurrent social support. We also found some evidence that engagement in more extracurricular arts activities was associated with higher levels of social support one year later, although this longitudinal association was not independent of previous levels of social support. This is not surprising given the consistency of social support scores between waves one and two. The longitudinal association looked for a change in social support over one year, but little change was apparent in this time, let alone in association with arts engagement. Despite this, in sensitivity analyses, doing other (non-arts) extracurricular activities was associated with a smaller decrease in social support over time compared to not doing any activities. Most adolescents participated in at least one extracurricular activity, so it is possible that not participating in any activities (whether artistic or not) is particularly detrimental to perceived social support. Our findings contrast with previous research, which suggested that arts activities are more likely to lead to new friendships than sports or academic clubs because they are less competitive and appeal to a lower status group, allowing stronger friendships to form.³³

Despite the inconsistent longitudinal association, there is a theoretical rationale for why extracurricular arts activities could increase social support. They provide opportunities to connect with others, improve both quantity and quality of social relationships, develop social skills, increase social engagement, and build group cohesion, a sense of community, and a shared purpose.²³ Adults have previously reported that activities such as reading, book clubs, playing an instrument or singing, and dance made them feel connected to others.²² Specifically in young adults, music, recreational dance, and theatre group interventions promote social connectedness and improve relationships.^{34–37} Given the finding that arts engagement was associated with social support, even if not with a change in social support over time, encouraging adolescents to participate in school-based extracurricular arts activities as part of their everyday lives may be important. Future intervention studies are recommended to ascertain if arts activities can causally change social support over time.

It is possible that the nature of our measure of social support in this study, which focussed mainly on perceived social support from family, influenced our findings. For adolescents, participation in extracurricular arts activities may be determined by their family environment. In line with this, young people's engagement in arts activities is related to their family's socioeconomic status.⁴³ Although we adjusted for a range of sociodemographic factors to account for this social gradient in engagement, familial social support may independently influence engagement in extracurricular activities. More support within families, including both material resources (e.g., funding, transport) and non-material resources (e.g., advice, emotional support), may encourage adolescents to engage in extracurricular activities. In line with this, there is evidence that parental social support is associated with increased positive health behaviours,¹⁸ of which arts engagement is one example. The focus on perceived social support from family sources may also explain why we found evidence for an association between arts engagement and social support but not loneliness. In young adults, social support from friends is more strongly associated with loneliness than social support from family.⁴⁴ As peers become more important sources of support during adolescence,^{9,14} further

research is needed on the association between engagement in the arts and perceived social support from friends.

This study has several strengths. We used data from Add Health, a nationally representative longitudinal study with a rich data on arts engagement and covariates, meaning that we could include sociodemographic and health-related factors that are likely to confound the association between arts engagement, loneliness, and social support. We included two distinct outcomes, assessing different aspects of social networks. Future research could extend this work by considering further social outcomes that affect health, including social influence and access to resources.⁴⁵ Additionally, in our analyses, we were able to cluster participants within schools, accounting for the fact that adolescents within schools are more similar to each other than to adolescents at other schools, due to historic and contemporary neighbourhood and school segregation in the US.

However, this study also has some limitations. We were limited by the measures of art engagement, loneliness, and social support in Add Health, which could have been more detailed. We could not distinguish adolescents who were currently participating in extracurricular arts activities from those who planned to participate. This could be why we found no association between engagement and loneliness. Additionally, as these measures were only included in waves one and two, we could not use more sophisticated analytic approaches such as growth curve models. Future research should investigate the developmental trajectories of arts engagement, loneliness, and social support in more detail. Although Add Health included a nationally representative sample of the target population (1994-1995 grades 7-11), this sample is no longer representative of the US population.⁴⁶ Our findings should thus be replicated with more recent data, although this is challenging due to the lack of current data on arts and cultural engagement in representative cohorts. It is possible that other characteristics influence extracurricular arts engagement, loneliness, and social support, as there is a social gradient in all these factors.^{43,47,48} Although we have adjusted for a wide range of sociodemographic factors, it remains possible that the influence of arts engagement is due to self-selection or residual confounding. We have suggested that the lack of evidence for a longitudinal association between arts engagement and social support after accounting for previous social support was due to the lack of variation in social support scores between waves one and two. However, the initial association could instead be a result of reverse causation, with higher levels of social support leading participants to engage in more arts activities.

Future research should examine whether the association between arts engagement and social support differs according to age, gender, ethnicity, and other factors that may increase adolescents' risk of low social support. We recognize that we used an overly simple race/ethnicity variable (White, Black, Asian/Pacific Islander, Other) due to small numbers in non-White groups. This approach conflates experiences across diverse racial/ethnic groups, which might be particularly problematic as these groups may not have equal access to arts resources.⁴⁹ Future research must use more diverse samples and collect detailed data on race/ethnicity, while considering the potential influence of structural racism on loneliness and perceived social support.

Conclusion

Overall, we found no evidence that engagement in extracurricular arts activities was associated with loneliness during adolescence. In contrast, engagement in more extracurricular arts activities was associated with higher levels of social support, both concurrently and one year later, independent of participation in other extracurricular activities. However, there was no longer evidence for the longitudinal association after accounting for previous levels of social support. Given that adolescents are at particular risk of feeling lonely and lacking social support, and loneliness and lack of social support are associated with a range of negative outcomes, identifying ways to reduce loneliness and

enhance social support at a population level is particularly important. Despite the lack of consistent evidence for the effectiveness of extracurricular arts activities in this study, there are well-established benefits of arts engagement for health,⁵⁰ with much evidence that these may benefits may occur, at least partially, through social processes.²³ A key priority should thus be to explore the associations between arts engagement, loneliness, and social support in more detail, enabling better understanding of this potential strategy for reducing loneliness and enhancing social support during adolescence.

Declarations

Acknowledgements

We thank Shanae Burch, thought leader on work at the intersections of the arts, equity, and public health in the US, for her comments on this manuscript. We also gratefully acknowledge the contribution of the Add Health study participants.

Funding

The EpiArts Lab, a National Endowment for the Arts Research Lab at the University of Florida, is supported in part by an award from the National Endowment for the Arts (1862896-38-C-20). The opinions expressed are those of the authors and do not represent the views of the National Endowment for the Arts Office of Research & Analysis or the National Endowment for the Arts. The National Endowment for the Arts does not guarantee the accuracy or completeness of the information included in this material and is not responsible for any consequences of its use. The EpiArts Lab is also supported by the University of Florida, the Pabst Steinmetz Foundation, and Bloomberg Philanthropies. This work was also supported by an award from Arts Council England (INVF-00404365). DF is supported by the Wellcome Trust (205407/Z/16/Z).

Author contributions

JKB, FB, MEF, and EP designed the study. JKB conducted the analysis and drafted the manuscript. JKB, FB, MEF, EP, JKS, and DF contributed to the writing, made critical revisions, and approved the final manuscript.

Declaration of interest

No authors report any conflicts of interest.

References

1. Peplau LA, Perlman D. Perspectives on Loneliness. *Loneliness: A Sourcebook of Current Theory, Research and Therapy*. Published online 1982:1-18. doi:10.2307/2068915
2. Hupcey JE. Clarifying the social support theory-research linkage. *Journal of Advanced Nursing*. 1998;27(6):1231-1241. doi:10.1046/j.1365-2648.1998.01231.x
3. Cohen S. Social relationships and health. *American Psychologist*. 2004;59:676–684.
4. Morgan T, Wiles J, Park HJ, et al. Social connectedness: What matters to older people? *Ageing and Society*. 2021;41(5):1126-1144. doi:10.1017/S0144686X1900165X
5. O'Rourke HM, Sidani S. *Definition, Determinants, and Outcomes of Social Connectedness for Older Adults: A Scoping Review*. Vol 43.; 2017. doi:10.3928/00989134-20170223-03
6. Pyle E, Evans D. *Loneliness - What Characteristics and Circumstances Are Associated with Feeling Lonely? - Office for National Statistics.*; 2018.
7. Lim MH, Eres R, Vasani S. Understanding loneliness in the twenty-first century: an update on correlates, risk factors, and potential solutions. *Social Psychiatry and Psychiatric Epidemiology*. 2020;55(7):793-810. doi:10.1007/s00127-020-01889-7

8. Luhmann M, Hawkey LC. Age Differences in Loneliness from Late Adolescence to Oldest Old Age. *Developmental Psychology*. 2016;52(6):943-959. doi:10.1037/dev0000117
9. O'Brien SF, Bierman KL. Conceptions and Perceived Influence of Peer Groups: Interviews with Preadolescents. *Child Development*. 1988;59(5):1360-1365.
10. Lam CB, McHale SM, Crouter AC. Time with peers from middle childhood to late adolescence: Developmental course and adjustment correlates. *Child Development*. 2014;85(4):1677-1693. doi:10.1111/cdev.12235
11. Steinberg L, Silverberg SB. The Vicissitudes of Autonomy in Early Adolescence. *Child Development*. 1986;57(4):841-851.
12. Giordano PC. Relationships in adolescence. *Annual Review of Sociology*. 2003;29:257-281. doi:10.1146/annurev.soc.29.010202.100047
13. Resnick MD, Bearman PS, Blum RW, et al. Protecting Adolescents From Harm: Findings From the National Longitudinal Study on Adolescent Health. *JAMA*. 1997;278(10):823-832.
14. Tomova L, Andrews JL, Blakemore SJ. The importance of belonging and the avoidance of social risk taking in adolescence. *Developmental Review*. 2021;61(November 2020). doi:10.1016/j.dr.2021.100981
15. Goosby BJ, Bellatorre A, Walsemann KM, Cheadle JE. Adolescent loneliness and health in early adulthood. *Sociological Inquiry*. 2013;83(4):505-536. doi:10.1111/soin.12018
16. Chu P Sen, Saucier DA, Hafner E. Meta-analysis of the relationships between social support and well-being in children and adolescents. *Journal of Social and Clinical Psychology*. 2010;29(6):624-645. doi:10.1521/jscp.2010.29.6.624
17. Jakobsen AL, Hansen CD, Andersen JH. The association between perceived social support in adolescence and positive mental health outcomes in early adulthood: a prospective cohort study. *Scandinavian Journal of Public Health*. 2021;(September 2020):1-8. doi:10.1177/1403494821993718
18. Vilhjalmsson R. Effects of social support on self-assessed health in adolescence. *Journal of Youth and Adolescence*. 1994;23(4):437-452. doi:10.1007/BF01538038
19. Department for Digital Culture Media and Sport. A connected society: A strategy for tackling loneliness. *HM Government Strategy*. Published online 2018:84.
20. Mann F, Bone JK, Lloyd-Evans B, et al. A life less lonely: the state of the art in interventions to reduce loneliness in people with mental health problems. *Social Psychiatry and Psychiatric Epidemiology*. 2017;52:627-638. doi:10.1007/s00127-017-1392-y
21. Masi, C.M., Chen, H.Y., Hawkey, L.C., Cacioppo JT. A Meta Analysis of Interventions to Reduce Loneliness. 2013;15(3). doi:10.1177/1088868310377394.A
22. Perkins R, Mason-bertrand A, Tymoszuk U, Spiro N, Gee K, Williamon A. Arts engagement supports social connectedness in adulthood : findings from the HEartS Survey. *BMC Public Health*. 2021;21(1208):1-15.
23. Fancourt D, Aughterson H, Finn S, Walker E, Steptoe A. How leisure activities affect health: A review and multi-level theoretical framework of mechanisms of action using the lens of complex adaptive systems science. *The Lancet Psychiatry*. Published online 2021. [https://doi.org/10.1016/S2215-0366\(20\)30384-9](https://doi.org/10.1016/S2215-0366(20)30384-9)
24. Kou X, Konrath S, Goldstein TR. The relationship among different types of arts engagement, empathy, and prosocial behavior. *Psychology of Aesthetics, Creativity, and the Arts*. 2020;14(4):481-492. doi:10.1037/aca0000269
25. Cutler D. *Tackling Loneliness in Older Age - The Role of the Arts.*; 2012.
26. Dadswell A, Wilson C, Bungay H, Munn-Giddings C. The role of participatory arts in addressing the loneliness and social isolation of older people: A conceptual review of the literature. *Journal of Arts & Communities*. 2017;9(2):109-128. doi:10.1386/jaac.9.2.109_1
27. Cohen GD, Perlstein S, Chapline J, Kelly J, Firth KM, Simmens S. The impact of professionally conducted cultural programs on the physical health, mental health, and social functioning of

- older adults—2-year results. *Journal of Aging, Humanities, and the Arts*. 2007;1(1-2):5-22. doi:10.1080/19325610701410791
28. Gutheil IA, Heyman JC. Older Adults and Creative Arts: Personal and Interpersonal Change. *Activities, Adaptation and Aging*. 2016;40(3):169-179. doi:10.1080/01924788.2016.1194030
 29. Perkins R, Williamon A. Learning to make music in older adulthood: A mixed-methods exploration of impacts on wellbeing. *Psychology of Music*. 2014;42(4):550-567. doi:10.1177/0305735613483668
 30. Skingley A, Martin A, Clift S. The Contribution of Community Singing Groups to the Well-Being of Older People: Participant Perspectives from the United Kingdom. *Journal of Applied Gerontology*. 2016;35(12):1302-1324. doi:10.1177/0733464815577141
 31. Tymoszuk U, Perkins R, Fancourt D, Williamon A. Cross-sectional and longitudinal associations between receptive arts engagement and loneliness among older adults. *Social Psychiatry and Psychiatric Epidemiology*. 2020;55(7):891-900. doi:10.1007/s00127-019-01764-0
 32. Tymoszuk U, Spiro N, Perkins R, Mason-Bertrand A, Gee K, Williamon A. Arts engagement trends in the UK and their mental and social wellbeing implications: HEartS Survey. *Plos One*. 2021;16(3):e0246078. doi:10.1371/journal.pone.0246078
 33. Schaefer DR, Simpkins SD, Vest AE, Price CD. The Contribution of Extracurricular Activities to Adolescent Friendships: New Insights Through Social Network Analysis. *Developmental Psychology*. 2011;47(4):1141-1152. doi:10.1037/a0024091
 34. Papinczak ZE, Dingle GA, Stoyanov SR, Hides L, Zelenko O. Young people's uses of music for well-being. *Journal of Youth Studies*. 2015;18(9):1119-1134. doi:10.1080/13676261.2015.1020935
 35. Gardner SM, Komesaroff P, Fensham R. Dancing beyond exercise: Young people's experiences in dance classes. *Journal of Youth Studies*. 2008;11(6):701-709. doi:10.1080/13676260802393294
 36. Koch SC, Mehl L, Sobanski E, Sieber M, Fuchs T. Fixing the mirrors: A feasibility study of the effects of dance movement therapy on young adults with autism spectrum disorder. *Autism*. 2015;19(3):338-350. doi:10.1177/1362361314522353
 37. Bradley BS, Deighton J, Selby J. The "Voices" Project: Capacity-building in Community Development for Youth at Risk. *Journal of Health Psychology*. 2004;9(2):197-212. doi:10.1177/1359105304040887
 38. Harris KM, Halpern CT, Whitsel E, et al. *The National Longitudinal Study of Adolescent to Adult Health: Research Design*.; 2009.
 39. Chen P, Mullan Harris K. *Guidelines for Analyzing Add Health Data*.; 2020. doi:10.17615/C6BW8W
 40. White IR, Royston P, Wood AM. Multiple imputation using chained equations: Issues and guidance for practice. *Statistics in Medicine*. 2011;30(4):377-399. doi:10.1002/sim.4067
 41. StataCorp. Stata Statistical Software: Release 16. Published online 2019.
 42. Weiss RS. *Loneliness: The Experience of Emotional and Social Isolation*. MIT Press; 1973.
 43. Mak HW, Fancourt D. Do socio-demographic factors predict children's engagement in arts and culture? Comparisons of in-school and out-of-school participation in the Taking Part Survey. *Plos One*. 2021;16(2):e0246936. doi:10.1371/journal.pone.0246936
 44. Lee CYS, Goldstein SE. Loneliness, Stress, and Social Support in Young Adulthood: Does the Source of Support Matter? *Journal of Youth and Adolescence*. 2016;45(3):568-580. doi:10.1007/s10964-015-0395-9
 45. Berkman LF, Glass T, Brissette I, Seeman TE. From social integration to health: Durkheim in the new millennium. *Social Science and Medicine*. 2000;51(6):843-857. doi:10.1016/S0277-9536(00)00065-4
 46. US Census Bureau. US Population. Published 2021. Accessed August 13, 2021. <https://www.census.gov/topics/population.html>

47. Madsen KR, Holstein BE, Damsgaard MT, Rayce SB, Jespersen LN, Due P. Trends in social inequality in loneliness among adolescents 1991-2014. *Journal of Public Health (United Kingdom)*. 2019;41(2):E133-E140. doi:10.1093/pubmed/fdy133
48. Gayman MD, Turner RJ, Cislo AM, Eliassen AH. Early adolescent family experiences and perceived social support in young adulthood. *Journal of Early Adolescence*. 2011;31(6):880-908. doi:10.1177/0272431610376247
49. Bone JK, Bu F, Fluharty ME, Paul E, Sonke JE, Fancourt D. Who engages in the arts in the United States? A comparison of several types of engagement using data from the General Social Survey. *BMC Public Health*. 2021;21:1349. doi:10.1186/s12889-021-11263-0
50. Fancourt D, Warran K, Aughterson H. *Evidence Summary for Policy: The Role of the Arts in Improving Health & Wellbeing.*; 2020.

Tables and figures

Table 1. Sociodemographic characteristics of the sample at wave one.

	Overall sample
Mean (SD)	
Age (years)	14.94 (1.57)
Percentage	
Gender	
Male	50%
Female	50%
Race/ethnicity	
White	75%
Black/African American	15%
Asian/Pacific Islander	3%
Other	7%
First language	
English	94%
Non-English	6%
Urbanicity	
Urban	32%
Suburban	39%
Rural	29%
Missed activity due to health	
Never	76%
A few times	22%
Once a week or more	2%
Parental education	
Less than high school	15%
High school	33%
Some college	30%
College graduate	22%
Household income (quartiles)	
\$0-\$20,000	25%
\$21,000-\$38,000	25%
\$39,000-\$60,000	29%
\$61,000+	21%
Parental marital status	
Married	72%
Unmarried	28%

Note. n=11,060. Results weighted and based on 30 multiply imputed data sets. SD: standard deviation.

Table 2. Logistic regression models testing associations between number of extracurricular arts activities engaged in and concurrent and subsequent loneliness.

Loneliness	Odds ratio	95% CI	p value
Concurrent			
Unadjusted	1.00	0.92-1.07	0.904
Adjusted ^a	0.94	0.86-1.02	0.152
Longitudinal			
Unadjusted	1.01	0.94-1.08	0.814
Adjusted ^a	0.98	0.91-1.06	0.603
Additionally adjusted ^b	1.00	0.92-1.08	0.944

Note. n=11,060. Results weighted and based on 30 multiply imputed data sets. 95% CI: 95% confidence interval. a: models adjusted for age, gender, race/ethnicity, first language, urbanicity, missed activity due to health, parental education, parental marital status, and household income. b: model additionally adjusted for loneliness at wave one.

Table 3. Linear regression models testing associations between number of extracurricular arts activities engaged in and concurrent and subsequent perceived social support.

Social support	Coefficient	95% CI	p value
Concurrent			
Unadjusted	0.32	0.15-0.49	<0.001
Adjusted ^a	0.20	0.02-0.38	0.030
Longitudinal			
Unadjusted	0.31	0.14-0.48	0.001
Adjusted ^a	0.20	0.02-0.38	0.029
Additionally adjusted ^b	0.08	-0.07-0.23	0.300

Note. n=11,060. Results weighted and based on 30 multiply imputed data sets. 95% CI: 95% confidence interval. a: models adjusted for age, gender, race/ethnicity, first language, urbanicity, missed activity due to health, parental education, parental marital status, and household income. b: model additionally adjusted for social support at wave one.