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Introduction to Special Issue: Dementia and Music

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DEMENTIA AND MUSIC: CHALLENGES AND FUTURE DIRECTIONS

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AS ONE OF THE GUEST EDITORS FOR THIS SPECIAL ISSUE, THE task falls to me to collate a few themes on research in music and dementia in the future. Several of our authors have touched on these issues, and this afterword is a chance to expand on those and offer some additional thoughts. The Guest Editors hope that this issue will not only serve as an archive for a sampling of new work, but will inspire other researchers to consider the intersection of music (and other arts) and neurodegenerative diseases. In addition to helping us understand how different neural systems operate across a range of human activities, music and art can communicate emotions, provide enjoyment, and offer a shared activity among patients and caretakers and loved ones. That is why music and art matter.

The first point I want to comment on are the methodological challenges in working with cognitively impaired people. One ever-present decision is how simplified to make the materials. As with all experimental psychology, one constantly has to trade off ecological validity with experimental control. *Music Perception* publishes articles using both fully realized musical excerpts as well as simplified single-line MIDI melodies (as I study auditory imagery, sometimes I use no music at all!), and both approaches are represented in this volume. It is not entirely clear whether impaired individuals would typically have more problems with richer materials (more true to life, but more complex) compared to simplified materials (the opposite tradeoff). And it is also the case that some real music that people carry with them for life is fairly simple, like children's tunes that many of us learned as single lines without accompaniment. The decline in sensory abilities in some dementias might imply that simpler materials would be processed better; however, the relative integrity of musical semantic knowledge long into dementias (Omar et al.) might suggest that pieces with intact harmony, instrumentation, lyrics, etc. would have the processing advantage. Because currently aging cohorts have been massively exposed to recorded music all their lives, it might be useful to also consider the effect of using particular well-known versions of popular music vs.

less-well-known or simplified versions. Is the memory representation of music in the semantic store abstract and context-independent (*Yesterday*), or do we represent particular renditions (*Yesterday* as sung by the Beatles)?

Another methodological consideration is how to measure responses. Patients particularly in the early stages of dementias can use a range of typical verbal/numerical response scales or at least dichotomous choices (Cuddy et al.). As long as a coding scheme is in place, observations of behavior to indicate familiarity or affect, such as facial expressions (Clément et al.) obviate the need to have more impaired patients use symbolic or verbal behavior. However, here we have to consider what the absence of a physical behavior might mean, as people may not respond on a particular trial for many reasons. A lack of response may mean the item was not processed, or may mean the item was processed but did not elicit a reaction, or simply that physical responses are by their nature not completely reliable indicators of internal state.

We should also consider to what extent research questions require that a participant make responses consciously. Some questions do require quite conscious responses, such as when we ask respondents to use a rating scale. We have to keep in mind that some responses are "second order," i.e., pleasantness ratings need to be under a participant's conscious control but are sometimes used secondarily as an index of an unconscious state (implicit memory). We could employ other physiological indices, from metabolic to hemodynamic, that do not require higher-order skills from an impaired person. But sometimes it is the very conscious state that is important to capture. For instance, is an indirect index of recognizing a tune all that significant if the person has no sense of remembering it? The answer might be yes for some research and therapeutic questions but no for others. We may wish to look to developmental literature for some other ideas about capturing responses without recourse to language or symbolism.

Turning to a more epidemiological point, this collection of papers prompts us to consider to what extent we should be trying to include different dementias in our studies of dementia and music. On the one hand, using AD as a model system has some advantages: We understand quite a lot about the course of this disease at various neural and

behavioral levels and we have converged on reasonably good diagnostic standards. Finding large groups of well-diagnosed patients is not that difficult, compared to some of the other dementias. On the other hand, confining ourselves to Alzheimer's disease as a model system inevitably constrains our conclusions. Omar et al. explicitly contrast AD with semantic dementia, for instance, in their discussion of musical semantic memory. Even if we continue to think of AD as a typical dementia, we may want to continue to broaden our understanding of other dementias. For instance, the motor impairment in Parkinson's disease is amenable to some rhythmic therapies (Thaut & Abiru, 2010). However, little is known about whether music therapies might also be effective in ameliorating consequences of the cognitive deficits that can accompany a sub-cortical dementia such as can be found among Parkinson's patients.

As we continue to study Alzheimer's disease and Mild Cognitive Impairment, researchers should be aware that diagnostic criteria are being revised (Jack et al., 2011). These include use of biomarkers and formalization of different stages of the diseases. These developments argue for close consultation between behavioral scientists and clinicians to keep up to date with research-standard diagnoses.

One goal of the research in this volume is an increased understanding of cognitive, perceptual, and affective systems at the neural level. To the extent we can characterize neural damage in different syndromes, and individual differences within an syndrome, we may characterize brain-behavior relationships with more precision. In that respect, longitudinal studies and prospective studies (including enrollment of healthy but at-risk relatives of AD patients) can give us more information. And with increasing availability of neuroimaging techniques, the contribution of both gray matter and white matter in these illnesses should be examined. White matter integrity is associated with processing speed. Because music is produced and perceived over time, precise temporal processing is likely to be at a premium in the preservation of musical skills.

The goal of many of the researchers in this volume is to characterize behavioral differences in music processing in pathological aging. The most prominent theme was the separation of episodic from semantic memory: These are dissociated even in later stages as patients can distinguish familiar from novel music (semantic) much later into the illness than they display intra-experimental learning of new tunes (episodic; Samson et al.; Vanstone et al.). Another dissociation of interest is whether dementias can affect musical and nonmusical processing differently. Folk wisdom suggests that music might be more preserved than processing of other kinds of materials such language. Cuddy et al. did find advantages of some musical over nonmusical tasks,

although it is hard to make exact comparisons between these domains and to match tasks precisely. Although the domains are separable, in songs the music and language systems certainly interact (Moussard et al.). On the other hand, a large body of evidence suggests that several important aspects of musical functioning, such as encoding new tunes, are not protected in dementia (Cuddy et al.; Vanstone et al.).

Less clear is the status of nonconscious memories. Vanstone et al. found that implicit memory scores were low in AD patients and age-matched controls, but not differentially impaired, whereas Halpern and O'Connor (2000) showed that patients were more impaired than controls (in fact at chance) on this task. Thus, we are not sure exactly what circumstances promote at least some encoding success among patients. It would also be useful to investigate systematically other kinds of nonconscious memory. For instance, trained musicians are sometimes reported to have retained the ability to play their instruments, and particular pieces, after disease onset (e.g., Crystal, Grober, & Masur, 1989). It might be worthwhile to explore procedural memory in nonmusicians via more use of singing tasks, given that many nonmusicians can sing rather well. Of course scoring issues are nontrivial for any production task and would need to be considered carefully.

Another point of great interest is the interaction of affective and cognitive systems in dementia, given the relative preservation of emotional decoding and responses (Gagnon et al.). Although not all music carries emotional messages, much music does. And one of the reasons people listen to music is that they enjoy receiving those messages (and may also enjoy the decoding process itself). In some cases, the listener's point is to deliberately change affective state (Hodges, 1996), which we saw is also effective for dementia patients (Clément et al.). This state of affairs can prompt us to think more about the role of music and the other arts in the lives of people living with dementia. Particularly as language processes such as reading decline, home and institutional caregivers may want to offer opportunities to patients to listen to music, both old (to reactivate semantic memories) and new. Listening may engage intact perceptual as well as emotional abilities, and moderate sad or agitated moods. We may also want to consider the benefits of exposure to other arts in live and digital contexts. Although subtle signals may eventually be missed, arts that have large "gestures" (obvious changes in musical structure, dramatic or broadly comical theatrical or movie performances) may be pleasurable activities for impaired individuals quite late into dementing illnesses, as well as emphasizing social bonds when the activity is shared.

This suggestion then leads to the consideration of the communication (or lack thereof) between the

biomedical and behavioral science communities and music therapists. Although no one would propose that psychologists and medical researchers should certify as music therapists and vice versa, everyone including patients would profit from closer linkages. It would make sense for music therapists to take advantage of findings from articles like these to organize useful trials in the therapeutic setting and researchers could offer specific suggestions about how their findings might be useful to therapists. Evaluating therapies poses some challenges, of course. Not all music therapists are trained in methodology and statistics, and not all behavioral scientists are cognizant of the difficulties involved in recruiting and matching participants, and evaluating outcomes, particularly for more impaired populations. It is not always clear what the best control condition should be. For instance, should there always be a no (or routine) activity control group, or should music therapy be tested against activities that partly overlap in components, such as Clément et al. opted for? These decisions will help us distinguish any unique benefits of music therapy as against the benefit of participating in any engaging activity.

Different aspects of music can be exploited in a therapy setting. I already noted that dementia patients have been shown to decode and enjoy music; one of my studies showed that early-stage Alzheimer's disease patients have as stable preferences for unfamiliar works of art similar to healthy counterparts (Halpern, Ly, Elkin-Franklin, & O'Connor 2008). Thus exposure to the arts can be enriching to various populations.

Although harder to effect, we now have evidence that music making can also improve affect (Clément et al.). Basic music production such as group singing and use of rhythm instruments can be implemented in general

populations. But as the population ages, more and more healthy and impaired older individuals will have had some music training, as more recent generations in many countries have had the advantage of music lessons in school or privately. Professional and community choruses, bands, and orchestras are populated by many older adults, and a generation of rockers and garage band members is reaching pension age – the Rolling Stones are well into their 60's! Some will develop dementias. Music therapists will have good opportunities to see if music making in trained people and at higher levels of musical sophistication will be helpful in maximizing cognitive reserve and improving affect.

The social benefits of group music making are well established (Kreutz, Bongard, Rohrmann, Hodapp, & Grebe, 2004), and even solo performers create bonds with listeners. People with previous experience in teaching an instrument might still be able to serve in that role to the extent that lessons can be conveyed via actual playing rather than extensive verbalization.

Similarly, with the advent of easy-to-use software (some marketed for children), therapists and researchers could explore whether basic music composition is a feasible and enjoyable activity for dementia patients. It is possible that some aspects of composition do not depend heavily on verbal skills, although a minimal level of executive functioning is likely needed for composition.

In summary, the papers in this collection will, we hope, provide some inspiration for further exploration of the potential (and pitfalls) of using music to help understand and maybe ameliorate symptoms from a range of dementing illnesses. Further explorations with other artistic media should also be on the research agenda. We thank the authors for their contributions to this special issue, and look forward to future contributions in this area from readers of *Music Perception*.

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