Mitigating adverse social and health impacts of COVID-19 with applied arts

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Abstract: In this project, we analyze whether the arts can mitigate negative impacts of social distancing and isolation on mental health and wellbeing, ease the burden of closed day-care and school facilities on families, and preserve attitudes of solidarity and trust. Using the SOEP-CoV questionnaire, we examine whether experience with music enabled individuals and households to handle social isolation and distancing rules and requirements better than their peers without this artistic experience. Research has shown that persistent shocks on income have a significant impact on happiness and hence on social and health well-being, thus, we explore the importance of music in this context. Using discrete choice econometric estimation techniques, this paper finds that music does indeed mitigate the negative impact of prolonged social distancing proxied for by life satisfaction. In addition, musical practice leads to feelings of less social isolation during this period.

"Instrumental ensembles can enhance cooperation, attention, and can provide opportunities for practicing various leadership-participant roles. Playing instruments may assist those with prior musical experience to revisit previously learned skills, thereby allowing the individual to experience a renewed sense of pleasure and enjoyment. It can also develop increased well-being and self-esteem in those who are learning to play an instrument for the first time."

-- *World Federation of Music Therapy (*http://www.instrumentsofhealing.org/music-heals-the-soul.html*)*

Introduction

Oliver Sacks wrote in Musicophilia: Tales of Music and the Brain that "Music can lift us out of depression or move us to tears — it is a remedy, a tonic, orange juice for the ear. But for many of my neurological patients...music is not a luxury, but a necessity." (Sacks, 2007, p. 114). Music is often seen as an important comfort mechanism during periods of stress. Whether singing in the shower or listening to lyrics after a bad romantic breakup, music is a constant accompaniment to life's events.

In this paper, we analyze whether the arts can mitigate the overall negative impacts of German Covid-19 policies, including social distancing and isolation. We focus on the effects of music on mental health and well-being during the pandemic. Using the SOEP-CoV questionnaire, we examine whether experience with the arts (represented by the proxy music) enabled individuals and households to handle social isolation and distancing rules and requirements better than their peers without art experience.

We find that, focusing at cross sections of the panel data there are no significant differences due to music listening or practice. However, when looking for the impact of listening or practicing music, we find that music has a positive effect on life satisfaction, when considering the panel structure appropriately. With respect to the feeling of being isolated during the phases of lockdown, we find similar effects for weekly musical interaction.

Literature Review – SOEP Music

There is a long-standing relation between music, self-regulation, and emotional contagion shown in, primarily, the psychology literature. The importance of music is revealed through its ability to induce an emotional response when one listens (Schellengerg and Schimmack, 2010; Lundqvist et al., 2009). Randall et al. (2014) and Saarikallio (2011) found that music is used as an instrument to self-regulate both emotions and moods. Mood regulation is defined by Saarikallio and Erkkilä (2007, p. 89) as "*the process directed towards maintaining the occurrence, duration and intensity of both negative and positive moods*". As Saarikallio and Erkkilä (2007) observe, there are different regulatory strategies aimed at different outcomes and music is an important instrument used to cope with everyday life. Egermann and McAdams (2012) show that both emotional contagion and empathy play a role in inducing the emotional response to music.

Juslin et al. (2008) studied, in a non-laboratory setting, the nature of this emotional response and showed that the latter is dependent on the interaction between listener, music, and context. Moreover, Morinville et al. (2013) found that the motive of adolescents to listen music has important implications on subjective well-being. This highlights the efficacy of music as an emotional self-regulating instrument, subject to the listener's strategy of use. Moreover, Chamorro-Premuzic and Furnham (2007) find that such a motive is highly related to individual personality traits.

Music therefore has the capacity to induce an emotional response (Hunter et al., 2010; Juslin and Vastfjall, 2008; Lundqvist et al., 2009) even if a semantic component is missing, thus generating a relationship with empathy. Emotions may be induced through emotional contagion (Juslin and Vastfjall, 2008; Lundqvist et al., 2009; Scherer and Zentner, 2001) and empathy (Egermann and McAdams, 2012; Scherer and Zentner, 2001; Vuoskoski and Eerola, 2011; Wallmark et al., 2018). In empathy, there is awareness of the relatedness with the other's emotion, while emotional contagion does not involve such an awareness (Miu and Vuoskoski, 2017).

Wallmark et al. (2018) found that trait empathy modulates musical processing. The authors showed that more empathetic individuals are more sensitive to "noisy"

music and more responsive to familiar music. Vuoskoski and Eerola (2011) find a positive relation between dispositional empathy and the emotional inducement by music in individuals. Additionally, Hietolahti-Ansten and Kalliopuska (1991) find that children who attend a music school display higher levels of empathy than children that attend a regular school. In the same vein, Rabinowitch et al. (2013) showed that children participating in a musical group interactive program displayed an increase in empathy, compared to that of the control group. In an experimental setting, Clarke et al. (2015) found evidence for a positive relationship among dispositional empathy, music exposure, and racial bias. In this study, participants listened to foreign music and those with higher dispositional empathy showed lower racial bias therefore, providing evidence of a higher change in cultural attitudes for those participants with higher dispositional empathy. We thus conclude that musical exposure enhances empathy and emotional responses, thereby furthering the process of strategic emotional self-regulation. Emotional self-regulation has also been shown to be linked to lower stress levels and higher contentment and measures of well-being.

Arts and Stress

Music is also important in mitigating stress levels. Yehuda (2008, p. 87) defines stress as "a response or reaction to an external event or interference that disturbs and jeopardizes the functioning of an organism". Smyth et al. (2020) note that stress has serious implications for health and well-being. Puertas-Molero et al. (2018) find that university teachers' stress levels are related to emotional exhaustion and lack of personal fulfilment. There is abundant evidence on the relationship between music and stress reduction and recovery (Baltazar et al., 2019; Chafin et al., 2004; Labbé et al., 2008; Khalfa et al., 2003; Sandstrom and Russo, 2010; Suda et al., 2008) as well as stress prevention (Knight and Rickard, 2001; Thoma et al., 2013). Furthermore, listening to music has been shown to be a useful method to regulate the stress of daily life (Baltazar et al., 2019).

Most studies analyse how music affects stress within a laboratory setting, e.g., Khalfa et al. (2003) and Suda et al. (2008) who find that musical intervention reduces stress, as measured by levels of salivary cortisol, after being subject to a stressor. Chafin et al. (2004) find this same positive effect of music on stress when measuring the latter

through systolic blood pressure. Using other measurements of stress, such as skin conductance levels (Baltazar et al., 2019; Sandstorm and Russo, 2010), heart rate (Labbé et al., 2008; Sandstorm et al., 2010), or subjective measures of stress (Sandstorm and Russo, 2010), the same positive effect of listening to music is found to contribute to stress reduction.

However, studies analysing the effects of music on stress prevention in a laboratory setting show mixed results. Knight and Rickard (2001) find that musical listening has positive effects on preventing stress, measured both subjectively and physiologically. On the other hand, Thoma et al. (2013) find that listening to music prior to a stressor facilitates the stress response. In their study, they showed that listening to music has a negative effect on stress measured by different physiological measures such as salivary cortisol or salivary alpha-amylase. Alternatively, as argued by the authors, music puts individuals in a relaxation state, incompatible with the subsequent stress induction stimuli. Linnemann et al. (2015) studied the effect of music in a non-laboratory setting, finding that listening to music positively affects stress reduction measured by subjective and physiological levels of stress. Moreover, physiological stress, measured through salivary cortisol, is lowest when the reason/motive for music listening was relaxation. Getz et al. (2014) observe that the reason for listening to music has a strong relationship with a particular life aspect and find that individuals with high levels of stress tend to use music for emotional regulation.

In both laboratory and non-laboratory settings, research shows that the effect of music on stress depends on circumstantial factors. Several studies observe that classical music (Chafin et al., 2004; Knight and Rickard, 2001; Labbé et al., 2008) provides the best results in stress management. Additionally, the strategy used in music listening is also found to have an impact on the levels of stress reduction (Baltazar et al., 2019). Moreover, music in major modes is found to have a greater effect than that of minor modes (Suda et al., 2008). The effects of musical intervention on stress and anxiety have also been examined in a medical/clinical setting (Bradt et al., 2013; de Witte et al., 2020; Pelletier, 2004). Pelletier (2004) conducted a meta-analysis on 22 randomized control trials (RCT) that studied the effect of music intervention in a clinical setting and finds that music intervention has an impact on reducing stress and anxiety levels. To replicate

Pelletier (2004), de Witte et al. (2020) conduct a meta-analysis on 104 RCTs, finding the same positive evidence of music intervention on psychological and physiological stress-related outcomes.

In the same vein, Bradt et al. (2013) conduct a meta-analysis on 26 RCTs or quasi-RCTs that study the effect of intervention on stress on coronary-heart disease patients finding a positive effect of music on psychological and physiological stress-related outcomes. Finally, Nilsson (2008), also through a meta-analysis of 42 RCTs, finds a positive effect of music perioperative interventions on patients' stress, pain, and anxiety. Shown in a variety of experimental situations, these results indicate a clear relationship between music listening, anxiety and stress reduction, measured both through physiological and subjective stress-related responses.

Several studies explored the effects of active (Garland et al., 2007; Visnola et al., 2010; Walsh et al., 2004) and passive (Abbot et al., 2013; Clow and Fredhoi, 2006) engagement with arts on stress and anxiety. Visnola et al. (2010) study the effect of arts therapy on healthcare workers' stress and anxiety levels measured objectively by cortisol and, in addition, by a self-reported questionnaire. Both measures showed that participants who underwent an arts therapy program showed lower levels of stress compared to the control group. In addition, Mangione et al. (2018) find a strong correlation between exposure to humanities and reduced burnout levels on physicians.

Furthermore, in a non-randomized intervention study, Garland et al. (2007) found that a creative arts intervention program had positive effects on reducing self-reported (or subjective) levels of stress for cancer outpatients. Walsh et al. (2004) find that a creative arts intervention has a positive effect on reducing cancer patient caregivers' self-reported levels of stress and anxiety reduction as well as improving their positive emotions. Sandmire et al. (2012) find positive results from art creation interventions on reducing anxiety for undergraduate students. Moreover, Walsh et al. (2005) find that a creative arts intervention reduces levels of stress and anxiety on nursing students; however, both studies use measurements of self-reported levels of stress.

Creative arts intervention programs were generally comprised of active engagement with the arts such as drawing, painting, or collage making, although passive engagement is also found to be valuable as a means of stress reduction. Clow and Fredhoi (2006) find positive results of passive engagement with art as an effective tool for reducing stress levels. They study the impact of a visit to an art gallery by a group of City of London workers on their levels of stress, measured by both subjective and salivary cortisol levels. The authors observe a significant fall in cortisol levels in those participants that enter the study with high levels of cortisol, meaning high levels of stress. Abbot et al. (2013) study the effect of both passive and active engagement artistic activities compared to that of non-artistic ones on stress reduction. While they found that artistic activities are a more effective instrument for reducing stress, in contrast to non-artistic activities, they did not confirm any significant difference between active and passive engagement in artistic activities on stress reduction.

Martin et al. (2018) perform a meta-analysis on the effects of arts therapy, highlighting music, dance, and drama therapies on stress and anxiety reduction. They find that all these different intervention programs significantly reduce stress and anxiety. Another meta-analysis conducted by Koch et al. (2019) analysed the effects of dance movement therapy on health-related psychological outcomes. They reported that this intervention program decreased anxiety and depression levels while increasing quality of life and cognitive skills. We thus conclude that active or passive consumption of other art forms, in addition to music, has a vital role in stress reduction.

Arts and Empathy

Finally, we review studies that have investigated the relationship between engagement in the arts and empathy. Kou et al. (2019), through the study of four different datasets, found that engagement with arts, in terms of consumption and creation, are positively associated with prosocial traits and behaviour, which include compassionate concern. This positive association holds true for all artistic genres studied: visual arts, performing arts, and literature. Moreover, the authors find that such association is mutually reinforced over time. Mangione et al. (2018) observe a positive correlation between exposure to humanities and empathy, tolerance to ambiguity, and wisdom within physicians. Graham et al. (2016) reported a positive causal relationship between

humanities exposure and improved empathy scores after an intervention consisting of an elective course offered for medical students.

Mogro-Wilson and Tredinnick (2020) find that a social and emotional learning program integrated into a visual arts and music program has a positive impact on high school students' empathetic concerns and other emotional competencies. Gernot et al. (2018) find that empathy has a relevant impact on the aesthetic visual art experience. In their study, the authors find that individuals with a higher disposition towards emotional contagion rate art as more moving, interesting, and with higher merit, both with subjective and psychophysiological ratings. Goldstein and Winner (2012) observed that actor training fosters improvements in theory of mind and empathy for elementary and high school students. Theory of mind is defined as "understanding others' mental states" (Goldstein and Winner, 2012, p. 20). Dow et al. (2007) note that professors from the theatre department successfully increased internal medicine residents' empathy when teaching them a course on clinical empathy using theatre techniques.

Finally, Bal and Veltkamp (2013) find that reading fiction, as compared to reading non-fiction, influences empathy and theory of mind. The direction of influence is affected by emotional transportation: high levels of transportation are related to higher empathy while the opposite holds for lower levels of transportation. Furthermore, Kidd and Castano (2013) find that reading fiction enhances theory of mind. We thus conclude that any form of involvement in the arts, whether consumption or production, should influence lowering stress levels and improve coping mechanisms during the Covid-19 pandemic period.

Music and Well-being

Music can evoke a variety of emotional responses. Stress has been linked to lower levels of overall well-being in the medical literature, with important physiological and mental health consequences (American Psychological Association, 2022). Because music has important ramifications for both emotional regulation and stress reduction, making music or listening to music also has implications for subjective well-being. Weinberg and Joseph (2017) found that well-being scores were higher for those who engaged in musical events or dance than those who did not engage at all. There was no significant

difference in results when controlling for those who listened, sang, played an instrument or composed. While the study did not offer causal explanations, it was postulated that music may have important results due to the social interactions that it facilitates. This would imply that a more solitary existence could be combatted with musical intervention.

Linnemann et al. (2018) postulate that music listening in daily life may reduce stress. They further argue that this effect increases over time thus contributing to overall well-being. Raglio and Oasi (2015) examine the basic characteristics of therapeutic interventions with music and their use in reducing anxiety and stress prior to invasive medical procedures, finding this to be a low-cost aid. Croom (2015) surveys the literature and shows that since positive emotions contribute to psychological well-being, engaging with music contributes as well since music participation and practice contribute to positive emotions. Justine and Västfjäll (2008) review the literature indication that people value music primarily due to the emotions evoked. They argue that music evokes emotions through mechanisms that are not unique to music suggesting that further research into these mechanisms might be important. Krause et al. (2021) find that there are positive associations between listening to music and well-being.

The psychology literature, however, argues that enhancing emotional well-being is one of the primary results from listening to music and Rickard (2011) has shown that volitional music listening has important benefits. Dingle et al. (2021) found that shared music listening enhances social connections and mood, especially for older adults. Intentional musical listening had improved health outcomes. Loneliness and social isolation are increasingly recognized as public health issues and Covid-19 exacerbated these issues for many people. Clair et al. (2021) found that coping strategies, including exercise, musical interludes, and virtual communication, led to lower levels of social isolation. They further argue that it is the perceived social isolation that was important, meaning that those who engaged in coping mechanisms felt less isolated than those who did not.

Music is one of these coping strategies. Since these isolation issues are found to be combatted through intentional musical listening, using panel survey data, we turn to an examination of whether music contributed to better well-being outcomes in Germany during the Covid-19 lockdown periods.

Methodology

SOEP-CoV data

The Socio-Economic Panel Study (SOEP), which began in 1984, is one of the largest and longest-running multidisciplinary panel studies in the world. Nearly 30,000 people in 20,000 households are surveyed on an annual basis. The SOEP has several important features. The most important of these is that the same households participate in the survey every year, so it is possible to follow the participants over their lifetime.

In this paper, we use data from both the SOEP-CoV panel and the SOEP-CoV study. The subsample constituting the SOEP-CoV panel of the SOEP respondents were interviewed by telephone between April and August 2020 and again between January and February 2021. In the first phase of the survey, 6,694 individuals were interviewed. Of these, 6,038 agreed to take part in the second survey. For the participating households, the nine tranches were structured such that the household composition was representative of Germany. Tranches 1 to 4 were successively surveyed over a period of two weeks and tranches 5 to 9 were surveyed successively over a period of one week to measure how the crisis was affecting private households over time. 12,000 households were asked to participate in the SOEP-CoV study. Of these, most households were interviewed at the beginning of the survey (tranches 1 to 4), when Germany had stricter social distancing restrictions in place. A smaller number of households was surveyed towards the end of the survey, when restrictions had been loosened (tranches 5-9). This design reflects the assumption that the effects of the crisis are likely to have been more severe at the beginning and to have decreased over time (Kühne et al., 2022).

Together with the data from the SOEP-CoV study covering the years of 2020 and 2021, we also consider panel data from the survey year 2019 to be able to look at changes over time. Table 1 displays the number of observations for the categories of the variables considered for all three survey years, 2019-2022. Because we want to analyse

the changes, we choose a balanced panel data set including 5,867 individuals, who have been surveyed in all three years. The analysis sample consists of 3,567 female and 2,300 male participants. Because of the design of the SOEP-CoV study only adults have been surveyed. The frequencies for age categories are provided in the table below. The average age of the participants is 53.4 years in 2019, 54.4 years in 2020, and 55.4 in 2021. Most of the participants are employed in all three years. Life satisfaction is usually found to be relatively stable in surveys, and this is also true of the SOEP data. Life satisfaction is measured using an eleven-point scale ranging from 0 to 10. For 2019, the average life satisfaction is 7.60 with a standard deviation of 1.60. In 2020, the average life satisfaction drops slightly to 7.49 with a standard deviation of 1.44, and in 2021, the average life satisfaction drops further to 7.19 with a standard deviation of 1.61. Not only for the overall sample, but also for everyone, the score for life satisfaction is mostly stable over time. For our analysis we recode the original 11-point rating scale (ranging from 0 to 10) to an ordinal variable with three categories. These are being *Unsatisfied* (0-4), *Somewhat satisfied* (5-7), and *Satisfied* (8-10).

Table 1: Variables considered in the analysis.

Variable	Categories	Survey year		
		2019	**2020**	**2021**
Sex	Male	2300	2300	2300
(pla0009_v2)	Female	3567	3567	3567
Age (categorized)	18 - 30	489	433	381
(syear - gebjahr)	31 - 45	1371	1307	1243
	46 - 60	2072	2067	2074
	61 - 75	1406	1448	1500
	76 or older	529	612	669
Employed	Yes	3774	3725	3588
(plb0022_h)	No	2093	2142	2279
Income (categorized)	0	2106	2293	2500
(pglabnet)	1 - 450	827	655	558
	451 - 1000	1310	1239	1182
	1001 - 1500	1182	1220	1176
	1501 or more	442	460	451
Worries about health	A lot	928	487	647
(plh0035)	Some	3287	2988	3215
	None	1652	2392	2005
Feeling isolated	Very often	0	268	392
(plj0589)	Often	0	820	974
	Sometimes	0	1091	1034
	Rarely	0	1959	1505
	Never	0	1729	1962
Music and arts	Daily	305	507	369
(pli0093_h, pfrei11_n)	Weekly	870	922	759
	Rarely	2027	585	757
	Never	2665	3853	3982
Life satisfaction	Unsatisfied (0-4)	265	192	318
(plh0182)	Somewhat (5-7)	1865	2343	2682
	Satisfied (8-10)	3737	3332	2867

Empirical estimation

Given that the theoretical literature has found correlations between abilities to mitigate stress through the pursuit of artistic activities, we ask whether the state of mind correlates with artistic and/or musical activities during the Covid-19 pandemic. To pursue this empirical analysis, we use a series of questions that exist within the survey, for example, concerning life satisfaction or contentment. The relevant variables from the survey are shown in Table 1. Preliminary correlations show that the relationships

with contentment and life satisfaction are positive whereas, for social isolation and arts, it is negative.

When modelling life satisfaction, next to the frequency of doing music and arts, we consider sex, a person's employment status, their worries about health, age (in categories), and their income (in categories) as independent variables. Following Krause et al. (2021), we use multilevel regression models to analyse our hypotheses and account for the nested structure of the data. We model the two dependent variables life satisfaction (*Unsatisfied, Somewhat satisfied,* and *Satisfied*) and feeling isolated (*very often, often, sometimes, rarely,* and *never*) using an ordered logit model implemented by the clm (without random effects) and clmm (with random effects) functions in the package ordinal (Christensen, 2022) in R (R Core Team, 2023). Data preparation as well as the processing of the results is done using the tidyverse (Wickham et al., 2019). From the variables presented in Table 1, we create dummy-variables removing the most frequent category for the estimation.

We look at four different model specifications. First, we estimate separate models for the time of the two corona years covered by the cross-sections of 2020 and 2021. Second, we estimate two panel models for three years covering the time ranging from 2019 (pre-corona year) to 2021. In all models explaining life satisfaction, we include the following explanatory variables: worries about health, sex, music, income, and age. The coefficient plot for the models is displayed in Figure 1, with the variable names on displayed on the y-axis. The estimates are displayed as a dot and the error bar indicates the estimate's 95%-confidence interval. The values can be seen from the x-axis and the dotted line marks the value zero. Thus any coefficient to the right of the dotted line has a positive effect and each coefficient on the left side of the line indicates a negative effect. Estimates for which the error bar does not touch or cross the dotted line are significant on the 0.05 significance level. The figure displays the coefficient plots of four different models. The models for the cross-sections (2020 and 2021) as well as the models for the panel models covering 2019 to 2021 (pooled and random). Readers preferring a tabular display can find the corresponding table for the random intercept panel model in Table 2, in the appendix.
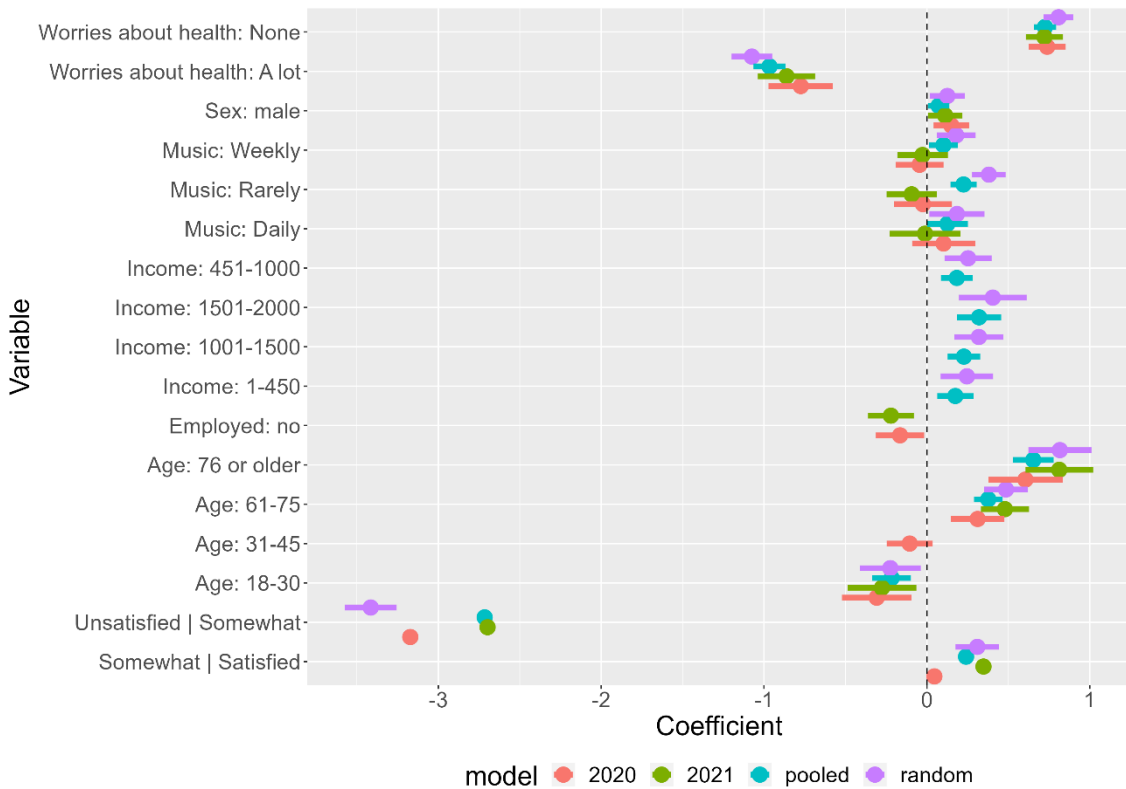
Figure 1: Coefficient plot for the estimated model of life satisfaction.

In general, a positive coefficient suggests that higher frequency levels are associated with a higher likelihood of being in a more satisfied category. For example, being a man (Sex: male) the estimated coefficient is 0.126. Thus, the log-odds of being in a higher category (more satisfied) compared to the reference category increases by 0.126. The positive coefficient suggests that being male is associated with a higher likelihood of being in a more satisfied category. Moreover, we find people who do not worry about their health to be more likely satisfied with life, whereas people who worry about their health tend to be less satisfied. For age, we find younger people (18 to 30) to be less satisfied and contrarily older people (61 to 75 and 76 or older) to be more satisfied with life. A generally higher life satisfaction we find for higher incomes, compared to not having an income at all. Finally, we find that doing music rarely (compared to not at all) has the largest impact on the likelihood of ending up with a higher life satisfaction. Moreover, doing music on a daily or weekly basis also does increase the likelihood of a higher life satisfaction.

The threshold coefficients indicate the point at which the cumulative probability changes from being "Unsatisfied" ("Somewhat satisfied") to being "Somewhat satisfied"

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("Satisfied"). These threshold coefficients help to understand how changes in predictor variables influence the transitions between different satisfaction levels. The positive or negative values of these coefficients indicate the direction and strength of the effect on the transition probabilities. The negative threshold coefficient (Unsatisfied|Somewhat: -3.415) implies that as the predictor values increase, the log-odds of transitioning from "Unsatisfied" to "Somewhat satisfied" decrease. In other words, higher predictor values are associated with a lower likelihood of moving from the "Unsatisfied" category to the "Somewhat satisfied" category. The positive threshold coefficient (Somewhat|Satisfied: 0.309) suggests that as the predictor values increase, the log-odds of transitioning from "Somewhat satisfied" to "Satisfied" increase. In other words, higher predictor values are associated with a higher likelihood of moving from the "Somewhat satisfied" category to the "Satisfied" category.

The random intercept coefficient pertains to the variability between different groups, in this case, individual participants. The random intercept coefficient provides information about the variability in the baseline log-odds of the ordered response variable between different participants. Here, the standard deviation (estimate: 1.367) is a more interpretable measure of variability. It represents the amount by which the baseline log-odds vary between different participants. A larger standard deviation indicates more diversity or dispersion in the baseline log-odds across participants. In essence, this random intercept coefficient indicates that there is variability between participants in their baseline levels of the ordered response variable, even after accounting for the fixed effects of the predictor variables included in the model. This variability might be due to unobserved individual differences that are specific to each participant and contribute to the way they respond to the ordered response variable.

The final models we estimate for life satisfaction contain the following explanatory variables: worries about health, sex, music, income, and age. The coefficient plot for the models is displayed in Figure 2. The figure displays the models for the cross-sections (2020 and 2021) as well as the models for the panel models covering 2019 to 2021 (pooled and random). Readers preferring a tabular display can find the according table for the random intercept panel model considered in Table 3 in the appendix.

Figure 2: Coefficient plot for the estimated model of feeling less isolated.

The findings for feeling isolated in 2021 and 2022 are similar to those for life satisfaction. Men tend to feel less isolated. The same holds for people not worrying about their health. Contrarily, people worrying about their health a lot tend to feel more isolated. Younger people, here, 18 to 30 as well as 31 to 45 year old people, more often do feel isolated, whereas older people (61 to 75 and 76 or older) do not feel isolated that often. Participants who are in higher income categories also tend to feel less isolated compared to those in lower income categories or without any income at all. Being unemployed also makes people feel more isolated. Finally, making music on a weekly basis makes people feel less isolated. The coefficients for making music on a daily basis, or rarely making music, turn out not to be significant here.

The negative threshold coefficients (Very often | Often: -3.201, Often | Sometimes: -1.420, Sometimes | Rarely: -0.262) imply that as the predictor values increase, the log-odds of transitioning from "Very often" to "Often" decrease. In other words, higher predictor values are associated with a lower likelihood of moving from the "Very often" category to the "Often" category. The same holds for the threshold

coefficients of the other categories "Sometimes" and "Rarely". The positive threshold coefficient (Rarely | Never: 1.368) suggests that as the predictor values increase, the log-odds of transitioning from "Rarely" to "Never" increase. In other words, higher predictor values are associated with a higher likelihood of moving from the "Rarely" category to the "Never" category.

Discussion

In the cross sections of the panel data, we see no significant differences due to music listening or practice. However, when looking for the impact of musical interaction when the panel nesting structure is considered, we find that that music has a positive effect on life satisfaction. We find that those who practiced only rarely are more satisfied than even those who practice daily or weekly, although only 18%. This means that an increase from somewhat satisfied to satisfied would occur with 40% probability when the individual practiced some form of music, be it listening or playing.

The control variables that we included such as income, age, gender, health concerns, all had the expected signs and were significant. Interestingly, men are more satisfied than women by nearly 12% when musical interaction is included. We cannot overly state the causal direction, however, it is noted that musical interactions led to more satisfaction during this period of covid and the subsequent lockdowns.

With respect to isolation, we find the same effect. It is noticeable for weekly musical interaction. Those who practiced music in some form, felt less isolated. It is important that is a regular interaction, perhaps meaning that is the regularity of the activity and not necessarily the activity in itself that leads to this finding. We are in line with the academic findings described above and thus conceptually find that since music leads to lower stress levels and positive feelings of belonging, the finding is consistent. All other variables are as expected, and interestingly, men felt less isolated when taking musical interaction into account.

Conclusion

During the period of enforced home-stays due to the Covid-19 pandemic in Germany, one of the issues of uncertainty is how people fared in terms of their mental health.

Stress is an important factor of consideration and much research surrounds the social isolation impacts on happiness and therefore social well-being. In this context, we examine whether the practice of arts and music has a significant impact on health and social well-being.

Using a discrete choice framework for analysis, we examine whether the arts mitigated the overall negative effects of the Covid-19 policies in Germany. We find that feeling isolated and life satisfaction measures present similar results. Health, income, and age categories all contributed to the overall results. Importantly, making music on a weekly basis made people feel less isolated. Although, at cross-sections of the panel data, there are no significant differences between music listening or practice. However, we find that music does have a positive effect on life satisfaction and contributes to lower feelings of isolation. Further research on the importance of music and other art forms in contributing to life satisfaction and overall health and well-being should be explored.

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Appendix

Table 2: Coefficients for the estimated model of life satisfaction.

term	estimate	std.error	statistic	p.value
Unsatisfied | Somewhat	-3,415	0,081	-42,144	0,000
Somewhat | Satisfied	0,309	0,068	4,542	0,000
Sex: male	0,126	0,055	2,298	0,022
Worries about health: A lot	-1,075	0,064	-16,887	0,000
Worries about health: None	0,809	0,047	17,315	0,000
Age: 18-30	-0,224	0,095	-2,352	0,019
Age: 61-75	0,486	0,069	7,085	0,000
Age: 76 or older	0,817	0,099	8,277	0,000
Income: 1-450	0,245	0,082	2,990	0,003
Income: 451-1000	0,253	0,074	3,431	0,001
Income: 1001-1500	0,319	0,077	4,156	0,000
Income: 1501-2000	0,405	0,106	3,815	0,000
Music: Daily	0,185	0,086	2,137	0,033
Music: Rarely	0,381	0,052	7,256	0,000
Music: Weekly	0,180	0,061	2,960	0,003

Table 3: Coefficients for the estimated model of feeling isolated.

term	estimate	std.error	statistic	p.value
Very often | Often	-3,201	0,073	-43,682	0,000
Often | Sometimes	-1,420	0,059	-23,917	0,000
Sometimes | Rarely	-0,262	0,056	-4,664	0,000
Rarely | Never	1,368	0,059	23,262	0,000
Sex: male	0,434	0,051	8,579	0,000
Employed: no	-0,161	0,064	-2,494	0,013
Worries about health: A lot	-0,584	0,073	-8,016	0,000
Worries about health: None	0,432	0,045	9,552	0,000
Age: 18-30	-0,748	0,095	-7,846	0,000
Age: 31-45	-0,482	0,062	-7,752	0,000
Age: 61-75	0,346	0,070	4,973	0,000
Age: 76 or older	0,745	0,096	7,749	0,000
Income: 1001-1500	0,182	0,065	2,777	0,005
Income: 1501-2000	0,279	0,096	2,911	0,004
Music: Daily	-0,009	0,081	-0,111	0,912
Music: Rarely	0,125	0,065	1,933	0,053
Music: Weekly	0,149	0,060	2,479	0,013