# Emotional Evocative User Interface Design for Lifestyle Intervention in Non-communicable Diseases using Kansei

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***Abstract*—The advancement of technology has led to the development of an artificial intelligence-based healthcare-related application that can be easily accessed and used to assist people in lifestyle intervention for preventing the development of non-communicable diseases (NCDs). Previous research suggested that users are demanding a more emotional evocative user interface design. However, most of the time, it has been ignored due to lack of a model that could be referred in developing emotional evocative user interface design. This creates a gap in the user interface design that could lead to the ineffectiveness of content delivery in the NCD domain. This paper aims to investigate emotion traits and their relationship with user interface design for lifestyle intervention. Kansei Engineering method was applied to determine the dimensions for constructing emotional evocative user interface design. Data analysis was done using SPSS statistic tool and the result showed the emotional concepts that are significant and impactful towards user interface design for lifestyle intervention in NCD domain. The outcome of this research shall create new research fields that incorporate multi research domain including user interface design and emotions.**

***Keywords*—*Emotion; Kansei; non-communicable diseases; lifestyle intervention; user-interface design***

## I. INTRODUCTION

Most technologies in the healthcare domain user interface design are equipped with a clear and simple interaction approach that includes a text and button. However, the new display technology paradigm has shifted to touch-screen or semi-transparent display, allowing a new approach for visual human-machine interaction which more complex and efficient. The emergence of the new display technologies and artificial intelligence (AI) resulted in the adaptation of devices interface navigation that depending on the user's behaviour [1]. Recently, the chatbot has seemed to be a potential tool in communicating the context of healthcare effectively and improved patient education and treatment compliance[2] with an abundance of technologies that have been developed to assist people on a daily basis. However, affective interaction principles are not able to be realized yet [3]. Previous research showed that users are demanding for more emotional evocative user interface design [4]. Nevertheless, most of the time, it has been ignored due to the lack of a model that could be referred to in developing user interface design (UID) that is emotionally evocative[5]. This creates a gap in the user interface design that could lead to the ineffectiveness of content delivery by the personal healthcare application.

Assessment of emotion related to UID is vital for the utmost user experience and effectiveness in using the application to achieve the desired usage objectives. Researchers are focusing mainly on how to design and redesign UID by examining the possible UID cognitive features such as design colour, characteristic, size, contents and messages [6]. The process of redesigning UID has been however carried out on a trial-and-error basis, which led to difficulties in selecting the most suitable design that can increase usage efficiency. Although the emotional embedded design is preferable by users, there are inadequate studies done on this topic.

To improve the human factor in interacting with a machine, the existing methodology namely Kansei Engineering (KE) is capable of guiding UID designers in developing UID that is in line with the complexity of dimension in a lifestyle intervention and user experience-based application design. Thus, in the UID context, various dimensions in a lifestyle intervention can be mapped to establish a joint representation of an optimum function of lifestyle intervention. Since KE is effective enough in addressing all dimensions needed for the user interface design, this paper proposed Emotional Evocative User Interface Design for Lifestyle Intervention in Non-communicable diseases (NCDs) domain using KE.

This paper is organized as follows: In Section II we present a brief overview of our research including advice and recommendation in avoiding the development of NCDs, the criteria of chatbot UID in smartphone and an overview of Kansei Engineering. Section III follows with details of our pilot study that utilize chatbot interfaces to evaluate the relationship between chatbot UID and user's emotion trait. Finally, we conclude in Section IV with a discussion on the result investigation and determined the significant emotions for the lifestyle intervention for NCDs development.

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## II. Related Work

### A. Non-Communicable Diseases

Non-communicable disease (NCD) cases are a global health problem that continues to rise globally. The pandemic Covid-19 that is forcing people to be at home when there is no need to go out contributed to less exercise and overeating, causing the increase of NCD developments[7]. The development of NCDs do not result from germs and viruses, but individual risky behaviours such as tobacco use, alcohol consumption, unhealthy diet and inactive lifestyle [8],[9],[10]. Therefore, it is important to undergo a regular health screening to help to identify any early signs of chronic disease to reduce the socio-economic burden on an individual [11] and turn it to reduce morbidity and mortality as well as improve health and prevent disease [12], [11], [13].

A healthy lifestyle is classified into two categories [14], which are non-modified (age, family history) and modified (no obesity, healthy diet, physical activity and no smoking) variables that contribute to having a longer life with good health [13], [15]. This study utilised modified variables to measure user's emotion for lifestyle intervention compliance including food and nutrition intake. According to the previous research, healthy eating is based on the right amount of nutrients (protein, fat, carbohydrate, vitamins and minerals) and proportions of foods recommended by the food pyramid for daily requirement [16]. Meanwhile, the best amount of food serving depends on the types of exercise done by an individual. For instance, higher intensity activity increases energy expenditure and fuel for muscles. Besides, physical activity can balance energy by changing appetite and cutting food intake [17]. According to WHO, adults aged between 18 to 24 should do at least 150 minutes per week for mild physical exercise or at least 75 minutes per week for intense physical activity or both physical activities[18].

With the advancement of technology, lifestyle intervention can be done using the application to assist the users in their lifestyle. Nowadays, technology is widely used as a healthcare tool in spreading awareness and promoting health since it is effective, convenient, and cost-effective. Recently, several chatbots such as Quro, Shihbot and Mandy have been used in public health to reduce the burden of low and middle-income countries[19]. Since a decade ago, smartphones have been gaining popularity with mobile health (mHealth) applications used to conduct lifestyle interventions in gaining better health at a lower cost [20]. However, most of the applications are not considering the user's emotion during the designing and development phase that creates a gap in the established UID. Therefore, an emotional embedded user interface design for lifestyle intervention to prevent NCDs development should be developed to ensure the effectiveness of the applications.

### B. Significance of Emotion in Lifestyle Intervention Compliance

Emotions are one of the essential properties of human-to-human interaction and complex process that consists of feeling, behaviour and psychology influenced by surrounding[21]. According to Legg et al., physicians ability in determining the current patient's emotion will improve the level of compliance to the instruction given [22] due to the patient's satisfaction and adherence to treatment influenced by the level of understanding towards the instruction of lifestyle interventions. Anger, frustration and irritation due to negative experience caused by inappropriate health service providers will lead to non-adherence behaviour by the patients[23]. Legg et al. also emphasized that anxious emotions (worry and nervousness) trigger difficulty for individuals to understand instruction given by health providers and impede people's decision making[22].

Emotional issues cannot be ignored and should be taken into consideration while implementing any type of lifestyle intervention and more research is needed in this area [22]. In addition, Lockner & Bonnardel also highlighted the importance of studying emotions especially in the context of UID [24]. Therefore, it is vital to determine the emotional expression of an individual before implementing any lifestyle intervention to avoid the development of NCD effectively. As a result, people will be able to comply with instruction provided by the healthcare provider and lead a healthy lifestyle [23].

### C. Kansei Methodology

Kansei Engineering is the combination of technology between Kansei and engineering realms, which is frequently used for product development that includes components such as desired need, emotion or sense [25]. Kansei can be utilised to establish a new product design based on users' evaluation of a product emotionally. Kansei integrates the product based on knowledge of what the users feel. Thus, Kansei is useful in influencing implicit users' insight related to the product design element and incorporating these insights with a new product[26]. Recently, people have shown interest in the application of Kansei in various fields such as industrial products, healthcare, education and e-commerce[27]–[29]. Furthermore, Kansei has been proven successful in measuring human emotions toward services and products such as in designs of eyewear, popup box and e-commerce websites desired by users[30], [31]. In the realm of information security, Kansei is utilised to design information security-related UID [32].

Kansei expresses human's feeling towards artefact, situation, or environment. Kansei refers to an external process that is tacit or known as a function of the brain at a higher level. This means that Kansei cannot be measured directly but can be measured partially or indirectly through a quantitative method using a self-reporting system like Semantic Differential (SD) scale, Different Emotional Scale (DES) or free labelling system. The measurement is done using Kansei Checklist, a form of a questionnaire that includes emotional keywords or known as Kansei Words (KW). KW is a word representing a user's emotions [6]. Commonly, the selection of KW is done based on the literature review and experts' advice. Normally, Kansei is used to measure the emotion of a user towards a product design. In this study, Kansei was applied using a quantitative method with KW, a form of questionnaires distributed to participants to evaluate related evocative user interface design based on users' insight towards artefact.

In this work, we proposed that Kansei can be utilised as a methodology to measure users' emotion in a chatbot design where the result can serve as a guideline on how to design a UID that can be associated with emotional evocative user interface design focusing on a lifestyle intervention for NCD. In this study, a chatbot was used as the UID. Generally, a chatbot can be used to spread awareness, promote health and act as a medium of interaction in lifestyle intervention to ensure a healthy lifestyle practice towards preventing the development of NCD.

### *D. Emotion Evocative User Interface Design (UID)*

The most important factors in designing chatbot UID for lifestyle intervention are: 1) to make sure that the chatbot interaction with the target user is pleasant and comfortable to be used emotionally, 2) the chatbot could use a similar approach in understanding the target user like the one used by the health provider and 3) to create a relationship with target user to use the chatbot continuously. The dependency on technology has increased in people's daily activities whether in education, entertainment, business, or healthcare. Hence, the use of technology in assisting individuals in lifestyle modification for NCD intervention is convenient and accessible as smartphones are easily acquired today. Previous studies have shown the significance of technology in lifestyle intervention, which can help people with lifestyle modification and motivation [33], [34].

To increase emotional evocative user interface design in chatbot, user preferences are used as a guideline in designing UID and are the main concern of designers [35], [36]. Researchers have suggested that gender, age preference and emotion factors have to be included in the technology that addresses user's feelings, process and behaviour [37]. Moreover, embedded culture in UID affects product development [38], [39]. Thus, the influence in designing the users' interface and understanding attraction depends on how the users use the technology.

Before starting to develop the chatbot UID, it is important to decide the personality of the bot. According to Pricilla et al., the personality should be developed based on the bot's function, target audience, and type of task that the bot must complete [35]. Creating the right personality for the bot will boost the user experience and interaction. Besides, female-gendered chatbots have a huge effect on gaining trust for both women and men because female bots are perceived to be friendlier and trustworthy [36].

To provide a good user experience, the bot may also need to support rich interactions such as audio, pictures, and maps. Suggestion criteria in designing chatbot followed by user preference, gender, age and culture preferences include typefaces[37], colour [38], emoticon[1], avatar[5], tone[5] and voice[5].

*1) Typefaces:* People's impressions of books, packages, signs, and screen interfaces are affected by typeface elements. The typefaces used have a huge impact on how users view a chatbot and appreciate the emotion evoked while reading the contents. Fig. 1 shows two types of typefaces based on the finding by Candello et al. that stated, a robot-like typeface (OCR) was more identified as a machine in a chat, rather than script typefaces (Bradley). Typefaces (Bradley) were less perceived as human in a chat. These show that script typefaces give an impression of more human alike emotional conversation and have higher ratings of trust than robot-like speech.[37] Besides, the author suggested, designers can select different typefaces based on target users' familiarity with chatbots to give a favourable first impression. People who have had less experience with chatbots need additional elements or content reinforcement in order to view chatbots as less emotionless machines and designers' role in decreasing the typeface bias are vital.

Typeface 1: A robot-like typeface (OCR-A neutral typefaces such as Helvetica and Georgia)


Typeface 2: Mimics handwriting (Bradley)


Fig. 1. Type of Typeface [37].

*2) Colour:* Colours are also associated with other feelings and emotions. Colours not only affect our attitudes and perceptions toward a product but are also correlated with variations in UI trusting behaviour. Most studies agree that blue is perceived as a cold colour, while red is perceived as a warm colour. The author in [38] believes that the warmth of the user interface has a positive effect on trusting behaviour. However, pleasant colours and a joyful atmosphere in a chatbot should be surrounded by cheerful and lively design settings for a more positive effect. The colours design and atmosphere of a chatbot can result in a positive effect on user's attitudes toward it, which in turn influences compliance to the advice given by the chatbot in having a healthy lifestyle.

*3) Emoticon and Gifs:* Emojis are defined as the typographic display of a facial representation that used to express communication feelings and emotions[39]. Emojis have the ability to change the tone of a message. Furthermore, emojis are added with text and other platforms such as stickers and GIFs to expand and complement the text's expressive message. Unlike plain text, which is informative and brings the meaning of a message within the text, emojis are richer in terms of meaning that show stronger emotional behaviour. For example, the text "That not funny" and "That not funny☹💔" convey different meanings. The first sentence sounds serious whereas the second one looks sad and heartbroken[1].

*4) Avatar:* An avatar may incorporate "joy-of-use" into the conversation and inspire the user with friendly encouragement and the right answers to promote a positive

work climate. A character's trustworthiness is also important in natural communication. As a result, each character's exterior appearance, speech characteristics, gesture, and general movement can vary. Fig. 2 shows alarm messages which require immediate actions. The red colour and the fireman avatar was representing the warning and alert towards the situation[5].


Fig. 2. Avatar for Alarm Message [5].

This criterion is a significant element in measuring users' emotional trait towards interaction with a chatbot using all the senses of vision, hearing, sensitivity and scent that resulted in a reaction established and stored in the human brain by experiencing all the impressions. Thus, this created a reaction of human behaviour towards the design of a chatbot. In this study, we proved that the data gathered using Kansei Engineering methodology are capable of providing a guideline to UID designers in developing UID that is able to address the emotion complexity dimension for NCDs lifestyle intervention and user experience-based application design. Thus, in the UID context, various dimensions in NCDs can be mapped to establish a joint representation of an optimum function of NCDs lifestyle intervention from the perspective of chatbot design.

## III. Emotional Evocative User Interface Design for Lifestyle Intervention in Non-Communicable Diseases

Emotional evocative UID can be realized if there are enough data gathered to explain the relationship between design and how it will affect user emotion in a particular domain. Emotion embedded UID will enable the optimum joint representation for lifestyle intervention to avoid NCDs development. Communication using chatbot has the potential to deliver message according to user's need if the chatbot design considers the emotion that capable to increase the positive effect on user's attitudes. This study adopted a model proposed by [40] to determine the emotional trait that will increase the adherence to instructions related to lifestyle intervention to prevent the development of NCDs. However, in this study, some modifications were made to this model to the suitability of the study scope. This study was conducted in four phases, which were 1) Identifying instrument of lifestyle intervention in NCD 2) Emotional measurement 3) Emotional Conceptualisation and 4) Design Requirement Formulation. This paper reports the result of a pilot study performed to determine the reliability of the research methods and test the subject recruitment strategy.

For this study, the process for determining emotion assessment for chatbot interface for NCDs lifestyle intervention is shown in Fig. 3. The first phase was the process of identifying the artefact of the chatbot application interface from the Google App store and journals. The chatbot UID is defined as a visual layout design of artefacts that can interact with users [41].

Based on the findings, 8 out of 15 chatbots were selected using a matrix approach. The matrix approach is used to validate a specimen by checking the features of design and values that make up the appearance of each specimen [31]. Table I show the extraction of chatbot UID with the corresponding category, item and value, respectively.

### A. Methodology

In the second phase, 71 KW was synthesised from a literature review and models including Panas-X that connected to the lifestyle intervention domain. In addition, a Kansei Affinity Cluster (KAC) was adopted for the process of synthesising KW and the confirmatory phase of KW. It was recommended that the researcher choose and pick only certain words that are important to the study [42]. Therefore, based on the 71 KW discovered, the words were filtered and selected based on the KAC model since KAC words are very suitable for representing emotions in chatbot UID. The result of this selected process was 16 KW. Finding from this process is as shown in Fig. 4.

After the KW was determined, Kansei Checklist was developed to evaluate emotions and was represented as a form of a questionnaire that consists of KW. The developed Kansei Checklist is shown in Fig. 5.

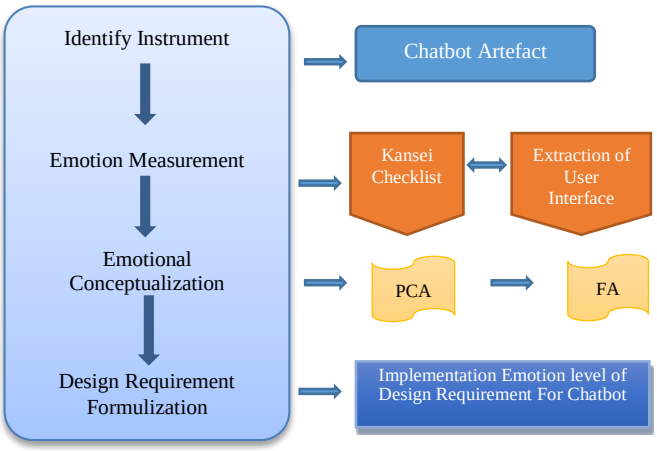


Fig. 3. Process for Emotion Assessment for Chatbot Interface using KE [40].

Frustration, Disgusting, Irritating, Annoying,
Concern, Painful, Stressful, Joyful, Cheerful,
Energetic, Satisfaction, Exciting, Exhausting,
Hopeful, Panic, Lively

Fig. 4. The Kansei Words [42].

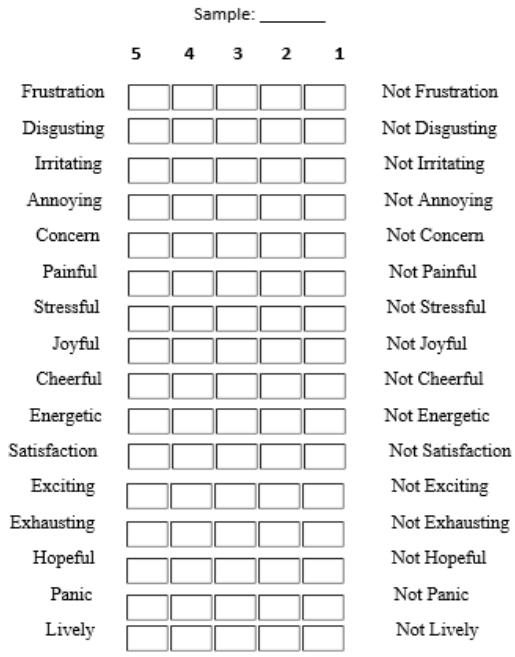


Fig. 5. The Kansei Checklist.

To conduct the evaluation experiment, KW was assembled into a 5-point Semantic Differential (SD) scale to form a checklist. Ten participants were recruited based on different demographic factors to evaluate KW appeal for eight artefacts that were selected in Phase 1. The samples of the artefact are as shown in Fig. 6. The artefacts' categories were made according to the literature review obtained. However, not all categories and items were included in this pilot evaluation process due to the limitation on the allocation of timeframe and process delivery.

This evaluation was made by the selected participants with interest in lifestyle intervention using chatbot to prevent development of NCDs. The process was conducted in a close environment to prevent the emotion changes of the participants between five to six hours.

In this study, the demographic factors included sex, race and age in between 18 and 30. In this study, 10 smartphones were given to all subjects to show the artefacts simultaneously by the facilitator. The participants were asked to give a score based on their feelings on the Kansei Checklist for each sample product chatbots (artefacts).

## B. Result

Result analysis started by determining the Cronbach's alpha of Kansei Checklist. Cronbach's alpha is a convenient test used to reach a reasonable reliability standard [50]. Cronbach's alpha reliability commonly ranges from 0 (very unreliable) to 1.0 (perfect reliability). The nearer the Cronbach's alpha to 1.0, the higher is the internal consistency of the scale item. Based on Cronbach's alpha rules of thumb recommended value; above 0.9 is excellent, above 0.8 is good and above 0.7 is acceptable[51]. This value also relies on the number of items that affect whether the scale reliability will be higher or lower. Therefore, in this study, Cronbach's alpha was performed in SPSS Statistics using Reliability Analysis.

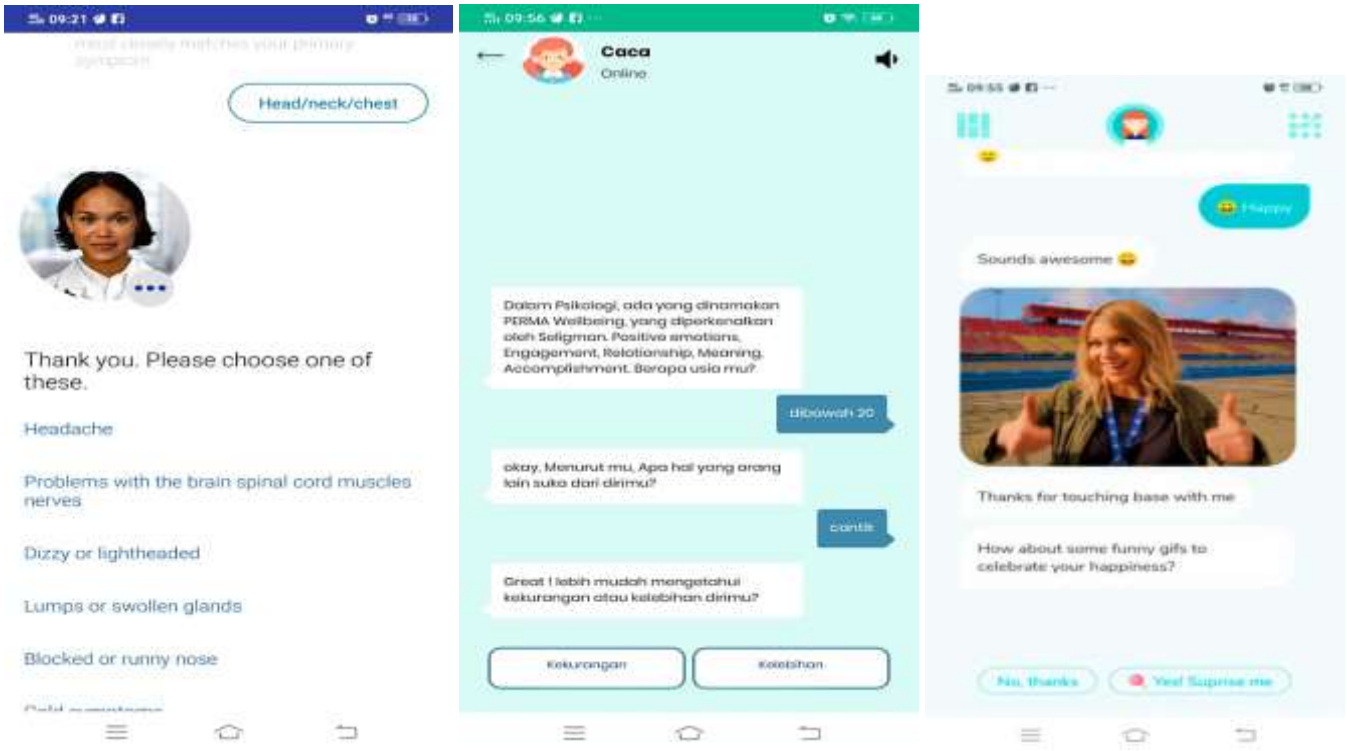


Fig. 6. The Kansei Checklist.

TABLE I. EXTRACTION OF CHATBOT UID

| Category | Item | Value |
|---|---|---|
| Timing [40],[43] | Appear of notification | Seconds, Minutes, Hours |
| | Speed of reply | Fast, Medium, Slow |
| | Appear of location box | Above, Below, Centre, Right, Left |
| Typography[37] | Font Type | Regular, Italic, Bold |
| | Font Size | Small, Medium, Large |
| | Font Colour Reply | Red, Blue, Green, White, Black, Grey, Others |
| Emoticon[39],[44] | Type of emoticon | Unicode, Graphic |
| Colour[45] | Colour of header | Red, Blue, Green, White, Black, Grey, Others |
| Size[46] | Size of screen box | Half, Full |
| Button [47] | Size of button reply | Small, medium, large |
| | Colour of button reply intensity | Light, Dark |
| | Shape of button reply | Round, Rectangle, Oval, Square |
| | Location of button reply appear | Centre, Right, Left, Down, Up |
| Profile Picture [5] | Frame of Avatar | Oval, Round, Square, |
| | Type of Avatar | Robot, Human, others |
| Media[48] | Image | Less, More |
| | Gif | Yes, No |
| Animation [49] | Motion path of text | Appear, Fade, Fly-in, Float in, Wipe |
| Voice tone | Type of conversation | Robotic, Natural |

TABLE II. EXTRACTION OF CHATBOT UID

| Cronbach's Alpha | Cronbach's Alpha for Standardized Items | Number of Items(N) |
|---|---|---|
| 0.771 | 0.757 | 128 |

Based on Table II, the alpha coefficient for 128 items was 0.771, which indicated that the items have high internal consistency. Meanwhile, the Cronbach's Alpha standard was 0.757. Alpha coefficient values between 0.60 and 0.70 have been shown to be acceptable in exploratory research, whereas range values between 0.70 and 0.95 are known to be satisfactory to a good degree of reliability [52]. Thus, it can be concluded that the reliability of the Kansei checklist was verified.

Then, the analysis was performed using principle loading analysis (PCA). PCA is an exploratory data analysis method that requires a technique to reduce a large dataset to a small set, but still maintains the amount of information in a large set[53]. There are three types of PCA namely PC Loading, PC Score and PC Vector. In this study, PC Loading was used, which represented the evaluation of how KW affects specimens. Fig. 7 shows the result of PC Loading for Component 1 and Component 2.

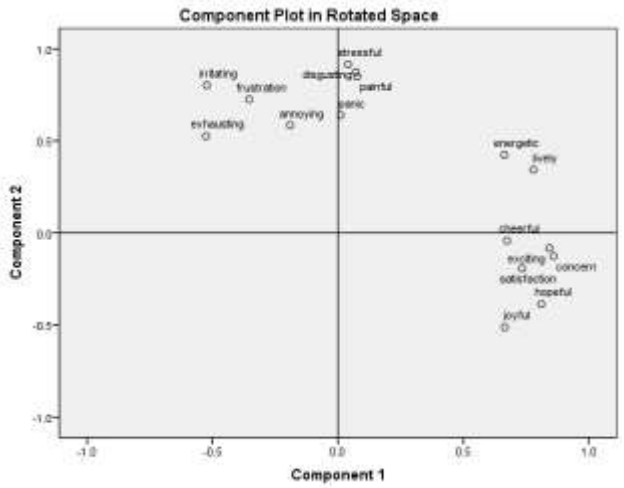


Fig. 7. PC Loading for Pilot Study.

From Fig. 7 above we observed that a good distribution of KW existed on both axes, which indicates an efficient evaluation. Based on a previous study, the loading can range -1.0 to 1.0. Furthermore, loading closer to -1 or 1 means that the component is highly influenced by the variable. While loading close to 0 means that the variable has a lower influence on the component [54].

In this loading, plot "Concern", "Hopeful", and "Exciting" have a large positive PC loading on component 1 (x-axis), whereas "Exhausting" has a moderate negative loading, making this component to be marked as an "Attractiveness". This study assumed that chatbots with a high score on component 1 of the PC axis would have a greater sense of attraction and vice versa.

Meanwhile, "Stressful" and "Disgusting" have a large positive PC Loading on component 2 (y-axis) near to 0; so, this component was marked as a "Hostility". This study assumed that chatbots with a higher score on component 2 of the PC axis would tend to feel hostility and vice versa.

Then, Factor Analysis (FA) was conducted to identify significant KW variables for the chatbots that reflect adherence of people in the chatbot features in a lifestyle intervention. The result was used to refine the outcome of PCA. FA is a technique of data reduction to describe ambiguity in terms of unobserved explanatory variables named factors [55]. Table III shows the result of FA after varimax rotation.

Based on this table, the first factor indicates the majority contribution with 28.109%, followed by the second factor with 24.216%. The majority of factors represented both variables. Therefore, as can be observed in this table, both Factor 1 and Factor 2 have a dominant KW affect, representing 28.109% and 52.325% = of the variability. Meanwhile, the third and fourth-factor contributions were 19.36% and 15.243%, respectively. Thus, Factor 2, Factor 3 and Factor 4 were seen with 52.325%, 71.693% and 86.936% of variability, respectively.

TABLE III. CONTRIBUTION AN ACCUMULATED CONTRIBUTION

| Factor | Contribution (%) | Accumulated Contribution (%) |
|---|---|---|
| 1 | 28.109 | 28.109 |
| 2 | 24.216 | 52.325 |
| 3 | 19.368 | 71.693 |
| 4 | 15.243 | 86.936 |

The results of factor loading after rotation of the varimax are shown in Table IV. In chatbot design, variables with a higher score are considered as important factors. This study defined 0.7 as the standard score. However, a slightly lower score can be also known as a significant concept[56].

Factor 1 consisted of “Disgusting”, “Painful", “Frustration", “Stressful", “Panic", and “Irritating". These variables were labelled as the concept of “Hostility". Factor 2 consisted of “Satisfaction", “Hopeful", “Concern" and “Lively". These variables were labelled as the concept of “High-spirited". Factor 3 comprised “Cheerful", “Exhausting" and “Concern”, which were labelled as the concept of “Complicated". Factor 4 consisted of “Energetic", “Annoying" and “Exciting”. These variables were labelled as the concept of “Hyperactive”. This study reflected the common procedure in KE using representative terms for naming each factor group, the one that could effectively define the factor group. There is nothing right or wrong in naming group factors, except that the name must match the variables in factors.

TABLE IV. FACTOR LOADING FOR KW

| Variable | Factor 1 | Factor 2 | Factor 3 | Factor 4 |
|---|---|---|---|---|
| Disgusting | 0.908 | 0.125 | -0.209 | |
| Painful | 0.896 | | | |
| Frustration | 0.796 | | -0.414 | -0.324 |
| Stressful | 0.794 | -0.1 | -0.116 | 0.439 |
| Panic | 0.68 | -0.381 | 0.32 | 0.156 |
| Irritating | 0.668 | -0.602 | -0.356 | 0.124 |
| Satisfaction | | 0.923 | 0.101 | |
| Hopeful | -0.204 | 0.847 | 0.408 | |
| Concern | -0.158 | 0.748 | 0.226 | 0.485 |
| Lively | 0.43 | 0.697 | 0.228 | 0.27 |
| Cheerful | 0.206 | 0.295 | 0.835 | |
| Exhausting | 0.387 | -0.117 | -0.816 | |
| Joyful | -0.34 | 0.336 | 0.792 | |
| Energetic | 0.238 | 0.297 | 0.134 | 0.842 |
| Annoying | 0.209 | -0.41 | -0.431 | 0.754 |
| Exciting | -0.177 | 0.471 | 0.405 | 0.704 |

From the experiment results, we determine that the concept of emotion in Chatbot UID is structured by four variables as evident from the outcome of FA, which was Hostility, High-Spirited, Complicated and Hyperactive. However, it can be concluded that Factor 1 and Factor 2 were more relevant concepts of Kansei for Chatbot due to the 52.325% of data variance. Thus, to obtain an optimal outcome, two factors were used namely Hostility and High-spirited, which were very significant emotion concepts. Whereas the other two factors were also significant, which were Complicated and Hyperactive, but have a poor impact to be used in designing the chatbots that include targeted emotions as supporting elements.

### C. Discussion

This paper has described our research to establish emotions evocative chatbot UID in the healthcare domain. This finding will be useful in future research concerning the use of KE in the measurement of emotion, which integrates the user's subjective perception in a UID. In this study, we had extracted 16 KW related to lifestyle intervention from previous studies and eight chatbots artefacts have been identified using multilinear techniques. For this pilot study, the significant KW has been chosen using FA. Participants were recruited from different demographic factors that include a variety of analysis and a more precise relationship to reflect the specific regional field of NCDs. FA revealed more detailed findings compared to PCA. However, PCA illustrated a larger picture of the emotion structure, where it is shown that emotion was strongly affected by the first PC, which was “Attractiveness”, whereas the second main component “Hostility” has a poorer effect. From this pilot study, it has been determined that the significant emotions for designing UID chatbot for the lifestyle intervention in NCDs domain are hostility and high-spirited. These emotions will be the pillars in guiding the chatbots' design requirement that could influence emotion level for NCDs lifestyle interventions.

Based on the extraction of chatbot UID that has been chosen, the results show that evaluation using the Kansei Engineering method have revealed that two significant factors which are “Hostility and “High-spirited” as likely to have strong healthcare awareness and influences to individual’s behaviour in using a chatbot. An individual is comfortable, pleasant and confident to comply with the chatbot guidance and instruction when supported with these two emotional factors. In this study, we selected UID from the applications in the Google App store as our artefacts since many applications are related to the healthcare domain and free to access.

## IV. CONCLUSION AND FUTURE WORK

As a conclusion, this paper has conceptualised emotion assessment in UID for lifestyle intervention especially NCDs domain using KE methodology. The results were presented as a pilot study to determine the reliability of its data collection towards a small number of participants.

The next step is to perform activities with a larger group of participants to obtain more comprehensive data to determine emotion assessment in the NCDs domain for lifestyle intervention using Kansei Engineering method. The result could be utilised to create the guidelines on the representation of emotions towards the design of chatbot in the lifestyle intervention for NCDs domain. The guideline can be used by developers and software designers in designing emotionally evocative chatbot to guide lifestyle intervention and contribute to reducing the risk factor in developing NCDs. The most

important factor in designing a chatbot for lifestyle intervention is to make sure that chatbot interaction is pleasant and comfortable to be used emotionally and users have a tendency to share and follow the instructions guided by the chatbot to prevent the development of NCDs. This is to ensure that the users are comfortable and willing to cooperate upon receiving instructions of any lifestyle intervention in NCDs.

This research was able to offer insight into people's attitudes, sensitivity, and knowledge of lifestyle interventions for preventing NCD development issues. As a result, the findings of this study are recommended to be used as a foundation for future research into the relationship between emotion and UID using a chatbot or other conversation agent interfaces as an artefact. Nevertheless, a thorough investigation involving comprehensive evaluation and measurement of emotion is needed to expand the research findings and to extend more promising results.

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