

ORIGINAL ARTICLE

Spiritual Therapeutic Robot for Elderly With Early Alzheimer's Disease: a Design Guide Based on Gender

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ABSTRACT

Introduction: Researchers and technologists have been exploring ways to utilize robotic technology to aid elderly care and to increase their emotional wellbeing. Previous studies indicated that spirituality is a core factor for successful aging. Various research was done on therapeutic robots for the elderly with Alzheimer's Disease (AD). However, little focus was given to emotions and spiritual elements perceived by different genders. Therefore, this research aims to explore spiritual therapeutic robot design elements based on the elderly's emotional experience by different genders. **Methods:** The research firstly conducted expert interview involving 9 experts on elderly care, robotics, and spiritual practice; secondly, KJ Method involving 4 language, spiritual, elderly care, and robotic experts; and thirdly, qualitative and quantitative Kansei assessment (n=12) among the elderly with early AD to determine the conceptual design guide, spiritual emotion words, and finalize the design guide. **Results:** Two-Sample t-Test shows five of ten spiritual design elements have a p-value of 0.05, which indicates there is a 50-50 chance of a significant difference in spiritual emotional experience between male and female respondents. Further analysis shows differences in results from both genders, but shows similar scores for zikr, surah, and prayer. **Conclusion:** The results enabled the research to produce a gender-based design guide for therapeutic robots based on spiritual elements and emotions, to successfully evoke positive emotions among the elderly with early AD. The gender-focused design will further extend the effectiveness as it will fit the specific demands of each gender, thus effectively elevating their emotional wellbeing. *Malaysian Journal of Medicine and Health Sciences* (2022) 18(9):71-79.doi:10.47836/mjmhs18.s9.11

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INTRODUCTION

According to the World Health Organization (1), the world's population of people aged over 60 years will double from 11% to 22% between the years 2000 and 2050. Growing old comes with the increasing demands of caregiving, especially for those with Alzheimer's disease (AD). AD is a type of dementia disease that causes problems with memory, thinking and behaviour. It's possible for people with early AD to live well by taking control of their health and wellness, and focusing their energy on aspects of their life that are most meaningful to them (2).

Today, with the rapid advancement of the robotic field, robots are believed to be able to multitask similar to humans (3). The evolution of robots has always been an

interesting subject for both generalists and technologists alike (4) as well as researchers and scientists have been exploring ways to develop robotic technology to aid in the care of the elderly (5). There has been therapeutic robot research done in the past to facilitate the elderly with AD, such as assistive robots for AD and related Dementia patients (6), and healthcare robots for older people at home (7). Several have highlighted that affective and social characteristic are important human attributes for machine behaviour (8), and have emphasized the aspect of human emotion or affect in robot interaction (9-12). Thus, the research argues that assistive robots must prioritize this important element of human emotion in their design, so that effective strategies to positively influence the elderly emotions could be devised.

On another note, in a cultured society, good spirituality has been the guiding principle for realizing good acts and positively influencing individuals, societies (13), as well as nature in the future (14). In a study conducted among the Malaysian community, (15) pointed that despite

physical, mental, and social well-being, spirituality is an essential aspect for successful aging. Little research was found addressing spiritual elements in emotional therapy using robots (16-17). However, no studies have investigated the aspect of spiritual therapy for robotics based on gender for the elderly with early AD. This is in view of possible differences in the way certain spiritual practices are performed by different genders, such as when Muslims perform prayers.

The above are the motivations for the research to explore spiritual therapeutic robot design elements based on the elderly's emotional experience by different genders, and produce a design guide for therapeutic robots based on the elderly's emotion to cater for their emotional wellbeing. In its investigation, the research focused on Muslim spiritual practise and the elderly with early AD, aged 60 years old and above in Malaysia.

MATERIALS AND METHODS

Fig. 1 shows the method used for this research. The method was divided into three phases.

Phase I was a focus group study conducted to determine a conceptual design guide for therapeutic robots based on spiritual elements and robot design elements. An in-depth interview was conducted with nine experts on elderly care, robotics and spiritual practice. They were chosen based on their familiarity with the elderly and have practiced for more than five years in their respective

fields. The experts were asked to describe spiritual practice and design elements as well as attributes suitable for the elderly with early AD to be embedded in a humanoid robot. Thematic analysis was conducted to enable the research to determine a conceptual design guide for therapeutic robots.

Phase II involved a qualitative KJ Method study conducted to synthesize keywords for Emotional User Experience (UX) in therapeutic robots based on Kansei Engineering. The synthesis involved selecting domain-specific spiritual emotional keywords through journals, proceedings, thesis papers, and books related to spiritual and elderly emotional concepts. The words were then checked across thesaurus and glossaries to check the accurate meaning and make comparisons with the existing words. Redundant or inaccurate words were then excluded. The finalized list of words was sent to the experts for verification. Followingly, the words were classified into their affinities using the KJ (Kawakita Jiro) Method, a method for classification and prioritization, by four experts: language, spiritual, elderly care, and robotic experts. In the KJ Method, experts were requested to conduct repetitive activities to group words according to their similar meanings, and brainstorm or choose a suitable word to become a header for the cluster. The header must be a keyword that represents the meaning of the cluster. The header is considered as a significant spiritual emotion.

Phase III involved a quantitative and qualitative Kansei assessment conducted to develop a design guide for the

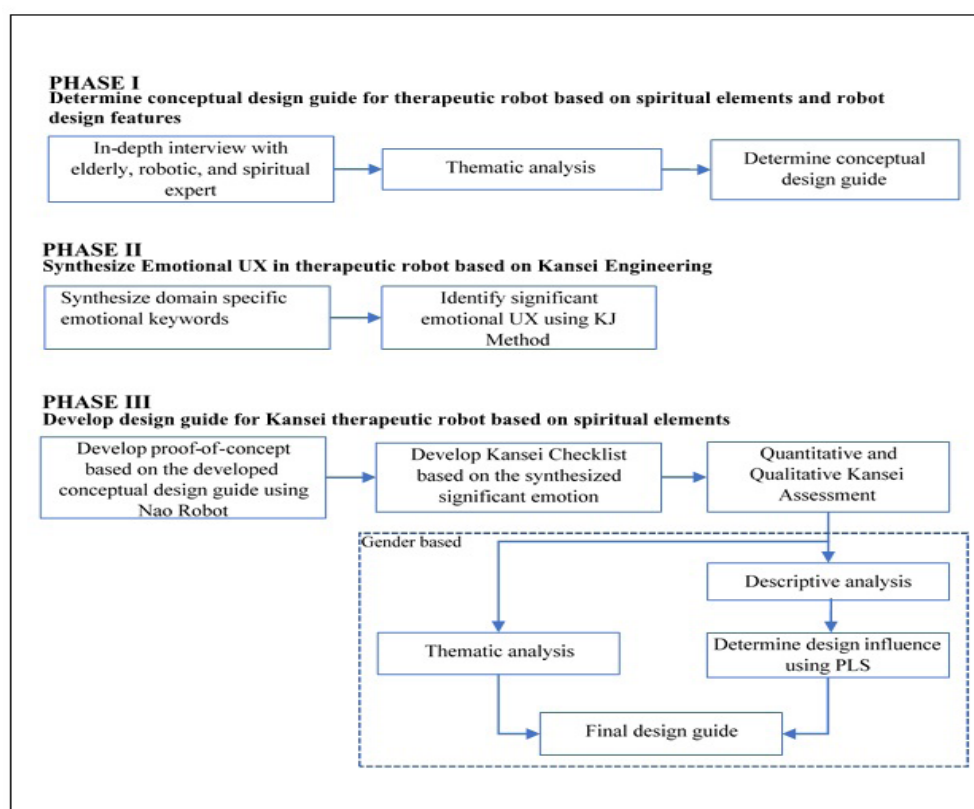


Fig. 1: The Research Phases.

Kansei therapeutic robot based on spiritual elements. In this phase, first, the identified spiritual practice and design elements as well as attributes from Phase I were programmed into the humanoid robot Nao. This is used for proof-of-concept based on the developed conceptual design guide using Nao Robot. Secondly, the significant spiritual emotion words identified in Phase II were then developed into a Kansei Checklist, with a scale from one to five. Thirdly, a quantitative Kansei evaluation was conducted where the elderly were asked to first experience the interaction with the robot performing spiritual practices. Then, upon completing the robot interaction, each of the elderly rated their experience according to the Kansei checklist to indicate their spiritual emotion towards each spiritual practice and design element performed by the robot. After completing the quantitative evaluation, the elderly were interviewed to obtain a qualitative assessment of their emotional experience based on the interaction with the robot. The interview results were then transcribed, and thematic analysis was conducted. Parallely, a Two-Sample t-Test was conducted on the quantitative data to determine whether there is statistical evidence that both means are significantly different. Then, PLS and central tendency were analysed to validate the qualitative results, and finalize the design guide for both genders. The phase was conducted in a controlled environment, involving a video camera, the researcher, the elderly as respondent and Nao robot with 70 cm distance, a caregiver (Doctor/Nurse), and a robot expert. The approval and ethical clearance from UiTM Research Ethics Committee, was attained upon commencement of the study [Reference No: 600-IRMI (5/1/6)].

During the assessment, the environment for the user study was assured to be as natural as possible to ensure the elderly felt safe and willing to participate in the study without being compromised. The user study involved 12 elderly of equal proportions between male and female above 60 years old with early AD as the evaluation subject and a Nao robot programmed with five modules of interaction as stimuli to evoke spiritual emotions in the elderly. The subjects were selected purposively among elderly with early-stage AD by equal proportion for comparative purposes. The environment involves the researcher to supervise the study, the caregiver and doctor/nurse to ensure that the participants are safe and comfortable during the assessment, and the robotic expert to manage the robot. The therapeutic robot was placed 70 cm from the elderly as suggested by the robot expert for a safe distance for the elderly to see clearly as well as provide a natural environment. A video recorder was placed at a suitable angle to capture the process as well as the elderly' emotional responses.

Two-Sample t-Test was then calculated from the data obtained from the Kansei checklist to compare datasets from male and female respondents. This is to test whether the design elements induced the same

experience or not for the male and female elderly. The research then conducted Partial Least Square (PLS) analysis to determine the significant influence of design elements and attributes on the elderly's experience when interacting with the robot. For PLS, two datasets are used. The first dataset is the data obtained from the Kansei evaluation. The second dataset is the binary matrix of design elements and attributes against the specimen, i.e. the spiritual practice. The matrix was developed using an item-category classification method by Kansei Engineering.

The research then analysed the results from thematic analysis and PLS analysis to finalize the intended design guide for the Kansei-spiritual therapeutic robot for the elderly with early AD.

RESULT

The results derived from the research were divided into three parts accordingly.

Phase I: Determine conceptual design guide for therapeutic robot based on spiritual elements and robot design elements

Based on the in-depth interview, the research conducted a content analysis and found five types of spiritual practices suitable for elderly therapy using a robot, and the spiritual elements were also identified for each type of practice. The results are shown in Table I.

The interview has also enabled the research to discover initially that audio, voice, movements, and haptics were suitable elements for designing interaction between therapeutic robots and the elderly. Further analysis shows that the most important design elements were audio and voice, as the sound from the robot is targeted to influence the elderly. The audio and voice are believed to be able to attract the elderly's attention and focus. Loud and clear audio and voice are believed to be the best design attributes for the therapeutic robot. The second most suitable design is the movement of the robot. The result shows that the movement, together with the audio element, is possible to help the elderly with early AD to better comprehend the therapeutic robot's purposes and intentions to assist them with spiritual practices. Thus, audio, voice, and movement were selected as the best design to be associated with spiritual practices. Table I summarizes the identified spiritual practices, spiritual elements, and robot design elements, which are called spiritual design elements, to be implemented into the therapeutic robot as synthesized by the experts.

Phase II: Synthesize keywords for Emotional UX in therapeutic robot based on Kansei Engineering

Initially, 135 SEW were synthesized from the activities explained in the methodology section. The experts then conducted the KJ Method to find affinity between the words to establish SEW concepts. The result was ten

Table I: Spiritual Elements and Robot Design Elements

Spiritual Practices	Spiritual Elements	Robot Design Elements	
		Audio and Voice	Movements
Zikr	Asma ul-Husna and Salawat Syifa' (Source: soundcloud.com)	- Adult Male's voice - Soft and clear voice - Smooth tones - Moderate speed and volume	- Moving both hands inwards and outwards - Sitting on its knees
Prayer	Prayers to improve memory and to avoid forgetfulness (Source: soundcloud.com)	- Adult Male's voice - Strong and husky voice - Moderate speed and volume	Sitting on its knees and raising both its hands imitating behaviour when saying a prayer
Surah	Al-Qursi and An-Nas (Source: quran.com)	- Adult Female's voice - Medium and clear voice - Smooth tones - Moderate speed and volume	Sitting with cross legs imitating position when reciting Quran
Religious song	Ya Nabi Salam 'Alaik (Source: soundcloud.com)	- Adult Male's voice - Strong and rhythmic voice - Moderate speed and volume	Moves head and hands and dancing lightly to the songs
Praying	The ablution steps and the intention to pray (Source: soundcloud.com)	- Adult Male's voice - Strong voice - Clear pronunciations - Moderate speed	- Demonstrate steps taking ablution from start to end - Position in reciting the intention before praying, which is standing straight on two feet

SEW concepts derived from the KJ Method, namely 'Pious', 'Calm', 'Strive', 'Devout', 'Mystic', 'Cheerful', 'Knowledgeable', 'Religious', and 'Blessed'. Table II shows the SEW concepts, the spiritual-emotional elements clusters, and descriptions derived from the KJ Method.

Phase III: Develop design guide for Kansei therapeutic robot based on spiritual elements

Five modules (zikr, prayer, surah, religious song,

praying) were programmed into the humanoid robot Nao, to perform the spiritual practice as identified in Phase I. Fig. 2 illustrates the programmed Nao.

The subjects evaluated their experience interacting with the programmed Nao robot on the Kansei checklist, which was constructed using SEW concepts derived from Phase II. 2 datasets were prepared from the evaluation results: i) Raw data for the Two-Sample t-Test, and ii) Average evaluation data for PLS analysis.

Table II: Spiritual Emotion Words (SEW) derived from the KJ Method

SEW concept	Spiritual-Emotional elements	Definition
Pious (<i>Ihsan</i>)	<i>Taqwa</i> (Piety), <i>Tawadhuk</i> (Humility), <i>Tafakur</i> (Meditation), Moderate.	The elderly's feeling of near to God while worshipping.
Calm	Calm, Confident, Peaceful, Restful, Convenient, Fearless, Relieved, Secure, Warm, Undisturbed, Quiet, Relaxing, At peace, Fine, Serene, Comfortable, Tranquillity, Peace-loving.	The effects to the elderly's feeling when they perform spiritual activities.
Strive (<i>Mujahadah</i>)	Pray, Adhere to advice (<i>Istiqamah</i>), Resign to fate (<i>Tawakal</i>), Effort, Amused, Adaptive.	The elderly's feeling of trying to draw himself/herself closer to God.
Devout (<i>Taat</i>)	Faith, Bow to God, Devout, Obey.	The elderly's feeling when they are devoted to God by performing obligations as commanded.
Good deed (<i>Amal soleh</i>)	Good deed, Repent, Seeking knowledge, Courtesy, Tolerable, Accepting, Agreeable, Thoughtful, Welcomed, Responsible and supportable.	The elderly's feeling when they try to find ways to being closer to God.
Mystic (<i>Tasawwuf</i>)	Patient, Sincere, Accepting, Well-thinking (<i>Husnuzon</i>), Humble, Thankful.	The elderly's positive feeling of being surrounded by normal elderly, and able to perform the spiritual practice as same as the normal elderly.
Cheerful	Easy, Cheerful, Joyful, Lively, Positive, Fun, Playful, Jolly, Mercy, Wonderful, Celebration, Enjoyable, Happy, Care-free, Fantastic, Exciting, Festive.	The elderly's emotions when they are able to learn, remember and capture knowledge despite of their health conditions.
Knowledgeable	Creative, Smart, Optimistic, Intelligent, Clever, Adorable, Responsive, Brainy, Bright, Ace, Admiration, Interested, Well-chosen, Well-informed	The elderly's feelings when they are able to learn and gain knowledge.
Religious	Gratifying, Belief, Devotion, Merciful, Hopeful.	The elderly's feeling after they have learnt the spiritual practices.
Blessed	Pleasant, Contented, Complacent, Blissful, Abundant, Glad, Grateful, Satisfied, Plenty, Lucky, Feel special, Glad, Grateful.	The elderly's feeling of blessed when they are able to recall and practice the spiritual practices perfectly.

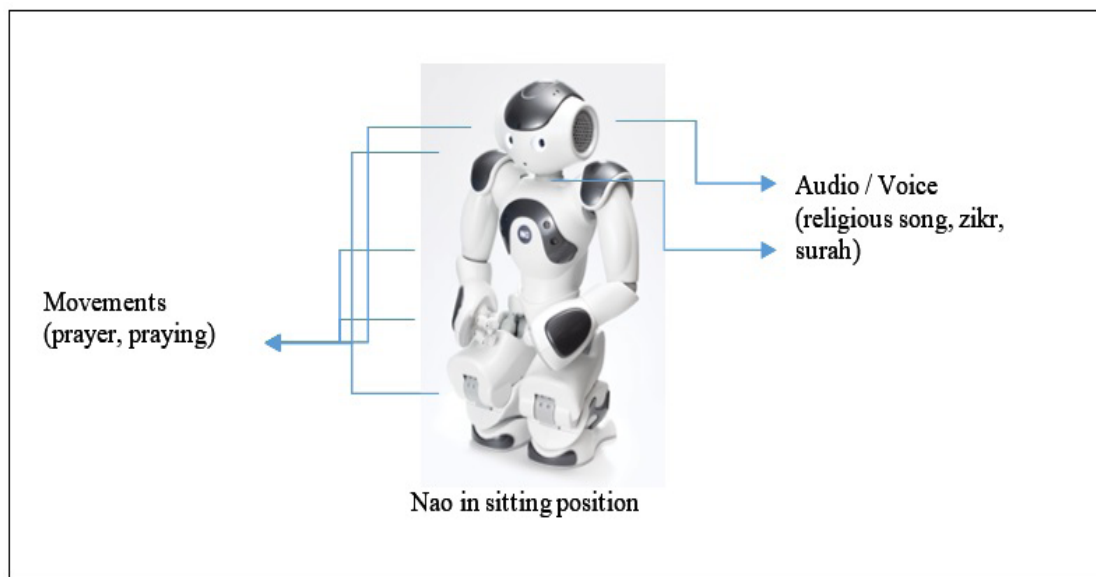


Fig. 2: Spiritual Practice and Elements Programmed into Nao.

Two-Sample t-Test

The results of p-value from Two-Sample t-Test are Pious (p-value = 0.000), Calm (p-value = 0.014), Strive (p-value = 0.016), Devout (p-value = 0.097), Good deed (p-value = 0.573), Mystic, (p-value = 0.320), Cheerful (p-value = 0.048), Knowledgeable (p-value = 0.851), Religious, (p-value = 0.004), and Blessed (p-value = 1.000). The Two-Sample t-Test conducted on the dataset showed that five of ten spiritual design elements have a p-value < 0.05, which indicates that there is a significant difference in spiritual emotional experience between male and female respondents. Thus, it can be concluded from the test that there is a 50% chance that the design elements are experienced differently by different genders. This provides sound support for the argument that different design guides should be composed for each gender for the spiritual emotional elements to positively influence the elderly's emotions, thus promoting their spiritual wellbeing.

Partial Least Square (PLS) Analysis

A PLS analysis was then conducted to determine which spiritual design elements in the Nao robot are influential on the elderly's emotional experience. The result of item-category classification were converted to a binary matrix of design elements and attributes against the specimen, i.e., the spiritual practice. In the matrix, '1' represents the existence of the design elements, while '0' represents the non-existence of the elements in spiritual practices. This data was then used to perform PLS analysis.

Fig. 3 shows partial the PLS result for robot design elements related to SEW based on both gender's perspectives.

The following interprets the emotional response from the male's perspectives:

1. Pious is highly influenced by robot body sitting, husky voice and soft sound.
2. Calm is influenced by soft voice, smooth sound tone and sitting.
3. Strive is highly influenced by soft voice, husky voice and sitting.
4. Devout is highly influenced by husky voice, smooth sound tone, sitting.
5. Good deed is highly influenced by soft voice, smooth sound tone, and sitting.
6. Mystic is highly influenced by soft voice, fast movement, and sitting.
7. Cheerful is highly influenced by fast movement, sitting, and dancing.
8. Knowledgeable is highly influenced by husky voice, smooth sound tone, dancing, and sitting.
9. Religious is highly influenced by husky voice, smooth sound tone, and sitting.
10. Blessed is highly influenced by soft voice, smooth sound tone, and sitting.

The following interprets the emotional response from the female's perspectives:

1. Pious is highly influenced by soft voice, robot body sitting, and husky voice.
2. Calm is highly influenced by robot body sitting, soft voice, and smooth sound tone.
3. Strive is highly influenced by robot body sitting, fast movement, and dancing.
4. Devout is highly influenced by robot body sitting, smooth sound tone, and soft voice.
5. Good deed is highly influenced by robot body

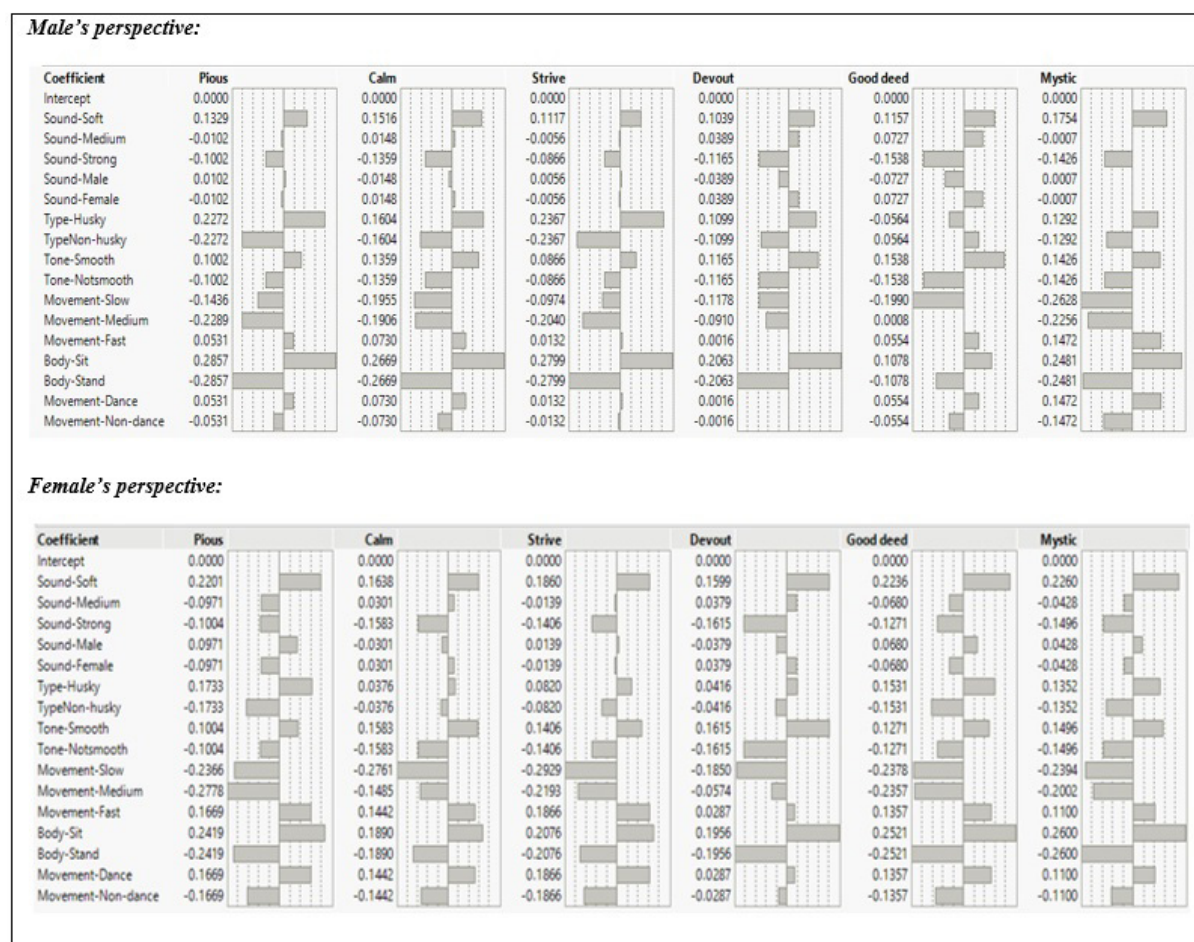


Fig. 3: PLS Based on Different Gender's Perspective.

sitting, soft voice, and husky voice.

6. Mystic is highly influenced by robot body sitting, soft voice, and smooth sound tone.
7. Cheerful is highly influenced by fast movement, sitting, and dancing.
8. Knowledgeable is highly influenced by soft voice, smooth sound tone, sitting.
9. Religious is highly influenced by soft voice, husky voices, and sitting.
10. Blessed is highly influenced by soft voice, smooth sound tone, and sitting.

From the males' perspectives, the data revealed: i) Soft (six occurrences) as compared to medium and strong voices; ii) Smooth (six occurrences) as compared to husky (five occurrences) voices; and iii) Movement of the robot while sitting (11 occurrences) as compared to dancing (one occurrence) and standing (no occurrence). This has provided evidence that the most influential design features are the soft voice, smooth tone, and robot movement while sitting. Similarly, the females' perspectives data revealed: i) Soft (nine occurrences) as opposed to medium (no occurrence) and strong voice (no occurrence); ii) Smooth (five occurrences) as opposed to husky (three occurrences) sound tone; and iii) Movement of robot while sitting (ten occurrences) as opposed to dancing (three occurrences), and standing (no

occurrence). The results show agreement in both genders that soft voice, smooth tone, and robot movement while sitting are the most influential design elements in the Kansei-spiritual therapeutic robot for the elderly.

Thematic analysis

Thematic analysis was conducted on the qualitative data transcribed from the interview session to perform qualitative assessment of the elderly' emotional experience based on their interaction with the robot. The results from thematic analysis were used to validate the quantitative evaluation results. Table III shows instance of the thematic analysis.

The result from the thematic shows that there were observable pattern showing that the elderly has positively responded towards the robot interactions. This can be seen in the narrative which showed the emotional responses from the elderly during the interview, as illustrated in Table IV. The structure of the themes was guided by the identified SEW in earlier phase. The overall results have provided evidence that the elderly have positively responded to the robot performing zikr, prayer, surah, religious song, and praying.

Analysis of central tendency was used to support the thematic analysis results. It can be observed from the

Table III: Instance of the Thematic Analysis for Zikr

Themes	Sub-themes	Narrative
Pious	Piety	ER1: "... helps me to remember this zikr again which make me feels closer to God". ER2: "I feel more pious in devoting to God". ER3: "... it helps me to remember and recalled the zikr again...". ER4: "...it helps me recall the zikr". ER5: "I can learn and remember it well". ER8: "... it reminds me to Allah SWT, the Almighty God."
Devout	Godly	ER1: "...educating myself to be a better person". ER4: "It's comforting, I feel calm and closer to Allah S.W.T.". ER10: "... I feel calm and closer to Allah S.W.T."
	Bow to Allah	ER2: "... it's politer to sit when you are worshipping God". ER12: "It shows that you are fully submitting yourself when you are worshipping Allah S.W.T."

results that the male elderly has shown a significant positive response to three spiritual design elements, i.e., zikr, prayer and surah. The average scores from quantitative data for the three were 4.07, 3.92, and 3.99 respectively, which were higher than the central tendency (3.79). They also encouragingly enjoyed religious songs, in which the average score is 3.67, which is near to the central value. However, the results from the thematic analysis showed that the elderly had low emotional reactions towards the praying robot.

From the male elderly's perspective, zikr is the most influential spiritual practice in spiritual therapeutic robots, followed by surah and prayer. The influential level was measured based on the higher average value against the central tendency of the whole data population and validated by the thematic analysis result. Based on

the findings, the research developed a design guide for the Kansei-Spiritual Therapeutic Robot for the male elderly with early AD according to its influential level, as shown in Male Elderly's column in Table IV. On the other hand, the female elderly has shown a significant positive response to three spiritual design elements, i.e., zikr, prayer, and surah, and religious song. The average scores from quantitative data for the three were 4.46, 4.09, 4.21, and 4.05 respectively, which were higher than the central tendency (3.77). The results from the thematic analysis also showed that the elderly had low emotional reactions towards the praying robot, and the average score was also low. Thus, the research concluded that, from the female elderly's perspective, zikr is the most influential spiritual practice in spiritual therapeutic robots, followed by surah, prayer, and religious song. The influential level was measured based on the higher average value against the central tendency of the whole data population and validated by the thematic analysis result. Based on the findings, the research developed a design guide for the Kansei-Spiritual Therapeutic Robot for Female Elderly with Early AD according to its influential level, as shown in Female Elderly's column in Table IV.

DISCUSSION

The findings indicated that the elderly, regardless of their gender, were accepting the therapeutic robot. The suggested design guide could aid in the development of a therapeutic robot embedded with spiritual elements for the purpose of eliciting positive emotion in the elderly through spiritual practises therapy. The influential design features identified for both genders should serve as a guide for robot therapy designers for evoking a desired emotion. The therapeutic robot employed in this study was embedded with spiritual design elements from spiritual practises, which corroborates previous research on spiritual learning for the elderly through mobile

Table IV: Design Guide for Kansei-Spiritual Therapeutic Robot for Male & Female Elderly with Early AD

Influence Level	Spiritual design elements	Design Elements			
		Male Elderly		Female Elderly	
		Sound and Voice	Movements	Sound and Voice	Movements
1	<i>Zikr</i>	- Adult Male's voice - Soft and clear voice - Smooth sound tones - Moderate speed and volume	- Moving both hands inward and outward - Sitting on its knees	- Adult Male's voice - Soft and clear voice - Smooth sound tones - Moderate speed and volume	- Moving both hands inward and outward - Sitting on its knees
2	<i>Surah</i>	- Adult Female's voice - Medium and clear voice - Smooth sound tones - Moderate speed and volume	Sitting with crossed legs imitating position when reciting Quran	- Adult Female's voice - Medium and clear voice - Smooth sound tones - Moderate speed and volume	Sitting with crossed legs imitating position when reciting Quran
3	<i>Prayer</i>	- Adult Male's voice - Strong and husky voice - Moderate speed and volume	Sitting on its knees and raise both hands imitating behaviour when saying a prayer	- Adult Male's voice - Strong and husky voice - Moderate speed and volume	Sitting on its knees and raise both hands imitating behaviour when saying a prayer
4	<i>Religious song</i>			- Adult Male's voice - Strong and rhythmic voice - Moderate speed and volume	Moves head and hands and dancing lightly to the songs

spiritual applications (18) and a spiritual experiences diary study (19).

The outcome demonstrates that including spiritual aspects into therapy with the elderly, including assisted therapy using a therapeutic robot, is feasible. This is consistent with earlier research demonstrating that robots are capable of healthcare and human-robot interaction (20-21). Also, it is consistent with (22), who discovered that interaction between a robot and people with dementia and Alzheimer's disease improves and maintains their cognitive attention through a music-based cognitive stimulation game.

Additionally, the findings indicate that Zikir is the most influential spiritual design aspect for KS-TRI, as it has the highest average score when compared to the other elements. Accordingly, the user study with the elderly employing the spiritual design element Zikir yielded positive outcomes, with the elderly feeling calm and grateful as they improved their recall and recitation of the zikir after listening to the therapeutic robot recite the zikir. The ability to recall and re-learn made them happier and more blessed. This is viewed as an emotional treatment session for them. Their actions reflected their responses, as they smiled and walked beside the zikir and the therapeutic robot. The usefulness of the KS-TRI design guide is calculated based on the average score of emotional assessment, and it has been determined that Zikir is the most influential Spiritual Design Element, followed by Surah and prayer.

The research findings established the feasibility of using a therapeutic robot to improve emotional well-being. With the aim of eliciting spiritual emotion in elderly people suffering from Alzheimer's disease, the therapeutic robot is seen to provide benefits while also gaining acceptance from the elderly. (23) supported this argument by suggesting that as robotics advances, the factor of emotion or affect is incorporated into robot interaction. In summary, the findings indicate that a therapeutic robot combined with spiritual design elements from spiritual practises could have a positive influence on spiritual emotions in elderly people with early stages of Alzheimer's disease. The therapeutic robot's intervention made the elderly feel happy and content since they were able to recall and remember things they may have forgotten as well as learn something new, like the prayers.

CONCLUSION

The research discovered from the analysis that male and female elderly have slightly different perspectives on the influential design elements for the therapeutic robot. Both male and female elderly perceived the design elements of soft sound, smooth tone and movement of the robot while sitting on a therapeutic robot to significantly evoke their emotions. The influential level for the design guide

is almost the same, except the female perspective has indicated that religious song is also one of the influential spiritual practices to be embedded in the robot.

The elderly from both genders have given positive responses and shown a similar perception towards the three spiritual design elements, zikir, surah, and prayer, with higher value on the Kansei checklist, and thus acknowledged zikir as the most influential spiritual design element for the spiritual therapeutic robot, followed by surah, and prayer. Thus, the design guide for the male elderly has three kansei-spiritual elements, i.e., zikir, surah, and prayer. On the other hand, the female elderly has four kansei-spiritual elements, i.e., zikir, surah, prayer, and religious song. The use of robots for spiritual therapeutic purposes has thus proven possible. The research has revealed spiritual-emotional elements in both male and female elderly as well as successfully discovered design elements that evoked positive experiences for the elderly.

This research has discovered new knowledge by providing a deeper understanding of the elderly's emotional responses and the associated spiritual design elements for both genders. The elderly with early AD could benefit from robotic technology in terms of performing spiritual practices, which are believed to elevate their emotional wellbeing and aid their memory. This corresponds to (3) arguments on humans' recognition and responses to social robot's artificial emotions during human-robot interactions, as well as the considerable necessities for robots to participate in rehabilitation environments (4). The implementation of the design guide in the introduction of therapeutic robots for spiritual practices is seen as promising to successfully evoke positive emotions among the elderly with early AD. Gender-focused design will further extend the effectiveness of positive emotion evocation as it will fit the specific demands of each gender.

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