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Altered states of consciousness induced by online chanting meditation

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Abstract
Chanting is a universal practice with deep ethnocultural roots. More recently, chanting has become popular on online platforms and meditation apps which have extended chanting practices beyond their original cultural, sacred, and healing traditions. The aim of the current study was to determine if online chanting meditation promotes altered states of consciousness and psychosocial benefits when compared to a narrative listening control and whether there are different effects of online chanting for experienced and novice meditators. Experienced and novice chanters completed a 10-minute online chanting or listening activity prior to measures of ego dissolution, mystical states, mindfulness, social connection and anxiety. Differences between chanting conditions (chanting vs. listening) and experience (experienced vs. novice meditators) were examined using 2 × 2 ANOVAs and ANCOVAs, controlling for spirituality. Results showed ego dissolution and mystical state scores were higher in the chanting compared to the listening condition for experienced chanters, but not for novices. Spirituality was also a significant covariate for ego dissolution, mystical experience and mindfulness, suggesting these states of consciousness were partially dependent on spiritual or religious beliefs. This research shows that an online chanting intervention can lead to marked altered states of consciousness for individuals with prior experience with chanting. The findings may inform future design and development of contemplative activities.

Keywords Chanting · Altered states · Meditation · Consciousness · Spirituality

Chanting has historically been part of spiritual and religious traditions across the world with some traditions believing that sounds and rhythms of vocal chanting have the power to transcend ordinary states of consciousness (Beck, 2019; Feuerstein, 2012). Chanting involves the rhythmic repetition of a sound or phrase either mentally or vocally ranging from spoken to melodic tones or more complex musical structures. Chanting is practiced in many contexts and traditions such as mantra meditation, mantram repetition, mantra chanting, repetitive prayer, repetitive sound, and holy name repetition (Bandura, 2007; Berkovich-Ohana et al., 2015; Bhasin et al., 2013; Bormann & Oman, 2007; Shobitha & Agarwal, 2013). Notably, chanting is repetitious whether it is simple, complex, silent, vocal, practiced alone or in a group. Another feature of chanting is that it is participatory and not considered to be a performance. Sounds chanted can be meaningful, nonsensical, or designed specifically for physiological or psychological effects (Benson et al., 1974; Burchett, 2008). Chanting does not need to be done in a religious or spiritual context. However, in many traditions, sounds, words, or phrases are chosen for their spiritual meaning and there is an explicit mystical dimension to chanting (Bormann et al., 2006; Wolf & Abell, 2003). Chanting may be part of religious ceremonies, often practiced to celebrate important events, express one's beliefs, or achieve desired psychological or physiological outcomes. Chanting is associated with several psychological outcomes including decreased symptoms of anxiety and depression, increased positive mood, focused attention, relaxation and mystical states (Bormann et al., 2006; Lutz et al., 2008; Perry et al., 2016, 2021; Simpson et al., 2021; Wolf & Abell, 2003). Recently, chanting meditation apps and programs have been marketed, however most research has focused on mindfulness meditation apps (Cloonan et al., 2023; Degenhard, 2023; Sullivan et al., 2023). Increasingly, people are turning to technology for mental health and well-being.

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According to company reports, Calm, a meditation app, has reached over 80 million downloads (Gál et al., 2021). Another meditation app, Insight Timer, has become one of the largest online mental health communities with over 15 million users worldwide (Google Cloud, n.d.). Further, there are over 6000 apps related to religion and spirituality available on the iTunes App store, yet the effectiveness of using meditation and spiritual apps for health and wellbeing is largely unknown (Buie & Blythe, 2013).

Altered states of consciousness

In tantric traditions, *mantras* (repeated sounds/prayers) are believed to be phonetic representations of deities, and it is believed that an individual may merge with the energy represented by the sound (Burchett, 2008; Stewart & Strathern, 2007). Similarly, in other Yogic and Hindu traditions, chanting mantras is believed to dissolve the ego, resulting in a loss of duality between the self and external world (Burchett, 2008; Feuerstein, 2012; Millière et al., 2018). In Buddhist philosophy, one's personal identity is believed to be illusory, and one must move towards a complete loss of the individual self to reduce psychological suffering (Millière et al., 2018). Although altered states of consciousness are integral to many traditions and believed to be associated with chanting, there is little understanding of the nature of these states, or the mechanisms that give rise to them.

Contemplative practices like chanting and mantra meditation can lead to a pause in self-referential thought, which may be experienced as a profound shift in personal identity (Millière et al., 2018). This change to subjective self-awareness can be captured by the psychological constructs of ego dissolution (Millière et al., 2018) and mystical states (Vieten et al., 2018). Ego dissolution is characterized by a reduced sense of self-referential awareness and a disruption of boundaries between the self and one's surroundings (Nour et al., 2016). Mystical states are an altered state of consciousness characterized by a sense of peace, loss of boundaries, feelings of unity with objects or one's surroundings, positive emotions, and alterations in one's sense of time and space (Griffiths et al., 2019; MacLean et al., 2012; Vieten et al., 2018). Experiences of ego dissolution and mystical states are recurrent themes in many traditions, and have been found to have lasting positive outcomes such as enhanced self-awareness and feelings of social connection (Letheby & Gerrans, 2017; Newson et al., 2021). Mystical states have been associated with long-term chanting practices (Perry et al., 2021), however, the immediate effects of a short chanting practice are unknown and ego dissolution has not previously been investigated.

Chanting is often associated with the sensation that the boundary between oneself and the surrounding world is blurred, an experience described by the psychological construct of mystical states and ego dissolution. Mystical states involve an altered state of consciousness marked by peace, boundary loss, unity with surroundings, positive emotions, and altered perceptions of time and space (Griffiths et al., 2019; MacLean et al., 2012; Vieten et al., 2018). Ego dissolution, also referred to as ego loss (Hood, 1976) is characterized by a diminished sense of self-awareness and blurred boundaries between the self and environment (Nour et al., 2016). Both mystical states and ego dissolution have been found to be associated with lasting benefits, including greater self-awareness, improved social connection (Letheby & Gerrans, 2017; Newson et al., 2021), reduced depressive symptoms, decreased addiction, and enhanced general well-being (Millière et al., 2018). Accordingly, these concepts provide insight into how altered states of consciousness shape personal growth and social bonds. Despite the central importance of altered states of consciousness in many traditions worldwide, and their short- and long-term benefits for practitioners, there is an absence of research on chanting and such alterations in consciousness.

Perry et al. (2022) proposed a model explaining how chanting may contribute to altered states of consciousness through five core elements: attention, repetition, synchrony, rhythm, and belief. These elements function both individually and together, influencing neurocognitive processes. Attention and repetition may help disengage from automatic thoughts, reduce mind-wandering, and alter the sense of time through semantic satiation, where a phrase temporarily loses its meaning (Margulis, 2014; Bormann et al., 2006, 2014). Rhythm and synchrony facilitate perception–action coupling and neural entrainment while suppressing self-referential thinking (Keller et al., 2014). Additionally, engaging in synchronized musical activities can foster shared purpose and unity as well as triggering neurohormonal shifts, such as increased levels oxytocin (Good et al., 2017; Good & Russo, 2022). Together, these elements create a framework through which chanting may induce transformative states of consciousness and foster a sense of connection and well-being.

Mindfulness is another aspect of conscious experience that is often associated with chanting practices. Mindfulness is both a practice and a state of awareness, cultivated through observing naturally occurring thoughts and sensations in the present moment (Didonna, 2009; Kudesia, 2019). Chanting involves mindful sound and thought observation, emphasizing both mindfulness during chanting and achieving mindfulness as a goal of the practice. That is, chanting involves paying close attention to the sounds and thoughts that arise,

focusing on being mindful during the practice and also aiming to cultivate mindfulness. Mindfulness is a recurrent theme in many chanting traditions with research finding mindfulness is both enhanced through chanting (Bormann et al., 2014) and also correlates with chanting experience as well as regularity of chanting (Perry et al., 2022). Together, these findings demonstrate the role of mindfulness in chanting practices and its importance as both a process and an outcome.

Therapeutic and social benefits

Chanting, whether live or online, may offer therapeutic and social benefits through focused attention, rhythm, repetition, and belief (See Perry et al., 2021 for a detailed model). Simpson et al. (2021) found group chanting via video conference decreased anxiety and increased social connection. However, the effects of pre-recorded guided chanting sessions (such as in apps) remain unexplored. Previous research shows that singing and chanting can slow breathing, decrease heart rate, and decrease cortisol levels (Bernardi et al., 2001; Fancourt et al., 2016; Good & Russo 2022; Perry et al., 2024). Also, coordination of breathing and heartbeat have been observed in uncomplicated, wordless singing in groups (Vickhoff et al., 2013). It is likely that the act of vocalization could contribute to controlled, relaxed breathing thereby activating a relaxation response and decreased anxiety.

Research suggests that music listening may increase social connection, even when done alone, as listeners may unconsciously imagine and interpret emotional expressions of others through the music (Schäfer et al., 2020; Schäfer & Eerola, 2020). Chanting alone with a recording may provide a sense of social connection, as seen in the experiences of music listeners. However, there is a lack of evidence for the immediate impact of a short individual chanting practice.

Religious or spiritual beliefs could also enhance social connection through shared beliefs or common goals. Common goals, even without direct interaction, may increase social connection. Fancourt and Steptoe (2019) found that participants in an online choir felt a higher sense of social presence compared with face-to-face choirs. This suggests online singing interventions can enhance social connection irrespective of physical proximity. Given the potential of chanting to foster social connection through synchrony and shared beliefs, this study aimed to investigate the impact of digital chanting on social connection and anxiety, while also assessing if spiritual beliefs amplify such benefits.

Spirituality and experience

Prior experience with chanting or spiritual beliefs may enhance the effects of chanting. Perry et al. (2021) found high religiosity to be associated with mystical states during chanting. However, it is unknown whether spiritual or religious beliefs impact other psychological constructs such as ego dissolution, mindfulness or social connection.

Enhanced effects may occur for experienced chanters for a few reasons. Firstly, individuals are likely to respond more strongly to music they are familiar with (Penman & Becker, 2009) Secondly, experienced meditators demonstrate enhanced attentional control, which likely amplifies the effects of chanting by allowing them to focus more deeply and sustain their attention during the practice (Brefczynski-Lewis et al., 2007; Carter et al., 2005). Lastly, Thompson et al. (2023) proposed a music appreciation framework including *structure* (rhythm, harmony, melodic contour), *self* (memories, identity) and *source sensitivity* (appreciation of the cultural and historical contexts of the music). This framework may be relevant to chanting, where continued exposure to familiar musical structure offers comfort and reinforced identity. Source sensitivity may be relevant for an experienced chanter, whereas novice chanters may not share an appreciation for cultural or historical contexts of chanting. Thus, various forms of music appreciation may result in different effects of chanting for novices compared to experienced chanters.

Similarly, enhanced benefits of chanting may occur for individuals with strong belief systems. Certain chanting traditions emphasize the importance of beliefs, where maintaining focus on the meaning of sounds being chanted is crucial (Burchett, 2008). Sounds are often believed to invoke spiritual symbols, such as deities or qualities like wisdom and compassion (Feuerstein, 2012). These practices may help redirect attention away from everyday stressors to spiritual concepts, fostering feelings of surrender and connection. Research suggests that the psychological benefits of chanting are amplified when attention is focused on spiritually meaningful phrases (Wachholtz & Pargament, 2008; Wolf & Abell, 2003). It is possible the salience of chanting experiences may increase with stronger personal association and shared communal goals. For example, shared attention can create emotional synchrony, fostering social connection and a sense of unity among group members (Hobson et al., 2018). Overall, these findings indicate that spiritual beliefs about chanting may influence individuals chanting experiences. In particular, in the current study we were interested in how baseline spiritual beliefs would impact responses to our chanting intervention.

The current study

Previous research suggests that chanting can lead to decreased stress and increased social connection for novice participants, as well as experienced participants reporting altered states of consciousness in a live chanting intervention (Perry et al., 2021, 2022). However, it is not clear if a short online chanting intervention will lead to similar changes. The current study seeks to answer this question by examining whether an online chanting intervention is more effective than a listening control in inducing altered states of consciousness. Many of the features of chanting that induce altered states of consciousness in live contexts may also be employed within an online setting (See Perry et al., 2021 for a model on mechanisms). However, online technologies necessarily remove participants from the environmental and direct interpersonal contexts in which traditional chanting takes place. If environmental and interpersonal cues are essential to the experiences of altered states, then this form of intervention may be less effective.

The current study aimed to determine if online chanting meditation can lead to states of consciousness such as ego dissolution, mystical states, and mindfulness. Mindfulness was assessed as an outcome rather than a process to evaluate whether chanting fosters sustained mindfulness beyond the practice itself, aligning with its goal as a cultivated state and enabling assessment of its broader impacts on well-being. The study also examined whether impact of chanting practices depended on experience, and spirituality. Lastly, we examined the impact of chanting on feelings of social connection and anxiety levels.

The study design was informed by the growing popularity of chanting on digital platforms, where practices are increasingly accessible to diverse audiences. A control condition was included to isolate the effects of chanting from those of passive auditory engagement to ensure an accurate evaluation of the unique contributions of vocal chanting.

Prior research suggests that long-term meditation practitioners exhibit structural and functional brain changes that may enhance the effects of chanting (Afonso et al., 2020; Brefczynski-Lewis et al., 2007). Therefore, incorporating both novice and experienced chanters addressed potential differences in outcomes based on familiarity with the practice. Further, by controlling for spirituality and religiosity, the study also accounted for their potential influence on altered states, as high levels of spirituality are often linked to more pronounced effects of contemplative practices (Perry et al., 2021).

We employed a between-subjects design rather than a pre-and-post design to avoid potential confounding effects of practice or familiarity with the task over time. A pre-and-post design might have introduced biases due to participants becoming accustomed to the experimental conditions or altering their behaviour in response to initial measures. The between-subjects design allowed for assessment of the immediate effects of chanting by eliminating such temporal or practice-related influences. This approach ensured that differences observed could be more confidently attributed to the experimental manipulation rather than repeated exposure. Therefore, participants were randomly allocated to either a chanting condition (chanting along with a recording) or a narrative listening control condition, which involved listening to an audio recording describing natural history. This manipulation was selected as it ensured that both conditions involved focused attention to an auditory stimulus. The key difference is that the listening control condition involved passive listening only, whereas the chanting condition involved listening plus vocalisation of chanting sounds.

It was predicted that vocal chanting would lead to increased altered states of consciousness (ego dissolution, mystical states and mindfulness) when compared to a narrative listening control. Also, it was anticipated chanting would increase social connection, and reduced anxiety when compared to a narrative listening condition. Given the structural and functional brain changes found in long term meditation practitioners (Afonso et al., 2020; Brefczynski-Lewis et al., 2007; Engström et al., 2010; Lutz et al., 2009), it was also expected that these effects would be stronger for experienced chanters than novice chanters. Previous research suggests that high religiosity is associated with enhanced effects of chanting, and experienced chanters are often involved with spiritual traditions related to their practice (Perry et al., 2021). Therefore, the effects of chanting were also evaluated while controlling for spirituality/religiosity.

Methods

Participants

Experienced and novice chanters, over the age of 18 and proficient in English, were invited to participate in an online survey. There were two methods of recruitment: experienced participants were identified through snowball recruitment on social media platforms and chanting communities. Novice participants were recruited via Prolific, an online participant recruitment platform. Participants recruited via social media and chanting communities were offered the chance to go into a prize draw to win one of five AUD$100 Amazon vouchers. Participants recruited via Prolific received payment for 30 min participation as per the standard payment level which was USD$6.50 at the time of study. Different incentives were provided to experienced and novice

chanters due to the recruitment methods and practical constraints. Experienced chanters, recruited via social media and chanting communities, were offered a prize draw in line with community engagement practices, while novice participants, recruited through Prolific, received standard monetary compensation (USD $6.50 for 30 min) as per platform norms. This difference was unavoidable due to the differing recruitment approaches.

Recruitment strategies resulted in 132 participants (72 experienced and 60 inexperienced). G*Power 3.1 was used to determine the appropriate sample size for a 2 ×2 ANCOVA. To obtain 0.80 statistical power, a medium effect size $h_p^2 = 0.25$, and an alpha of a = 0.05, the required sample size, was 128 participants (64 in each group) to detect an interaction. Ethics approval was granted by the Macquarie University Ethics committee and each participant provided electronic consent.

Materials

Ego dissolution inventory

The Ego Dissolution Inventory was used to measure ego dissolution (EDI; Nour et al., 2016). Ego dissolution includes the feeling of dissolved ego-boundaries and union with one's surroundings. The EDI consists of two subscales: Ego dissolution and ego inflation (self-assuredness and confidence). The current study focused on the ego dissolution 8-item measure only which uses a visual analogue format (0–100, with incremental units of one) ranging from 0 (*No*, *not more than usually*) to 100 (*Yes*, *entirely or completely*). For each statement, participants rated how they felt during the chanting or listening activity. Scores for the EDI range from 0 to 800 with higher scores indicating a greater sense of ego dissolution. While this measure is typically based on 8 items, due to a coding error, we used only 7 items with the question "*I felt a sense of union with the universe*" being omitted. This omission may reduce the ability to compare results with studies that used the complete 8-item scale. Despite this, internal consistency in the present study remained high (α = 0.93), suggesting the modified scale was still reliable. Convergent validity for the EDI has been demonstrated by the strong correlation between the EDI and questions related to 'unitive experience' in the MEQ30 scale (Nour et al., 2016).

The revised mystical experience questionnaire

Mystical experience was measured with the revised mystical experience questionnaire (MEQ30; Barrett et al., 2015), a 30-item measure that measures an extreme positive altered state of consciousness developed from the MEQ43 (MacLean et al., 2012). The MEQ30 measures mystical experiences as an extreme positive altered state of consciousness, often accompanied by feelings of unity and peace. It has four subscales: mystical, positive mood, transcendence of time and space, and ineffability. Each statement is rated on a 6-point scale ranging from 0 (*none*, *not at all)* to 5 (*extreme*). For each statement, participants rated how they felt during the chanting or listening activity. Scores range from 0 to 150 with higher scores indicating mystical experience. The MEQ30 has shown good reliability and validity as well as be robust to different demographics such as education and gender (Barrett et al., 2015; MacLean et al., 2012). Internal consistency in the present study was good (α = 0.99).

State mindfulness scale

The State Mindfulness Scale was used to measure state mindfulness (SMS; Tanay & Bernstein, 2013). This scale is based on the Mindful Attention Awareness Scale (MAAS; Brown & Ryan, 2003). The SMS is a 21-item measure (with 15 items related to mind and 6 items related to body) with a 5-point scale ranging from 1 (*not at all*) to 5 (*very well*). For each statement, participants rate how well it represents their current state. Scores for the SMS range from 21 to 105 with higher scores indicating higher mindfulness. Discriminant and convergent validity for the SMS has been demonstrated by its lack of correlation with trait mindfulness scales and high correlation with other state mindfulness scales such as the Toronto Mindfulness Scale (Tanay & Bernstein, 2013). Internal consistency in the present study was good (α = 0.96).

Spielberger's state trait anxiety

The State Trait Anxiety Scale was used to measure perceived anxiety (STAI; Spielberger & Lushene, 1970). This scale consists of two subscales: State anxiety and trait anxiety. The current study only included state anxiety to measure immediate effects of chanting. The state anxiety measure (STAI-S) is a 20-item measure with a 4-point scale ranging from 1 (*not at all*) to 4 (*very much so*). For each statement, participants rate how well it represents their current state. Scores for the STAI-S range from 20 to 80 with higher scores indicating higher anxiety. The STAI-S has demonstrated good internal consistency (Cronbach's α = 0.95) and test-retest reliability is low (r =.33) making it a good measure for transitory states (Spielberger, 1983; Spielberger et al., 1983). Internal consistency in the present study was good (α = 0.92).

Social connection

To create a single social connection measure, a composite measure was calculated by combining The Social Connectedness Scale (Pavey et al., 2011) and the Inclusion of Other in Self Scale (Aron et al., 1992). The Social Connectedness Scale is a 6-item measure with a 7-point scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). The Inclusion of Other in Self Scale included 3 individual questions using 7 Venn diagrams (see Fig. 1) to represent feelings of closeness to others. The current study used a variation of the original questions and asked: *"Referring to the image, indicate which circle best describes your relationship with (1) your immediate family and friends (2) your larger community (3) people from all cultures worldwide."* Scores were averaged across measures and then combine to form a composite variable giving both scales equal weight. This procedure was based on previous research that used similar methods of forming composite measures (Charles et al., 2021; Price & Launay, 2020; Simpson et al., 2021). Internal consistency in the present study was good ($\alpha = 0.85$).

Centrality of religiosity scale

The Centrality of Religiosity Scale was used to measure spirituality/religiosity (CRS; Huber & Huber, 2012). Although this measure is often used to assess religiosity, we made minor adjustments to wording to focus on spiritual beliefs making this more inclusive of various traditions and cultures. Specifically, we included the word 'spiritual' in addition to the word 'religious' in items 1,3,8,10 and 15. We also included the word 'chant' when there was the word 'pray' in items 4 and 18 (See [OSF] at https://doi.org/10.17605/OSF.IO/5R8MN for all items). Further, we used the custom 20-item version which includes phrasing that reflects openness for polytheistic practices as this is recommended when using the CRS in surveys with Buddhists, Muslims, and Hindus (Huber & Huber, 2012). Therefore, "*God or something divine*" was replaced with "*God, deities or something divine*" in questions 2, 5, 10 and 15. In the 20-item CRS there are 8 questions on the importance of spirituality/religion rated on a 5-point scale ranging from 1 (*never*) to 5 (*very often*). There are 12 questions on the frequency of spiritual/religious behaviors rated on a 5-point scale from 1 (*not at all*) to 5 (*very much so*). Scores on the CRS range from 20 to 100 with higher scores indicating higher spirituality/religiosity or stronger spiritual/religious beliefs. Validity of the original CRS has been confirmed through its high correlations with religious identity ranging from 0.73 to 0.83 (Huber & Huber, 2012). Internal consistency in the present study was good ($\alpha = 0.98$).

Attention check

To assess activity engagement, participants were asked "*During the meditation, how much did you feel you were chanting/listening?*" Participants responded on a 5-point scale ranging from 1 (*not at all*) to 5 (*the whole 10 min*).

Music engagement

To assess level of musical engagement, participants were asked to rate their level of active engagement and experience with music (not including chanting). Participants responded on a 7-point Likert scale ranging from 1 (*little or no active engagement with music*) to 7 (*high level of active engagement with music*).

Open ended responses

Participants were given an opportunity at the end of the survey to provide feedback on their experiences with chanting (See [OSF] at https://doi.org/10.17605/OSF.IO/5R8MN for a list of the responses). The question was as follows: *"Do you have any feedback about this survey or anything you would like to report about your experience with chanting?"*

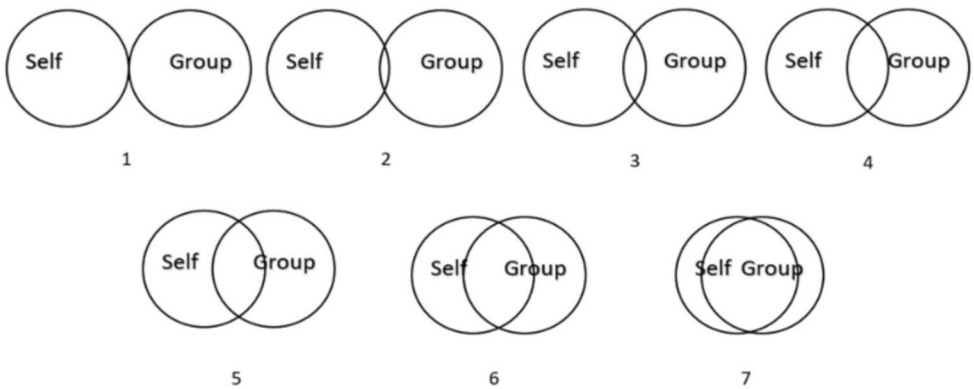

Fig. 1 Aron's inclusion of other in self scale with numbers representing the score of each option (Aron et al., 1992)

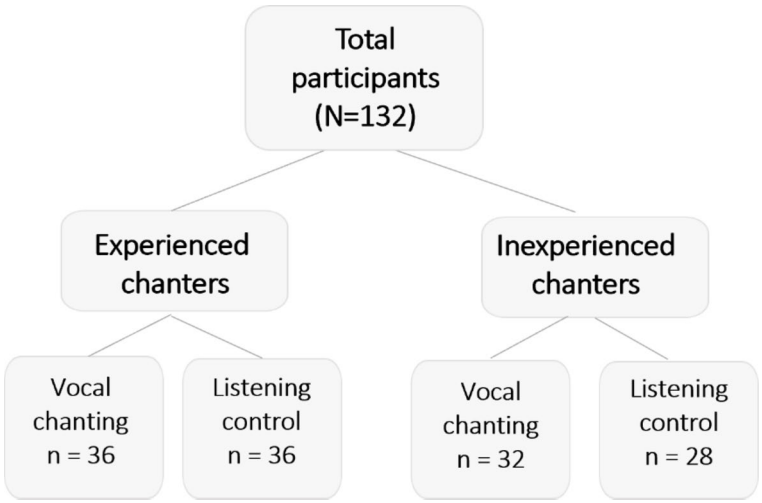

Fig. 2 Illustration of the four conditions and participants

Audio stimuli

The chanting condition used an audio recording of the sound "om" which participants were invited to chant along with. The chanting audio included overlapping voices to encourage participants to chant whenever they naturally exhaled and to provide enough range of rhythms and tones for participants to be able to synchronize comfortably with their own breath and voice.

The control audio was a 10-minute recording describing the natural history of the village of Selborne, South England, including descriptions of the community, flora and fauna surrounding the village. This recording has been used in previous meditation research as a control (Lueke & Gibson, 2015; Simpson et al., 2021). The use of this audio was intended to elicit the same level of focused attention and listening that was required in the chanting activity, however, without the vocalization. The audio was re-recorded for this study in order to match the female voice and accent of the guided chanting audio (See [OSF] at https://doi.org/10.17605/OSF.IO/5R8MN for chanting and control audios).

Procedure

Experienced and novice chanters were randomly allocated to one of two conditions: vocal chanting or narrative listening. Figure 2 provides a visual representation of the conditions. The survey included a consent form, demographic questions, and the Centrality of Religiosity Scale. Following this, participants completed either the chanting or the narrative listening and were encouraged to wear headphones for both activities. During the chanting, participants were instructed to chant the sound 'om' with a recording whereas the listening did not require participants to vocalize. Instead, they listened to a 10-minute narrative recording. After either chanting or listening, participants completed the ego dissolution, mystical states, mindfulness, state anxiety and social connection questionnaires. Lastly, to assess engagement, participants were asked how much they felt they were engaged in the activity and a free text response asked if they had any feedback. The survey took around 30 min to complete.

Table 1 Experienced and inexperienced mean and standard deviation scores of variables by vocal chanting and narrative listening control conditions

Variable	Experience	Vocal Chanting	Listening Control
Ego Dissolution	Experienced	51.49 (26.22)	34.54 (24.96)
	Inexperienced	24.37 (26.43)	32.26 (23.65)
Mystical Experience	Experienced	87.33 (32.25)	50.89 (46.41)
	Inexperienced	56.34 (39.32)	48.64 (36.65)
Mindfulness	Experienced	78.75 (15.21)	70.47 (22.46)
	Inexperienced	63.72 (17.47)	60.46 (17.15)
Anxiety	Experienced	28.08 (8.77)	30.19 (9.06)
	Inexperienced	33.41 (8.83)	34.32 (11.66)
Social Connection	Experienced	9.68 (2.17)	9.57 (1.83)
	Inexperienced	8.78 (2.46)	8.36 (1.93)
Spirituality	Experienced	77.44 (13.25)	81.69 (12.78)
	Inexperienced	47.02 (18.70)	50.39 (18.79)

Statistical approach

To assess group differences on the five measures of ego dissolution, mystical experience, mindfulness, anxiety and social connection, a series of 2 × 2 analyses of variance (ANOVA) with a between-subjects factor of Activity (chanting vs. control) and another between-subjects factor of Experience (experienced vs. inexperienced) was conducted for each of the five measures (See Table 1 for means).

Subsequently, to assess if Experience and Activity were impacted by spirituality, and if any effects remained after controlling for spirituality, we conducted a series of 2 × 2 analyses of covariance (ANCOVA), controlling for spirituality on the same five dependent variables. Spirituality scores were mean centred (Schneider et al., 2015). Similar to a hierarchical regression, this allowed for a stepwise approach to evaluate the contribution of spirituality and if significant effects remained when adding spirituality as a covariate. Given that separate ANOVAs and ANCOVAs were used to address specific hypotheses, and outcome measures were all significantly correlated, correcting for multiple comparisons would be overly conservative (Perneger, 1998). See Table 2 for a correlation matrix and see [OSF] at https://doi.org/10.17605/OSF.IO/5R8MN for detailed correlation matrices of individual groups.

Interaction effects of ANOVAs and ANCOVAs were followed up by splitting the data file between experienced and inexperienced groups and performing one-way ANOVAs and ANCOVAs to explore the activity effect. Thereafter, the data was split between chanting and listening control conditions to explore the experience effect.

Prior to the analyses, variables were examined for conformity to assumptions. Robust standard errors were used for measures that did not meet the assumption of homogeneity of variance (Hayes & Cai, 2007).

Results

Descriptive statistics

The final analysis consisted of 72 experienced and 60 inexperienced participants. Ages ranged from 18 to 78 years (Total: M= 47.93, SD= 14.00; Novice: M= 48.6, SD= 12.75; Inexperienced: M= 47.2, SD= 15.6). Participants were 87.1% female, 12.1% male and 0.8% preferred not to say (Experienced: 61 females, 10 males, 1 preferred not to say; Novice: 54 females, 6 males). Participants were from 19 different countries, mostly from Australia (28%) and the United Kingdom (22%), and the remainder from a range of countries including the United States, Canada, South Africa, Portugal, Spain, Ireland, Mexico, Argentina, Belgium, France, Germany, Iceland, India, Israel, Italy, Poland, and Slovenia. Participants represented various religious and spiritual backgrounds, with 31.1% identifying as Christian, 16.7% as Secular, 15.9% as Yoga practitioners, 10.6% as Spiritual, 8.3% as Hindu, 6.1% as Buddhist, 9.8% as Other, and 1.5% as Jewish.

We aimed to closely match the samples on age and gender. Initially, participants were recruited through social media, where we noted the distribution of age and gender. We subsequently used Prolific to recruit inexperienced chanting participants, ensuring alignment with the age and gender distribution of the initial sample. An independent samples revealed no significant differences between age of participants in the experienced group compared to the inexperienced group $t(130) = -0.609$, p=.240). Further, a chi-square test revealed no significant differences between inexperienced and experienced groups in terms of gender distribution ($\chi 2(2, N= 132) = 1.346$, p=.510). However, there was not sufficient power to determine differences between countries or religious affiliation.

Descriptive statistics were calculated and mean scores for each outcome variable are presented in Table 1. A correlation matrix between all variables is presented in Table 2.

Of the 177 participants who completed the survey, 25 were excluded because they did not meet the inclusion criteria. For example, 'experienced' chanters were asked to participate only if they chanted regularly; if they reported to have only chanted a few times, they were excluded. Similarly, novices recruited via Prolific were excluded if they had chanted more than 3 times. Ten responses were excluded from the analysis as they were identified as automated entries (e.g., bot-generated), evidenced by originating from the same IP address and being submitted simultaneously. Four participants were excluded because they scored 0 on the engagement question asking how much they were engaged in the activity during the 10 min of chanting/listening. Five participants were excluded for extreme response bias on the SMS (defined as a tendency to endorse the same response on the scale regardless of context (Paulhus & Reid, 1991). Finally, one person was excluded as they stated: *"I didn't understand what some of the questions meant so I rated extra low because I had to give a number."*

Table 2 Correlation matrix

	Ego Dissolution	Mystical Experience	Mindfulness	Anxiety	Social Connection	Religiosity
Ego Dissolution	1.0000					
Mystical Experience	**0.798****	1.0000				
Mindfulness	**0.550****	**0.664****	1.0000			
Anxiety	−0.115	**−0.281****	**−0.231****	1.0000		
Social Connection	**0.408****	**0.453****	**0.577****	**−0.179***	1.0000	
Spirituality	**0.192***	**0.318****	**0.383****	**−0.299****	**0.287****	1.0000

Significant correlations are highlighted in bold *p<.05. **p<.01

A total of 132 participants were included in the final analysis as shown in Fig. 2.

Effects of chanting and experience on outcome variables

For each measure, a 2 ×2 ANOVA was conducted with between-subjects factors of Activity (chanting vs. control) and Experience (experienced vs. inexperienced). Results are summarized in Table 3.

For Ego Dissolution, there was a main effect of Activity, $F(1,128) = 10.89$, $p = < 0.001$, $\eta_p^2 = 0.908$. Ego Dissolution scores were higher for chanting ($M = 37.93$, $SD = 16.34$) compared with the listening control ($M = 33.4$, $SD = 24.31$). There was also an interaction between Chanting and Activity, $F(1,128) = 7.077$, $p = .006$, $\eta_p^2 = 0.057$.

A follow up one-way ANOVA to assess the direction of the interaction (splitting the data by experience groups) showed no effect of Activity in the novice group, $F(1,58) = 0.132$, $p = .718$, $\eta_p^2 = 0.002$. However, there was an effect of Activity in the experienced group, $F(1,70) = 19.105$, $p = < 0.001$, $\eta_p^2 = 0.214$. Participants in the experienced chanting group had higher scores on Ego Dissolution ($M = 51.5$, $SD = 26.2$) than the experienced listening group ($M = 24.4$, $SD = 26.4$).

Table 3 ANOVA results for effects of experience and chanting on Ego dissolution, mystical experience, mindfulness, anxiety and social connection

Variable	Model Term	F	*P*	η_p^2
Ego Dissolution				
	Activity	10.89	**<0.001**	0.908
	Experience	1.03	0.311	0.009
	Activity x Experience	7.77	**0.006**	0.057
Mystical Experience*				
	Activity	10.211	**0.002**	0.084
	Experience	5.788	**0.018**	0.047
	Activity x Experience	4.329	**0.039**	0.033
Mindfulness*				
	Activity	3.185	0.077	0.027
	Experience	15.017	**< 0.001**	0.108
	Activity x Experience	0.604	0.438	0.005
Anxiety				
	Activity	0.822	0.366	0.007
	Experience	8.012	**0.005**	0.059
	Activity x Experience	0.128	0.721	0.001
Social Connection				
	Activity	0.512	0.475	0.004
	Experience	8.204	**0.005**	0.060
	Activity x Experience	0.162	0.688	0.001

Significant effects are highlighted in bold. * = Used robust standard errors to correct for heteroskedasticity

A follow up one-way ANOVA to assess the direction of the interaction (splitting the data by activity type) showed no effect of Experience in the listening group $F(1,62) = 1.53$, $p = .22$, $\eta_p^2 = 0.024$. However, there was an effect of Experience in the chanting group $F(1,66) = 7.40$, $p = .008$, $\eta_p^2 = 0.101$. Participants in the experienced chanting group showed higher scores on ego dissolution ($M = 51.5$, $SD = 26.2$) than the inexperienced chanting group ($M = 24.4$, $SD = 26.4$). Mean Ego Dissolution scores for experienced and inexperienced participants for vocal chanting and listening control conditions are presented in Fig. 3.

For Mystical Experience (See Fig. 4), there was an interaction between Activity and Experience $F(1,128) = 4.329$, $p = .039$, $\eta_p^2 = 0.033$. Therefore, a one-way ANOVA was conducted to explore the data further (splitting the data by experience groups). The ANOVA showed no effect of Activity in the inexperienced group, $F(1,58) = 0.595$, $p = .443$, $\eta_p^2 = 0.010$. However, there was an effect of Activity in the experienced group, $F(1,70) = 14.56$, $p = < 0.001$, $\eta_p^2 = 0.178$. Participants in the experienced chanting group had higher scores on Mystical Experience ($M = 87.33$ $SD = 32.25$) than the experienced listening group ($M = 50.89$, $SD = 46.41$).

A one-way ANOVA was conducted to explore the data further (splitting the data by chanting group). There was no effect of Experience for the listening group $F(1,62) = 0.044$, $p = .83$, $\eta_p^2 = 0.001$, but there was an effect of Experience in the chanting group $F(1,66) = 12.737$, $p = < 0.001$, $\eta_p^2 = 0.162$. Participants in the experienced chanting group reported higher scores on Mystical Experience ($M = 87.33$, $SD = 32.25$) compared with the novice chanting group ($M = 56.34$, $SD = 39.32$). Mean Mystical Experience scores for experienced and inexperienced participants for vocal chanting and listening control conditions are presented in Fig. 4.

For Mindfulness, there was a main effect of Experience, $F(1,128) = 15.017$, $p = < 0.001$, $\eta_p^2 = 0.108$. Mindfulness scores were higher in the experienced group ($M = 74.67$, $SD = 18.84$) compared with the inexperienced group, irrespective of whether they chanted or did the listening activity ($M = 62.09$, $SD = 17.31$).

For Anxiety, there was a main effect of Experience, $F(1,128) = 0.822$, $p = .005$, $\eta_p^2 = 0.059$. Anxiety scores were lower in the experienced group ($M = 29.14$, $SD = 8.92$) compared with the inexperienced group, irrespective of whether they chanted or did listening activity ($M = 33.87$, $SD = 10.25$).

For Social Connection, there was a main effect of Experience, $F(1,128) = 8.204$, $p = .005$, $\eta_p^2 = 0.060$. Social Connection scores were higher in the experienced group ($M = 9.63$ $SD = 2.00$) compared with the inexperienced group, irrespective of whether they chanted or did listening activity ($M = 8.57$ $SD = 2.30$).

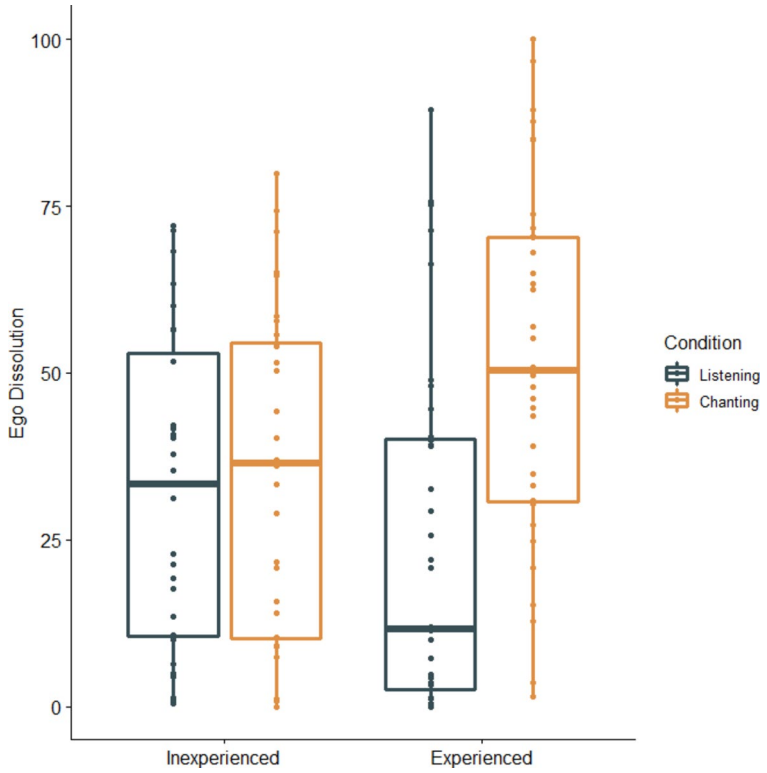

Fig. 3 Mean ego dissolution scores for experienced and inexperienced participants for vocal chanting and narrative listening control conditions

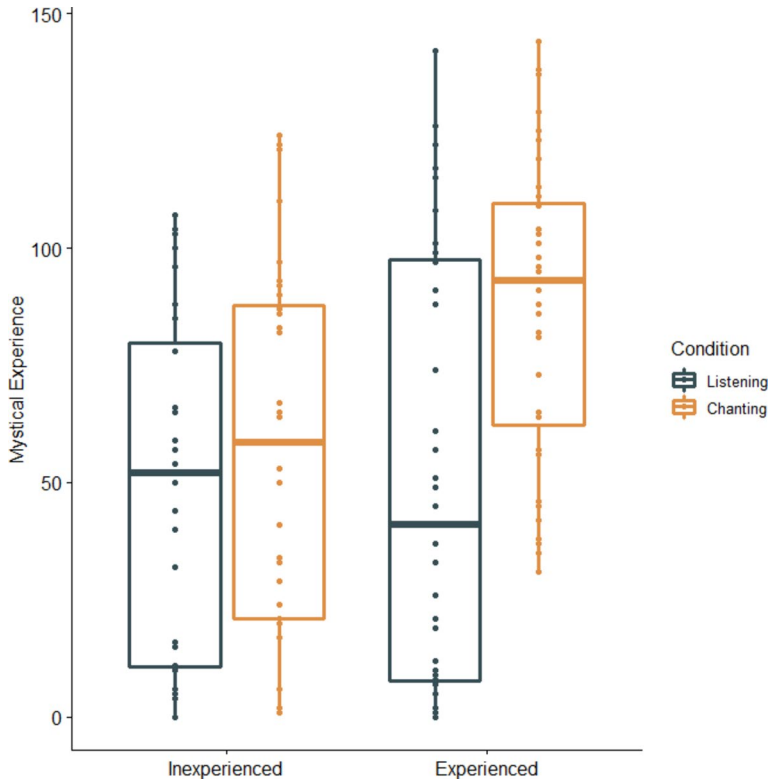

Fig. 4 Mean mystical experience scores for experienced and inexperienced participants for vocal chanting and narrative listening control conditions

Table 4 ANCOVA results, controlling for spirituality/religiosity, for effects of experience and activity on Ego dissolution, mystical experience, mindfulness, anxiety and social connection

Variable	Model Term	F	*p*	η_p^2
Ego Dissolution*	Activity	15.061	**<0.001**	0.120
	Experience	2.255	0.135	0.017
	Spirituality/Religiosity	9.635	**0.002**	0.071
	Activity x Experience	7.702	**0.006**	0.057
Mystical Experience*	Activity	15.784	**<0.001**	0.123
	Experience	0.776	0.380	0.008
	Spirituality/Religiosity	11.523	**<0.001**	0.106
	Activity x Experience	4.228	**0.042**	0.033
Mindfulness*	Activity	5.697	**0.018**	0.044
	Experience	0.304	0.583	0.002
	Spirituality/Religiosity	8.595	**0.004**	0.004
	Activity x Experience	0.492	0.484	0.004
Anxiety	Activity	1.686	0.197	0.014
	Experience	0.105	0.746	0.001
	Religiosity	5.441	**0.021**	0.041
	Activity x Experience	0.082	0.775	0.001
Social Connection	Activity	1.130	0.290	0.008
	Experience	0.268	0.606	0.002
	Spirituality/Religiosity	4.347	**0.039**	0.330
	Activity x Experience	0.227	0.634	0.002

Significant effects are highlighted in bold. * = Used robust standard errors to correct for heteroscedasticity

Spirituality and religiosity

Next, we investigated whether the impacts of Activity and Experience remained when controlling for spirituality/religiosity. Results from ANCOVA analyses for our five outcome variables are summarized in Table 4.

For Ego Dissolution, Spirituality was a significant covariate $F(1,128) = 9.635$, $p = .002$, $\eta_p^2 = 0.071$. Individuals who were more spiritual/religious reported higher scores of Ego Dissolution. There was also a main effect of Activity $F(1,128) = 15.061$, $p = < 0.001$, $\eta_p^2 = 0.120$ and an interaction of Activity x Experience $F(1,128) = 7.702$, $p = .006$, $\eta_p^2 = 0.057$. A follow up one-way ANCOVA to assess the direction of the interaction (splitting the data by experience groups) showed no effect of Activity for inexperienced participants $F(1, 57) = 0.607$, $p = .439$, partial $\eta_p^2 = 0.011$. However, the significant effect of Activity remained for experienced participants $F(1, 69) = 22.500$, $p = < 0.001$, partial $\eta_p^2 = 0.246$. Participants in the experienced chanting group had higher scores on Ego Dissolution ($M = 51.5$, $SD = 26.2$) than the experienced listening group ($M = 24.4$, $SD = 26.4$). A follow up one-way ANCOVA to assess the direction of the interaction (splitting the data by activity type) showed an effect of Experience in the control group $F(1,61) = 9.546$, $p = .003$, $\eta_p^2 = 0.135$. Participants in the inexperienced control group had higher scores of Ego Dissolution ($M = 32.3$, $SD = 23.7$) than the experienced control group ($M = 24.4$, $SD = 26.4$). However, there was no effect of Experience in the chanting group $F(1,65) = 0.682$, $p = .41$, $\eta_p^2 = 0.010$.

For Mystical Experience, Spirituality was a significant covariate $F(1,128) = 11.523$, $p = < 0.001$, $\eta_p^2 = 0.106$. Individuals who were more spiritual/religious reported higher scores of Mystical Experience. There was also a main effect of Activity $F(1,128) = 15.784$, $p = < 0.001$, $\eta_p^2 = 0.123$. Further, results showed the interaction between Activity and Experience for Mystical Experience remained when controlling for Spirituality, $F(1,127) = 4.228$, $p = .042$, $\eta_p^2 = 0.033$. A follow up one-way ANCOVA to assess the direction of the interaction (splitting the data by experience groups) showed no effect of Activity for inexperienced participants $F(1, 57) = 1.672$, $p = .201$, partial $\eta_p^2 = 0.030$. However, there was a significant effect of Activity for experienced participants $F(1, 69) = 18.659$, $p = < 0.001$, partial $\eta_p^2 = 0.219$. Participants in the experienced chanting group had higher scores on Mystical Experience ($M = 87.33$ $SD = 32.25$) than participants in the experienced listening control group ($M = 50.89$, $SD = 46.41$). A follow up one-way ANCOVA to assess the direction of the interaction (splitting the data by activity type) showed no effect of Experience in the listening group $F(1,61) = 2.685$, $p = .11$, $\eta_p^2 = 0.047$. Further, there was no effect of Experience in the chanting group $F(1,65) = 0.149$, $p = < 0.70$, $\eta_p^2 = 0.004$.

Spirituality was not a significant covariate for Anxiety ($p = .021$) or Social Connection ($p = .039$). However, including Spirituality in these models nullified significant main effects (that were present in the ANOVAs), emphasizing Spirituality may have been impacting these variables (rather than or as well as Experience). Spirituality was a significant covariate for Mindfulness ($p = .004$), however, there were no other main effects or interactions, again demonstrating the impact of Spirituality and that the effect of Experience (found in the ANOVA) was nullified.

Discussion

The present study examined the impact of an online chanting intervention on altered states of consciousness for experienced and inexperienced chanters. Ego dissolution and mystical state scores were higher in the chanting condition compared to the control for experienced participants only. Other psychological variables were also investigated. Mindfulness scores were higher for experienced participants (whether chanting or listening), but did not remain significant when controlling for spirituality suggesting spirituality/religiosity may be driving such effects. Chanting also impacted upon feelings of social connection and anxiety.

Overall, the findings highlight the connection between chanting and altered states of consciousness suggesting psychological benefits of online chanting may be amplified for individuals with chanting experience.

Altered States of consciousness

Experienced chanters showed higher ego dissolution and mystical experience after chanting compared to listening to a story, but this effect was not observed in inexperienced chanters. One interpretation of this finding is that a short online intervention is insufficient to trigger shifts in consciousness among novices. Ego dissolution and mystical states are profound experiences, and such states may require deep levels of engagement with chanting practice that can only be achieved with experience over time. For example, intentionality (e.g., focus on sound, devotion or intention while chanting) and higher engagement were found to be associated with altered states of consciousness (Perry et al., 2022). In addition, one's ability to enter altered states has been found to be dependent on factors such as set (e.g., goal setting or intention) and setting (social or physical environments; Hartogsohn, 2016).

The importance of experience was also reflected in the written feedback by experienced participants, who reported typical feelings of altered states, such as feelings of oneness or merging with others and the environment. For example, one experienced participant stated that he "felt held and soothed and in union with others". Another experienced participant stated that chanting helps them to "connect to the Universe". Such experiences likely contributed to higher scores on the altered state measures and may have assisted with enhanced psychological effects. In contrast, inexperienced participants may have needed encouragement to focus on explicit goals (set) or to chant in specific environments (setting). One inexperienced participant reported feeling "ridiculous" and unsure if they were doing it "wrong," which may have prevented strong experiences during chanting. In contrast, experienced participants likely already had clear intentions for chanting, were comfortable chanting, and may have been set up (or imagined) optimal conditions for the chanting intervention.

It has also been argued that responses to experiences of chanting (mantra) may become a conditioned response if practiced regularly (Delmonte & Kenny, 1985). Therefore, if experienced participants chant familiar sounds and associate those sounds with previous profound experiences, then chanting the same sounds could be sufficient for similar experiences to occur again. Afterall, the more one associates with ritualized actions, the more salient the experience tends to be (Hobson et al., 2018). Belief systems may also enhance music appreciation and expectation effects, known to influence the degree to which individuals experience altered states (Olson et al., 2020; Perry et al., 2021; Polito et al., 2010). Novice participants may not have the same music appreciation, nor strong beliefs about the stimulus. Taken together, these factors could account for some of the enhanced effects of ego dissolution for experienced participants.

Altered state scores were higher during chanting compared with the narrative listening control for experienced chanters. This finding suggests that altered states may be induced by the explicit vocalisation and focused attention required in chanting, which contrasts with the passive nature of listening to a narrative. Indeed, results of a two-way ANOVA revealed participants in the chanting group had higher attention check scores ($M = 4.04$, $SD = 0.13$) than the listening group ($M = 3.35$, $SD = 0.13$), possibly indicating that vocalization facilitated a more embodied practice, enhancing attention and resulting in heightened altered state scores for chanting groups.

Rhythmic repetition may have enhanced effects of altered states as rhythm and repetition have been found to promote disengagement from automatic thought processes and self-referential thought (Fachner, 2011; Margulis, 2014). Rhythmic repetition was a feature of the chanting, but not the listening condition. Chanting involved rhythmic and predictable vocalisations for 10 min, however, the listening control involved variable and unpredictable speech rhythms. Intense focus on musical activities can inhibit self-referential thought and induce flow states, where individuals become so immersed in an activity that they lose awareness of themselves and their surroundings (Csikszentmihalyi & Csikzentmihaly, 1990). This may explain higher altered state scores in chanting groups with rhythmic repetition. Whereas the listening, lacking rhythmic repetition, may not have exhibited the same impact on self-referential thought.

Chanting may also have encouraged participants to contemplate the rich cultural meaning and contexts of the practice, which may have enhanced experiences of altered states. Evidence suggests that music is appreciated beyond its musical structure and involves thinking about the musical activity (in this case chanting) as an affirmation of one's identity and contemplating the causal contexts and sources of the activity, termed "source sensitivity" (Thompson et al., 2023). Contemplating the personal and cultural significance of chanting likely facilitated experiences of altered states in participants. Overall, the structured, rhythmic, and culturally meaningful nature of chanting appears to facilitate altered states of consciousness, likely due to enhanced focus, disengaging in self-referential thought, and a connection with both the practice and its cultural significance.

Mindfulness, anxiety and social connection

Unexpectedly, there were no effects observed in chanting compared to listening conditions for mindfulness, anxiety, or social connection when controlling for spirituality; however, the effects were present when spirituality was not controlled. This pattern of results suggests that spiritual beliefs and practices may establish a psychological state of readiness for chanting to influence these psychological outcomes. Participants with higher spirituality may have been more receptive to the effects due to their existing engagement with spiritual practices, which can enhance the experience and outcomes of chanting. Therefore, the interplay between chanting and spirituality warrants further exploration to understand these dynamics fully.

Experienced participants reported stronger experiences of mindfulness and social connection, and lower anxiety scores, than inexperienced participants (regardless of whether they were chanting or listening). However, these effects did not remain when controlling for spirituality. In addition, spirituality was a significant covariate for ego dissolution, mystical experience, and mindfulness, suggesting these variables are influenced by spirituality/religiosity, or heightened spiritual/religious beliefs, or both. The findings are broadly consistent with previous findings that religiosity is associated with positive health outcomes such as reduced anxiety, pain, negative affect and improved quality of life (Hill & Pargament, 2003; Mishra et al., 2017; Wachholtz & Pargament, 2008). Specifically, many people who are experienced chanters have spiritual/religious beliefs compatible with their chanting practice and this meant that higher spirituality scores were evident in the experienced group, as shown in the descriptive statistics.

Limitations and future research

While this study provides some insights into the effects of online chanting meditation, there are some limitations that should be noted. First, the study did not control for all potential confounding variables. Although the narrative listening condition accounted for listening and attention effects, it did not provide a direct comparison between chanting vocalization and another form of vocalisation. This raises the possibility that differences between the chanting and narrative listening control conditions could be attributed to the act of vocalisation rather than the properties of chanting itself. However, other research suggests that not all vocalisations will induce similar psychological effects (Kavan, 2004) making it less likely that vocalization alone can explain the observed outcomes. Future studies should incorporate an active vocalization control condition, such as conversational speaking, to better isolate the unique effects of chanting.

A second key limitation of this study was the omission of one item from the Ego Dissolution Inventory (EDI). The missing item, which relates to the unitive aspects of ego dissolution, may have influenced the scale's validity. While internal consistency was strong, this modification could reduce the ability to fully compare results with studies that used the complete 8-item scale. Also, experienced participants may have held prior beliefs about ego dissolution or mystical states, potentially introducing response bias.

Moreover, the observed effects may have been influenced by expectancy or placebo effects, as participants who believed in the benefits of chanting (especially experienced participants) might have reported altered states of consciousness based on expectation rather than actual change. While such effects are common in psychological interventions, prior research suggests that chanting produces measurable neurophysiological changes that are unlikely to reflect expectation alone. Further, previous research demonstrates that not all experienced chanters report altered states of consciousness (Perry et al., 2022). Nonetheless, future studies could include a control condition in which participants are explicitly led to expect altered states of consciousness without engaging in chanting. This would help distinguish the effects of chanting itself from those driven purely by expectation.

Another limitation is that this study relied exclusively on self-report measures, which are susceptible to response biases such as social desirability and demand characteristics. Although self-reports provide valuable subjective insights, they do not offer objective evidence of altered states of consciousness. To strengthen the validity of findings, future research should incorporate physiological or behavioral measures—such as heart rate variability, EEG, or performance-based cognitive tasks—to assess changes in consciousness beyond self-perception.

Further, while a between-subjects design was chosen to minimize practice-related confounds, this approach has its own limitations. Between-group design does not pick up subtle within-subject changes, which may be particularly important in measures like state mindfulness or anxiety. A pre-and-post design could have provided additional insights into the immediate effects of chanting on these states. Future research might explore hybrid designs that incorporate both between- and within-subject measures to address these challenges.

Lastly, most participants in this study were female, limiting the generalizability of findings. Expanding the scope of study populations to include diverse demographic groups would enhance the generalizability of findings.

Concluding remarks

The current findings indicate that vocal chanting has the potential to induce profound states of consciousness including ego dissolution and mystical states for individuals with prior experience of chanting. The current investigation extends previous research on benefits of utilising technology for chanting and broadens previous knowledge of meditation apps. While chanting with a recording may not be a replacement for face-to-face chanting, it could complement other practices when they are not accessible. Technology such as smart phones and computers play a fundamental role in many people's lives, and during the COVID-19 pandemic many communities relied on these devices for ongoing prayer and meditation practices (Halafoff et al., 2020). Therefore, chanting is a way people can interact with technology to achieve altered states of consciousness which, in turn, may lead to positive change.

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Declarations

Consent Informed consent was obtained from all subjects involved in the study.

Data The data presented in this study are openly available in [OSF] at https://doi.org/10.17605/OSF.IO/5R8MN.

Ethical Standards This study was conducted according to the guidelines of the Declaration of Helsinki and approved by the Ethics Committee of Macquarie University (protocol code: 52021953327709)

Conflict of interest The authors declare no conflict of interest.

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