

It's better together: The psychological benefits of singing in a choir

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Abstract

Previous research has suggested that singing in a choir might be beneficial for an individual's psychological well-being. However, it is unclear whether this effect is unique to choral singing, and little is known about the factors that could be responsible for it. To address this, the present study compared choral singing to two other relevant leisure activities, solo singing and playing a team sport, using measures of self-reported well-being, entitativity, need fulfilment and motivation. Questionnaire data from 375 participants indicated that choral singers and team sport players reported significantly higher psychological well-being than solo singers. Choral singers also reported that they considered their choirs to be a more coherent or 'meaningful' social group than team sport players considered their teams. Together these findings might be interpreted to suggest that membership of a group may be a more important influence on the psychological well-being experienced by choral singers than singing. These findings may have practical implications for the use of choral singing as an intervention for improving psychological well-being.

Keywords

choirs, entitativity, self-determination theory, singing, well-being

In recent years, researchers have shown a growing interest in the idea that singing in a choir might have significant positive psychological effects for individuals (see Clift, Nicol, Raisbeck, Whitmore, & Morrison, 2010, for a review). In particular, a number of studies have found evidence to suggest that choral singing might lead to significant improvements in psychological well-being (e.g., Bailey & Davidson, 2003a, 2005; Beck, Cesario, Yousefi, & Enamoto, 2000; Clift, Hancox, et al., 2010; Cohen et al., 2006; Grape, Sandgren, Hansson, Ericson, & Theorell,

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2002). These perceived well-being benefits are arguably most clearly reflected in the growing popularity of singing in a choir (British Choirs on the Net, 2015).

Despite widespread popular interest and participation, relatively little research has investigated the extent of the supposed positive effects of choral singing on well-being, or the possible mechanisms responsible for these effects. A recent systematic review of research concerned with choral singing and well-being found that investigations varied widely in terms of method, the participant samples studied, the kind of data gathered and their approach to data analysis (Clift, Nicol, et al., 2010). Perhaps most importantly, they offered no theoretical framework for understanding the proposed benefits of choral singing (Clift, Nicol, et al., 2010). This variability makes it difficult to arrive at any clear conclusions concerning the true psychological and physical benefits of choral singing (Clift, Hancox, Staricoff, & Whitmore, 2008; Clift, Nicol et al., 2010).

Choral singing interventions have already been introduced with the aim of improving well-being for people with chronic health conditions (e.g., Lord et al., 2010) and mental health issues (e.g., Clift & Morrison, 2011). However, these interventions have been undertaken with no clear understanding of how, and to what extent, choral singing might improve well-being (Clift, Nicol, et al., 2010), and as such it is not clear how beneficial and/or cost-effective singing-related interventions could be (Clift et al., 2011), especially in relation to other leisure activities.

To date, four studies have compared the psychological effects of choral singing to those of other leisure activities (Bailey & Davidson, 2003b; Hills & Argyle, 1998a, 1998b; Valentine & Evans 2001). Hills and Argyle compared membership of musical groups (i.e., amateur choirs and other non-specified musical groups) to attending church services (Hills & Argyle, 1998a, 1998b), engaging in sport/exercise, and watching TV soaps (Hills & Argyle, 1998b). Factor analysis yielded some evidence to link the social elements of leisure activities to improved overall well-being, but the investigators' lack of precision in defining the activities precludes any firm conclusions with regard to choirs. Bailey and Davidson (2003b) found that group singing was significantly more beneficial on a range of measures of 'holistic' health (e.g., emotional, physical, cognitive) than isolated or group listening. However, since choral singing was compared with two passive listening activities, the study did not yield any insight into how more active forms of musical activity might compare with each other. In contrast, Valentine and Evans (2001) compared mood and physiological arousal in groups of solo singers, choral singers and swimmers. While it was found that engaging in all three activities had a positive effect on mood and arousal, these effects were significantly more pronounced for swimming than for singing, with no significant differences found between choral and solo singers. However, the moment-based measurements were (unavoidably) taken in very different contexts depending on the activity (i.e., a rehearsal hall, practice room or swimming pool), which may have inadvertently impacted upon participants' self-reported mood states.

In the context of these previous studies, the first aim of the present study was to evaluate the effect of choral singing on participants' psychological well-being in comparison with appropriately selected comparison groups. The second aim was to investigate the psychological factors that may be responsible for the supposed positive well-being effects of singing in a choir. To examine these questions it was important to address the apparent lack of a coherent theoretical framework among existing studies on choral singing and well-being (Clift, Hancox, et al., 2010). The present study therefore aimed to investigate the well-being effects of choral singing using a theoretical framework that consisted of two elements: (1) entitativity, to provide a means of understanding the group processes involved; and (2) self-determination theory, to provide a means of understanding the processes affecting participants as individuals.

Entitativity

Choral singing is an example of an activity that involves joint action, or the ability of individuals to coordinate their actions with those of others (Sebanz, Bekkering, & Knoblich, 2006). Physical synchrony, or the non-conscious mimicry of others' actions, can aid joint action (Sebanz et al., 2006) and is also a prominent feature of choral singing (Vickhoff et al., 2013). Recent evidence suggests that high levels of physical synchrony may provide a possible explanation for the well-being effects of singing in a choir. For example, Vickhoff et al. (2013) found that when singing the heart rates of choral singers accelerate and decelerate in synchrony with each other as they breathe. The coupling of respiration and heart rate variability has previously been linked to physiological benefits, for example, lowered blood pressure (e.g., Pramanik et al., 2009), and as such the positive effects of singing in a group might conceivably be the result of such synchronous physiological changes.

Physical synchrony has also been found to have significant psychological effects that may be relevant to understanding the well-being effects of singing in a choir (McNeill, 1995). Singing or marching in synchrony with others has been found to increase cooperative behaviour among group members (Kirschner & Tomasello, 2010; Wiltermuth & Heath, 2009). Physical synchrony has also been shown to lead to 'self-other' merging (i.e., blurring of the perceived conceptual boundaries between individuals) (Paladino, Mazzurega, Pavani, & Schubert, 2010), which may encourage choral singers to adopt a 'we-perspective' rather an egocentric perspective (Vickhoff et al., 2013).

In a related vein, recent evidence indicates that physical synchrony can directly influence our perception of groups, namely by increasing 'entitativity' (Lakens, 2010; Lakens & Stel, 2011), or the subjective perception that a group is a 'real thing' or 'coherent whole' (Campbell, 1958). Campbell (1958) suggested, for example, that groups such as trade unions or families are typically perceived to be more entitative or meaningful groups than people waiting together at a bus stop. Proposed antecedents of entitativity (in addition physical synchrony) include shared goals and outcomes, and the perception that group members are similar to each other (Lickel et al., 2000). Recent studies have shown that groups with higher degrees of perceived entitativity are more likely to meet the affiliation and achievement needs of their members (Crawford & Salaman, 2012; Johnson et al., 2006).

With these findings in mind, the concept of entitativity might be considered a useful psychological construct to understand the well-being effects associated with synchronous group singing. It is proposed here that choral singers are likely to regard their choir as a psychologically meaningful group, and that this high level of perceived entitativity might, in part, explain the positive effects of choral singing.

Self-determination theory

Self-determination theory (SDT) describes the conditions thought to be necessary for an individual to be motivated and psychologically healthy (Ryan & Deci, 2000). SDT proposes that an individual's motivation for taking part in any activity (e.g., exercise, studying for an exam) is likely to exist anywhere on a continuum that ranges from intrinsic to extrinsic motivation (Deci & Ryan, 2000). When individuals are intrinsically motivated they are expected to pursue an activity because of the inherent satisfactions it offers, such as fun, meaning, interest, or challenge. In contrast, extrinsic motivation refers to instances where a person performs an action to obtain rewards, to avoid punishments or to attain approval from others (Ryan & Patrick, 2009). It is thought that an individual can experience various levels of motivation

along this continuum for any given activity (i.e., introjected regulation or identified regulation). When people are motivated to undertake a task/activity for intrinsic, rather than extrinsic reasons this is known to have a number of positive consequences, including improved performance, increased persistence and enhanced subjective well-being (see Ryan & Deci, 2000, for a review). Individuals who sing in choirs usually do so voluntarily, with little apparent regard for extrinsic rewards, and perhaps it is this intrinsic motivation that is responsible for the supposed psychological benefits of choral singing.

A particular strength of SDT is that it also provides a model of the social and psychological conditions under which self-determined and intrinsic forms of motivation are most likely. These conditions are described in the form of three basic psychological needs: (1) autonomy (i.e., the need to experience behaviour as self-organized and self-endorsed); (2) competence (i.e., the need to feel sufficiently effective and confident in order to act); and (3) relatedness (i.e., the need to feel that one belongs and is connected to others) (see Deci & Ryan, 2000). Self-determination theory and the satisfaction of these basic psychological needs have been used once before to interpret the well-being effects of choral singing.

Livesey, Morrison, Clift, and Camic (2012) asked choral singers open-ended questions to explore how they felt that their choirs contributed to their quality of life, well-being and health. The authors analysed these written responses using thematic analysis, interpreting a number of the resulting themes in the context of SDT. For example, the perception of belonging to a group was felt to give participants a sense of togetherness and support, suggesting that singing in choirs might satisfy individuals' need for 'relatedness'. It was argued that satisfaction of these basic psychological needs may be responsible for an increased sense of well-being among choral singers. This study suggested for the first time that SDT might be a useful theoretical framework to understand the proposed well-being effects of singing in a choir.

The present study

The present study aimed to compare choral singing with two other relevant leisure activities in order to address two questions: (1) Does choral singing afford individuals a significantly higher level of well-being than other leisure activities?; and if so (2) How might the well-being effects of choral singing be brought about? An experimental design was not considered suitable for the present study given that the skilled nature of the activities under investigation would make it problematic to assign individuals randomly to groups. Instead, the psychological benefits of choral singing (Research question 1) were assessed by comparing the subjective well-being of choral singers with that of participants undertaking two other relevant leisure activities, solo singing and playing a team sport. These comparison groups also made it possible to examine the possible mechanisms responsible for the proposed well-being effect of choirs (Research question 2), because each comparison group shares one important aspect with choral singing: (1) either sung music as a focus; or (2) being a member of a cohesive group or team. It was hoped that this comparison would make it possible to identify which of these two factors may be most important to the well-being benefits afforded by choral singing. This is the first study concerned with the psychological benefits of choral singing to measure *entitativity*, and the first *quantitative* study on choirs to be underpinned by SDT.

Choral singers were expected to report greater perceived *entitativity* than those participating in team sports, on account of the physical synchrony required. This heightened sense of being part of a cohesive group was further expected to be reflected in the extent to which the basic SDT psychological needs were met by the different activities. Specifically, choral singers were expected to experience lower 'autonomy' and higher 'relatedness' than the other two

groups. In contrast, the need for 'competence' was expected to be met equally across the three groups, reflecting a common focus on developing skills and mastery in a given field. Finally, it was suggested that individuals who engage in either type of singing (choral and solo) were more likely to be intrinsically motivated than those who pursue team sports. Unlike team sports, solo and choral singing are both frequently pursued outside the context of a competition or match; it was therefore considered reasonable to expect that they are pursued for their own sake, rather than for the extrinsic rewards associated with winning or beating an opponent.

Two control measures were included as they were considered to be potentially relevant to the study design. A measure of overall life satisfaction was used to control for the possibility that group differences in reported well-being scores might actually reflect differences in overall contentment between individuals pursuing different leisure activities. Secondly, extraversion was measured as it has previously been found to be positively associated with greater intrinsic motivation (Ingledeew, Markland, & Sheppard, 2004) and greater subjective well-being (for a review see Ryan & Deci, 2001). Extraversion has furthermore been found to correlate with individuals' choice of leisure activity in a number of studies (Hills & Argyle, 1998b; Kirkcaldy & Furnham, 1991; Rhodes & Smith, 2006).

Method

Participants

A total of 375 participants (178 males, 197 females) were recruited using email invitations and posts on social media websites. Participants ranged from 18 to 78 years of age, with a mean of 36.65 ($SD = 14.99$). Equal numbers of participants were recruited for each of the three activity groups (i.e., 125 choral singers, 125 solo singers and 125 team sport players).¹ Participants were considered eligible to take part in the study if they were aged 18 or over and participated at an amateur level in one or more of the activities under investigation. There were 231 participants (62%) that took part in only one of the three activities, 120 participants (32%) that took part in two activities and 24 participants (6%) that took part in all three activities. Informed consent was obtained from all participants.

Most choral singer participants reported that they sang either in a church ($n = 48$) or a classical choir ($n = 41$), although there were a number of participants who sang in a variety of different choirs (i.e., gospel, community, pop/rock, and amateur dramatic chorus). Choral singer participants also reported singing in choirs with an average of 42.50 singers ($SD = 39.66$), range 8–250. Most solo singers reported singing classical music ($n = 50$) and in musical theatre ($n = 23$). Most team sport participants reported playing either cricket ($n = 42$) or football ($n = 23$), but there were a number of participants who played a variety of other team sports (i.e., rowing, hockey, rugby, etc.). Team sport participants reported playing in teams with an average of 12.90 players ($SD = 6.44$), range 4–50.

Measures

Participants were asked to complete an on-line questionnaire concerned with 'the psychological effects of taking part in leisure activities'. This questionnaire first required participants to indicate which of the three activities they took part in: (1) solo singing (i.e., defined as 'you sing alone in front of other people, with or without instrumental accompaniment'); (2) playing a team sport (i.e., defined as 'you are one of three or more players on a sports team'); and/or (3) singing in a choir. Participants were then instructed to select the activity most important to

them; all subsequent questions and scales were then re-phrased and adapted with this activity in mind (e.g., '[When I sing in a choir] I feel confident'). Participants were then asked to complete adapted versions of the following scales:

Well-being. Three different scales were used to assess hedonic and eudaimonic aspects of well-being (Deci & Ryan, 2008). The first scale was a 12-item hedonic well-being measure that was developed specifically for choral singers (Clift & Hancox, 2010) but then was also adapted for solo singing and playing team sports using appropriate contextual stems (i.e., Well-being scale 1). Participants rated statements (e.g., '[Playing a team sport] is something that helps to make me feel a lot happier in myself afterwards') on a five-point rating scale (1 = *Strongly disagree* to 5 = *Strongly agree*). In the present study, this scale was found to be internally consistent ($\alpha = .90$).

The second scale was an adapted version of the subjective vitality scale (SVS) (Ryan & Frederick, 1997) that has previously been used as an indicator of eudaimonic well-being (Ryan & Deci, 2001) (i.e., Well-being scale 2). Participants rated statements (e.g., '[When I am singing solo] I have energy and spirit') on a seven-point rating scale (1 = *Not at all true* to 7 = *Very true*). In the present study, the adapted SVS scale was found to be internally consistent ($\alpha = .92$).

The third scale was an adaptation of the Warwick-Edinburgh Mental Well-being Scale (WEMWBS) (Tennant et al., 2007). The WEMWBS is a measure designed to assess mental well-being, and items refer to both hedonic and eudaimonic aspects of well-being (i.e., Well-being scale 3). The original item wording ('over the last two weeks') was replaced with a contextual stem making direct reference to participants' chosen leisure activities. Participants were asked to rate each of the six statements (e.g., '[When I sing in a choir] I feel optimistic about the future') on a five-point rating scale (1 = *None of the time* to 5 = *All of the time*). In the present study, the adapted WEMWBS was found to be internally consistent ($\alpha = .89$).

Entitativity. A 10-item measure was adapted to measure perceived entitativity in choral singer and team sport participants (Johnson et al., 2006; item wording provided by M. T. Crawford, personal communication, 8 April 2013). Two questions were removed from the original 10-item scale (i.e. 'How large is this group?' and 'How long has this group been in existence?'), because they were considered irrelevant given the variety and range of likely sizes of participants' sport teams and choirs. Choral singers and team sport players were asked to answer the resulting eight questions (e.g., 'To what extent do members of this group share common goals?') using a seven-point rating scale (1 = *Not at all* to 7 = *Very*). In the present study, this adapted 8-item entitativity scale was found to be internally consistent ($\alpha = .80$).

Self-regulation of behaviour. The 'Motivation for exercise' self-regulation scale (SRQ-E) (Ryan & Connell, 1989) was adapted to measure each participant's intrinsic (self-determined) versus extrinsic (controlled) behavioural regulation with regard to their chosen activity. The 18-item SRQ-E contains four subscales: (1) external regulation; (2) introjected regulation; (3) identified regulation; and (4) intrinsic motivation. One item from the original SRQ-E was considered not to be relevant to either choral or solo singers ('because feeling healthier is an important value for me'), and was substituted with a more suitable question ('because it is a useful way to keep well') adapted from the 'Motivation for gymnastics scale' (Ryan & Connell, 1989). Participants were asked to respond using a seven-point rating scale (1 = *Not at all true* to 7 = *Very true*). Three of the four sub-scales of the SRQ-E were found to be internally consistent in the present study (external regulation $\alpha = .79$; introjected regulation $\alpha = .80$; identified regulation $\alpha = .80$). The sub-scale for intrinsic motivation was, however, found not to be internally consistent

($\alpha = .57$). Scores for each subscale were then multiplied according to different weightings and summed together to calculate each participants' relative autonomy index (RAI) (Grolnick & Ryan, 1989). This index was used to assess the extent to which respondents feel self-determined when engaged in their chosen activity.

Autonomy, competence and relatedness. An adapted version of the 'Basic need satisfaction at work' scale (Kasser, Davey, & Ryan, 1992) was used to assess the extent to which participants' needs for autonomy, competence and relatedness were met through their chosen activity. Feedback from piloting the questionnaire indicated that one item (i.e. 'I feel like I can make a lot of inputs to deciding how playing a team sport gets done') was difficult to understand. This item was replaced with an item taken from the 'Basic need satisfaction in general' scale ('I feel like I am free to decide for myself how to [play a team sport]') (Gagné, 2003). Participants were asked to respond to each of the 21 items using a seven-point rating scale (1 = *Not at all true* to 7 = *Very true*). In the present study, two of the three sub-scales were found to be internally consistent (autonomy $\alpha = .71$; relatedness $\alpha = .85$). However, the internal consistency of the competence subscale was found to be questionable ($\alpha = .68$).

Extraversion. A 10-item measure was used to assess individuals' tendency towards extraverted behaviour (IPIP, 2014). Participants were asked to rate each of the 10 statements (e.g., 'I don't mind being the centre of attention') on a five-point scale (1 = *Very inaccurate* to 5 = *Very accurate*). In the present study, this scale was found to be internally consistent ($\alpha = .91$).

Satisfaction with life. To assess their overall satisfaction with life, participants were asked to respond to a single question (i.e., "Thinking about your own life and personal circumstances, how satisfied are you with your life as a whole?") using an 11-point rating scale (0 = *Completely dissatisfied* to 10 = *Completely satisfied*) (International Well-being Group, 2006). This single item measure is considered to provide a good reflection of an individual's general state of subjective wellbeing (Cummins, Eckersley, Pallant, Van Vugt, & Misajon, 2003).

Results

Preliminary analysis

The three participant groups were first examined to rule-out significant differences that might affect or confound any subsequent analyses. It was evident that there was a significantly greater proportion of men among team sport players (66% male, 34% female) than among choral singers (34% male, 66% female) or solo singers (42% male, 58% female), $\chi^2(2) = 28.90, p < .001$. In addition, the activity groups were found to differ significantly by age, $F(2, 234.90) = 12.251, p < .001, \eta^2p = .047$. Post hoc tests revealed that team sport players were significantly younger (Mean age = 32.06, $SD = 10.36$) than choral singers (Mean age = 38.94, $SD = 16.99$) and solo singers (Mean age = 38.94, $SD = 15.82$). No significant differences between activity groups were found for extraversion, $F(2, 245.68) = 2.62, p > .05$, or overall satisfaction with life, $F(2, 243.93) = 1.46, p > .05$.

Main analysis

A MANCOVA was conducted to test the extent to which participants in the three activity groups differed on the psychological constructs investigated (e.g., well-being, basic psychological

Table 1. Means (and standard deviations) for all dependent variables by activity group.

Dependent variables	Choral singers	Solo singers	Team sport players
Well-being scale 1	50.25 (6.80)	48.80 (7.47)	49.07 (5.99)
Well-being scale 2	31.85 (7.63)	33.54 (7.22)	31.58 (6.27)
Well-being scale 3	52.06 (8.23)	48.60 (8.66)	50.80 (6.40)
Perceived entitativity	39.39 (6.61)	–	36.97 (7.67)
<i>Basic psychological needs</i>			
Autonomy	4.65 (0.99)	5.65 (0.81)	5.14 (0.77)
Competence	5.44 (1.02)	5.69 (0.77)	5.44 (0.83)
Relatedness	5.71 (0.92)	5.66 (0.90)	5.69 (0.86)
<i>Self-regulation</i>			
External regulation	6.34 (3.34)	6.37 (3.60)	7.13 (4.15)
Introjected regulation	8.91 (5.00)	9.69 (4.94)	10.26 (5.33)
Identified regulation	18.21 (5.69)	18.32 (5.67)	20.39 (4.33)
Intrinsic motivation	22.12 (3.94)	22.82 (3.59)	22.91 (3.09)
Relative autonomy index (RAI)	40.86 (15.77)	41.54 (13.94)	41.70 (12.99)
Extraversion	33.00 (9.45)	34.98 (8.09)	35.38 (7.40)
Overall life satisfaction	7.98 (1.90)	8.10 (1.64)	8.32 (1.38)

needs, intrinsic motivation, etc.), using participants' age and gender as covariates. Perceived entitativity was excluded from this multivariate analysis because it was only measured in two of the three activity groups (i.e., choral singers and team sport players). Mean scores and standard deviations for all dependent variables are provided in Table 1.

The MANCOVA revealed a multivariate main effect for activity group, $F(20, 724) = 11.33$, $p < .001$, $V = 0.48$, $\eta_p^2 = .24$. Subsequent univariate analyses² showed significant differences between the three activity groups on four of the psychological constructs investigated (i.e., well-being scale 3, autonomy, competence and identified regulation) (see Table 2 for a summary).

Post hoc tests revealed that choral singers (Cohen's $d = 0.39$) and team sport players ($d = 0.35$) reported significantly higher scores on one measure of subjective well-being (i.e., well-being scale 3) than solo singers, while no significant differences were found between team sport players and choral singers on the same scale. Post hoc tests also revealed that scores for autonomy were significantly higher for solo singers than for both team sport players ($d = 0.58$) and choral singers ($d = 1.11$), and significantly higher for team sport players than for choral singers ($d = 0.61$). Team sport players were also found to report significantly higher identified regulation scores than both choral singers ($d = 0.58$) and solo singers ($d = 0.54$), but no significant differences were evident between choral singers and solo singers. Although univariate analysis indicated a significant difference between the groups for competence, post hoc tests were non-significant.

An independent samples t test was then conducted to compare the perceived entitativity of participants' choirs and sporting teams. It was found that choral singers considered their choirs to be significantly more entitative than team sports players considered their teams, $t(248) = 2.68$, $p < .01$, $d = 0.34$. Because group size is sometimes considered an antecedent of entitativity (Lickel et al., 2000),³ an ANCOVA (activity group with choir/team size as a covariate) was then used to consider whether the size of participants' team or choir might have affected perceived entitativity scores. However, the covariate choir/team size was not found to be significantly related to perceived entitativity, $F(1, 247) = 1.02$, $p > .05$.

Table 2. Summary of results from univariate analyses (ANCOVA).

Dependent variables	<i>F</i>	<i>df</i>	η_p^2
Well-being scale 1	1.24	2, 370	
Well-being scale 2	2.30	2, 370	
Well-being scale 3	6.31**	2, 370	.03
<i>Basic psychological needs</i>			
Autonomy	42.10***	2, 370	.19
Competence	3.07*	2, 370	.02
Relatedness	0.07	2, 370	
<i>Self-regulation</i>			
External regulation	0.76	2, 370	
Introjected regulation	1.71	2, 370	
Identified regulation	10.56***	2, 370	.05
Intrinsic motivation	2.49	2, 370	
Relative Autonomy Index (RAI)	0.99	2, 370	

* $p < .05$; ** $p < 0.01$; *** $p < .001$.

Three multiple regressions were used to explore the extent to which the investigated SDT variables (e.g., relatedness and introjected regulation) significantly predicted a participant's self-reported psychological well-being on the three scales used. The first multiple regression showed that the seven SDT predictors together accounted for 34.7% variance (adjusted $R^2 = .34$) in participants' hedonic well-being scores (i.e., Well-being scale 1), where $R = .59$, $F(7, 367) = 27.87$, $p < .001$. The second multiple regression showed that the same SDT predictors together accounted for 45.4% variance (adjusted $R^2 = .44$) in participants' eudaimonic well-being scores (i.e. Well-being scale 2), where $R = .67$, $F(7, 367) = 43.61$, $p < .001$. The third multiple regression showed that the same SDT predictors together accounted for 43.0% variance (adjusted $R^2 = .42$) in participants' scores on a measure of both eudaimonic and hedonic well-being (i.e., Well-being scale 3), where $R = .66$, $F(7, 367) = 39.52$, $p < .001$. The standardized beta coefficients derived from the multiple regressions are summarized in Table 3. With the exception of external and introjected regulation, the SDT variables were found to significantly predict well-being on at least one of the three well-being scales investigated.

Three simple linear regressions were then used to explore the extent to which perceived entitativity significantly predicted choral singers' and team sport players' self-reported psychological well-being on the three scales. The first simple regression showed that entitativity accounted for 9.2% variance (adjusted $R^2 = .09$) in participants' hedonic well-being scores (i.e., Well-being scale 1), where $R = .30$, $F(1, 248) = 25.14$, $p < .001$, $\beta = .30$. The second simple regression showed that entitativity accounted for 15.9% (adjusted $R^2 = .16$) variance in participants' eudaimonic well-being scores (i.e., Well-being scale 2), where $R = .40$, $F(1, 248) = 47.02$, $p < .001$, $\beta = .40$. The third multiple regression showed that entitativity accounted for 23.1% variance (adjusted $R^2 = .23$) in participants' scores on a measure of both eudaimonic and hedonic well-being (i.e., Well-being scale 3), where $R = .48$, $F(1, 248) = 74.36$, $p < .001$, $\beta = .48$.

Discussion

The aim of the present study was to compare psychological well-being in individuals who sing in a choir with those who sing solo or play a team sport. It was found that choral singers and team sport players reported significantly higher levels of well-being than solo singers. In other

Table 3. Standardized Beta coefficients derived from the multiple regression analyses.

Predictor variables	Well-being scale 1	Well-being scale 2	Well-being scale 3
<i>Basic psychological needs</i>			
Autonomy	-.04	.08	.14**
Competence	.19***	.22***	.21***
Relatedness	.23***	.18***	.17***
<i>Self-regulation</i>			
External regulation	-.06	.04	.02
Introjected regulation	-.00	.02	.05
Identified regulation	.39***	.37***	.24***
Intrinsic motivation	.01	.07	.21***

** $p < .01$; *** $p < .001$.

Note. $N = 375$ in all cases.

words, the two activities that participants pursued as part of a group yielded higher well-being scores. This finding might be interpreted to suggest that membership of a group may be a more important influence on the psychological well-being experienced by choral singers than singing.

Although the significant difference observed between the group and solo activities is intriguing, caution should also be exercised when interpreting these findings. Indeed, it should be noted that significant differences were only found on one of three measures of well-being, and in both cases relatively small effect sizes were observed. Although this failure to observe a significant difference on all three measures would appear to bring the validity of these findings into question, it is important to remember that the three scales used differed in terms of their emphases on hedonic and eudaimonic forms of well-being (Deci & Ryan, 2008). In previous qualitative studies (e.g., Bailey & Davidson, 2003a, 2005; Livesey et al., 2012) choral singers have reported experiencing both hedonic and eudaimonic well-being. With this in mind, it is entirely conceivable that only measures intended to assess both forms of well-being (i.e., well-being scale 3), rather than only one form or the other (i.e., well-being scales 1 and 2) might be expected to discern differences in well-being reported by solo and choral singers.

The present study also used measures of perceived entitativity, motivation and basic need satisfaction to examine the possible psychological factors that may be responsible for the well-being effects associated with choral singing, at both a group (entitativity) and an individual (SDT) level. In keeping with initial expectations, it was found that participants who sing in a choir reported higher entitativity scores than those who play a team sport. This indicates that choral singers may experience a greater sense of being part of a meaningful or 'real' group than team sport players. Furthermore, there was no evidence that these differences in perceived entitativity between choral singers and team sport players were the result of differences in group size (Lickel et al., 2000).

Regression analyses indicated that entitativity may be relevant to how well-being is experienced in both choirs and sports teams. Specifically, perceived entitativity was found to significantly predict participants' scores on all three measures of well-being. This is consistent with previous research suggesting that groups with high entitativity (e.g., families, friends and fraternities) meet important psychological needs for their members (Crawford & Salaman, 2012; Johnson et al., 2006).

The idea that perceived entitativity might be significantly higher among choral singers than among team sport players is an interesting one. Choral singing is very often a synchronous

activity (Vickhoff et al., 2013), and physical synchrony has been found to foster a greater sense of entitativity among otherwise unrelated participants (Lakens, 2010; Lakens & Stel, 2011). With this in mind, it is perhaps unsurprising to find that choirs might be regarded as more entitative than sports teams. Future studies should seek to employ a more controlled experimental research design to investigate the role of synchrony relative to other candidate factors in bringing about entitativity in choral singers.

The present study was the first *quantitative* study concerned with choral singers to use self-determination theory (Ryan & Deci, 2000) as a theoretical framework to understand the proposed benefits of singing in choirs. Using this theoretical framework it was possible to compare the extent to which each of the three leisure activities (i.e., choral singing, solo singing and team sports) were considered to have met participants' basic psychological needs for autonomy, competence and relatedness as well as the kind of motivation for their participation (e.g., identified regulation).

Comparison of participants' autonomy scores indicated that choral singers experienced the lowest autonomy of the three groups. This lower sense of autonomy is perhaps entirely understandable given that choral singing requires individuals to cooperate with others as a part of a broader group effort. Given that the satisfaction of autonomy is considered to be important for well-being (Ryan & Deci, 2000), the suggestion of relatively low autonomy in choral singers could perhaps be seen as the 'price paid' for being part of a cohesive and meaningful social group. Future research should investigate this possibility that another psychological variable (e.g., entitativity, relatedness or competence) might in some way 'compensate' for a lower sense of autonomy in bringing about well-being.

Contrary to initial expectations, a comparison of relatedness scores showed that participants did not differ significantly in terms of how their chosen activity was considered to meet their need for social connection and belongingness. Although it is perhaps not surprising that the two activities pursued with a group should appear to meet the need for relatedness, it would seem somewhat counterintuitive that singing solo to an audience might be equally psychologically satisfying with regard to relatedness. Nevertheless, this finding suggests that any leisure activity pursued with, or in front of, other individuals may serve to satisfy this need to belong and connect with others.

The hypothesis that scores for competence as a basic psychological need would not differ significantly between the three activity groups was supported. This is, arguably, entirely understandable, reflecting a desire to improve and ultimately master a task or activity that is likely to be a common feature among participation in all three activities under investigation. However, the internal consistency of the measure used to the fulfilment of this basic need for competence was found to be questionable, and as such future research should re-examine this.

Finally, it was predicted that both choral and solo singers would report greater intrinsic motivation than team sport players, reflecting the less explicit focus in singing on winning or beating an opponent. In fact, identified regulation scores were found to be significantly higher for team sport players than for both choral singers and solo singers. Identified regulation sits towards the intrinsic end of the motivation spectrum, and indicates that an individual values an external goal and accepts it as personally important (Ryan & Deci, 2000). Thus, this finding would appear to imply that team sport players are more intrinsically motivated than both groups of singers. However, it must be noted that the aggregated relative autonomy index (RAI) score (which indicates the overall degree to which a person feels intrinsically motivated) was not found to differ significantly between the three activity groups. Perhaps the low internal consistency of the intrinsic motivation subscale ($\alpha = .57$) could have unduly affected RAI scores. Future studies might re-consider the present finding of an apparent difference in

identified regulation and investigate the reasons why team sport players might report greater intrinsic motivation than choral singers.

The present findings inevitably raise a number of questions about the nature of the relationships found between the fulfilment of basic psychological needs, intrinsic motivation and self-reported well-being. While the non-experimental design of the present study prohibits direct conclusions concerning causality, exploratory regression analyses did suggest that, in addition to entitativity, measures of autonomy, competence, relatedness, identified regulation and intrinsic motivation all significantly predicted participants' well-being, regardless of the leisure activity undertaken. Competence, relatedness and intrinsic motivation were found to be especially consistent at predicting well-being, doing so on all three well-being scales used. It could also be argued that the lack of a predictive relationship between extrinsic motivation, introjected motivation and well-being is theoretically consistent (i.e., intrinsic forms of motivation predict well-being while extrinsic forms of motivation do not). Taken together, these findings are consistent with previous research indicating that SDT measures can help to identify the factors that predict the psychological well-being afforded by activities (e.g., Ryan & Patrick, 2009). This lends further support to the idea that SDT might be an appropriate theoretical framework to study the well-being effects of choral singing. It is also proposed that this framework can be further enhanced by employing the integrative approach of the present study, i.e., by incorporating measures (e.g., entitativity) that are more attuned to group processes.

The findings discussed above should, however, be viewed in the context of a number of limitations. Firstly, the present study relied solely on self-report data, the accuracy of which can be affected by a broad range of factors (Baumeister, Vohs, & Funder, 2007). Secondly, although between-group differences in age and gender were controlled for in the analysis, future studies should seek to recruit a sample that is balanced in both of these respects. In addition to this, over a third of participants took part in more than one of the three activities under investigation; this means it is not possible to rule-out the aggregate effects of participating in multiple activities because the three activity groups under investigation here did not necessarily constitute entirely discrete social groups. One potential way to address this issue would be to exclude individuals who participated in multiple activities from the analysis. However, on the basis of the present data, it is seemingly common for individuals to pursue more than one of the three activities under investigation; the resulting sample would arguably be unrepresentative of the general population. The extent to which undertaking more than one leisure activity affects well-being therefore seems an obvious candidate for future research.

Although it was not possible within the present design to allocate participants randomly to groups, two possible individual difference effects were controlled for (i.e., overall life satisfaction and extraversion). Firstly, life satisfaction scores were similar across groups, implying that well-being scores participants reported with regard to specific activities were not simply a reflection of how generally happy they felt with their lives. It should, however, be noted that all participants took part in the study voluntarily, and as such the present sample may have had a more positive outlook than the typical individuals who take part in their activity but chose not to participate in the study. That said, this potential bias would be expected to have affected each group equally. Secondly, although extraversion scores were found not to vary significantly between activity groups, it is possible that other unmeasured personality traits could still have influenced the group differences in some way. With this in mind, future studies might also consider controlling for other traits that have also been found to influence individuals' subjective well-being and self-determined behaviour, such as neuroticism and agreeableness (Ingledeu et al., 2004; Ryan & Deci, 2001).

Caveats aside, the present findings are important as they support the idea that the well-being benefits afforded by choral singing could be distinct in comparison with other leisure activities. These findings should be re-examined using a broader range of appropriate comparison groups. Although team sport players proved a useful comparison in the present study, sport differs from singing in a number of important ways. For example, while playing a sport, participants are likely to experience greater energetic arousal (Valentine & Evans, 2001) and direct competition (Vallerand & Losier, 1999). Future investigations should aim to identify an activity where group cooperation is still necessary but without these energetic and competitive elements. One possible candidate for comparison might be people who play a musical instrument. Like solo and choral singers, instrumentalists can play both on their own or together with others as part of a synchronous musical group. With this in mind, it is proposed here that orchestral musicians and soloists would represent suitable comparison groups to further investigate the well-being effects of choral singing.

In conclusion, the present findings indicate that being part of a group appears to give choral singers and team sport players a higher sense of well-being than solo singers. Furthermore, higher perceived entitativity in choirs than in sports teams suggests that well-being could be brought about differently in these two group activities. Importantly, self-determination theory has been identified as a theoretical framework that is likely to prove useful for future research on choirs. An improved understanding of the apparent psychological benefits of choral singing would be an important first step for identifying the activity's potential role as an intervention to improve well-being.

Ethical approval

Ethical approval for this project was given by the Research Ethics Committee of the Faculty of Health and Life Sciences at Oxford Brookes University [ref number 1213/108].

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Notes

1. A predetermined quota ($N = 125$) was set for each of the three activities to ensure comparison groups were of equal size. Recruitment ended when these quotas were met.
2. Post hoc comparisons using the Bonferroni correction were used to follow up statistically significant findings, at the .05 level of significance.
3. Some studies suggest that larger groups are perceived as more entitative, while others suggest the same effect for smaller groups. For a review, see Lickel et al. (2000).

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