

App and Mind-map Supported Jigsaw Puzzle for Elderly with Dementia

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Abstract—Nostalgia-based Jigsaw Puzzle and App were designed for elderly with Dementia. Image and texts are utilized to trigger a previously owned memory, which brings out shared experience between players. Cards are shuffled, player sort these cards into the right sequence. The caregiver can use QR code to retrieve information. By utilizing the mind-map, family members and caregiver may be specific depiction their thinking context and enhance the memories recall process. The app also helps record the audio response of previously memory. The mind-map built through collection and induction, which is much easier to share with the family members.

I. INTRODUCTION

Recently, the number of dementia patients has increased. Thus, particular abilities require for the caregiver. Cognitive rehabilitation has been found to be very useful in teaching individuals with dementia [1] to learn or relearn information. It emphasizes the importance of an individual's context, environmental context, and social system [3]. Context-aware computing can assist people with dementia [4]. A planning system to guide activities of hand-washing was proposed by Boger [5]. Milhaildis [6] demonstrated that individuals simulating cognitive impairment in dementia could benefit from a graded hierarchy of audiovisual prompts. The increase of social interaction can slow down the dementia process.

The design of nostalgia-based game requires to include individual's context and social experience. Nostalgia-based treatment took different forms [7] and got a good response. The trigger elements can be an image or text associated with their experience, and sometimes the feedback from the patient are more than expected. Lacking shared experience, the caregiver had difficulty with the communication and responses (Fig. 1). By the organization those responses to mind-map, family member or friend can recall and share it with the mobile app. If we further translate the text using icon or figure, the caregiver has more chance to participate and communicate with the patient.



Fig. 1. Lacking common experience and relationship, the caregiver had difficulty with the response and feedback.

II. PROBLEM AND PROPOSE APPROACH

The caregiver usually knows nothing about the elder. If the family member is not present in the daytime, the elderly will not have a channel to communicate with the caregiver. The proposed approach is:

- (1) Family members select related image and text,
- (2) Pre-collect reflections to build a memory map,
- (3) Make QR code for different prepared cards,
- (4) Proceed with the game and collect response,
- (5) Extend the memory map by family members.

The caregiver can periodically select different ready theme cards, and trigger feedbacks of the elderly using these prepared images and text. Theme cards can be old maps, newspapers, videos, etc. That memory buried inside one's mind can be revived by the right words. It will be a waste if those thoughts disappear silently. The family member who did not join the activity or event can access response audio message and still bond with the patient. The Jigsaw Puzzle and App design implemented from traditional skills. Game steps are:

- (1) Divided procedure in sequential step, cards. Cards are shuffled and sorted into the right sequence,
- (2) If the elderly do not understand the meaning of the card, the caregiver scan QR code and get an audio explanation (Fig. 2),
- (3) Sometimes audio explanation trigger verbal response such as experience, question; then caregiver can pause the game and activate recording,
- (4) Family member builds mind-map through collected feedbacks and can use in next time.

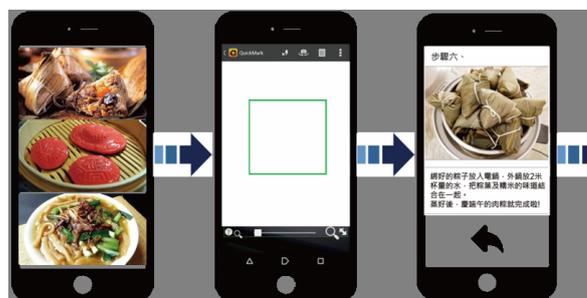


Fig. 2. The theme of rice dumplings, rice cake, and noodle soup making. App explanation of the category and sequence [8].

The player selects specific theme; the six food making steps shuffled in random order are present. Player has to sort out into the correct sequence. While the player did the game successfully, he can try a multiple-theme match. The cards of three themes are mixed. Firstly, players select those cards that related to a specific task and re-arrange those cards in proper sequence. Understanding and grouping those category relationships between the images card require memory association ability.

III. IMPLEMENTATION

One of a mind-map tool is "Connected to the Mind" [9], which allows users to organize information visually. A toolbox of design elements turns dull information into dynamic memories. The specific map sync with multiple mobiles and desktop devices and share with group members. Figure 4 is a general background map of the lady.

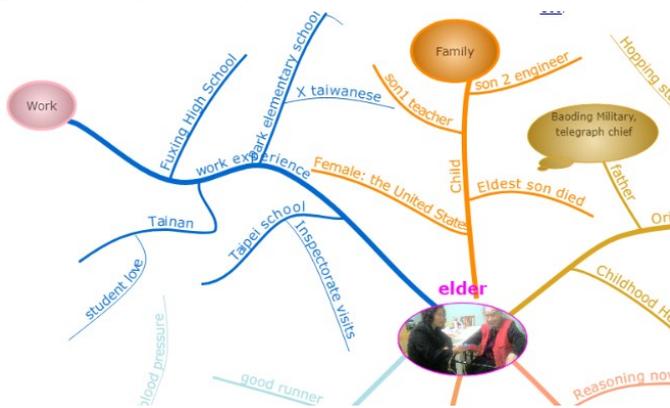


Fig. 3. General background map of an elder (part of).

The app was made using MIT App Inventor 2. The flow chart of Jigsaw Puzzle indicated in Fig. 4. The built-in QR scan, recording, and sharing function reduce the programming load. The picture steps for each theme (such as making rice dumpling, red turtle cake, and rice noodle soup) are stored in different lists; the text explanations are stored in separate lists. The player recognizes each card (trigger element) and recalls its affinity so that he or she can place the related cards in the right group and sequence.

During group playing, discussions among members are encouraged. Especially when the player of same age group, they have shared context and social experience. The mind-map is the tool to collect and build an internal connection that helps others to comprehend. Nostalgia-based treatment can be fun through the mutual interaction through the Puzzle game. The joint communication also happens between player and caregiver. The participants actively talked to us about experiences related to making rice dumplings. For instance, one lady mentioned how to make tastier dumplings, and one said how her mother made it in her ways. Different background and culture bring in the various different aspect of view. If the group communication occurs, we can collect and construct a group mind-map. Those group mind-maps help elderly extend their individual experience.

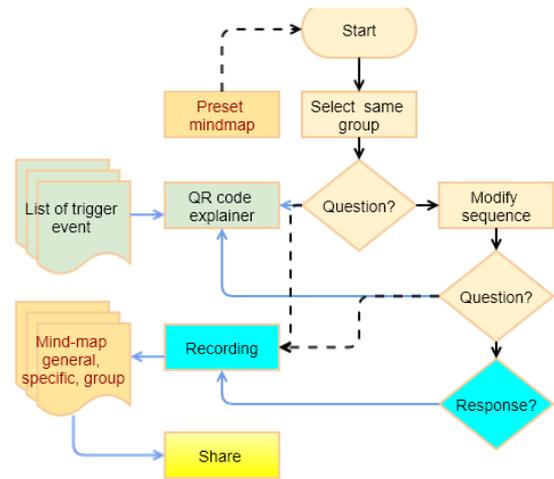


Fig. 4. App with triggering element, QR code explainer, and the recording enable the memory recalling and organization with mind-map skills.

IV. CONCLUSION

Family relatives can utilize mind-map and App to archive, and remote access to bond with the patient, and increase the effect of nostalgia-based supporting. The caregiver can use QR code to retrieve information. By utilizing the mind-map, family members and caregiver may be specific depiction their thinking context and enhance the memories recall process. The nostalgia triggering theme is not only a game but also remember of individual's background using a cloud-based mind-map tool.

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