Emotional Recognition from Face, Voice, and Music in Dementia of the Alzheimer Type

Implications for Music Therapy

Joanie Drapeau, a Nathalie Gosselin, b Lise Gagnon, a Isabelle Peretz, b and Dominique Lorrain a

a Université de Sherbrooke, Sherbrooke, Québec, Canada
b Brain, Music and Sound (BRAMS), Université de Montréal, Montréal, Québec, Canada

Persons with dementia of the Alzheimer type (DAT) are impaired in recognizing emotions from face and voice. Yet clinical practitioners use these mediums to communicate with DAT patients. Music is also used in clinical practice, but little is known about emotional processing from music in DAT. This study aims to assess emotional recognition in mild DAT. Seven patients with DAT and 16 healthy elderly adults were given three tasks of emotional recognition for face, prosody, and music. DAT participants were only impaired in the emotional recognition from the face. These preliminary results suggest that dynamic auditory emotions are preserved in DAT.

Key words: face; voice; music; emotion; recognition; dementia

Introduction

In the early stages of Alzheimer’s disease, some of the most important cerebral structures associated with emotional processing are damaged, such as the hippocampus, the amygdala, and the posterior association areas. Most systematic studies that have examined emotional processing in dementia of the Alzheimer type (DAT) have concluded that the emotional recognition from both face and voice was impaired.2–4 However, these studies showed different degrees of recognition impairment according to the type of emotion tested (e.g., happiness,2–4 anger,2–4 fear,2,3 sadness,2–4 surprise,2,4 and disgust2). Divergences could be explained by the possibility of a disorder in the recognition restricted only to certain categories of emotions. Indeed, damage to the amygdala is mainly associated with recognition of fear from face, voice, and music. Thus, recognition of fear could be affected in mild DAT. It is also possible that a lesion in the amygdala cannot affect the recognition of emotions other than fear (e.g., happiness5–8). Despite some impairment in emotional recognition, clinical practitioners encourage the use of facial expressions and prosody to communicate with persons with DAT. Music, via music therapy, is also used in clinics. However, two studies have yielded divergent results. Allen and Brosgole9 showed that recognition of happy, sad, and angry musical expressions was impaired in demented participants, whereas Gagnon, Peretz, and Fülöp10 found preserved recognition of sadness and happiness from music in mild DAT. It is worth noting that most prior studies have not distinguished DAT participants according to the severity of their dementia. The goal of the present study is to assess emotional recognition from nonverbal mediums of communication (face, voice, music) in mild DAT and in normal aging. Emotional recognition for each medium may well be preserved, with a limited deficit for the recognition of the fear.
Material and Methods

Participants

Seven participants with mild DAT (3 men, 4 women) and 16 healthy elderly matched controls (5 men, 11 women) were tested. DAT was diagnosed using a geriatric evaluation, and the participants received standardized neuropsychological tests that indicated the presence of neuropsychological characteristics most common to mild DAT.11

The two groups did not differ according to age (DAT, mean [M] = 74, SD = 9; matched controls, M = 72, SD = 6; P = 0.37 by Mann–Whitney tests) and education (DAT, M = 10.3, SD = 4.1; matched controls, M = 9.5, SD = 2.3; P = 0.92). As expected, they differed significantly in general cognitive functioning (DAT, M = 23.3, SD = 4; matched controls, M = 27.9, SD = 1; P < 0.01) as assessed by the MMSE.12

Materials and Procedure

Facial Expressions Task

Sixty emotional faces from Pictures of Facial Affect13 that evoke happiness, sadness, fear, anger, surprise, or disgust were presented in random order. Participants were asked to select the emotion expressed by each stimulus.

Prosody Task

Sixty sentences with concordant emotional semantic contents that evoke happiness, fear (e.g., “Au Secours! La glace se fend sous mes pieds!” [Help! The ice is breaking under my feet!]), sadness, peacefulness, anger, disgust, or surprise were presented in random order. All matched controls and four DAT participants were asked to rate the extent to which each stimulus expressed each emotion on a 10-point scale (0 = absent, 9 = present). Because of the difficulty of the task, the last three DAT participants were simply asked to select the emotion expressed by each stimulus (categorical judgment).

Musical Task

Fifty-six novel instrumental clips from the film genre, intended to induce happiness, sadness, fear, and peacefulness,14 were presented in random order (to hear some of these clips, visit: www.brams.umontreal.ca/plab/publications/article/96). The same procedure as used for the prosody task was employed here.

Participants’ answers were collected by an experimenter and written choices of emotional labels were presented simultaneously with the presentation of each stimulus. Stimuli were represented if requested. A session lasted approximately two hours.

Figure 1. Mean percentage of the correct responses and standard errors for facial expressions as a function of the intended emotions and groups. An asterisk indicates where the performance of the DAT participants differs significantly from that of the matched controls.
Analysis of Responses

All responses were analyzed categorically. Thus the responses of the matched controls and the first four DAT participants who used the ratings scales were converted as follows. Emotions that received the highest ratings were considered as responses (Derivation of Best Labels; see Gosselin et al. for a similar procedure). Ambivalent responses (those presenting an equivalent highest rating for at least two emotions) were not included in the analysis. Accordingly, a score of 1 was given when participants selected the intended emotion and a score of 0 was allocated otherwise.

Results

No significant differences were found between the two subgroups of DAT participants with regard to the two procedures used (i.e., Scales versus Categorical Judgment; Mann–Whitney tests; \( z = 0, P > 1 \) for the prosody task and \( z = -1.1, P > 0.4 \) for the musical task). Thus the results were pooled across the seven DAT participants.

Facial Expressions Task

As can be seen in Figure 1, DAT participants were less accurate than matched controls in the recognition of sadness (\( z = -2.67, P < 0.01 \)), fear (\( z = -1.2, P < 0.05 \)), and disgust (\( z = -3.11, P < 0.01 \), all by Mann–Whitney tests). The controls generally had more problems recognizing fear from face as compared to happiness (\( z = -3.5 \)), sadness (\( z = -3.4 \)), anger (\( z = -3.1 \)), surprise (\( z = -3.4 \)), and disgust (\( z = -3.4 \), all \( P < 0.002 \) by Wilcoxon tests).

Musical Task

As can be seen in Figure 3, the performance of the DAT participants is similar to that of the matched controls in terms of recognizing happy
Conclusion

Compared to the matched controls, DAT participants were impaired in the recognition of emotion from face, especially for sadness, disgust, and fear. This finding is consistent with those of prior studies. The observation that scary faces are hard to recognize by normal controls is also consistent with the literature, which shows poor recognition of fear in normal aging. Emotional recognition from voice and music was well preserved in the present study. However, the finding of preservation of emotional recognition from prosody in DAT is ambivalent, because verbal semantic content is associated with voice tone. The nonverbal aspect of the voice was therefore not exclusively examined. Besides, the absence of a significant difference between groups for the emotional processing of music agrees with the results of a recent study showing well-preserved emotional recognition in mild DAT.

Conflicts of Interest

The authors declare no conflicts of interest.

References


