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REVIEW

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Musical improvisation and health: a review

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Abstract

There is an expanding field of research into how making or listening to music can improve wellbeing. As a spontaneous, social, creative nonverbal process unfolding in real time, musical improvisation between individuals is a unique psychological phenomenon distinct from other areas of musical activity. It may therefore have an influence on health or wellbeing distinct from other musical behaviours, and from other components of a musical intervention. Given the psychological complexity of this behaviour it is important to establish the parameters of improvisation, the effects on health or wellbeing that are perceived or claimed for it, and any mechanisms understood to bring about these effects. To establish this, literature was reviewed that explicitly investigates or theorises about the capacity of musical improvisation to influence health or wellbeing. Only work examining its application within music therapy was identified. The behaviours and interactions that constitute improvisation during music therapy are clearly defined. Improvisation in music therapy is seen to have specific benefits for particular populations including the amelioration of neurological damage, improvements in mental health conditions, reductions in stress and anxiety, and improved communication and joint attention behaviours in children with autistic spectrum disorders. Four unique characteristics of musical improvisation are identified as underlying these effects: its potential to link conscious with unconscious processes, the demands on attention of absorption in a creative process, the non-verbal social and creative interaction experienced, and the capacity for expressing difficult or repressed emotions without having to articulate these verbally. Although improvisation is undertaken in music therapy for a purpose distinct from that of improvisation in other contexts, its processes can be seen as substantively similar, suggesting that improvising in itself may offer intrinsic benefits to health or wellbeing to broader populations and outwith the therapeutic context. Based on this review, a model is proposed for how improvisation in music can influence the health or wellbeing of those involved.

Keywords: Improvisation; Music; Health; Wellbeing; Music therapy; Review

Introduction

Music is increasingly appreciated as important to health, with an expanding field of research into how making or listening to music can improve wellbeing (MacDonald et al. 2012a; Kamioka et al. 2014). For instance, singing in choirs can have a positive effect on emotional states and anxiety levels (Sanal and Gorsev 2014) and musical rhythm can be harnessed to improve gait recovery in stroke rehabilitation (Thaut et al. 2007). Knowledge is however lacking as to which specific aspects of musical participation influence specific conditions or aspects of health. Playing music in particular is a complex activity that can be social and engages non-verbal physical and mental processes.

This means it offers an interface with a wide range of health problems, but also that any use of musical participation to improve health or wellbeing is likely to constitute a complex intervention. Furthermore, 'playing music' encompasses a vast range of different behaviours, from interactive electronic processing of live sound to executing the appropriate note at the right time in a gamelan ensemble, or from teaching scales on an instrument to an infant experimenting with pitches for their voice.

Within the field of health psychology, it has been observed that complex interventions sharing the same label can comprise highly varied components (Michie et al. 2011). For instance, brief interventions to reduce excessive alcohol consumption may be delivered by doctors or other healthcare staff in sessions of varied lengths, in groups or individually, and may consist of information provision or motivational dialogue, with varying numbers of follow-up sessions delivered at various intervals (Michie et al. 2012). This makes it problematic to talk of the effectiveness of generic types of intervention, prompting an initiative to demonstrate not just the effectiveness of complex interventions, but also the components of those interventions and their relative effectiveness. For musical interventions for health to be more widely developed, implemented and prescribed, there is a need to establish models for the specific effects of specific features of musical activity on health or wellbeing; to know, in other words, what the 'effective ingredients' are of taking part in music (Kamioka et al. 2014). Nevertheless, some practitioners caution against such a reductive approach, arguing that effectiveness can only be located at the level of the whole intervention (Pavlicevic 1997; Wigram et al. 2012).

Improvisation represents a distinct strand within music in that much musical activity, (for instance learning or performing thoroughly notated music or rehearsing to replicate substantively a recorded performance) involves little or no improvisation. Yet it is a feature of many applications of music that are seen as having health benefits. For example improvisation facilitates the crucial clinical relationship between a therapist and a client within Creative Music Therapy approaches (Trondalen and Bonde 2012) and an improvised music intervention has been found beneficial to patients in a cancer ward (Pothoulaki et al. 2012). Improvisation is however itself a complex phenomenon with unique psychological features (MacDonald and Wilson in press). Most musical improvisation is social, involving the idiosyncratic contributions of two or more individuals, each interpreting and musically responding to the other(s) and their playing. It is spontaneous in that music is formed as it is played through moment-by-moment responses to immediate musical contexts. It is creative in that improvising musicians produce novel music each time they play that may be similar to, but is different from, any previous performance. Finally, while masterful improvisation garners most attention and may be what comes to mind first when considering this musical practice, musical improvisation is something in which anyone can engage. From early infant-mother interactions onwards (Trevvarthen 2002), all humans have the creative capacity to generate and modify patterns of sound in response to each other (MacDonald et al. 2012b). Since all are musical improvisers to some extent, everybody can engage in improvisation at some level, unlike many other musical activities where specific technical skills or knowledge are required to participate. This accessibility of improvisation means it has the potential for wide-ranging application as an intervention.

These features may underlie the perceived utility of improvisation within a health care context. Although improvisation as an aesthetic activity has been studied, its potential function in relation to health, rather than that of music in general, has not. Given the psychological and structural complexity of this behaviour, a model for how improvisation in music can influence the health or wellbeing of those involved would be useful. Three considerations are crucial to this:

What are the parameters of improvisation? The term 'improvisation' covers a broad range of practice. For instance, in Iranian or Indian classical music only certain aspects can be spontaneously created according to relatively strict conventions (Nooshin 2003) while in post-idiomatic free improvisation, players seek to avoid all reference to existing music or musical conventions each time they play (Bailey 1993). Any attempt to set out associations between improvisation and health must at the same time identify the parameters taken to constitute improvisation.

What effects on health or wellbeing are perceived or claimed? Improvisation may be expected to have direct benefits for psychological symptoms or conditions such as depression and low mood, or physiological processes such as rehabilitation or levels of stress. Measurement may be at the level of self-report, objective assessment or biological markers. But these effects should be attributable to improvisation specifically, rather than other musical or non-musical components of a music intervention. It is also important to know which groups are expected to garner which specific benefits.

What mechanisms are understood to bring about these effects? Improvisation is typically seen as a process analogous to communication or expression; indeed this is hailed as part of its appeal across a range of educational and health related contexts. However communication and expression have been framed in various psychological models with varied implications. These processes may be seen by theorists as either involving a transfer of information; an identification of internally consistent selves; or the construction of identities in specific social contexts (Potter and Wetherell 1994; Miller 2002). Such varied explanations of what takes place in a communicative process have significant implications for how we are to understand influences on health from improvised musicking. If, for example, a therapist spontaneously plays a particular chord for a patient during a session, does that patient experience exactly the same association as the therapist and understand their intent; or does the patient form their own distinct perception of that configuration of sound according to an internally consistent self; or do they inevitably receive and respond to it in ways that reflect a particular understanding of self and therapist within that immediate context only?

Such implications are central to understanding how improvisation may function as a component of an intervention. In this paper, literature specifically addressing improvisation as a musical intervention to improve health is reviewed. We identify effects attributed to the unique features of improvisation and the reasoning behind any claims; and we reflect on whether the effects of improvisation are separable from those of other musical activities or from the intervention considered as a whole, presenting qualitative evidence gathered in the evaluation of such interventions. We also consider any distinctions perceived between improvisation for aesthetic goals and for therapeutic goals. This provides an initial step towards a model based on discourse theory for how improvisation can affect specific health states positively, and indicates how a robust evidence base can be gathered towards development of interventions that harness this vital human process.

Review

Method

The Medline and PsycInfo databases were searched for peer-reviewed journal articles in English with all of the search terms music*, improvis* and either therap*, well-being or health* in the abstract, returning 177 articles. In addition published works known to the authors were reviewed, and the reference lists of identified articles were checked for further relevant references. Articles were excluded if the abstract mentioned the search terms, but the study was not substantively concerned with the influence on an aspect of health or wellbeing of taking part in musical improvisation. One hundred and one articles were identified through this process.

Background and discussion/conclusion sections were reviewed to identify causal assumptions, theories or explanations of the specific effects of improvisation. The characteristics of the improvisation involved were also identified. Where studies evaluated music interventions involving improvisation, they were examined for any specific measurement or conclusions regarding the improvised component of the intervention separately from the overall intervention.

Characteristics of improvisation

Although database searches were not exclusively limited to interventions labelled as 'therapy', all the relevant references examined or discussed music therapy; that is, improvisation undertaken with therapeutic intent, involving a trained and certified music therapist. Rolvsjord et al. (2005) identifies improvisation as an 'essential but not unique' part of music therapy; however, not all approaches involve improvisation. It is nevertheless central to the Creative Music Therapy founded by Nordoff and Robbins and to Psychodynamic approaches, and these are the most widely discussed in the literature on improvisation and health (Trondalen and Bonde 2012). Also, community music therapy locates the therapeutic intervention in the context of a community making music, which may involve improvisation (Pavlicevic and Ansdell 2004).

Improvisation is mostly described as taking place on a one-to-one basis with a therapist over multiple sessions (e.g. Aigen 2009). This essentially involves therapist and client performing music together that is spontaneously created in some or all respects. Wigram (2004) has provided a categorisation of the activities that may be undertaken by a therapist improvising on a one-to-one basis with clients. These include:

- **Mirroring:** simultaneously playing what the client is playing, as nearly as possible. This is intended to 'give a message to the client that they are meeting them at exactly their level' and provide confirmation of their activity.
- **Matching:** producing musical input compatible with the client's though not identical, within the same parameters of tempo, dynamic etc.
- **Empathic improvising and reflection:** the therapist playing to the client, or following the client's input, in a way that articulates or restates the client's apparent emotional state, to provide supportive and empathic confirmation.
- **Stabilising techniques (grounding, holding and containing):** providing ongoing stability through constant or repetitive rhythm or tonality.
- **Dialoguing:** understood as communication through music analogous to conversation, either on the basis of turn-taking, interjection or simultaneous input.

- **Modelling:** providing a musical idea or theme for the client to develop or respond to.
- **Accompanying** the client's music at a lower dynamic level on the basis of rhythm, harmony and/or melody, to provide support and empathy.

Improvisation identified in the literature that did not involve one-to-one sessions took the form of therapist-led group improvising sessions on percussion (Rickson 2006; Burns et al. 2001; Watson 2002) or on various instruments (e.g. Pothoulaki et al. 2012; Albornoz 2011; Davies and Richards 2010; Stewart 1997; Pavlicevic 1999).

It is stressed that while interactive improvisation is a distinct phase within a music therapy session, it is not necessarily seen as therapeutic in itself, but explicitly as a basis for subsequent verbal dialogue and exploration (Austin 1996; Pavlicevic 1997). Although improvisation may be an expected part of the toolkit of the therapist, they will apply their own discretion in choosing which aspects of their musical interaction with a client are improvised in accordance with their perceptions of that client's needs (Wigram 2004); their interaction can involve a continuum from completely free improvisation to improvising one part or aspect in performance of an existing piece of music, e.g. supplying occasional rhythmic 'fills'.

Effects on health or wellbeing

Therapy involving musical improvisation has been studied in application to a wide range of groups and conditions, including patients in rehabilitation from neurological damage (Aigen 2009; Pavlicevic and Ansdell 2004); patients with substance use disorders (Albornoz 2011); cancer patients (Burns et al. 2001; Pothoulaki et al. 2012); patients in palliative care (Hartley 2000); adults with mental health conditions (Erkkilä et al. 2011; Gold et al. 2013; Pavlicevic 1997); and children or young people with disorders including autistic spectrum disorders (ASD), attention deficit hyperactivity disorder (ADHD) and eating disorders (Geretsegger et al. 2012; Kim et al. 2008, 2009; Rickson 2006; Simpson and Keen 2011; Justice 1994).

Physical benefits

Physical benefits are seen to accrue for patients recovering from neurological damage who take part in improvisation. Aigen (2009) for instance describes the experience of time-keeping on a cymbal during improvisation sessions with a therapist as driving a patient's recovery of motor control in one arm. Tomaino (2013) cites one of the most striking outcomes from improvising as being a music therapy client regaining 'ability in the moment', or achieving during course of interaction something such as movement of a limb that they were not thought capable of. Robust trials to establish these effects are generally lacking, although 34 patients with severe brain injury in rehabilitation following a coma showed improvements in the psychomotor impairments and collaborative behaviours while receiving improvisational music therapy following the Nordoff Robins approach (Formisano et al. 2001).

Benefits to mental health

Benefits more commonly recognised as arising from improvisation include increase of vigour and reduction of tension, stress or anxiety. For instance improvements in biological measures of these symptoms have been measured in cancer patients following group sessions of improvisational music therapy; cancer patients have also reported

these benefits from music therapy in interviews, pointing specifically to aspects of their experience of improvisation (Burns et al. 2001; Pothoulaki et al. 2012; Logis 2011). Amelioration of the symptoms of depressed patients, including feelings of guilt, shame or despair has also been observed following participation in improvisation (Albornoz 2011). Changes in measures of the symptoms of patients with mental disorders before and after improvisational therapy indicate that this intervention brings about improvements compared with usual treatment (Gold et al. 2013). Not all patients with depression may benefit in this way; those with low motivation are identified as more likely to benefit from a therapeutic intervention based on reproduction of musical items (Erkkilä et al. 2012). However, improvisation in the course of therapy has been found to help individuals with anxiety and depression to perceive and maintain a more positive identity or sense of self (Erkkilä et al. 2012). Enhanced self-esteem, self-confidence, self-awareness or emotional wellbeing in individuals following improvisational music therapy have all been pointed to as indicators of improved wellbeing (Oldfield 2006; Pavlicevic and Ansdell 2004; Pothoulaki et al. 2012; Ruud 2010; Solli 2008; Magee 2007).

Communication benefits

Finally, it has been estimated that some 80% of music therapy goals relate to language or communication problems (Kaplan and Steele 2005), and improvement in these areas is seen as a central function of improvisation in therapy. Although improvisational therapy has no greater effect on the symptoms of schizophrenia than other than other forms of musical intervention (Mohammadi et al. 2013), it has been cited as an intervention that can improve the communication difficulties of patients with this diagnosis (Næss and Ruud 2007; Solli 2008; Pavlicevic et al. 1994). A review of studies of music therapy interventions for children with ASD concluded that improvisation was one of two main techniques for this group, associated with improvements in communicative behaviours, joint attention and emotional communication (Simpson and Keen 2011). Improvisational therapy has been shown to have positive effects on interactive behaviours among children with autistic spectrum disorders (ASD) in comparison with usual treatment (Geretsegger et al. 2012), and to lead to a greater observed increase in communicative behaviours than an intervention based on musical composition (Simpson and Keen 2011). Randomised controlled trials in children aged 3–5 with ASD have indicated that improvisation in therapy promotes capacities for self-expression, emotional communication and social interaction to a greater extent than play therapy (Kim et al. 2008, 2009). Teenage boys with ADHD have been found to benefit from music therapy, but benefits for this population from improvisational musical therapy including improved emotional lability and psychosomatic symptoms are likely to contrast with improvements that more structured musical activities can lead to, such as enhanced motor or timing skills (Rickson 2006).

Other benefits have been claimed for music therapy in general, and in respect of other patient groups; for instance, improvements in the symptoms of schizophrenic patients or in relaxation among prisoners (Gold et al. 2009; Thaut 1989). However those outlined above represent the key effects attributed in the literature to improvisation specifically.

Mechanisms

The mechanisms by which improvisation facilitates enhancements to health or wellbeing are not always specified in the literature, where the focus may be on

demonstrating effectiveness of the intervention as a whole. This is largely the case for studies observing an effect of improvisation on physical conditions arising from neurological damage, although Pavlicevic and Ansdell (2004) highlight that improvisation, more so than other forms of music activity, offers scope for stroke patients to explore and challenge their abilities in their own ways, and thus progress at their own speed. Amongst literature that suggests mechanisms for influence on mental health conditions, certain aspects of improvisation are widely proposed as effective. Following Austin (1996) and Bruscia (1988), the salient features offered by improvisation may be categorised as: a) a process mediating between the conscious and the unconscious; b) an absorbing experience confined to the present; c) a strongly mutual experience; and d) an activity based on symbolic rather than verbal language.

a) Unconscious expression

Skar (2002) describes an enhanced internal dialogue during improvisation as a 'waking dream' that allows images to crystallise from the unconscious. Allowing this emergence from the unconscious can increase the client's awareness of relationships between these two levels, and attune them to an internal self (Pavlicevic and Ansdell 2004), or to aspects of self with the potential to vary or remain constant (Wigram 2004). Atonal free improvisation during therapy in particular is seen as facilitating the manifestation and communication of inner states, unconscious conflicts and repressed emotions (Amir 2004; Priestley 1995). In the absence of the precise signification of verbal language, the client is able to 'try out' alternative selves and behaviours (Wigram 2004; Smeijsters and van den Hurk 1999; O'Callaghan 2004; Volkman 1993). This can be therapeutic for individuals with a negative or debilitating sense of self (Solli 2008). For instance, depressed patients who see themselves as worthless or hopeless, or patients with cancer or chronic conditions unable to perceive agency in their daily lives, may regain a sense of themselves as autonomous individuals in control during or through improvisation (Erkkilä et al. 2012; Pothoulaki et al. 2012; Magee 2007; Van der Walt and Baron 2006). Metzner (2010) emphasises the 'acting' taking place during musical improvisation as the basis for effectiveness with a patient suffering psychosis. Recent work gathering images of the brain activity of jazz musicians during group improvisation found that, while improvising, they exhibited reduced activity in the inhibiting region and arousal of the medial prefrontal cortex associated with self-expression and autobiography, the sense of self (Limb and Braun 2008). Tomaino (2013) argues that this evidence supports the idea of improvisation as an activity providing the 'opportunity to recreate ways of being' (Pavlicevic 1997).

b) Creative expression

The uncertainty of improvisation with another person, and the potential for the unexpected to occur, is seen as creating a heightened state of awareness and unique demands on attention (Pavlicevic 1997; Hartley 2000). As such, it is an absorbing and creative activity, with the potential to provide 'flow' experiences associated with gratification (Csikszentmihalyi 1991). It is on this basis that free improvisation is understood to contribute to the effects of music therapy for children with ASD; because improvisation provides instant rewards for creative endeavour, it appeals strongly to those with

this condition. It is also pointed out, however, that other more prescribed musical activity may be more beneficial in respect of other symptoms such as timing deficits. A balance of fixed and creative music-making such as improvisation affords is most helpful for children with ASD, helping them to work through their need to control (Kim et al. 2008; Oldfield 2006). The demands of simultaneous creativity and participation can also provide a diversionary function for those burdened with problems and/or pain, such as cancer patients (Pothoulaki et al. 2012).

c) Creative social interaction

Music therapists emphasise the importance of the experience of producing sound that is shared with another person (Pavlicevic 1997). Uniquely among forms of musical activity, in improvisation participants create, shape and decide in the moment the musical expressions and responses they wish to make to the other person, who reacts in their turn to what is played. This experience of give and take has been found helpful by therapists' clients suffering from depression (Erkkilä et al. 2012), by bereaved adolescents interacting within group improvisation (McFerran and Wigram 2005) and by patients receiving palliative care (Hartley 2000). It is seen as important for individuals with difficulties engaging in social intercourse because it gives a sense of communication without involving verbal exchange (Kim et al. 2009; Simpson and Keen 2011; Edgerton 1994; Gilbertson 2013; Næss and Ruud 2007; Pavlicevic et al. 1994). Thus a trial of music therapy including elements of improvisation for adults in mental health care found a significant effect for the intervention on social relationships (Gold et al. 2013), and a current trial of improvisational music therapy with children with ASD is predicated on the potential for social engagement within the framework of this activity (Geretsegger et al. 2012). Kim et al. (2009) suggest that children with ASD experiencing interaction with the therapist, rather than simply playing music themselves, undergo social processes without being required to frame their thoughts in verbal language, and their motivational and interpersonal responses are thus facilitated. As an interactive state of joint engagement, improvising with a therapist offers a more effective means to strengthen their interactive capacities than musical play in general. Engaging in spontaneous creativity has also been suggested as a factor in the benefits of improvisation for this population, for whom the immediate gratification this provides is strongly appealing and therefore engaging (Rickson 2006). Although all these studies have pointed to the effectiveness of improvisation with a therapeutic intervention involving improvisation, it is important to note that improvisation is not investigated as a separate component in these designs; they have not compared effects with other forms of music therapy, but with other therapies such as toy therapy (Kim et al. 2009).

d) Emotional expression

Improvisation is also crucially seen within music therapy as an act of self-expression whose preverbal character enables the release or expression of difficult or repressed emotions (Burns et al. 2001; Gilboa et al. 2006; Watson 2002; Stewart 1997). Emotions are considered by therapists not only to be expressed, but to be communicated in improvisation by means of the symbolic function of musical acts during improvisation.

There is debate over whether meanings are universal or specific to individuals or contexts (Erkkilä et al. 2012; Pavlicevic 1997) and research on emotional expression in musical performance continues to find that emotions other than basic categories are less clearly communicable (Gabrielsson and Juslin 1996; Quinto et al. 2014), even between music therapists (Gilboa et al. 2006). In the fixed-choice paradigm of such experimental work the listener recognises or rates pre-determined monolithic emotional categories, whereas a therapist seeks to apprehend and respond non-verbally to a client's emotional state at a more holistic level through improvising. Also, even if the therapist does not identify the precise nature of the client's emotions while playing, recognising the strength of their emotional state and whether it seems positive or negative will provide a basis for exploration during the subsequent verbal engagement. Nevertheless, it remains unclear from the literature whether any health benefits from the act of emotional expression during therapeutic improvisation are qualified by how successfully those emotions are communicated to the therapist. Scope to express emotions may imply a freedom from conventions (Gilboa et al. 2006); however some authors stress the framework provided by the improvisation activity and the safe context it provides as important factors (Geretsegger et al. 2012; Oldfield 2006). Cancer patients, for example, attribute benefits from improvising to being able to express difficult feelings through this activity in a reassuring context without having to use words (Pothoulaki et al. 2012; Logis 2011; G. Aldridge 1996). Improvisation may be effective for depressed patients because it helps them bypass the inhibitory effects of their condition; self-projection and free association within free improvisation allow therapists' clients to connect with emotionally charged memories and images (Erkkilä et al. 2011). These interpretations are supported by recent findings that adult patients whose depression and anxiety symptoms improved following improvisational music therapy also showed EEG changes consistent with differences in emotional expression and affect regulation (Fachner et al. 2013). Furthermore, a recent systematic review of evidence for the effects of music on emotion regulation (Moore 2013) found four studies of musicians that identified changes in activity while improvising consistent with this function, specifically in the amygdala (Limb and Braun 2008), anterior cingulate cortex (de Manzano and Ullén 2012; Brown and Martinez 2007; Berkowitz and Ansari 2008) and lateral prefrontal cortex (de Manzano and Ullén 2012; Bengtsson et al. 2007); it should be noted however, that only Limb et al. studied group improvisation.

A number of obstacles to identifying mechanisms for the effects of improvisation on health and well-being are raised in the literature. Improvisation is itself a complex accretion of behaviours and circumstances. Pointing to the difficulty of transcribing improvisations from therapy, Aigen (2009) argues that specific improvisatory events may not be readily separable from the whole interaction and attributable to specific health benefits. Also, trials that have compared music therapy built round improvisational activity with other forms have shown effects in both intervention and control arms. For instance a trial comparing improvising therapy for cancer patients with music listening therapy found similar positive effects on stress from both interventions, counter to the expectation that the improvising condition would result in greater benefits (Burns et al. 2001).

Aesthetic and therapeutic improvising

The literature reviewed above has examined uses of musical improvisation within therapy. Improvisation is of course more widely practiced than in therapy alone, primarily for aesthetic purposes (Aldridge 1998). To consider how the study of therapeutic improvising might inform our understanding of improvising in other contexts, it is important to establish any important ways in which practice (as opposed to purpose) differs across these settings.

In therapy, improvisation is undertaken to effect an interpersonal exchange, rather than a purely musical exchange, and therefore as a behaviour that is taken to reveal personal qualities (Pavlicevic 1997). In this respect, an expectation exists that any musical activity is personally meaningful. It is thus treated as a given in therapy that improvisations are meaningful, and allow client and therapist to infer emotional states or feelings from each other's contributions, which may result in the therapist projecting their own ideas on the session (Arnason 2003). Those engaged in music-making for its own sake might not concede this about their activity; musicians outwith the treatment setting may see themselves as aiming only to form and execute music to the best of their abilities, rather than expressing or representing themselves. Improvising is also undertaken in music therapy with the explicit expectation of follow-up, and represents part of a process for therapists rather than an end in itself. A verbal discussion and reflection on their improvisation by therapist and client is seen as integral to the intervention and an essential factor in any effects observable (Erkkilä et al. 2012; K. Bruscia 1989), and listening repeatedly to recordings of improvisation between sessions to determine their significance for the client is a key element of practice for therapists (Arnason 2003). Musicians on the other hand may not discuss their playing afterwards or seek to analyse their interaction; thus interviewees in qualitative music psychology research have spoken of how unusual it is for them to verbalise or reflect on what they do as improvisers (MacDonald and Wilson 2006). Finally, visual communication is often regarded as important though not essential within many therapeutic settings (Arnason 2003); for instance this is an important part of the effects of improvisation for children with ASD (Gold et al. 2006). While some visual communication may take place between those improvising in other settings, it is relatively less important, since there may be many settings where improvisers play with their eyes closed, or in an arrangement where they are not able to see their colleagues' faces (e.g. soloists in jazz facing the audience at the front of a stage).

Recent qualitative psychological work on improvisation, however, suggests that the processes of aesthetic improvising may be less distinct from those of therapeutic improvising than this comparison suggests. A repertoire of 'mystery' to account for improvising is apparent in the talk of improvisers from various backgrounds, such that improvisers say they are not aware of where the ideas and capacity for their contributions to group music come about in the moment (Wilson and MacDonald 2005, 2012). For instance, one jazz musician described their best improvising as taking place thus:

... you know your technique and all your practice and everything sort of, goes into autopilot and it lets it happen. So (.) in that sense I'm trying not to think when I play... (MacDonald and Wilson 2006, p. 64:participant 03)

This is strongly consistent with the idea of a connection to the unconscious. Flow experiences are recognised among improvising musicians as characteristic of successful group performance, wherein the challenges and excitement of participation create a focus on the present and a diminished awareness of an ongoing self (Csikszentmihalyi 1991; MacDonald and Wilson 2005, 2006). The perception of relinquishing control of self also reflects Tomaino's explanation of the effects of improvising following Limb's work on brain images of jazz musicians playing together (Limb and Braun 2008; Tomaino 2013).

Improvising musicians' accounts of their practice are strongly characterised by an understanding of communication through their playing together (MacDonald et al. 2005; Seddon 2005). For instance, a participant in a study of jazz musicians in England (2006) stated that improvising together "feels like you've had a real good conversation" (p. 65:participant 06). As in therapeutic circles (Pavlicevic 2000), different models are proposed for this, from the idea that musicians master a shared 'vocabulary' of musical signs whose meaning they recognise in each other's playing (Monson 1996), to recent work informed by discourse theory which has shown that improvisers make varied attributions of a shared musical event that shape identities for themselves and their colleagues in relation to context (MacDonald et al. 2012b; Wilson and MacDonald 2012; Sutton 2002). Finally, although musicians performing for aesthetic purposes may not see themselves as displaying personal emotion when improvising, interviews with improvisers suggests that they do construct their own and others' playing in terms of emotional attitudes. For instance, in a recent qualitative study of a post-genre improvising ensemble, one improviser described difficulty playing with those musicians whose contributions she characterised as antagonistic:

I care much more about the quality of the music that we make, than I did before so... er if I think that something's really nice and I see someone being kind of grrr in the corner I really it puts me off, I just can't, I have to stop... (Wilson and MacDonald 2012, p. 566: participant 104)

while others inferred empathy from perceiving the playing of others as supportive (Wilson and MacDonald 2012).

In summary, while the expectations and objectives of musical improvisation are divergent between therapeutic and other contexts, the processes taking place may be strongly similar and therefore share some of their effects.

Conclusions

In searching for literature that explicitly investigates the capacity of musical improvisation to influence health or wellbeing, only work examining its use within music therapy was identified. The behaviours and interactions that constitute improvisation during music therapy are clearly defined by Wigram (2004). Improvisation in music therapy is seen to have specific benefits for particular populations including the amelioration of neurological damage, improvements in mental health conditions, reductions in stress and anxiety, and improved communication and joint attention behaviours in children with ASD. Four unique characteristics of musical improvisation are identified as underlying these effects: its potential to link conscious with unconscious processes; the demands on attention of absorption in a

creative process; the non-verbal social and creative interaction experienced; and the capacity for expressing difficult or repressed emotions without having to articulate these verbally. Although the objectives for improvisation in music therapy are distinct from those for improvisation in other contexts, the musical interaction that takes place can be seen as substantively similar to that in improvisation in other contexts.

Improvisation may be taken by those involved in therapy as simply part of making music in the course of the intervention. Yet, as a spontaneous, social, creative nonverbal process unfolding in real time, musical improvisation between individuals is a unique psychological phenomenon, and distinct from other areas of musical activity in a number of key respects (MacDonald et al. 2012b). It might therefore be expected to have influences on health or wellbeing distinct from, or in addition to, other musical behaviours, and other components of a musical intervention. While this review has highlighted some evidence in health research to suggest particular effects of improvisation in its own right, investigation in this area appears limited. Establishing the effective components of complex interventions is now a central agenda in health research (Michie et al. 2011) and there have been calls for more specific understanding of the effectiveness of music interventions for health (Kamioka et al. 2014; Mössler et al. 2012). Given that improvisation itself may comprise multiple distinct strands of activity, future research could usefully be focused on how different improvisational practices or interactions may have differential or specific effects on health outcomes, for instance considering the effects of the different practices categorised by Wigram (2004). Publications of research findings should detail with greater consistency the intervention under consideration in terms of how and why improvisation is deployed, as Moore has recently stressed (Moore 2013). Furthermore, a number of key populations have been identified in this review as deriving benefits from improvisation in music therapy. It is likely that other patient populations may derive similar benefits. Kamioka et al. (2014) for example, note in relation to music therapy in general a lack of studies of effectiveness other than for a small number of conditions, and therefore a considerable potential for further research. In this respect, there is great scope for more work investigating the application of improvisation in relation to wider conditions, or among patients at different ages.

Such research should be able to demonstrate how any effects can be distinguished from those of non-improvisatory musical participation; however, the literature to date suggests a number of methodological considerations. Although there has been some testing of effectiveness, further comparison of the benefits of improvisation against other forms of treatment is crucial. Where trials of improvisational therapies have been conducted, these have usually compared an intervention to a non-musical intervention or to treatment as usual (e.g. Albornoz 2011), rather than comparing music therapy with improvisation to music therapy without (Gold et al. 2006; Kamioka et al. 2014; Maratos et al. 2008). Greater consideration should be given to the comparison conditions in trials of improvisational music therapy. Separation of effective components for research purposes may nevertheless be difficult to achieve within routine therapeutic practice, where therapists draw on these resources in a response to perceived individual needs on an emergent basis during sessions (Aigen 2009; Pavlicevic and Ansdell 2004). Finally, the use of larger sample sizes might help to strengthen the evidence base for

this field, and measurement of effects of musical interventions over a longer term has also been called for (Kamioka et al. 2014).

Recent research carried out in Scotland shows that participation in cultural activities is associated with better health and satisfaction with life (Leadbetter and O'Connor 2013). Explanations in the literature of how improvisation is effective as a therapeutic intervention suggest that it might also represent an important means of maintaining wellbeing for those who practise it more routinely. For instance, regular participation in improvised music in particular may have the capacity to stave off the development of depressive cognitions in populations where this is prevalent, such as older people or those with chronic illness or disabilities. Given that we have identified no studies exploring this preventive potential, a key direction for future research would be to identify what benefits might be gained from participation in improvised music without a therapeutic remit and role, for example in a community music or educational setting. There may for instance be benefits in terms of stress relief and overcoming negative emotions or self-perceptions; it is noteworthy for instance that a recent study finding positive effects on EEG-neurofeedback on children on the creative music performance, attention and wellbeing of children in school used musical improvisation as one of the outcome behaviours (Gruzelier et al. 2014). Qualitative research would help to consider how and whether improvisers more generally perceive links between their practice and their sense of wellbeing.

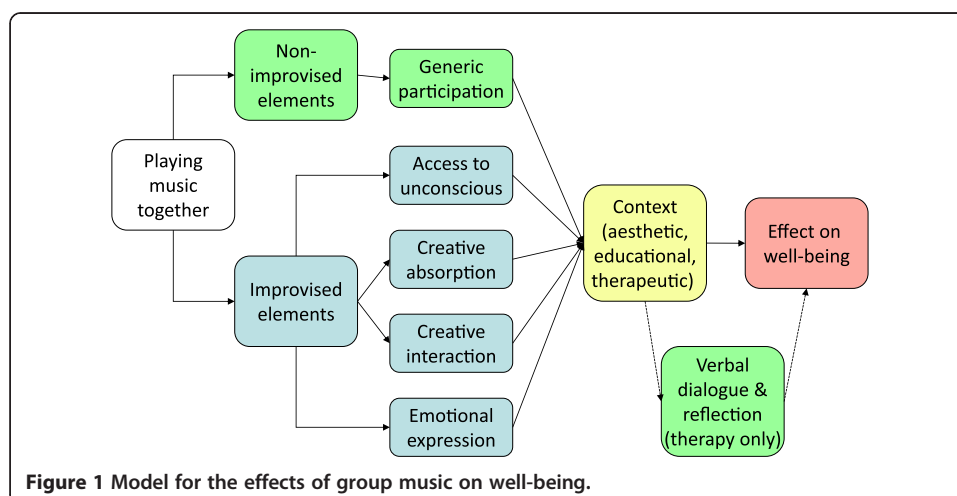
We have observed parallels in how improvisational interactions are understood to take place between the therapeutic and aesthetic improvisation, again suggesting that influences on health observed in the clinical context are likely to pertain to some extent in respect of improvisation in other settings, and therefore that benefits to health and wellbeing may be accessible by wider populations engaging in this activity. Wigram's (2004) categories of improvisatory interactions indicate analogous interactions that may be applied in other contexts. For instance, in teaching or leading improvisation in community music settings, players could be encouraged to try to replicate what their fellow improvisers produce, or emulate its characteristics or perceived emotional content in their own playing ('mirroring', 'matching' or 'reflecting'); provide a continuous backing ('grounding' or 'accompanying') pattern their contributions after the structure of conversation (dialoguing) or pitch musical ideas to each other ('modelling'). Teaching or practising improvisation in this way in community settings could maximise its potential to support the wellbeing of participants. However, aesthetic improvisation is best understood from the point of view of discourse theory, and it would be important for any research in this area to consider how psychological processes may be distinct if not coupled with the sophisticated therapeutic dialogue that follows clinical improvisation sessions.

While improvisation is now the focus of considerable psychological research interest and music is increasingly appreciated as a significant factor in aspects of health, this review is the first to consider and collate evidence for improvisation as a component of the health benefits of musical participation. It has identified important areas for investigation of an activity whose potential benefits are little understood, and highlighted issues for future research in this area. Further literature might have been included had search terms been applied to the full text of articles. However, it is unlikely that an article on the specific effects of improvisation would fail to mention the term in the

abstract; therefore we feel that the literature reviewed here is substantially that which considers improvisation specifically in relation to health. It is a limitation that only literature in English has been considered; however, inclusion of material in other languages was beyond the scope of this article. Explanations in this literature for how improvisation is able to effect health benefits nevertheless provide the basis for a model of how improvisation can influence health and wellbeing. There is an urgent need for the development of testable theory for why improvisation has the effects that are claimed for it; specific improvements to specific health conditions or states within specific populations should be attributable to specific processes of improvisation in isolation from other aspects of musical or clinical involvement. In light of these findings, a model for the relationship between musical improvising and health is proposed (see Figure 1).

This model seeks to take account of all routes by which musical improvisation between individuals may influence a given health condition in a given population. A group music-making intervention may involve both improvised activity and non-improvised (such as the maintenance of a groove, or rendition of a given melody). These two elements may have separate effects on health, with effects of non-improvised activity likely to be common to those for music interventions in general. Within group improvisation, four key processes were identified in the review as potentially effective. Since any or all of these may operate within an intervention with differential effects, each is represented in the model as a separate line of influence. Finally, the context of an intervention will have a mediating influence on any effects of improvised or non-improvised activities. For instance objectives and expectations will be very different between performing music in public and learning to do so in a classroom, and emotional expression in each of these settings might have a differing impact as a result. Therapeutic engagement in particular requires that improvisation will be analysed for significance. This goes far beyond interaction in other settings, and is represented here as a further mediating influence between context and outcome separate from the improvisation itself.

It should be expected that the relative influence of different routes within this model will vary depending on the condition and population to which the model is applied. For instance, the capacity for emotional expression in a therapeutic context may be most



effective in countering depressive symptoms in adults, while that for creative interaction in an educational setting may have unique effects for children with ASD.

It is notable that the literature reviewed here examines improvisation only in relation to a limited range of conditions and populations, and only in the context of music therapy. Yet the mechanisms proposed for the therapeutic effects of improvising suggest that this activity could be far more widely applied to benefit our health, and that more associations between the two would be identified with further research looking beyond the therapeutic context. This is not to belittle or undermine the significant improvements that hundreds of music therapists see in their clients following their work with them. The chimeric nature of improvisation is part of its appeal as a therapeutic instrument, yet makes for a highly complex and individualised intervention, one which resists standardisation for the purposes of measurement or examination. Nevertheless work such as that of Erkkilä et al. (2011) shows us that parameters and measures for music therapy interventions can be reached and applied to provide robust evidence. Improvisation is increasingly seen as a central tendency in current musical practice, and new research to help reconsider and revalue the role of this music within education and within everyday life is vital. The excitement improvisation holds for contemporary musicians shows its potential to engage wider populations in accessing the known health benefits of music.

Abbreviations

ADHD: Attention Deficit Hyperactivity Disorder; ASD: Autistic Spectrum Disorder(s).

Competing interests

The authors declare that they have no competing interests.

Authors' contributions

Both authors proposed and devised the review, and contributed to the writing. GW carried out the review and prepared the first draft. Both authors read and approved the final manuscript.

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