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How and why music therapy reduces distress and improves well-being in advanced dementia care: a realist review

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People with advanced dementia are at increased risk of institutionalization and experiencing distress. Research suggests that music therapy could reduce distress, but less is known about the causal mechanisms. Here we conducted a realist review to develop a program theory for how music therapy may reduce distress and improve well-being for people with advanced dementia in institutional settings. Initially, data were extracted from key literature alongside secondary reflexive thematic analysis of semi-structured interviews and stakeholder consultation. Subsequently, systematic literature searches were conducted along with a stakeholder survey. Data were extracted to iteratively refine the rough theory. Finally, the program theory was presented to stakeholder groups for consolidation. The theory outlines the core elements of the music therapy intervention alongside the individual, interpersonal and institutional contexts required to instigate hidden mechanisms, including meeting the unmeet needs of the person with dementia in the moment and increasing communication and understanding of music therapy among staff and family members. Outcomes include short-term reductions in distress and improved well-being, with the potential for music to become embedded in the management of distress and regulation of the care environment within the institution. Insufficient data were found to theorize infrastructural factors impacting the use of music therapy with this population. This theory should be tested through empirical research and used to inform clinical practice and policy.

Over half of people living with dementia in the United Kingdom are diagnosed with advanced dementia, which can require specialist care and is a predictive factor for experiencing persistent agitation, increased cost of care and institutionalization[1–7]. We refer to agitation, including aggression, wandering, physical abuse, verbal abuse and resistance to care as distress or distress behaviors to reflect that they can be a symptom of dementia and/or an expression of unmet need[8]. Distress behaviors, sometimes referred to as behaviors that challenge, are associated with institutionalization for people with dementia[5]. The National Institute for Health and Care Excellence (NICE) states that psychosocial, or nonpharmacological, interventions should be the first line of treatment for distress behaviors in dementia care[9]. The World Health Organization highlight the need for more research to enable the development of clinical and cost-effective toolkits for psychosocial interventions to manage distress[10].

Music therapy is a psychosocial intervention recognized in the Dementia NICE guidelines as a therapy that could support well-being[9]. In this Analysis, we refer to 'music therapy' as interventions delivered

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by a trained and registered music therapist, while 'music-based interventions' refer to those delivered by someone who is not a trained therapist. Registration to practice as a music therapist varies between countries. In the United Kingdom, registration is with the Health and Care Professions Council on completion of a 2-year full-time or 3-year part-time Masters. The therapist engages in interactive and receptive musical interactions with the client(s) to achieve established clinical goals and advises on ways individualized music can be used in everyday care, sometimes referred to as indirect music therapy[11].

So far, most music therapy research with people with dementia has been conducted in institutional community settings, in particular in residential care homes, with generally positive outcomes for reducing symptoms of distress[12–16]. Findings from literature reviews, including systematic reviews, suggest that music therapy may lead to short-term reductions in distress and improved engagement, but effects may not endure and there is wide heterogeneity in method of delivery[17–23]. A Cochrane review of music-based interventions for people with dementia reported moderate-quality evidence for reduction in depression and behavioral symptoms of dementia, and low-quality evidence for improved well-being and reduction in anxiety, with no adverse effects reported[24]. Individual music therapy had a larger effect for overall behavioral symptoms than for agitation and aggression separately, although a sensitivity analysis for stage of dementia was not conducted[24].

However, little is known about how and why music therapy may be helpful for this clinical population. Researchers have suggested that music therapy reduces distress by meeting unmet psychosocial needs and supporting positive relationships with caregivers, while others have outlined the neurological and biological mechanisms stimulated by music that enable access to preserved memories and cognitive abilities into late stages of disease progress[22,25–30]. There is a need to establish a comprehensive theory for how and why music therapy reduces distress for this population considering the wide-ranging implications of distress behaviors for the person with dementia and their caregivers, including changes in the care environment and increased cost of care.

Realism is an epistemological framework for theory-based research seeking to identify how interventions interact with the wider context to cause observable outcomes (see Box 1 for a glossary of key terms used in this paper)[31]. Within this methodology, the interaction between the intervention (also known as resource) and the context triggers hidden mechanisms (that is, changes in reasoning and response) that generate intended and unintended outcomes[32,33]. A program theory for an intervention aims to outline 'what works, for whom, in what circumstances'[32]. Realist reviews are conducted following standardized guidelines to form a program theory for an intervention drawing on academic literature and stakeholder input[32,34]. Theories are then tested and refined through empirical study.

Here, we present a realist review to explore how and why music therapy reduces distress and improves well-being for people with advanced dementia in institutional settings. In this Analysis, we define 'institutional settings' as any setting providing 24 hour support for people with dementia outside of their home, such as residential and nursing care homes and hospitals. The developed program theory should inform the development of music therapy posts and standardized protocols specific to these settings, guide ongoing research and facilitate changes to policy and practice. This was conducted as part of the MELODIC (Music therapy Embedded in the Life Of Dementia Inpatient Care) study, which aims to co-design a standardized music therapy intervention to reduce distress on inpatient mental health dementia wards (NIHR204928). Ethical approval was provided by Anglia Ruskin University (ETH2223-3914). The following questions were developed with experts-by-experience and stakeholders:

What are the mechanisms influencing the impact and implementation of music therapy interventions on distress behaviors and well-being of people living with advanced dementia, and staff and family members, in institutional settings?

1. What are the components and mechanisms of music therapy interventions that reduce distress behaviors and improve well-being for people with advanced dementia in institutional settings?
2. What are the components and mechanisms of music therapy interventions that improve the quality of care delivery and well-being for staff and family members?
3. What are the factors influencing successful implementation of music therapy interventions in these settings?

BOX 1

Glossary of key terms

- **Realism**: theory-based research seeking to identify hidden causal interactions between interventions and the context they are placed that lead to observable outcomes.
- **Realist review**: reviews drawing on written evidence and stakeholder input to develop program theories.
- **Program theory**: a theory that outlines 'what works, for whom, in what circumstances'. In this review, theories are constructed of intervention–context–mechanism–outcome configurations.
- **Context**: factors relating to the people, places, structures and policies within which an intervention is placed. These can relate to individual, interpersonal, institutional and infrastructural elements, and can enable or prevent mechanisms from being triggered.
- **Mechanism**: hidden elements, shaped and influenced by the context, generating the outcomes observed. We separate these into elements relating to the intervention (that is, the resources) and changes in reasoning and responses triggered by the resource when placed in the particular context.
- **Outcome**: observable, measurable outcomes. These can be intended or unintended outcomes.

Results

Three iterative phases were completed with experts-by-experience and stakeholders to provide an explanatory theory for the findings reported in research (Fig. 1). The research team included three music therapists, one clinical psychologist and one Consultant Old Age Psychiatrist practicing in the United Kingdom. The design and methods were discussed with a United Kingdom-based Dementia Inpatient Community of Practice. There was no hierarchy of evidence, but data were tested for their richness, relevance and rigor in relation to the developing theory[32,35]. The review is registered in PROSPERO (international prospective register of systematic reviews, CRD42023409635) and published in line with RAMESES (realist and meta-narrative evidence syntheses) guidelines[34]. There was one change from the method outlined with the addition of a separate search for literature reviews.

Phase 1

We identified 16 research articles that provided an important contribution to music therapy literature for this population (Supplementary File 1). In the developed rough theory, mechanism was separated into intervention (resource) and mechanism (reasoning), and outcome was separated into immediate and overall outcomes (Fig. 2). While the intervention and overall outcomes applied to all parts of the theory, the context–mechanism–outcome configurations (CMOCs) were separated into layers of reality: individual (CMOC 1), interpersonal (CMOC 2) and institutional (CMOCs 3 and 4). No data were found relating to the

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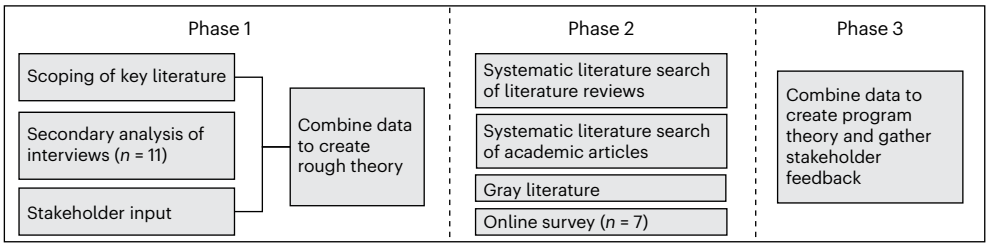

Fig. 1 | Method for realist review. Outline of iterative research activities in phases 1, 2 and 3 of the review process.

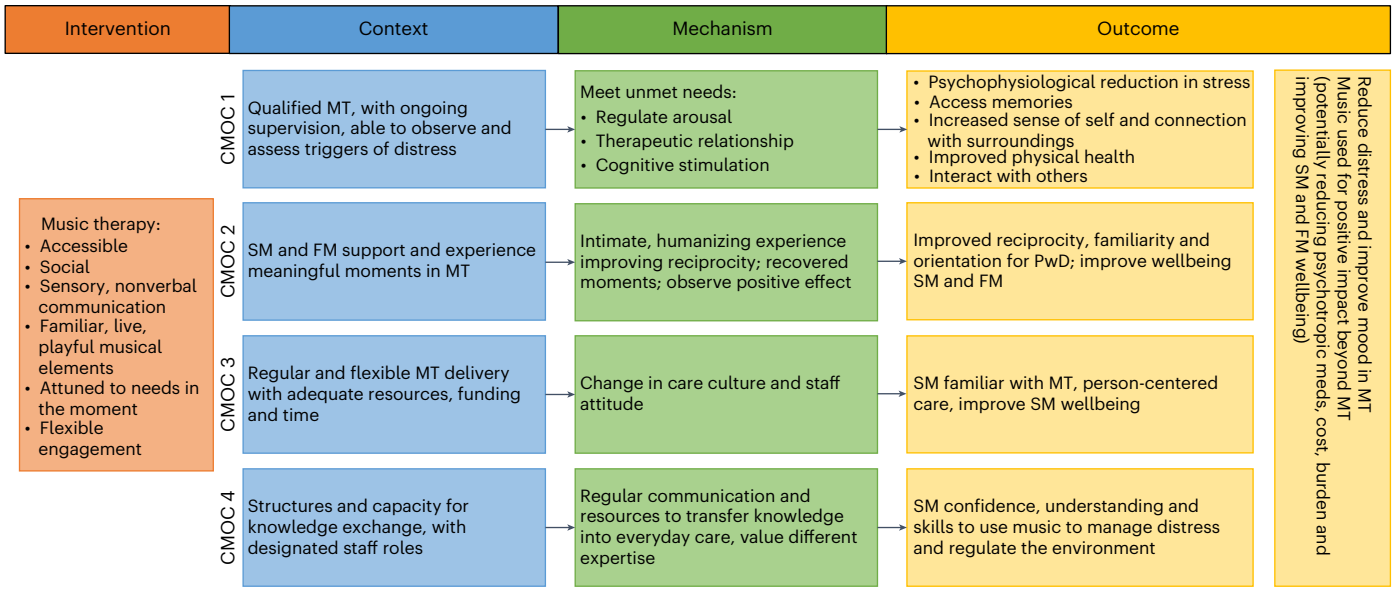

Fig. 2 | Rough theory. Rough theory following phase 1 data collection and analysis. MT, music therapy; SM, staff member; FM, family member; PwD, person with dementia; meds, medication.

infrastructural layers of reality. Key areas of uncertainty not addressed in the current theory were the role of staff training, type and purpose of the setting, impact of medication, impact of hearing, and outcomes for staff and family members.

Phase 2

Systematic searches identified 11 systematic reviews, 3 of which included meta-analyses, and 29 peer-reviewed research articles, 4 of which were randomized controlled trials and 2 of which were not published in peer-reviewed journals (see Table 1 for inclusion criteria, Fig. 3 for reasons for exclusion, and Supplementary File 1 for details of included literature). Searches for gray literature identified 16 non-peer-reviewed articles including blogs, reports and policy papers. In addition, seven participants completed the online survey, including music therapists (three), a medical consultant (one) and a Consultant Old Age Psychiatrist (one) (Table 2). Two participants did not state their profession.

Program theory. As in phase 1, no data were identified relating to infrastructural components (Fig. 4). Supporting evidence is provided in Table 3, with additional information in Supplementary File 2.

Music therapy intervention. When direct music therapy interventions are offered, these should be delivered by a trained, professionally registered therapist receiving supervision, with knowledge and expertise of dementia and distress behaviors. The therapist should ensure flexibility for active and receptive engagement in sessions. Group sessions are a resource efficient intervention, while individual sessions can be offered to those not accessing the group owing to high levels of withdrawal or agitation. Evidence for frequency of session delivery is limited, although most interventions were weekly or biweekly. Interventions lasting 6–12 weeks were most effective in one meta-analysis of seven studies[36].

Sessions should be tailored to needs, use nonverbal sensory communication and provide opportunities for social interaction with staff, carers and peers to be accessible regardless of cognitive impairment or musical ability. Meaningful songs from when the individual was aged 10–30 years old were thought to be most salient, although it was noted that preferences may change. Improvisatory, instrumental and recorded musical activities could also be used, enabling the intervention to be accessible regardless of impairment, age or culture, and up to the end of life. The therapist should monitor all musical elements for positive and negative effect through attuning to and observing changes in presentation and sharing these with staff and families. They should hold a predictable and familiar musical structure through opening and closing sessions with the same activity and maintaining an appropriate harmonic and rhythmic structure in improvisatory exchanges.

CMOC 1. Music therapy delivered regularly and flexibly (C) attunes to and meets unmet needs in the moment (M), reducing distress and improving well-being in the short term (O).

Music therapy interventions should be delivered regularly to establish a trusting therapeutic relationship, with a difference demonstrated between continuous and non-continuous therapy and the potential for knowledge to be shared with caregivers providing a sense of continued relationship[11,14,37]. Session times should be agreed with

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Table 1 | Inclusion criteria for reviews and articles

PICOS	Criteria
Participant	Includes people with advanced dementia (MMSE ≤14 or equivalent, or literature explicitly referenced advanced/severe dementia) or displaying distress behaviors (agitation, aggression, wandering, physical abuse, verbal abuse or resistance to care) to include mixed middle- to advanced-stage populations. For review articles only, include where dementia stage is not stated but participants in institutional settings can be separated.
Intervention	Music therapy or music-based intervention meeting NICE definition of psychosocial interventions.
Context	Any institutional setting for people with dementia, inclusive of residential care, acute hospital and mental health hospital wards. For review articles only, include where setting is not stated but participants separated for dementia stage.
Outcome	Measures specifically relating to distress, agitation, well-being and quality of care.
Study type	Reviews: any type of literature review (including systematic, scoping and narrative) where the search strategy is clearly provided; published in English since June 2017. Other literature: any type of literature, written in English, including gray literature, with no limit on date.

MMSE, mini-mental state examination.

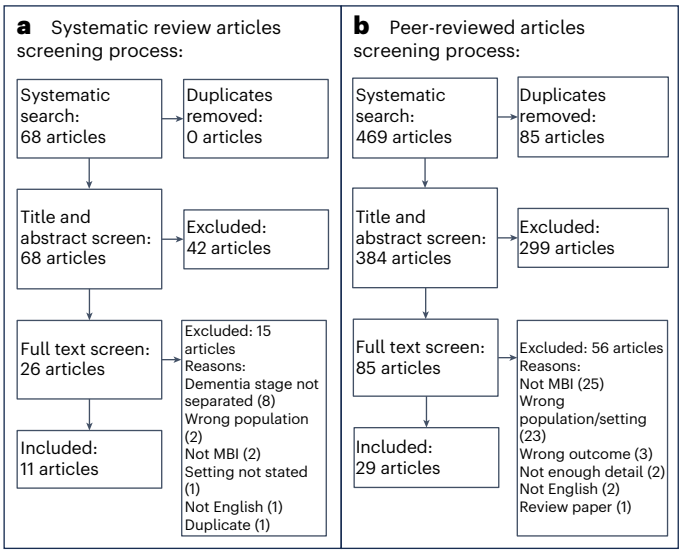

Fig. 3 | Prisma diagrams. a, PRISMA diagram for a systematic search for systematic reviews. **b**, PRISMA diagram for a systematic search for peer-reviewed articles. MBI, music-based intervention.

the service to avoid interruptions and be flexible to when the person is able to engage, possibly anticipating more difficult times of the day. However, practicalities may limit the therapist's ability to be flexible. A tailored music therapy service will require a private space, adequate funding and time to be free at the point of access, and access to equipment, including instruments and recorded music.

Within the therapeutic relationship, the music therapist attunes to and meets unmet emotional, sensory, psychological, social and occupational needs and assesses cognitive and physical function. Musical elements can be improvised to upregulate or downregulate arousal, and to validate and contain emotional expression. Musical interactions also provide cognitive and sensory stimulation activating wide-ranging bilateral neural networks that are well preserved in those with advanced disease progression, enabling access to remaining abilities and memories[27,30]. Music-evoked memories, triggered especially by familiar music, are recalled faster and are more positive and specific than memories recalled without music, and often relate to earlier life[27,29,30]. A felt and physiological reduction in stress, specifically the autonomic nervous system, is also shown, possibly linked to improved oxygen saturation, increased relaxation and/or a heightened stress threshold[24,38–40].

Short-term reductions in distress and improvements in well-being were reported. Most data reported an observable, immediate 'in the moment' reduction in agitation, including behaviors of distress. In addition, a reduction in anxiety was shown, which may contribute to the overall reduction in distress for the person with dementia. Music therapy may also lead to short-term improvements in attention, engagement, alertness and mood, possibly reducing depressive symptoms. When arousal and mood regulation is achieved, the person with dementia may experience a lasting sense of safety and self, increased orientation and connection with others. Adverse effects were rarely reported, although group music therapy did lead to increased agitation for a minority of people with dementia who would leave the session in these cases, thus minimizing long-term effects[41–43]. There was low-quality evidence that music therapy may improve physical health, including pain management and sleep quality, owing to increased daytime activity. Some evidence also suggests a reduction in prescribed and as-needed (pro-re-nata) psychotropic medication.

CMOC 2. When staff and families are involved in music therapy sessions (C) reciprocity, communication and mutual understanding with the person with dementia increase (M), changing staff attitudes and impacting care delivery (O).

Staff and families can provide support in music therapy sessions as well as communicating with the music therapist before and after sessions, including sharing notes and video footage. Staff and families experienced positive and meaningful moments in music therapy that may be different to their usual interactions with the person with dementia. However, time limited the ability for staff to take part.

Engaging in positive moments with the person with dementia in music therapy provided an intimate, humanizing experience, highlighting the individuals' strengths. These experiences may change the perception of the person and contribute to assessments and understanding of needs communicated through behaviors of distress. They may also increase understanding of music therapy and ways to use music in everyday care.

This can lead to a change in staff attitude that may impact care delivery. Staff may be more able to empathize with the person and use creative ways to interact with them, particularly during times of increased distress, potentially reducing time spent delivering care tasks. Families may be supported to process their loss and engage in positive activities with their relative. This can improve staff and family well-being and potentially reduce staff stress, with implications for job satisfaction and staff retention. In turn, the person with dementia may feel a sense of continued relationship and familiarity as meaningful interactions continue beyond music therapy.

CMOC 3. Structures and time for knowledge exchange (C) enable regular communication between staff, families and music therapists (M), with music used to manage distress and regulate the environment (O).

Table 2 | Sentence completion exercise for stakeholders and experts-by-experience

1. Music can help in care home, hospital and mental health settings because ...
2. A music therapist can help people with advanced dementia because ...
3. Things that maximize the benefits of music therapy include ...
4. Things that limit the benefits of music therapy include ...

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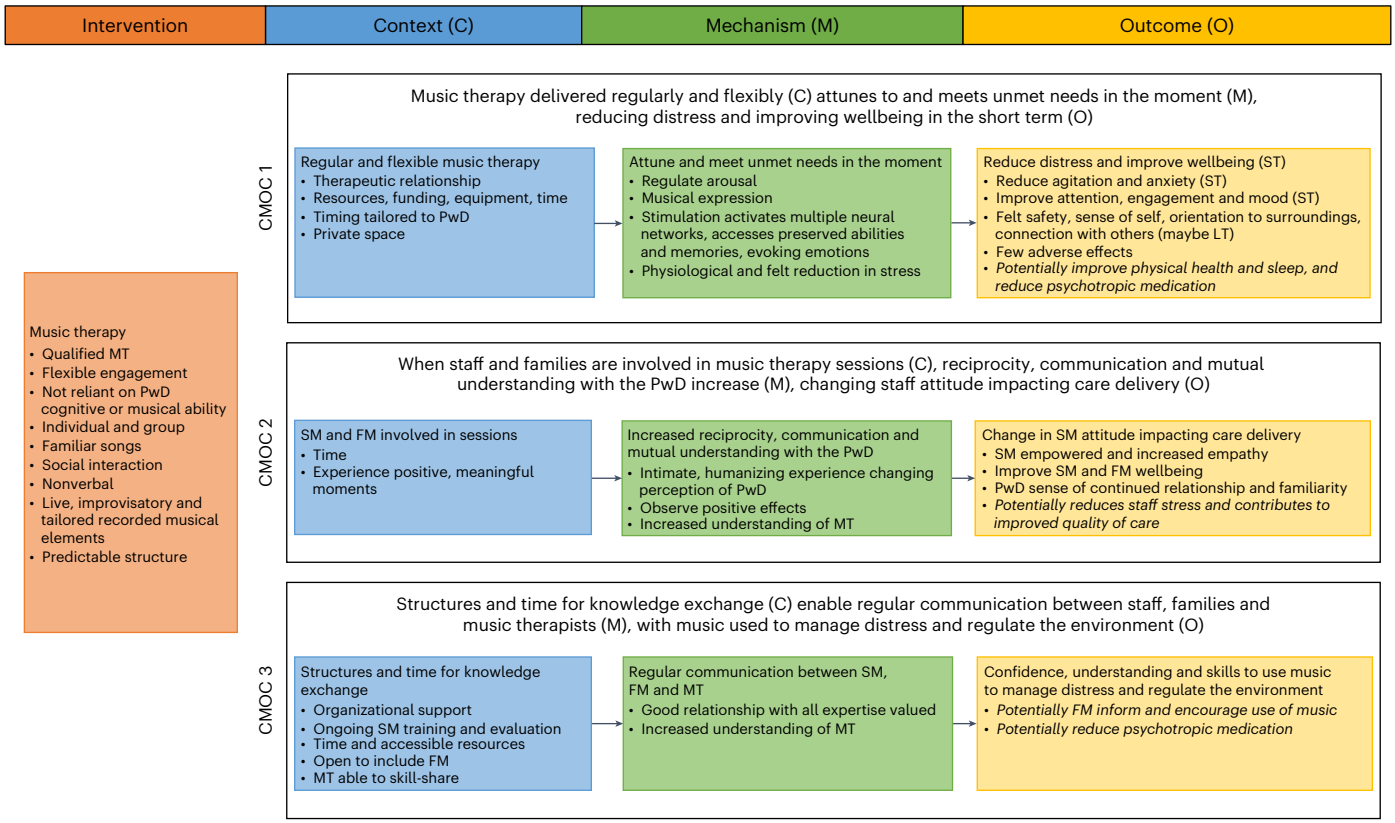

Fig. 4 | Program theory: how and why music therapy may reduce distress and improve well-being for people with advanced dementia in institutional settings. Statements in italics indicate where the supporting evidence is weak. MT, music therapist; SM, staff member; FM, family member; PwD, person with dementia; ST, short term; LT, long term.

The program theory highlights the importance of support within the organization and management for music therapy to become embedded in services, including policies and systems for knowledge exchange. Music therapists need to be equipped to skill-share with other professionals and transfer knowledge about individuals into everyday care, with recent studies seeking to manualize music therapist-delivered training for carers[26]. Training should be given to all staff not relying on individuals, build on ways all can use music in practice regardless of musical experience, and include formal and informal aspects to provide ongoing support and evaluation in specific contexts. This can also support training of new staff where staff turnover is high. While staff time is pressured, organizational support and understanding of the role of music in care delivery may support staff engagement. Resources to use music should be available and accessible when needed, including musical instruments and music-playing devices. Personalized playlists may be designed to support activities with clear and easy instructions for staff. Families should be invited to identify ways music could be used to support their relative in appropriate ways.

Regular and appropriate communication between staff, families and music therapists was shown to be possible when there is a culture of knowledge exchange. This could include inputting music activities into individual care plans, music therapists attending team meetings, and liaising with staff before and after sessions. Good relationships need to be established with time and respect for the expertise that all bring to help build an understanding of the individual. In addition, embedding training for all staff can support understanding of music therapy and the purposeful use of music, including times when it is not appropriate to play music.

Where the above mechanisms are triggered within the established context, staff will have the confidence, understanding and skills to use music to manage distress and regulate the environment. Staff use of music is shown to be a practical, cheap and time-efficient way to help manage distress and improve well-being in the moment. Individuals needing additional support or assessment can then be referred for music therapy. In addition, families may be empowered to inform and encourage appropriate use of music for their relative, and ways to use music can be shared with further placements for the individual. Finally, where creative ways to manage distress are used as the primary treatment, this may reduce the need for prescribed and as-needed antipsychotic medication.

Discussion

The program theory outlined provides a thorough and comprehensive explanation for how music therapy can reduce distress and improve well-being for people with advanced dementia in institutional settings, drawing on academic sources and stakeholder experience. The theory incorporates neurological, social and psychological models and involves music therapists delivering structured interventions and supporting the tailored use of music by staff and families to support care delivery[22,25–28]. The theory outlines the factors relating to the intervention and the individual, interpersonal and institutional contextual factors that are required to trigger changes in reasoning and response, thereby causing observable intended and unintended outcomes. These factors should be considered in the development of new music therapy services and research to support the embedding of music and music therapy within institutional services to reduce distress for people with advanced dementia.

Meeting unmet needs in the moment through nonverbal musical interaction was an essential mechanism for music therapy to enable a reduction of distress and improved well-being for the person with dementia. This draws on principles of person-centered care and being with the person in the moment, which are fundamental to

Table 3 | Supporting evidence and example quotes, indicated by italics, for the program theory

Supporting evidence	Example quotes
Music therapy (intervention)	
Systematic reviews[19,21–24,29,36,40,48]; peer-reviewed literature[13–15,26,41,42,56–61]; gray literature[62–68]; stakeholders: SH2,3,4,5,6,7	"[music therapists] are trained to listen attentively with warmth, and respond sensitively to all signs of communication however challenging, tiny or confusing these signs are" (SH4); "music and art and things that can operate on a more sensory level are accessible to people who are cognitively impaired" (P4); "Although I start and end most groups with songs, much of the central section is directed towards enabling and supporting group members in creating music in whatever way they can"[59].
Regular and flexible music therapy (context)	
Systematic reviews[19,22,24]; peer-reviewed literature[11,13–15,38,41–43,57,58,61,69–71]; gray literature[62,63,65,66,72–74]; stakeholders: SH2,3,4,7	"[The music therapist] can help to make a person feel safe and nurture a relationship built on trust and empathy" (SH6); "the therapist being flexible in times of sessions, accepting the person as they are on that day with respect and compassion" (SH4); "A regular time, uninterrupted space, light instruments, a piano or keyboard" (SH3)
Attune and meet unmet needs in the moment (mechanism)	
Systematic reviews[18–24,36,40]; peer-reviewed literature[11,13–15,26,37,38,42,56,58,59,70,71,75–77]; gray literature[62,64–66,68,78]; stakeholders: SH2,4,5,6	"These symptoms [of agitation, apathy, depression and anxiety] may often arise from a person's unmet needs such as untreated pain or environmental sensory overload. Therefore, a therapist's role is to help identify these needs and possible causes of symptoms"[64]; "Every song is a means of regulation that at the same time brings meaning and coherence. It is not only a question of choosing the 'right' song. but also of singing it the 'right' way."[70]; "[a music therapist] can reassure, calm and comfort, stimulate and inspire, bring back memories to promote joy, reinforce a sense of self and connection to life experiences … They can awaken responses that are unique and special to the person and provide an opportunity for them to release and express myriad emotions" (SH6)
Reduce distress and improve well-being in the short term (outcome)	
Systematic revi ews[19,20,22–24,36,48]; peer-reviewed literature[11,13,14,37,39,42,56–61,69,70,76,79]; gray literature[62,66,67,72,73,78,80–83]; stakeholders: SH4,6,7	"somebody can be quite agitated and then the music therapist comes in and they're just different people … So to have a music therapist come in is it's amazing they're just different people." (P8); "I've never seen them having too much music so I can't see there's a negative effect" (P5); "Nursing homes could develop the use of therapeutic music and playlists which can see dependency of medication lessened"[66]
Staff and families are involved in music therapy (context)	
Systematic reviews[23]; peer-reviewed literature[11,38,43,56,58,59,61]; gray literature[62,63,65,66,73,82–85]; stakeholders: SH3,5,6	"most of the staff join in all the time and they're quite positive and you can see actually, you know when a patient's engaged with the music therapists they're generally calmer and engaging" (P10); "I think the challenges are pressures on staff. Yes, they're just incredibly busy, so turning up and getting a hand over something can be quite difficult." (P1)
Reciprocity, communications and mutual understanding with the person with dementia increase (mechanism)	
Systematic reviews[18,21,22]; peer-reviewed literature[26,30,38,43,56,61,76,79,86]; gray literature[65,66,74,83,87]	"we spend time doing instrumental things with patients that are for their best interests or we spend time doing things that patients don't like, but are in their best interests. And so it's nice to be able to share something with patients that's positive for everyone." (P4); "Through reminiscence and meaningful interactions, staff gained greater insight into residents' lives and personalities, allowing them to see the identity behind the diagnosis"[22]
Change in staff attitude impacting care delivery (outcome)	
Systematic reviews[18,21,22]; peer-reviewed literature[11,26,43,56,58,76,77,86]; gray literature[63–66]; stakeholders: SH6	"Used sensitively [music] may create an uplifting atmosphere in the workplace for staff and be incorporated to help the daily routine for both staff and residents. It can bring people together socially and engage them in something meaningful." (SH6); "it feels like an easier day maybe because we're doing music and we're starting the day with music" (P2)
Structures and time for knowledge exchange (context)	
Systematic reviews[22]; peer-reviewed literature[11,26,38,61,76]; gray literature[63–67,78,82,83,85]; stakeholders: SH1,6	"I could see the music therapy being something that could collaborate around making an MDT care plan for somebody where we could have a bit more expertise about exactly what would help" (P4); "a positive culture of care was defined by giving time and resources to staff education and reinforcement of learning, and that feedback on progress encouraged a sense of shared ownership of a given change"[26]
Regular communication between staff, families and music therapists (mechanism)	
Systematic reviews[22]; peer-reviewed literature[13,26,38,61,77]; gray literature[63,65,66]	"increased collaboration with staff when working face-to-face enabled music therapists to adapt to the changing needs of the ward throughout the pandemic"[77]; "Individual music therapy is not successful unless therapist, staff and relatives are aware of their roles in bringing the positive results from the music therapy process outside the individual relation, and bring change in daily life as well"[13]
Confidence, understanding and skills to use music to manage distress and regulate the environment (outcome)	
Systematic reviews[21,22]; peer-reviewed literature[11,13,26,41,43,56,61,76,79,86]; gray literature[63,65–67,74,78,80,82,83,85]	"Music therapy can enhance the general quality of care, help staff deal with agitation, apathy, and communication problems, and help people live well with dementia"[80]; "somebody who'd had music therapy in the past and I think their family had mentioned this that they found it beneficial and we thought it would be a good idea to try that again" (P11)

For the extended version, see Supplementary File 2. Quotes followed by a 'P' and an accompanying number are from interview responses; quotes followed by 'SH' and an accompanying number are from online survey responses.

many psychosocial interventions in dementia care[44–46]. Unmet needs included a need for stimulation, familiarity through memories, relationship and emotional expression, and support with reduction of stress and arousal regulation. The focus on the here and now may be different to working with other client groups, and the use of song to trigger preserved abilities and memories, and the importance of nonverbal, sensory communication, is pertinent to working with people in advanced stages of disease progression. However, further research is needed to enhance understanding of the neurophysiological mechanisms triggered when people with advanced dementia engage in musical interactions with a therapist. This is reflected in the intervention and CMOC 1 outlined in the program theory, highlighting

the skill required by the music therapist to flexibly meet needs in the moment within a safe and predictable structure.

Music, in particular recorded music, is an accessible intervention for staff and families to incorporate into care delivery, and a music therapist can train and advise on tailoring music interventions for individuals and the environment. However, time and resources are critical for music to be used in an informed way, with organizational support required to embed music as part of care practices. Implications of using music to manage distress and improve well-being within services may be wide ranging, potentially reducing the use of antipsychotic medication to manage distress and improving staff and family well-being. This is crucial in an area where high levels of staff stress and turnover have been described[47].

While music therapy in advanced dementia care is a growing area of practice and research, there was not enough evidence to theorize the optimal frequency, duration and mode of delivery of music therapy interventions. While one review found receptive music-based interventions to be more effective at reducing symptoms of distress than active ones, most studies focused on the delivery of active music therapy interventions; research should explore the different mechanisms and outcomes for active and receptive interventions[48]. In addition, most literature explored factors relating to the individual(s) participating in music therapy sessions and the impact for them, with little discussion of the wider interpersonal, institutional and infrastructural factors that impact on the delivery and outcomes of complex interventions in complex settings. This included how to include families and staff in sessions, the impact of music therapy for family members, and the training and support needs of staff and music therapists to deliver interventions in these settings. Very little research looked at the implementation of interventions, including how many music therapists are needed to deliver interventions and what aspects of music therapy are transferable to places without access to a trained music therapist. Interpersonal and institutional elements of the program theory draw largely on stakeholder input and interviews; however, there were insufficient data to include infrastructural elements, such as government policies.

The role of music therapists in delivering clinical interventions alongside training and advising on use of music in everyday care should be reflected in the design and implementation of music therapy posts in institutional settings. This requires time for the therapist to work alongside staff and families as well as directly with the person with dementia. Research should focus on the impact of working in this way, including potential adverse effects reported in relation to group working, and the support needs for the music therapist to implement interventions within highly complex settings with pressures on time and funding allocation[41–43]. In addition, research is needed to explore the support needs of countries with less access to qualified music therapists and ways in which the program theory should be adapted to different cultures. This could include conducting further research to adapt the program theory to include all music-based interventions, particularly in light of research with people with dementia highlighting the benefits of music interventions delivered by other music facilitators[24,42]. The impact of working systemically on staff and family well-being and how this can be implemented are also not reported, including the impacts on staff stress, implications for care delivery, such as reduction in use of medication, and staff turnover and absence, all of which have considerable cost implications.

There are limitations to consider when interpreting the findings presented that should be addressed in future research to refine and test the program theory. The global relevance of the theory cannot be assumed, as the majority of evidence was from Europe and the United States, with none from the continent of Africa, and the authors work predominantly in the United Kingdom. In addition, demographic data for participants in the original research study included in phase 1 were not collected. This highlights a need for global research reviewed by international research teams including transparent reporting of the demographics of participants. The quality of the included studies varied in regard to relevance, richness and rigor, with many not sufficiently describing the interventions used and why, separating findings for those in middle to advanced stages of dementia or reporting adverse effects. Evidence was synthesized to ensure that elements identified in the theory were supported by high-quality evidence, clearly defining the study population, and corroborated with stakeholder and consultation groups. However, this highlights a need for more rigorous research reported following standardized guidelines. Exploration of the similarities and differences to explanatory theories of music therapy for people in early and middle stages of dementia, including those living at home, would also be valuable.

Concluding statement

This realist review followed a rigorous and systematic protocol, drawing on academic and gray literature alongside stakeholder and expert-by-experience input, to develop a program theory for how music therapy can reduce distress and improve well-being for people with advanced dementia in institutional settings. The theory is not proposed as a final depiction of music therapy with this population, but should be tested and refined through empirical research and updated iteratively as our knowledge and understanding grows, in line with realist methodology. The theory supports much of the current training and practice of music therapy in dementia care internationally, in particular the focus on meeting needs in the moment. It also highlights the contextual factors required for collaboration with staff and family members to ensure the short-term benefits of music for the individual can be embedded in everyday care and contribute to the management of distress in the wider environment.

Methods

All research activities comply with ethical regulations and were approved by Anglia Ruskin University, Arts, Humanities, Education and Social Sciences Faculty Ethics Board (ETH2223-3914). Written informed consent was gained from all participants. Where secondary analysis was conducted, participants provided informed consent in the original study and were informed via email of the analysis with an option to withdraw from this.

Phase 1

Key texts relating to music therapy with people with advanced dementia in institutional settings were identified by the research team. In addition, secondary analysis of 11 interviews with ward staff and music therapists, collected during a service evaluation of music therapy on 2 inpatient mental health dementia wards, was conducted by N.T. using reflexive thematic analysis[49,50]. Finally, a sentence completion exercise was conducted with five people with dementia and carers who are members of the Inpatient Dementia Experience Group, facilitated by Dementia UK (Table 2).

Data and feedback from consultations were transformed into if-then statements and synthesized to create the rough theory and CMOCs. The CMOC was adapted to separate 'context' and 'intervention', in line with previous reviews[33,51]. The outcomes were separated into initial and overall outcomes at this stage. The rough theory was reviewed by the research team, arts therapists and clinicians to identify gaps in the theory to inform testing and refinement in phase 2.

Phase 2

Systematic searches of the literature were performed. Data relating to any music interventions with this population, that is, those not delivered by a qualified music therapist, were included at this stage where music was the main component of the intervention and the intervention met the NICE definition of a psychosocial intervention[52]. A separate search for literature reviews was included as the majority of reviews found did not meet the inclusion criteria in the original search.

Table 4 | Quality assessment using relevance, richness and rigor criteria based on Dada et al. (2023)[35]

Relevance:
• Can the data contribute to the theory building or testing?
Richness:
• Is there sufficient detail to understand the intervention and the context, and whether findings could be transferred to other similar settings?
• Is there theoretical and contextual development of how the intervention is expected to work?
Rigor:
• Is the source credible? If the source cannot be verified (for example, online blog post), is there supporting evidence from other sources (for example, organization report/journal article)?
• Have ethics, including the wishes of the person with dementia, been considered?
• Are the methods used appropriate and trustworthy?
• Is the theory consilient (explains the data), simple (makes few assumptions) and substantive (aligns with existing theories)?
• If no to above, are there 'nuggets' of wisdom that could be included in the theory with supporting evidence from other sources?

Search results were transferred to Rayyan[53]. Titles and abstracts were screened for inclusion by N.T., with a third screened by M.H.H. Abstracts that met the criteria, or where there was uncertainty, were forwarded for full text screening, conducted by N.T. with a third reviewed by M.H.H. Data, including quality scores, separation of results by stage of dementia, interpretation of meaning and judgements in relation to the mid-theory, were extracted to a bespoke data extraction form in Microsoft Word by N.T. and reviewed by M.H.H. (Supplementary File 3)[54,55]. In addition, a quality appraisal was conducted by N.T., reviewed by M.H.H., based on the rigor, richness and relevance of the literature in relation to the rough theory (Table 4)[35]. Literature was given a score of 1–3, with 3 being high quality.

Systematic search of review articles. A systematic search of systematic reviews was conducted on PubMed in June 2023. Reviews were published after 19 June 2017 to include data since the latest Cochrane review (Table 1; for full justification, see Supplementary File 4)[24]. The search terms were the following: '(((Music) AND (dementia)) AND (systematic review[Publication Type])) AND (("2017/06/19"[Date - Publication] : "3000"[Date - Publication]))'.

Systematic search of articles. A systematic search was conducted on PsycINFO, MEDLINE, CINAHL, Web of Science, Scopus and Psychology and Behavioural Science Collection in April 2023 (Table 1; for full justification, see Supplementary File 4). Searching of references and forward searches were conducted for all included papers, as well as hand searching of the *British Journal of Music Therapy*, *Journal of Music Therapy*, *Nordic Journal of Music Therapy*, *Voices*, *Music Therapy Perspectives* and *Approaches*. Search terms were the following:

'(advanced dementia OR severe dementia OR late stage dementia OR end stage dementia OR advanced Alzheimer* OR severe Alzheimer* OR end stage Alzheimer* OR late stage Alzheimer* OR severe cognitive impairment OR advanced cognitive impairment OR late stage cognitive impairment OR end stage cognitive impairment OR severe memory loss OR advanced memory loss OR late stage memory loss OR end stage memory loss) AND (music*) AND (institution OR care home OR nursing home OR residential care OR hospital OR inpatient OR mental health ward OR mental health unit OR psychiatr* ward OR psychiatr* unit OR geriatric ward OR geriatric unit OR psychogeriat* ward or psychogeriat* unit OR dementia ward or dementia unit)'.

Search for gray literature. Searches for gray literature were conducted on 'Policy Commons' and using advanced Google searches. Potential sources of relevant literature were shared by the research team. This search was continued until data saturation was reached. The selection criteria and quality assessment processes were the same as those for peer-reviewed literature (Table 1).

Online survey. An online survey was distributed using the same sentence completion questions as those outlined in phase 1 (Table 2). This was shared on social media, through the research team's networks, and with the NAPA network of activities coordinators. If-then statements were created from the data to enable these to be transformed into CMOCs.

Phase 3

Data from phase 2 were synthesized and used to refine the rough theory to create a mid-range theory. The mid-range theory was presented to the research team, stakeholders, experts-by-experience and experts in realist reviews to establish the trustworthiness and clarity of the theory. Refinement of the program theory was an iterative process, with the research team working together to review feedback and integrate this into the theory.

Reporting summary

Further information on research design is available in the Nature Portfolio Reporting Summary linked to this article.

Data availability

Data used can be obtained from the original studies included in the realist review (Supplementary File 1). Databases searched included PsycINFO, MEDLINE, CINAHL, Web of Science, Scopus and Psychology and Behavioural Science Collection, PubMed and Policy Commons. Qualitative data used in secondary data analysis and survey responses are not publicly available due to ethical and consent restrictions.

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Author contributions

N.T., H.O.-M., B.R.U., E.W. and M.-H.H. designed the study and contributed throughout each iterative phase of the review. N.T. and M.-H.H. designed the search strategy and methods. N.T. and M.-H.H. collected, analyzed, reviewed and synthesized the data. N.T. drafted the rough and final program theories that were reviewed by all authors. N.T. drafted the manuscript. N.T., H.O.-M., B.R.U., E.W. and M.-H.H. read, edited and approved the final manuscript.

Competing interests

The authors declare no competing interests.

Additional information

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Our web collection on statistics for biologists contains articles on many of the points above.

Software and code

Policy information about availability of computer code

Data collection	Data was extracted to a bespoke data extraction form in Microsoft Word (supplementary file 2).
Data analysis	Reflective thematic anaysis of secondary qualitative data; data synthesised iteratively to create rough and programme theory

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- A description of any restrictions on data availability
- For clinical datasets or third party data, please ensure that the statement adheres to our policy

Data used can be obtained from the original studies included in the realist review (supplementary file 3). Databases searched included PsycINFO, MEDLINE, CINAHL, Web of Science, Scopus and Psychology and Behavioural Science Collection, PubMed and Policy Commons. Qualitative data used in secondary data analysis and survey responses are not publicly due to ethical and consent restrictions.

Research involving human participants, their data, or biological material

Policy information about studies with human participants or human data. See also policy information about sex, gender (identity/presentation), and sexual orientation and race, ethnicity and racism.

Reporting on sex and gender	Demographic data were not collected for survey respondents to protect anonymity. For demographic data for included studies see supplementary file 3 and original study manuscripts.
Reporting on race, ethnicity, or other socially relevant groupings	Reporting on demographics of included populations is included in supplementary file 3 and original manuscripts.
Population characteristics	Demographic data were not collected for survey respondents to protect anonymity. For demographic data for included studies see supplementary file 3 and original study manuscripts.
Recruitment	Recruitment to the online survey was through purposive sampling. Advertisements were distributed on social media, through the research team's network, and through the NAPA network.
Ethics oversight	All research activities comply with ethical regulations and were approved by Anglia Ruskin University, Arts, Humanities, Education and Social Sciences Faculty Ethics Board (ETH2223-3914).

Note that full information on the approval of the study protocol must also be provided in the manuscript.

Field-specific reporting

Please select the one below that is the best fit for your research. If you are not sure, read the appropriate sections before making your selection.

☐ Life sciences ☒ Behavioural & social sciences ☐ Ecological, evolutionary & environmental sciences

For a reference copy of the document with all sections, see nature.com/documents/nr-reporting-summary-flat.pdf

Life sciences study design

All studies must disclose on these points even when the disclosure is negative.

Sample size	
Data exclusions	
Replication	
Randomization	
Blinding	

Behavioural & social sciences study design

All studies must disclose on these points even when the disclosure is negative.

Study description	Realist review of music therapy in advanced dementia care. Mixed methods data were gathered.
Research sample	11 semi-structured interviews; 7 online survey respondents; 553 pieces of literature
Sampling strategy	As a predominantly literature led review, there were no sample size calculations. Interviews, surveys and stakeholder consultations were used to enrich data and fill gaps in the literature.
Data collection	Data were collected through: protocol-led systematic literature searches, with search results extracted to Rayyan; semi-structured interviews conducted online; online surveys. Researchers were not blinded to the study hypothesis.
Timing	Data collection took place in January 2023 - June 2023. Secondary analysis was conducted on interviews collected in 2021.
Data exclusions	497 articles were excluded following the predetermined inclusion/exclusion criteria for the systematic search on PROSPERO (supplementary file 4). Reasons are recorded in figure 3.
Non-participation	No participants dropped out or declined participation.
Randomization	Randomisation was not required as this is a literature review using additional qualitative methods.

Ecological, evolutionary & environmental sciences study design

All studies must disclose on these points even when the disclosure is negative.

Study description	
Research sample	
Sampling strategy	
Data collection	
Timing and spatial scale	
Data exclusions	
Reproducibility	
Randomization	
Blinding	

Did the study involve field work? ☐ Yes ☐ No

Field work, collection and transport

Field conditions	
Location	
Access & import/export	
Disturbance	

Reporting for specific materials, systems and methods

We require information from authors about some types of materials, experimental systems and methods used in many studies. Here, indicate whether each material, system or method listed is relevant to your study. If you are not sure if a list item applies to your research, read the appropriate section before selecting a response.

Materials & experimental systems

n/a	Involved in the study
☒	☐ Antibodies
☒	☐ Eukaryotic cell lines
☒	☐ Palaeontology and archaeology
☒	☐ Animals and other organisms
☒	☐ Clinical data
☒	☐ Dual use research of concern
☒	☐ Plants

Methods

n/a	Involved in the study
☒	☐ ChIP-seq
☒	☐ Flow cytometry
☒	☐ MRI-based neuroimaging

Antibodies

Antibodies used	
Validation	

Eukaryotic cell lines

Policy information about cell lines and Sex and Gender in Research

Cell line source(s)	
Authentication	
Mycoplasma contamination	
Commonly misidentified lines (See ICLAC register)	

Palaeontology and Archaeology

Specimen provenance	
Specimen deposition	
Dating methods	

☐ Tick this box to confirm that the raw and calibrated dates are available in the paper or in Supplementary Information.

Ethics oversight	

Note that full information on the approval of the study protocol must also be provided in the manuscript.

Animals and other research organisms

Policy information about studies involving animals; ARRIVE guidelines recommended for reporting animal research, and Sex and Gender in Research

Laboratory animals	
Wild animals	
Reporting on sex	
Field-collected samples	
Ethics oversight	

Note that full information on the approval of the study protocol must also be provided in the manuscript.

Clinical data

Policy information about clinical studies

All manuscripts should comply with the ICMJE guidelines for publication of clinical research and a completed CONSORT checklist must be included with all submissions.

Clinical trial registration	
Study protocol	
Data collection	
Outcomes	

Dual use research of concern

Policy information about dual use research of concern

Hazards

Could the accidental, deliberate or reckless misuse of agents or technologies generated in the work, or the application of information presented in the manuscript, pose a threat to:

No	Yes	
☐	☐	Public health
☐	☐	National security
☐	☐	Crops and/or livestock
☐	☐	Ecosystems
☐	☐	Any other significant area

Experiments of concern

Does the work involve any of these experiments of concern:

No	Yes	
☐	☐	Demonstrate how to render a vaccine ineffective
☐	☐	Confer resistance to therapeutically useful antibiotics or antiviral agents
☐	☐	Enhance the virulence of a pathogen or render a nonpathogen virulent
☐	☐	Increase transmissibility of a pathogen
☐	☐	Alter the host range of a pathogen
☐	☐	Enable evasion of diagnostic/detection modalities
☐	☐	Enable the weaponization of a biological agent or toxin
☐	☐	Any other potentially harmful combination of experiments and agents

Plants

Seed stocks

Novel plant genotypes

Authentication

ChIP-seq

Data deposition

☐ Confirm that both raw and final processed data have been deposited in a public database such as GEO.

☐ Confirm that you have deposited or provided access to graph files (e.g. BED files) for the called peaks.

Data access links
May remain private before publication.

Files in database submission

Genome browser session
(e.g. UCSC)

Methodology

Replicates

Sequencing depth

Antibodies

Peak calling parameters

Data quality

Software

Flow Cytometry

Plots

Confirm that:

☐ The axis labels state the marker and fluorochrome used (e.g. CD4-FITC).

☐ The axis scales are clearly visible. Include numbers along axes only for bottom left plot of group (a 'group' is an analysis of identical markers).

☐ All plots are contour plots with outliers or pseudocolor plots.

☐ A numerical value for number of cells or percentage (with statistics) is provided.

Methodology

Sample preparation

Instrument

Software

Cell population abundance

Gating strategy

☐ Tick this box to confirm that a figure exemplifying the gating strategy is provided in the Supplementary Information.

Magnetic resonance imaging

Experimental design

Design type

Design specifications

Behavioral performance measures

Imaging type(s)

Field strength

Sequence & imaging parameters

Area of acquisition

Diffusion MRI ☐ Used ☐ Not used

Preprocessing

Preprocessing software

Normalization

Normalization template

Noise and artifact removal

Volume censoring

Statistical modeling & inference

Model type and settings

Effect(s) tested

Specify type of analysis: ☐ Whole brain ☐ ROI-based ☐ Both

Statistic type for inference

(See Eklund et al. 2016)

Correction

Models & analysis

n/a	Involved in the study
☐	☐ Functional and/or effective connectivity
☐	☐ Graph analysis
☐	☐ Multivariate modeling or predictive analysis

Functional and/or effective connectivity

Graph analysis

Multivariate modeling and predictive analysis