

Health affordances of the RHYME artefacts

Even Ruud

The recent development within interactive music technology may provide the field of music and health with new opportunities to promote health and well-being. In order to test such possibilities, four generations of musical and interactive tangibles were developed through the RHYME project.¹ In this article, I will explore how the health consequences of this music technology as it operates within the testing of different generations of RHYME products may be understood in light of cultural psychology.

The RHYME products have been given many names: (musical) things, furniture, toys and instruments, and co-creative tangibles.² From the perspective of activity theory or cultural psychology, we might further label (and conceptualise) them as ‘artefacts’. Through this adherence to the principles of cultural-historical psychology, we also acknowledge “that the structure and development of human psychological processes emerge through culturally mediated, historically developing, practical activity” (Cole, 1996, p. 108).

As we know from the field of music therapy, musical instruments can serve as tools for communication and interaction in the service of health-promoting activity. Musical instruments, in general, we wrote earlier (Stensæth & Ruud, 2012, 2014 or elsewhere in this volume), represent *technologies*, and the use of actual digital music technology is nothing more than a continuation of the technological tradition that has long produced or reproduced music.³ Traditional instruments, electronic or digital music equipment and software, and the various generations of RHYME co-creative tangibles are also cultural artefacts, in the sense that they are human-made objects that in some way interact with individual development (Cole, 1996).

In the following, I will first introduce the RHYME project. Then I will explore how our understanding of the RHYME artefacts might benefit from being framed by the theory of cultural psychology. My main questions are the following: To

1 For a description of the RHYME project, see next page.

2 From now on I will call them co-creative tangibles. Learn more about the labeling of the RHYME artefacts in the other RHYME articles in this anthology (Stensæth, 2014) or see publication list on www.rhyme.no.

3 For an overview of music technology in music therapy, see Magee (2013).

what extent can the RHYME project be seen within a theoretical frame of cultural psychology? How might concepts like 'artefact' and 'affordance' prove helpful to our understanding of the health benefits of the musical co-creative tangibles?

The RHYME project:⁴

RHYME is a five-year interdisciplinary research project (2010–2015) financed by the Research Council of Norway through the VERDIKT program. Its aim is to develop Internet-based, tangible interactions and multimedia resources that have a potential for promoting health and life quality. The project specifically addresses the lack of health-promoting interactive and musical information and communications technology (ICT) for families with children with severe disabilities. RHYME explores a new treatment paradigm based on collaborative, tangible, interactive Internet-based musical 'smart things' with multimedia capabilities. Within the project, these interactive and musical tangibles are called 'co-creative tangibles' (also sometimes shortened to CCTs). The goal of RHYME is twofold: (1) to reduce isolation and passivity, and (2) to promote health and well-being. The RHYME research team represents a collaboration among the fields of interaction design, tangible interaction, industrial design, universal design and music and health that involves the Department of Design at the Oslo School of Architecture and Design, the Department of Informatics at the University of Oslo and the Centre for Music and Health at the Norwegian Academy of Music. The project encompasses four empirical studies and three successive and iterative generations of CCTs. The media is developed in collaboration with the Haug School and Resource Centre, the users and the families. Its user-oriented research incorporates the users' influence on the development of the prototypes in the project. The users include six - ten families who have volunteered to participate, and the children with disabilities in these families range from seven to fifteen years old. The children vary considerably in terms of behavioural style, from very quiet and anxious to cheerful and rather active, but all of them become engaged in enjoyable activities when these activities are well facilitated for them. The most extreme outcomes of the variation in behavioural style relate to disability conditions, and mostly those within the autistic spectrum, which applies to four of the children. These conditions include poor (or absent) verbal language and rigidity of movement. Also, the children's mental ages range from six months to seven years, and their physical handicaps range from being wheelchair dependent to being very mobile. The Norwegian Social Science Data Services approved the RHYME project in February 2011, provided it would gather, secure and store data according to the standards of ethics in Norwegian law.

The co-creative tangibles (CCTs) as artefacts

I first suggested that musical instruments should be regarded as 'tools' that people may use to promote development over two decades ago (Ruud 1990, p. 141) with reference to Norwegian activity theorist Regi Enerstvedt (1982). I also suggested

⁴ The section inside the frame below is similar in all of the RHYME articles in this anthology, Music, Health, Technology and Design by Stensæth.

that music should be regarded first as an *activity* rather than conceptualised as a work of art or an art object (Ruud, 1990, p. 220). Stige (2002) further elaborated upon the relevance of cultural psychology in his culture-centred, community-oriented approach to music therapy. He also categorised instruments as a type of artefact, which together with other artefacts such as technical equipment, songs and language, is important to the development of self and identity in relation to the community. He added: “How artefacts afford is again relative to both person and community, that is, to biography and to the cultural history of the community” (Stige, 2004, p. 107).

Such ideas have supplied much of the basis for a practice-oriented view of music therapy. Viewed in this light, music does not manifest any pre-existing content but instead makes possible or affords (see ‘affordance’ later) an interaction or communicative activity that acts in turn to define it: “It is practice that will determine the content of the concept of music”, I wrote (Ruud 1990, p. 220). Of course, this same inclination underpins Small’s powerful concept of ‘musicking’ (Small, 1998).⁵

This musical practice, in other words, can influence our cognition, our forms of thought and our modes of being in the world. Thought of as artefacts, instruments can be aligned with other material objects and tools that we have developed within a culture to realise certain goals. Cole (1996, p. 117) further underscores that artefacts, in their nature, are both *material* and *ideal*: “They are ideal in that their material form has been shaped by their participation in the interactions of which they were previously a part and which they mediate in the present”. Artefacts and actions are woven into one – material objects that carry with them ideas about how to be used.

Musical instruments as material objects are what Cole calls ‘primary’, but they are also secondary, in the sense that they imply prescriptions regarding their use that are governed by *schemas* and *scripts*. A schema represents our knowledge of the artefact – in this case, how the musical instrument (or RHYME artefact) can be applied. A schema can be more or less conscious or conventional – in the West, for example, we do not generally think about how to use a piano but rather take this for granted (at least, we did so until Bartok applied the piano as a percussion instrument). Context, of course, is important here – the relational aspects of our interpretation of the prescriptions associated with the object.

A script offers a more detailed notion of how to adapt the artefact to a certain situation (Cole, 1996, p. 124ff). It may specify the roles to be taken or the sequences of actions and causal relations within which the artefact exists. Music

⁵ Read about ‘Musicking Tangibles’ in Cappelen & Andersson (2014) or elsewhere in this volume.

therapists sometimes produce a new script that is adapted to the client and the instrument, thereby modifying and differentiating those existing cultural schemas (or knowledge) in order to further extend the actions that the artefact may afford.

In light of this approach, then, we must ask not only what kinds of material objects the RHYME artefacts are, and what actions they afford through their design, materiality or functionality, but also what their characteristics are as secondary artefacts with a “role in preserving and transmitting modes of action and beliefs” (Cole 1996, p. 121). Moreover, since “they include recipes, traditional beliefs, norms, constitutions, and the like”, Cole continues, new artefacts like the CCTs must be evaluated in terms of these secondary characteristics. Do they carry with them scripts that afford new possibilities for interaction and co-action that, in their particular case, might have implications for both health and quality of life?

Interactive music technology

Behind the *musical* design of the RHYME artefacts is the principle of interactive music. The ORFI, for example, is programmed in a unique way:

When one or many persons interact with the wings and microphones attached to the module, they then send signals to the computer, which memorises them and invites the person to respond and co-create music and graphics by playing, sitting, chilling out, socialising and making music together. An important feature of ORFI is that it is active, acting on its own as an actor. This means that ORFI is not simply an instrument or a neutral tool, giving the same response to the same stimuli. Instead, because of the computer program, it acts with a will of its own, enters into dialogue, imitates and answers the person interacting with the musical variations (Andersson, 2010, p. 4–5).

As Andersson explicates further (Ibid., p. 6), through interactive composing, he may transform the musical artefacts from simple intermediaries into ‘smart’ technical and musical actors. Through creating dynamically changeable algorithms in computer programmes, he may open the possibility for individuals to interact with the artefacts.

The ways in which the interaction with the musical CCTs motivate participants to explore and interact with the artefact, and also the way in which these algorithms are built into the programming, inform us about essential characteristics of the (musical) script. Thanks to its programming, the computer here has the ability

to learn and respond in an ‘intelligent’ way, in the sense that it adapts and changes in relation to the actions of the participant. This, in turn, motivates the participant to continue to engage, as the computer responds, waits, memorises and learns (Andersson, 2012).

Affordance

The notion of ‘affordance’ sheds light on the health aspects of the use of interactive music technology in the RHYME project, thanks to its conceptual history within both the field of design and musical aesthetics. Gibson (1979) developed it ‘to account for the fact that our perceptual experiences include not only awareness of the structure of objects and events in the environment, but also, and perhaps more fundamentally, an awareness of their functional significance, that is their functional meaning’, as Heft (1988, p. 29) writes. The affordances in our environment, for example, are its functionally significant properties considered in relation to an individual, Heft continues. We may use some common examples to illustrate this: a ball affords the possibility of being rolled; a small object, of being grasped. The wings of the CCTs in ORFI, then, afford the possibility of being bent, moved around, rested on, and so forth.⁶ The idiosyncratic features of each generation of the CCTs in the RHYME family could be described through reference to their affordances for participants, particularly in terms of any potential health benefit or improvement in life quality.

However, the participant must appropriate what is afforded if the artefact is to realise its full functional value. As demonstrated in the present project, affordances are determined by not only attributes of the artefacts but also attributes and abilities (e.g. perception, cognition, movement) of a given participant. This project was carried out with a mixed group of children and their siblings, parents or assistants in order to correct for the variation in affordance in this regard.

In the literature, *affordance* prompts a range of definitions. Wikipedia notes that the original definition encompasses all of the actions that are physically possible with a given object, and that this was later adapted to describe action possibilities of which the actor is aware. The term has further evolved in the context of human-computer interaction (HCI) to address the easy discoverability of possible actions.

According to Gibson (1979), affordances encompassed all of the ‘action possibilities’ that were latent in the environment and objectively measurable. Affordances could exist outside of the individual’s ability to recognise them but

6 Read about the design and the use of ORFI in Cappelen & Andersson (2014), Eide (2014), Stensæth & Ruud (2014) or elsewhere in this volume.

always existed in relation to agents and were therefore dependent on those agents' capabilities. They were not to be viewed as dependent upon culture, prior knowledge or individual expectations, Gibson insisted, thereby positioning himself within the philosophical tradition of 'direct realism'. This positioning has caused a lot of controversy within the field of cognitive psychology, where ideas of 'representational realism' prevail – that is, the conviction that we perceive the world *only* through our assumptions and interpretations.⁷

Within the field of design, Norman introduced the notion in his book *The Psychology of Everyday Things*, later re-released as *The Design of Everyday Things*: "The term *affordance* refers to the perceived and actual properties of the thing, primarily those fundamental properties that determine just how things could possibly be used" [. . .] Affordances provide strong clues to the operation of things. "When affordances are taken advantage of, the user knows what to do just by looking: no picture, label, or instruction is required" (Norman, 1989, p. 9).

Commenting upon Norman's co-optation of Gibson's term, Sjøgaard (2008) observes that Norman's inclusion of an object's *perceived* properties – that is, the information that specifies how the object can be used – differs from Gibson's insistence that affordances are independent of the actor's ability to perceive them. From the perspective of representational realism, direct perception refers to the conviction that the information supplied to our sensory receptors is sufficient to the perception of anything, and that higher-level cognitive mediation between our sensory experience and our perception is unnecessary. Norman later made clear that he should have said 'perceived affordance' rather than simply 'affordance' from the start (Norman, 1999, quoted in Hartson, 2003).⁸

Hartson discusses Norman's take on the term:

7 I will not go into this rather complex discussion, as discussed within ecological psychology; see Katz (1987), Marková (1987).

8 Wikipedia states: 'Norman's adaptation of the concept has seen a further shift of meaning, in which the term *affordance* is used as an uncountable noun, referring to the property of an object or system's action possibilities being easily discoverable, as in "this web page has good affordance", or "this button needs more affordance". This in turn has given rise to a use of the verb *afford*—from which Gibson's original term was derived – in a way that is not consistent with its dictionary definition. Rather than "to provide" or "to make available", designers and those in the field of HCI often use *afford* as meaning "to suggest" or "to invite"' (<http://en.wikipedia.org/wiki/Affordance>; accessed Sept. 13, 2013).

In simple terms, much of the difficulty stems from the confusion between what Norman calls real affordance and perceived affordance. To Norman, the unqualified term affordance refers to real affordance, which is about physical characteristics of a device or interface that allow its operation, as described by Gibson (Hartson, 2003, p. 316).

Hartson, in turn, distinguishes among *four* types of affordances. Norman's perceived affordance now becomes *cognitive* affordance, which addresses the user's cognitive actions. Norman's real affordance (that is, Gibson's physical properties) becomes *physical* affordance, which addresses the user's physical actions. Hartson's third type is *sensory* affordance, which addresses the user's sensory actions. In the present context, this applies to how the design, and in particular the choice of surfaces and fabrics, of the RHYME artefacts invites participants to touch or interact with it. Hartson's fourth type is *functional* affordance, which ties usage to usefulness.

While these types certainly enhance one's ability to describe an artefact's affordances, the RHYME artefacts respond best to a functional design perspective, whether it derives from Norman's everyday design or Hartson's HCI perspective. It seems like this functional perspective centres around developing a design, which has a goal-directed program – i.e. to make us perform a certain task as straightforwardly as possible, based on the information given in the design of the product. The RHYME artefacts, however, have a more open and interactive design, where the functions are many and unspecified, and where their goals and intentionality emerge in a process whereby the user defines and influences the ways in which the artefact can be put to use.

This, more processual perspective is also stated clearly by Cappelen and Andersson who are inspired by, among other things, Eco's poetics of the open work, as well as Latour's theory of actants, mediation and shifting roles. Cappelen and Andersson are also critical of the HCI-based, Heideggerian, functionalistic engineering ideals that have long advocated for the opposite of ambiguity and openness. They characterise this trend as follows:

Good has been a synonym for disappearing, 'natural', intuitive and reduction of ambiguity. But lately, when people with an artistic background have entered the HCI and Interaction Design field, the engaging and interpretative potentiality of ambiguity has been introduced to the field (Cappelen & Andersson, 2011, p. 2).

Or, as Andersson states in another article:

The main shortcoming is the field's (HCI) too heavy focus on functionality, and that it still doesn't understand aesthetic experience very well.

The notion of variation and ambiguity as aesthetically and musically interesting and relevant qualities, still has to stand back for transparency and effectiveness. It has to do with interaction design's background in engineering and ergonomics (Andersson, 2010, p. 7).⁹

Ackermann (2007, p. 6) refers to French philosopher Gaston Bachelard (1964), who notes that humans can be deeply moved by what he calls 'felicitous places' (i.e. things able to transport us), and that such objects cannot and should not be characterised according to their functionality alone. Such objects instead might be said to reverberate with atmosphere or ambience in ways that capture the human imagination, Ackermann writes (Ackermann, 2007, p. 6): "They attract us because they have become topographies of our intimate being". Even a doorknob could become a felicitous object if it did not just call up our urge to "push or pull to enter", she adds (Loc. cit.)

"Everyday objects could speak a language much more un-tangible and rich, in resonance with our being and aspirations. Ideally, designers could endow objects with the ability to speak such language", Ackermann comments in her essay on affordances (Loc. cit.). In the present context, it is clear that the RHYME artefacts have those qualities that attract our attention, make us hold our breath or slow down – they speak to us.

However, to maintain this artefact's open, ambiguous, play-like design, we might ask which *functional characteristics* we can observe in the different generations of the RHYME artefacts. On the basis of the observations we have conducted of children's use and interaction with these artefacts, it is possible to produce a functional taxonomy. We could then ask if there is anything in this taxonomy which points in the direction of health benefits.

Such functional characteristics were exactly what Gibson's notion of affordance sought out, as mentioned earlier. As Heft describes (1988, p. 29),

⁹ Andersson & Cappelen (2014, or elsewhere in this volume) also write about openness and ambiguity in the design and use of the CCTs in RHYME.

Gibson developed this concept to account for the fact that our perceptual experience includes not only the structure of objects and events in the environment, but also, and perhaps more fundamentally, an awareness of their functional meaning.

Heft, however, underscores the fact that a distinctive characteristic of affordances is that they are relationally specified. In that sense, the affordances of the RHYME artefacts are determined both by the attributes of the things themselves and by the attributes of the particular children, assistants, parents and other participants. It also seems as though Heft is modifying Gibson's 'representational realism' when he states that affordances are 'more primary, in an experiential sense, than is an awareness of form-based classifications'.

Affordance categories in the RHYME artifacts

Among the affordance categories that have emerged in the studies of children's interactions with the CCTs in ORFI, WAVE and REFLECT, we may list the following.¹⁰ In an article about ORFI (Stensæth & Ruud, 2012, 2014), we can see how Ulla:

- bends the wings
- accompanies sounds with dancing movements
- turns her head downwards
- focuses on what she hears
- listens intensely

– and Frode:

- is attentive and wandering
- explores
- bend-points with the wings
- explores his body and balance

In the article about the WAVE by Stensæth (2014a) in this anthology, Petronella:

- grabs the arms of the WAVE carpet
- talks and laughs into the microphone on the WAVE carpet
- pushes the 'bubbles' on the WAVE carpet

¹⁰ Read about the use of the various RHYME artefacts in Eide (2014), Stensæth (2014a, b), Stensæth & Ruud (2014) or elsewhere in this volume.

While exploring the WAVE camera, Dylan:

- watches the wall and holds the camera arm of the WAVE
- shows small movements, as if preparing to take action

Dylan also:

- leans his body over the WAVE carpet
- picks up a WAVE 'arm' and lets it fall back onto the floor

In the article about the REFLECT by Stensæth (2014b) in this anthology, Petronella:

- choreographs a dance together with her mother while holding REFLECT
- sings into the REFLECT 'tale' (as if it were a microphone)
- plays 'guitar' with the REFLECT 'whale' (as she calls it)
- cuddles and relaxes with one of the small CCTs in REFLECT

A more complete list of all of the affordances inherent to the different generations of RHYME artefacts could be organized according to, for example, developmental needs, relational and emotional aspects, fun and recreational affordances or (in the present context) health and quality of life.¹¹

Affordances of musicking

Over the past decade or two, Christopher Small's concept of 'musicking' (Small, 1998), like the concepts of 'affordance' and 'appropriation' (DeNora, 2000; Clarke, 2003, 2005), has gained wide acceptance in the literature. Small emphasises that 'music' must be understood as a practice and a process – as something we *do* – rather than as an object. This has profound implications for any understanding of the ways in which meanings are produced while one is engaged with music, and it leads Small to nuance the catch-all noun 'music' as the verb 'musicking'. This, in turn, seems uniquely applicable to a description of the use of music in health practice as 'health musicking' (Stige, 2012).¹²

According to Krueger (2011), music can also be seen as an 'affordance-laden structure'. In other words,

11 In a review of this article, Gary Ansdell also suggests a more categorical summary of the affordances, such as orientations, explores, acts on... etc.

12 Stensæth (2014b) also relates 'health musicking' to the a family's interaction with the REFLECT.

[...] musical experience is fundamentally a temporally extended, exploratory activity: a perception, manipulation and appropriation of different sonic affordances offered up by different pieces of music (Krueger, 2011, p. 2).

To Krueger, music also represents a nested acoustic environment ‘that affords possibilities for, among other things, (1) emotion regulation and (2) social coordination’:

A consequence of this view is that music ought to be thought of as a tool that we appropriate and use to construct different forms of self-experience and social relatedness. When we do things with music, we are very often engaged in the work of creating and cultivating the self, as well as creating and cultivating a shared world that we inhabit with others. As active perceivers, we are in many ways perceptual composers. Music invites this kind of dynamic engagement (Loc. cit.).

If this is true in relation to simply listening to music, it is even truer when it comes to the context of RHYME artefacts, which are designed for music-related interactivity and co-creation. As mentioned earlier, one’s interaction with the musical CCTs was always intended to spur further interaction – this was, in fact, a principle that was built into their programming. This means that the music, in this case, is an actor on equal terms with the user, “mediating co-creation, as creative activities of play, music creation and many-to-many communication” (Andersson, 2010, p. 13).

Health and life quality

If the RHYME artefacts set up a situation, which allows for interaction and co-creation, then they may clearly stimulate ‘communicative musicality’. Based on existing research within this tradition (Malloch & Trevarthen, 2009), Krueger argues that music affords emotion regulation and social coordination, among many other things. He draws on research from music therapy with prematurely born babies as well as phenomenological investigations of group listening to live music.

In order to relate such processes of communicative musicality to health, we must first define the sprawling concepts of health (Blaxter, 2004) and well-being. In general, researchers place these concepts somewhere on the continuum between the strictly objectivist position, whereby health is seen as subject to empirical investigation, and the strictly interpretivist position, whereby health is seen as subject to interpretation (Duncan, 2007).

When actual people are asked about their own notion of health, it is often regarded pragmatically, as a relative phenomenon, alongside expectations about aging, the burden of illness and the individual's social situation. Health, then, is at the end of a road that appears to be different from person to person. What is more, notions of 'good health' tend to encompass a sense of well-being, effective functioning, high spirits, a feeling of empowerment and a surplus of energy (Fugelli, 1998). Blaxter (2004) also refers to research that shows that one's view of one's health also depends on one's profession and social class.

From an interpretivist perspective, health is an experience, not a thing – in a sense, then, it is equivalent to the experience of well-being and meaning in life. Health is a resource or means of achieving the goals we have set for ourselves in our lives. Such a notion of health, of course, does not allow it to be regarded as a fixed state; it is something in flux and it can be influenced. Ultimately, then, it is a product of the relation between the individual, his or her actions and the environment (Medin & Alexandersson, 2000, see also DeNora, 2013).

This interpretivist definition sees music as a way to *mobilise* oneself towards a better quality of life. Swedish philosopher Lennart Nordenfelt points to the fact that most 'holistic' theories of health have been concerned with health as a feeling of well-being and even as a *capacity for action* (or, in the case of poor health, as a state of suffering or a lack of ability to act). In these cases, there is a strong conceptual connection between the state of well-being and the ability to act (Nordenfelt, 1991, p. 83).

Again from an interpretivist perspective, health as equated with quality of life relates to a number of other conditions as well: the state of our emotional life, our self-efficacy skills, our social relations and our experience of meaning in life (Ruud, 1998, 2001, 2011, 2013). Quality of life, then, derives from musicking as a . . .

- provider of vitality – that is, emotional stimulation, regulation and expression
- tool for developing agency and empowerment
- resource for creating a sense of belonging
- means of achieving meaning and coherence in life (see Ruud, 1997)

To the extent that musicking addresses these particular needs, we might argue that it offers a better quality of life, and thus better health. Yet we must not neglect the important physical aspects of health, lest we narrow the concept of health too much with regard to music's role within it.

As we have observed in the RHYME project, the children involved in the study, to varying degrees, responded with expressions of vitality and mastery. Through

the co-creative activities, they interacted with their parents and assistants in meaningful ways, and they reacted to the artefacts through moments of both recognition and anticipation. It certainly appears, then, that the artefacts as perceived within this particular ecological situation, afforded experiences of health and increased life quality, and further that the children were able to appropriate some of these possibilities for health-increasing activity.

Conclusion

In this article, I have framed the RHYME project according to certain tenets of cultural psychology. By regarding the different generations of the CCTs in RHYME as artefacts, whether material or ideal, we can come to appreciate the ways in which the aesthetic aspects of their design features, as well as the programming code of the interactive music, are novel scripts that inform our existing schemas for these 'musical objects'. Introducing these new cultural scripts into the discussion of health-related musicking may suggest new possibilities for understanding its impact.

References

- Ackermann, E.K. (2007) Experiences of artefacts. In M. Rochelle (Ed.) *Keywords in radical constructivism: Ernst von Glaserfeld*. Rotterdam: Sense Publishers, 249–259
- Andersson, A-P. & Cappelen, B. (2014) Vocal and Tangible Interaction in RHYME. In Stensæth (Ed.) *Music, Health, Technology and Design*. (Vol. 8) Oslo: NMH-publications 2014:7, Series from the Centre for music and health, 21–38
- Andersson, A-P. (2012) *Interaktiv musikkomposition [Interactive music composition]*. Phd thesis. Gothenburg: University of Gothenburg.
- Bachelard, G. (1964) *The poetics of space*. Boston, MA: Beacon Press.
- Blaxter, M. (2004) *Health*. Cambridge: Polity Press.

- Cappelen, B. & Andersson, A-P. (2014) Designing four generations of 'Musicking Tangibles' in Stensæth (Ed.) *Music, Health, Technology and Design*. (Vol. 8) Oslo: NMH-publications 2014:7, Series from the Centre for music and health, 1–19
- Cappelen, B. & Andersson, A-P. (2011) *Expanding the role of the instrument*. Paper published for the NIME (New Instruments for Musical Expression), Oslo: Conference report for NIME 2011, 511–514
- Clarke, E.F. (2005) *Ways of listening: An ecological approach to the perception of musical meaning*. Oxford: Oxford University Press.
- Clarke, E.F. (2003) Music and psychology. In H. Clayton & R. Middleton (Eds.), *The cultural study of music*. New York, NY: Routledge, 113–124
- Cole, M. (1996) *Cultural psychology: A once and future discipline*. Cambridge, MA: The Belknap Press of Harvard University Press.
- DeNora, T. (2013) *Music asylums: Wellbeing through music in everyday life*. Farnham: Ashgate.
- DeNora, T. (2000) *Music in everyday life*. Cambridge: Cambridge University Press.
- Duncan, P. (2007) *Critical perspectives on health*. New York, NY: Palgrave Macmillan.
- Eide, I. (2014) 'FIELD AND AGENT': Health and characteristic dualities in the Co-creative, interactive and musical tangibles in the RHYME project. In Stensæth (Ed.) *Music, Health, Technology and Design*. (Vol. 8) Oslo: NMH-publications 2014:7, Series from the Centre for music and health, 119–140
- Enerstvedt, R.T. (1982) *Mennesket som virksomhet [Man as activity]*. Oslo: Tiden.
- Fugelli, P. (1998). Folkehelse – folkets helse [Public health – the health of the people]. *Tidsskrift for Den norske lægeforening*, 118, 1421–1425
- Gibson, J.J. (1979) *The ecological approach to visual perception*. Hillsdale, NJ: Lawrence Erlbaum Associates.
- Hartson, H.R. (2003) Cognitive, physical, sensory, and functional affordances in interaction design. *Behaviour and Information Technology*, 2(5), 315–338
- Heft, H. (1988) Affordances of children's environment: A functional approach to environmental description. *Children's Environment Quarterly*, 5(3), 29–37
- Katz, S. (1987) Is Gibson a relativist? In Costall, A. & Still, A. (Eds.) *Cognitive psychology in question*. New York, NY: St. Martin's Press, 115–128
- Krueger, J.W. (2011) Doing things with music. *Phenomenology Cognitive Science*, 10(1), 1–22
- Magee, W.L. (2013) *Music technology in therapeutic and health settings*. London: Jessica Kingsley Publishers
- Malloch, S. & Trevarthen, C. (Eds.) (2009) *Communicative musicality: Exploring the basis of human companionship*. Oxford: Oxford University Press.

- Marková, I. (1987) The concepts of the universal in the Cartesian and Hegelian frameworks. In Costall, A. & Still, A. (Eds.) *Cognitive psychology in question*. New York, NY: St. Martin's Press, 213–234
- Medin, J. & Alexanderson, K. (2000) *Begreppen hälsa och hälsofrämjande – en litteraturstudie [The concepts of health and health promotion – A literature study]*. Lund: Studentlitteratur.
- Nordenfelt, L. (1991) *Livskvalitet och hälsa: Teori och kritik [Quality of Life and Health]*. Falköping: Almquist & Wiksell Förlag.
- Norman, D.A. (1998) *The psychology of everyday things*. Cambridge, MA: MIT Press.
- Ruud, E. (2013) Can music be a cultural immunogen? *International Journal of Qualitative Studies on Health and Well-Being*, 8, 17–28
- Ruud, E. (2011) The new health musicians. In MacDonald, R., Kreutz, G. & Mitchell, L. (Eds.) *Handbook of music and well-being*. Oxford: Oxford University Press, 87–96
- Ruud, E. (2001) *Varme øyeblikk: Om musikk, helse og livskvalitet [Meaningful moments: On music, health and life quality]*. Oslo: UniPub.
- Ruud, E. (1998) *Music therapy: Improvisation, communication and culture*. Gilsum, NH: Barcelona Publishers.
- Ruud, E. (1997) Music and the quality of life. *Nordic Journal of Music Therapy*, 6(2), 86–97
- Ruud, E. (1990) *Musikk som kommunikasjon og samhandling [Music as communication and interaction]*. Oslo: Solum forlag.
- Small, C. (1998) *Musicking: The meanings of performing and listening*. Middletown, CT: Wesleyan University Press.
- Stensæth, K. (2014a) Potentials and challenges in interactive and musical collaborations involving children with disparate disabilities. A comparison study of how Petronella, with Down syndrome, and Dylan, with autism, interact with 'WAVE'. In Stensæth (Ed.) *Music, Health, Technology and Design*. (Vol. 8) Oslo: NMH-publications 2014:7, Series from the Centre for music and health, 67–96
- Stensæth, K. (2014b) 'Come sing, dance and relax with me!' Exploring interactive 'health musicking' between a girl with disabilities and her family playing with 'REFLECT' (A case study) In Stensæth (Ed.) *Music, Health, Technology and Design*. (Vol. 8) Oslo: NMH-publications 2014:7, Series from the Centre for music and health, 97–118

- Stensæth, K. & Ruud, E. (2014) An interactive technology for health: New possibilities for the field of music and health and for music therapy? A case study of two children with disabilities playing with 'ORFI'. In Stensæth (Ed.) *Music, Health, Technology and Design*. (Vol. 8) Oslo: NMH-publications, Series from the Centre for music and health, 39–66
- Stensæth, K. & Ruud, E. (2012) Interaktiv helseteknologi – nye muligheter for musikkterapien? [Interactive health technology – new possibilities for music therapy?]. *Musikkterapi*, 2, 6–19
- Stige, B. (2012) *Health musicking: A perspective on music and health as action and performance*. In MacDonald, R., Kreutz, G. & Mitchell, L. (Eds.) *Handbook of music and well-being*. Oxford: Oxford University Press, 183–195
- Stige, B. (2004) Community music therapy: Culture, care and welfare. In Pavlicevic, M. & Ansdell, G. (Eds.) *Community music therapy*. London: Jessica Kingsley Publishers, 91–113
- Stige, B. (2002) *Culture-centered music therapy*. Gilsum, NH: Barcelona Publishers.
- Søgaard, M. (2013, September 13). Affordances. Retrieved from <http://www.interaction-design.org/printerfriendly/encyclopedia/affordances.html>.