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Analysis of Overlap during Group Conversation of Active Older Adults

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Interactive group conversation is one of the cognitive tasks which require division of attention. Compared to dialogue, participants have to pay attention to both topic and speaker. Turn taking becomes more difficult because candidates for the next speaker are more than one. We analyzed group conversation of active older adults and discuss application to cognitive training.

1. Introduction

Just as age-related changes in brain structure and function are not uniform across the whole brain or across individuals, age-related changes in cognition are not uniform across all cognitive domains or across all older individuals. The basic cognitive functions most affected by age are attention and memory [Riddle, 2007]. Attention is a basic but complex cognitive process that has multiple sub-processes specialized for different aspects of attentional processing [McDowd & Shaw, 2000]. One of the sub-processes of attention, divided attention, has usually been associated with significant age-related declines in performance, particularly when tasks are complex. Divided attention tasks require the processing of two or more sources of information or the performance of two or more tasks at the same time. In contrast, there is evidence that discourse skills actually improve with age. Older people often tell well-structured elaborate narratives that are judged by others to be more interesting than those told by young [Kemper & Kemtes, 2000]. They usually have more extensive vocabularies; and although they exhibit the occasional word-finding difficulty, older adults are easily able to provide circumlocutions to mask the problem. They are skilled conversationalists and appear to have few difficulties in processing ongoing speech. According to functional quality of life model [Martin, Schneider, Eicher & Moor, 2012], ideal activities for intervention use many of the individual's resources simultaneously as possible to achieve goal. Ideally, those activities are either everyday activities that function and work like a training or cognitive or social abilities. One of such activities is assumed to be an interactive group conversation. Turn taking occurs frequently which requires divded attention as well as discourse skill during interactive group conversation. Therefore, we have been working on interactive group conversation support method [Otake, Kato, Takagi & Asama, 2011], [Otake et al. 2011], [Otake, Nurzaman & Iida 2012]. However, it was not clear what level of interactivity might be achievable for older adults. In this study, we record and analyze group conversation of active older adults who chat energetically on a daily basis and discuss its characteristics and applications of the evidence to cognitive training.

2. Protocol of Group Conversation

We conducted a group conversation experiment. Group of people consisted of four healthy older adults. All were women whose average age was 93 years old. The subjects were referred to as S1, S2, S3, and S4 from older to younger. The group talked in an interview style. The interviewer named I1 asked questions for trigger. The group of subjects answered to the questions and started free group conversation after that. The group conversation was recorded for 20 minutes by the video camera.

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Table 1: Scripts of the part of group conversation whose topic was the possible occupation for older adults over 90 years old

Speaker	Sentence
S2	At the age of 93, it is impossible to become a "Sori-Daijin", a prime minister.
All	A ha ha ha ha.
S3	How about "Soji-Daijin", a cleaning minister?
S4	"Soji"?
S3	Yes, "Soji-Daijin".
S4	I think I cannot be hired as a cleaning lady.
S2	It's impossible.

Table 2: Scripts of the part of group conversation whose topic was on how they enjoy their chatting for releasing mental stress

Speaker	Sentence
S3	Well, we chat quickly and laugh loudly in order to release stress, I think this is good for our health.
S4	A ha ha ha ha!
S2	We all four get together and fight sometimes.
S4	Fight! A ha ha ha ha!
S1	A ha ha ha ha!

Figure 1: The time sequence data with labels for scripts shown in Table 1

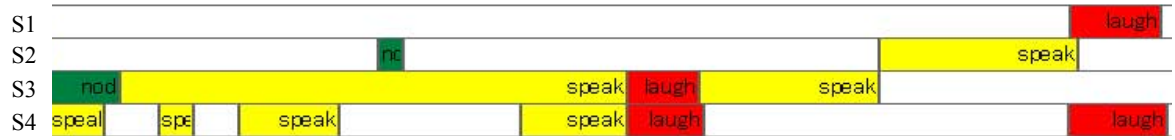

Figure 2: The time sequence data with labels for scripts shown in Table 2

3. Protocol of Conversation Analysis

Firstly, we made dictated scripts of the recorded group conversation by watching video data. The combination of utterers and utterances was identified. The number of turn takings was enumerated from the number of utterances. Responses and laughter in a loud voice were counted as utterances. Responses include but not limited to: "Really?", "Yeah!" Average period of utterances are calculated from the period of group conversation, in this study, 20 minutes divided by the number of turns.

Secondly, time sequence diagram for each subject was labeled with actions: speech, response, and laughter. We used "iCorpusStudio" [Sumi, Yano, & Nishida, 2010] for label editing system. The combination of start times and end times was recorded and the label was selected for each period of time. We tallied the total period of utterances for each subject by summing up the period of speech, response, and laughter. The total period for intervals where no subject uttered was summed up. The number of intervals which exceeded 1 second was enumerated.

4. Results

Typical sequences of scripts are shown in Table 1 and 2. The topic of the first sequence shown in Table 1 is the possible occupation for older adults over 90 years old. The subject S2 told that it is impossible to be a prime minister, "Sori-Daijin" in Japanese. Then, the subject S3 added that it is impossible to be a cleaning minister, "Soji-Daijin" in Japanese. These statements induced loud laughter since the pronunciations of "Sori" and "Soji" resemble with each other but their meanings are totally different. The topic of the second sequence shown in Table 2 is how they enjoy their chatting for releasing mental stress. The subject S3 told that it is good for health to chat and laugh. Then, the subject S2 continued that they sometimes fight with each other. The unexpectedness of the conversation also triggered laud laughter. The time sequence data with labels for scripts shown in Table 1 and 2 are illustrated in Figure 1 and 2 respectively. We can see that there is no interval between each utterance. The next speech starts before the previous laughter ends.

The total period of utterances for each subject by summing up the period of speech, response, and laughter is shown in Figure 3. The total periods of utterances of S1, S2, S3, S4 and I1 are 156[s], 383[s], 266[s], 599[s], and 238[s] respectively. We can see that each subject participated in the group conversation in a balanced manner. If only one subject speech at a time, the total period of utterances of all subject should be the period of group conversation, 20 minutes. It was 27 minutes and 22 seconds. Therefore, the total overlapped period of all utterances was over 7 minutes.

Here we summarize the characteristics of the group conversation. Numbers of turn takings were 381 times during 20 minutes group conversation. Then, the average period of utterances was 3.14 seconds. The frequency of turn taking was very high. The total interval where no subject uttered was only 52 seconds. There were few intervals or no interval between each utterance. The number of intervals continued for more than 1 second was only 6 among 381.

5. Discussion

There were slight or no intervals when turn taking occurred. The utterances were contextual which are typically shown in Table 1 and 2. The evidences that their utterances were contextual are as follows. First, they repeated the keywords in the last sentences, "Soji" in Table 1 and "fight" in Table 2. Second, they broaden the conversation by each statement. The subject S2 stated "Sori-Daijin" and the subject S3 came up with the idea of "Soji-Daijin". The subject S3 talked about chatting and laughing while the subject S2 referred to fighting. We can assume that the original listeners who became the next speakers should have been listening to the previous speeches carefully as well as preparing for the next statements, response or laughter. Namely, they were supposed to listen and plan simultaneously. Then, the divided attention function was engaged in the cognition process to achieve such tasks.

We could successfully collect evidence that older adults over 90 years old can talk very interactively with high frequency of turn taking with a period of up to 3 seconds. Turn taking occurred very smoothly with very short interval smaller than 1 second or without any interval. We can expect that such interactive group conversation may play a role of cognitive task which trains divided attention.

6. Conclusion

We recorded interactive group conversation of healthy older adults who chat energetically on a daily basis. Turn taking and overlap of the conversation were analyzed. We found that turn taking occur very frequently. We also found that there were few intervals or no interval between each utterance. Divided attention function of the subject must have been utilized because the original listeners who became the next speakers should have been listening to the previous speeches carefully as well as preparing for the next statements, responses or laughter. Roles of listeners and speakers switched very quickly so that all subjects play both roles of speakers and listeners. We can expect the group conversation with these characteristics to work as cognitive training as a result. Future work includes investigating the conditions to realize such an active group conversation and developing effective support method.

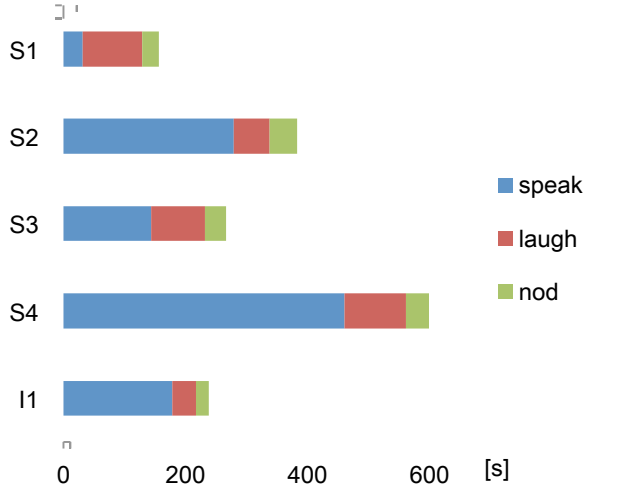

Figure 3: The total period of utterances for each subject

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