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A Study on Decision-Making with a Sense of Well-Being for the Elderly

Eriko Musashi [*], Takaaki Hosoda [†],
Daisuke Ikeda [‡]

Abstract

In Japan, the aging rate is increasing every year, and as of 2021, the percentage of the total population aged 65 and over will be 28.9%, making it increasingly important to analyze the behavior of the elderly in all aspects of their lives. As a theory of motivation, Carstensen proposes the socioemotional selectivity theory. This theory states that people are motivated by positive emotions when their remaining time is short, and it applies well to the elderly. However, it is unclear what factors influence this theory. Therefore, based on the Socioemotional selectivity theory, we aimed to construct a new decision-making model that takes into account the emotions of the elderly, based on existing decision-making theories and theories that include emotions. Finally, in this study, objective validity was assessed through interviews.

Keywords: Decision Making, Elderly People, Emotions, Socioemotional selectivity theory

1 Introduction

As of 2021, the aging rate in Japan is 28.9% [1]. With the increasing proportion of the elderly in the population, it is important to understand the behavioral patterns of the elderly, as it will help them to live happily and at the same time help the future generation to understand their own behavior as they age.

Against this background, gerontology is gradually becoming popular in Japan. Gerontology is the Japanese translation of the English word gerontology, a term created by the Russian scholar Mechnikov in 1903, and is an academic discipline that conducts interdisciplinary research on aging and various studies on old age [2]. A search on CiNii, the academic information database of the National Institute of Informatics, for articles published using the keyword “elderly” revealed 11,934 articles from 1985 to 1994 and 41,895 from 1995 to 2004, when the elderly population rate in Japan exceeded 14% and Japan became an aging society in 1995 Since then, various studies on the elderly have become active in Japan [3].

Musashi, one of the authors, worked to elucidate the causes of victimization of the elderly in special fraud based on the dual process theory [4], which explains human cognitive processing ability. According to the dual process theory, humans are equipped with both system 1 processing, which acts based on intuition, and system 2 processing, which is based on deliberation,

[*] Graduate School of Information Science and Electrical Engineering, Kyushu University, Kyushu, Japan
[†] Advanced Institute for Industrial Technology, Tokyo, Japan
[‡] Faculty of Information Science and Electrical Engineering, Kyushu University, Kyushu, Japan

and as people age, system 1 processing, which acts intuitively, prevails over system 2 processing, which is based on deliberation, causing them to be deceived by clever fraudulent methods. Using a model from a previous study, we have shown that this is the case [5].

The authors' efforts in this study led them to become interested in the behavioral patterns of the elderly and to observe them. As a result, they found that many elderly people engage in behaviors with similar characteristics. For example, elderly people living in the same apartment complex give up waiting for their turn at the elevator or supermarket to others and voluntarily clean the flower beds in the common space. In this way, considerate behavior toward others is observed. There were also a number of people who, while showing signs of physical decline as they aged, appeared to be emotionally peaceful. Even observing the behavior of my own parents, I found them to be emotionally calmer than they were then in their 40s and 50s. It is possible that they are emotionally calmer due to environmental factors, having retired from work and having finished raising their children, but this may not be the only factor.

Based on the above observations, the authors suggest that there are some characteristics of the processes that lead to the behavior of the elderly, and that clarifying these characteristics may be important for better understanding the behavior of the elderly.

Previous research approaches on the elderly have mainly consisted of studies examining the physical and psychological characteristics of the elderly, research on medical and nursing care for the elderly, and measures to support their daily lives.

For example, Gondo explains in his “mental aging model” the various responses of the elderly to the fact that they are able to maintain a sense of subjective well-being in stressful situations [6]. These responses include the Selective Optimization with Compensation (SOC theory) proposed by Bartes [7] and gerotranscendence theory proposed by Tornstam[8]. In everyday life, people will experience positive emotions when they set and achieve goals, but older adults have difficulty achieving goals for a variety of reasons. The SOC theory states that elderly people try to achieve their goals by selecting goals, optimizing their resources to solve their goals, and taking measures such as external assistance (compensation) [7]. The gerotranscendence theory describes the change in values during the developmental stage of the elderly, which leads them to move away from the values of their youth, to adopt an attitude of valuing others more than trying to achieve their own needs, and to see the positive aspects of negative events in the past[8]. Although both theories describe psychological characteristics of the elderly, not many have conducted research on the specific behavioral patterns of the elderly.

Therefore, this study focuses on the decision-making process, which is central to the process that leads to the behavior of the elderly, and aims to construct a decision-making model that takes into account the characteristics of the elderly, based on research on the decision-making process in existing decision-making theories and social psychological theories that motivate the behavior of the elderly.

2 Previous Research on Human Behavior

In order to clarify the decision-making process of the elderly, it is essential to survey how people make decisions. In this section, we survey the decision-making process of Simon, a researcher of descriptive decision theory who pursues the actual decision-making process of humans. Next,

we refer to the paper by Lerner et al. that discusses the relationship with emotions, which Simon also focused on, and finally, we discuss the results of our survey of Carstensen's Socioemotional selectivity theory, which presents a behavioral model for the elderly.

2.1 Research on Simon's Decision-Making Process

Simon's decision-making theory is extremely broad, but he first developed his theory by focusing on the decision-making process in human decision making. As a result, he argued that decision making can be viewed as a scientific object by defining decision-making premises, namely, value premises and factual premises[9]. Simon argued that humans do not have such complete rationality, but only bounded rationality [9] [10].

Under bounded rationality, it is impossible to consider and enumerate all alternatives as required by normative theory. Therefore, Simon argued that under such circumstances, humans make decisions according to the satisficing, whereby they set a certain goal level and choose an alternative once they have found an alternative that can achieve that goal level[11].

Simon further analyzed in detail the procedure by which humans make decisions under bounded rationality, dividing it into multiple activity processes, believing that the decision-making process, which is a factual premise, can be scientifically proven. He developed the idea that the decision-making process undergoes three activity processes: “Intelligence Activity”, “Design Activity”, and “Choice Activity”[12].

“Intelligence Activity” is the activity of clarifying the decision problem by collecting information for decision making and clarifying the problem. Intelligence are the beginning of the decision-making process, and the fact that the decision-maker was able to recognize the problem indicates that there is some discrepancy between the reality and the ideal.

“Design Activity” is activities to discover, develop, and explore possible alternatives to the problems identified through intelligence. Discovery and development can be considered to include the consideration of alternatives based on past experiences and actions.

“Choice Activity” is activities to select alternatives derived in the design for the decision-making problem set in the Intelligence. As the word "selecting" is used in the original text, it is not only a selection activity but also an activity that includes evaluation and examination of alternatives.

Intelligence, design, and Choice occur in this order. By the way, Simon added a fourth activity, review, to the 1977 revision of the previous document. Review is an activity to review and evaluate previous decisions. This activity generates feedback among the intelligence, design, and choice. In other words, the decision-making process is a nested structure in which each activity does not proceed in one direction, but rather intersects in both directions, looking back and circulating through the decision-making process [13].

Based on Simon's assertion above, the author believes that Simon's three-phase part is a flow diagram similar to Figure 1.

Thus, it can be inferred that Simon emphasizes the importance of looking back in the human decision-making process, since he develops his theory of the human decision-making process in

terms of four activities and further views the entire activity in terms of feedback structure and nested structure.

Simon later introduced the concept of procedural rationality, arguing that in addition to the importance of alternatives, how one goes through the decision-making process is also important [13]. This means that human rationality is limited when considering only the results from the single aspect of ends and means, but it becomes procedurally rational when the process (process) is considered.

Simon's argument can be summarized as follows: a person with bounded rationality ensures procedural rationality by reflecting on his decision-making process and deliberating sufficiently, and then selects an alternative that meets or exceeds his own requirements as a satisfactory solution.

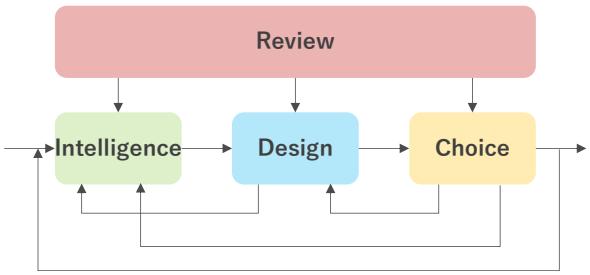

Figure 1: Circular structure of decision-making process （Prepared by the author）

2.2 Lerner et al.'s Emotion Imbued Choice (EIC) Model

Lerner et al. focus on emotions in decision making and propose the emotion imbued choice (EIC) model as a scientific model that synthesizes traditional rational decision theory and the latest emotion research. According to Lerner et al., a major revolution in emotion science has occurred in recent years, with a 100-fold increase in the number of papers published in 2013 compared to the number in 2000[14]. Lerner et al. note that emotions have a significant bearing on the human decision-making process and argue for the existence of mechanisms by which emotions influence judgments and choices by demonstrating that emotions are the driving force of decision making.

The EIC model is a model that attempts to explain conscious or nonconscious decision making based on the model built by Lerner and his collaborators in their previous research [15] [16] (Figure 2). In doing so, it incorporates the decision-making model of expected utility theory, which is central to traditional decision-making theory, and clarifies the role of emotions in this model.

Specifically, the decision maker selects a candidate option by evaluating the utility of the expected outcome for each option (line A). The utility that the decision maker perceives in this process is evaluated in combination with the decision maker's preferences depending on the likelihood, probability, and characteristics of the alternatives. (line B, C). Finally, an overall evaluation of the alternatives is made and the option that is considered the best is selected (line D).

Up to this point, the traditional utility theory is followed, but Lerner et al. add the effect of emo-

tion to this decision-making process; Lerner et al. show five factors that can be influenced by emotion in the decision-making process and identify the relationship from each of these factors to emotion. (dashed line).

For example, the presence of characteristics of the decision maker, such as chronic anxiety or depression, may influence the current emotional state (line B'). Second, the characteristics possessed by the characteristics of the alternatives could directly affect the current emotional state (line C'). For example, one can imagine that one may feel directly anxious if the information about the alternatives is ambiguous or if the probability of occurrence is not clear. The emotion of anticipation of an expected outcome also influences current emotions (line F'). For example, a person who anticipates a painful shock may feel fearful of it. Also, in the process of evaluating alternatives, if the alternatives are roughly equivalent and a trade-off relationship is established, it is quite possible that this could be a source of frustration during the evaluation process and affect emotions (line G'). Finally, apart from the previous factors, emotions can also be influenced by factors that are not directly related to decision making (line H').

Thus, emotions can have an impact on the evaluation of alternatives and the outcomes predicted from them, and the decision-making process influenced by them is not in line with the process of decision theory as represented by normative theory. The role of emotions in decision making, as identified by Lerner et al. The role of emotions in decision making identified by Lerner et al. is a significant contribution that allows for a clearer description of the nature of human decision making.

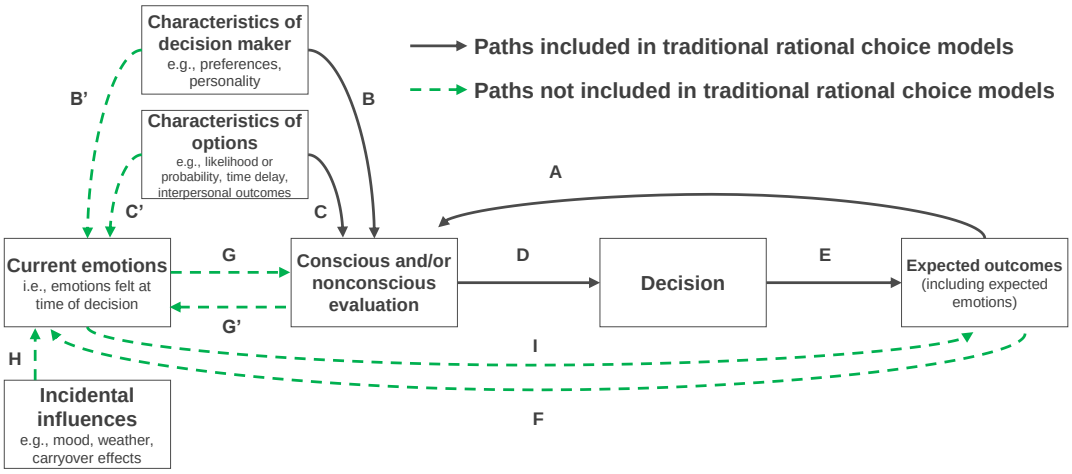

Figure 2: Lerner's Model

2.3 Carstensen's Socioemotional selectivity theory (SST)

As people age, they experience a variety of loss experiences, including loss of health, such as declining visual and auditory functions, loss of social roles due to retirement, and loss of relationships with spouses, friends, and others. The aging process is a stressful time compared to other developmental stages. However, this is not to say that elderly people are not happy during the stressful elderly period. When comparing elderly people and younger people, there is no difference in subjective well-being and psychological stability among the elderly, and it has been reported that the elderly feel more stable compared to younger people [17]. Why is it that psychological well-being is maintained in older age despite experiencing more loss? One theory that explains this mechanism of emotional regulation is the Socioemotional Selectivity Theory(SST)

proposed by Carstensen[18].

SST is a theory that explains how the perception that the remaining time in life is limited affects a person's thinking and behavior [19]. When people perceive that their remaining time in life is limited, they are said to value the “now” and make emotional adjustments that satisfy their current feelings [20]. It is assumed that elderly are motivated to engage in emotionally valuable behaviors as a result of their perceived limited remaining time. They explains that the elderly are able to lead happy and psychologically stable lives even in stressful situations because they value emotional control, emotional regulation, and emotional satisfaction and invest cognitive or social resources in obtaining them.

Carstensen et al. also experimented with a dot-probe task on information acquisition in older adults. In the dot-probe task, participants were presented with one photo of a face showing sadness, anger, or happiness, and a photo of a face showing a neutral expression on either side of the monitor. The participants were asked to judge which dot appeared on the left or right side. The results of the experiment showed that the elderly participants had faster reaction times when the dots appeared on neutral or positive face pictures than on negative face pictures. This result also suggests that the elderly avoid paying attention to negative information as soon as it is presented and give priority to positive information [21].

3 A Decision-Making Model of the Elderly

3.1 Implications from Previous Research Carstensen's Socioemotional selectivity theory (SST)

Based on the survey of previous studies in the previous section, this section focuses on the decision-making process in the elderly.

Simon descriptively analyzed the nature of the human decision-making process as a counterargument to normative theory and described the nature of the human decision-making process. Humans, in the decision-making process, “Intelligence Activity” and “Design Activity” are carried out repeatedly, after reviewing these activities, they make decisions through “Choice Activity”. This study reveals the reality of human decision-making, in which humans, who can only have bounded rationality, search for satisfactory solutions rather than optimal solutions based on normative theory. Simon's decision-making model is an excellent representation of standard human decision-making. Later, Lerner et al. revealed the effect of emotion in decision making, the importance of which was recognized by Simon himself, by developing the EIC model. Modifying the traditional decision-making model, the EIC model expresses the various ways in which emotions can act in each decision-making process. However, while the abstract representation of the relationship between emotion and choice allows the model to be applied to many decision makers as a general-purpose decision-making model, there are aspects of the model that make it difficult to explain groups of people, such as the elderly, who are the subject of this paper, whose decision-making is characterized by their characteristics.

Carstensen's SST assumes that humans make emotional adjustments that maximize positive emotions and minimize negative emotions, and that the premise is that people subjectively feel that their time is limited in anticipation of the end of their own lives. The premise of this theory is that people make emotionally satisfying choices with the resources they have by anticipating the

end of their own lives and subjectively feeling that their time is limited. Although the feeling that time is limited can be considered to be applicable to all human beings, it is especially true of the elderly, who are often triggered by this perception, and thus the theory is considered to be applicable to the elderly. This is a natural consequence of the fact that the elderly may feel that their time is limited in anticipation of their own demise. In addition, what Carstensen refers to as emotional adjustment can be thought of as the effect of emotions on the decision-making process in the EIC model.

However, Carstensen's theory does not specifically clarify what kind of decision-making process humans go through to make decisions in line with SST. While we can accept Carstensen's concept of human behavior based on SST as a general theory, we believe that clarifying how people make emotional adjustments will increase the utility of Carstensen's theory and anticipate its theoretical development.

Therefore, in the next section, we propose a descriptive model of decision making in the elderly based on the above previous studies.

3.2 One Way of Decision-Making for the Elderly: Well-being Models for the Elderly

Based on the suggestions from the previous studies organized in the previous sections, we constructed a conceptual model of the decision-making process of the elderly as shown in Figure 3.

As premises for the model construction, two decision-making models, Simon's decision-making process model and Lerner's EIC model, were used. The proposed model is based on Carstensen's SST and aims to construct a practical behavioral model for the elderly.

First, the proposed model is based on Lerner's EIC model, which incorporates the decision-making model of expected utility theory, the core of traditional decision-making theory, and expresses the linkage between conscious and/or nonconscious evaluation by introducing the function of emotion in it. The EIC model, which encompasses the results of previous research leading to decision making, was considered appropriate as the basis for a decision-making model to explain emotions and choice mechanisms in the elderly (①in the figure 3).

Next, the emotional function of the EIC model was defined as “positive emotions (② in the figure 3)” in order to explain the role of positive emotions in the elderly in Carstensen's theory. Of course, this does not mean that emotions other than positive emotions do not exist in the elderly, but in Carstensen's theory, “The increased importance of emotional goals may be one reason why older adults use coping strategies primarily aimed at regulating emotion states more so than younger adults.” [21]. Therefore, it was decided to construct this model specifically for positive emotions.

It has not been clarified how the conscious and/or nonconscious evaluation on the EIC model are carried out. It is significant to clarify which part of the evaluation activity is affected by the positive emotions possessed by the elderly. Therefore, we introduced Simon's idea of the three phases of the decision-making process into the model to clarify whether positive emotions have a strong influence on information, design, or choice activities, or on all activities.

The “characteristics of decision maker” in the EIC model were defined as “time perspective”

based on Carstensen's theory that, among the characteristics of the elderly, the perception of limited time remaining, which is emphasized in Carstensen's theory, influences emotions. This is in line with Carstensen's theory that the characteristic of "time perspective" affects the emotions of the elderly when it comes to positive emotions, as mentioned above.

Finally, two features of the EIC model that were not employed in the model construction are "Characteristics of options" and "Incidental influences". The "characteristics of options" were not affected by the introduction of Simon's three phases of decision making, which incorporated the "Conscious and/or nonconscious evaluation". It is clear that "Incidental influences" can affect positive emotions and is a factor that is difficult to eliminate, but we decided to conduct the verification in a form that eliminates "Incidental influences" as much as possible and did not include it in this model.

The above points are considered to be effective in describing decision-making situations in which the emotions of the elderly are taken into account. However, this is a theoretical discussion of the contents of this model, not an experimental demonstration. We will leave the experimental demonstration for the next time.

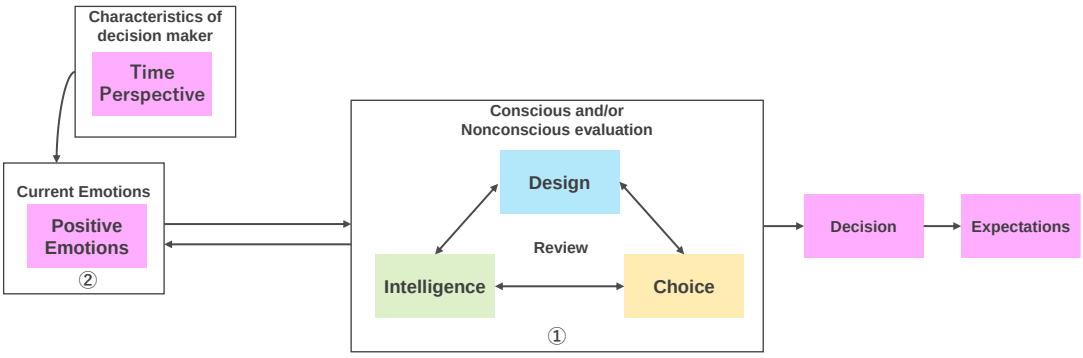

Figure 3: Well-being Models for the Elderly（Prepared by the authors）

4 Discussion

At this stage, this model is only a theoretical study and has not been experimentally demonstrated. A survey using questionnaires will be conducted in the future to evaluate the validity of the model, but as a preliminary step, interviews were conducted with elderly people and their decision-making content was analyzed qualitatively. The interview subjects were elderly people in their 70s who are currently retired. At the time of the interview, the subjects were asked to verbally report a recent decision they had made, and to report as much as possible about the decision-making process that led them to that decision and the thoughts that led them to their choice. As an ethical consideration, the purpose of the experiment and the handling of data were explained to the subjects in writing and orally, and their consent was obtained.

4.1 Qualitative evaluation

The results of the interviews were as follows.

Q: Do you remember any recent decisions that you made?

A: The decision to purchase a car was memorable.

Q: Why was it memorable?

A: Because it was a big purchase and I had to think about a lot of things.

Q: What did you think about?

A: I have driven a variety of cars, but I am of age now and this may be my last car purchase. If that is the case, I thought I should buy a car that fulfills my best wishes, which I have not been able to drive even if I had wanted to.

A: However, I also needed to save for my retirement and was concerned about buying a car that was too expensive, so I thought about my preferences and the performance of the car as I compared and considered.

A: However, at the end of my consideration, I decided that this would be the last car I would ever buy, and I wanted to drive the car I wanted, so I decided to buy the car I initially wanted. This is how it happened.

Q: What were your thoughts and feelings leading up to that decision?

A: It is difficult to express in one word, but at first I had some difficulty thinking about it because I had to worry about funding for retirement and whether I would be able to drive. However, as I thought about my future and thought about driving the car I wanted, I began to feel positive and a bit happy, and I feel that I was able to reach my final decision.

Q: Were you satisfied with your thinking in reaching your decision?

A: I had a lot of thoughts about it, but I think it was a satisfactory one because I was able to make a positive decision in the end.

4.2 Analysis of Interview Results

Based on the interview results in the previous section, we extract and analyze the characteristics of decision-making in light of the Well-being Models for the Elderly developed in this study.

First, it can be said that the subjects' thoughts about the time perspective influenced their emotions and made them have positive feelings, as evidenced by their statement, “I am of age now and this may be my last car purchase.”. This indicates the validity of Carstensen's theory. This influence of time perspective is explained in the behavioral economics of time preference. Time preference is defined as the attitude that places importance on present rather than future convenience or utility, and its degree can be measured by the time preference ratio. People with a high rate of time preference are considered to value the present more than the future, and are considered to have a so-called “impatient” disposition; the concept of time perspective in Carstensen's theory can be considered to correspond to time preference, but it is unlikely that the elderly value the present because they are impatient. We believe that a more detailed analysis of the factors that constitute the time perspective of the elderly is needed in this regard.

Next, statements such as “I began to feel positive and a bit happy, and I feel that I was able to

reach my final decision." suggest that positive emotions influence the decision-making process. This point indicates a certain validity of the authors' model. It can be said that attention is directed by the positive stimulus, "I thought I should buy a car that fulfills my best wishes" and thereby motivates the participants to focus on positive emotional satisfaction.

Although it is not clear from the interview results where positive emotions influenced the Conscious and/or nonconscious evaluation, statements such as "I thought I should buy a car that fulfills my best wishes" and "thought about driving the car I wanted" indicate that the participants were motivated to organize the collected information in order to make a choice. These statements seem to have led to an awareness of the need to make a positive choice in the design. We believe it is possible to hypothesize that positive emotions may have an impact on design. We would like to make this an issue for future study.

One thing that we believe is not fully explained by the model we constructed is that there may be some process between Conscious and/or nonconscious evaluation and decision. From the statement, "I think it was a satisfactory one because I was able to make a positive decision in the end." it can be said that there is a process between the evaluation activity and the decision to accept one's own choice. In this regard, Hosoda, one of the authors, mentions that "acceptable" in decision making as "a sense of satisfaction that implies objectifying and evaluating one's decision-making process and allowing it in light of one's own values" [22]. This point is considered to exist in the decision making of the elderly as well. We would like to make use of this point in future improvements of the model.

4.3 Limitations of the present study

From the discussion so far, it appears that the model proposed in this study has theoretical validity and can be demonstrated from the interview results.

However, the interview results are also overwhelmingly small, with only one interview, and the results do not adequately capture the decision-making process of the elderly, since they were not analyzed from a large amount of data as in a questionnaire analysis to measure the effectiveness of the model. It will be necessary to increase the number of interview subjects and further identify factors to improve the quality of the model. Based on the results, it is also necessary to extract questionnaire items and empirically validate the model.

As for theoretical development, although a decision-making model has been constructed based on Carstensen's theory, it is believed that there are still factors that influence the decision-making of the elderly. Based on the results of future interviews and questionnaire analysis, we believe it is necessary to continue the development of the model from the theoretical aspect with reference to other studies on the elderly.

5 Conclusion

In this paper, we examined a new decision-making model for the elderly based on Simon's decision-making process model and Lerner et al.'s EIC model, and Carstensen's SST.

As a result, we were able to propose a model that represents the characteristics of decision making among the elderly based on existing models. Regarding the validity of the model, the

results of a qualitative analysis conducted based on the results of interviews with familiar elderly people confirmed a certain level of validity.

However, this qualitative analysis was very limited, and in the future it will be necessary to conduct interviews and questionnaires with a large number of elderly people in order to improve the validity of the model. Based on the results, we would like to construct a model that takes into account additional factors that influence the decision-making of the elderly.

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