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**EVALUATING THE EFFICIENCY OF PENSION COMMUNICATION METHODS:  
THE CASE OF ESTONIA**

Master's thesis

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We have compiled the work independently. All the works of other authors used in the preparation of the thesis, fundamental principles, literature sources, and data from elsewhere are cited.

### **Abstract**

Individuals are being given more responsibility for making decisions about their pension, but studies show that many lack the knowledge and interest to actively engage in retirement planning. Previous studies have shown that it is important to educate people about retirement planning and use visual and interactive tools to make financial information more accessible and appealing. However, there is limited research on the use of visuals and interactivity in pension communication. This study explores the impact of pension communication methods on awareness, attention, confidence and pension planning behavior by analyzing data of an online survey pension literacy experiment in Estonia and conducting an eye-tracing experiment. Main findings of this study indicate that use of visuals and interactivity for communicating pension related information, is more effective in raising the awareness level of pension system and likelihood to make changes in pension planning in the near future, than presenting information in traditional way (e.g. text and tables). Additionally, the use of visuals and gradual presentation of information reduces cognitive load and enables individuals to focus on one task at a time, making it easier to comprehend the information. This study contributes to evaluating the efficiency of pension communication methods, highlighting the importance of information visualization and interactive approaches. These findings hold significant implications for policymakers, when formulating pension communication strategies.

Keywords: information visualization, nudging, behavioral experiment, online survey, eye tracking, emotions, S180 Economics, econometrics, economic theory, economic systems, economic policy

### **1. Introduction**

Due to an aging population in the large part of the world, changes in the labor market, increased life expectancy have led to pension reforms (Schröder et al., 2022, 2023), which have made pension systems more risky and less generous for the individuals. People have to make decisions regarding supplementary pension savings, investment strategies for their pension wealth and determining the timing of their retirement as the responsibility of is increasingly placed on them (Debets et al., 2022). While a majority of the working population gains an understanding of finances early in life, they often only begin contemplating retirement and showing interest in comprehending pension plans later on, typically during life events such as

marriage or divorce (Schröder et al., 2022). It is important to actively plan for retirement, but there is evidence that people find it complicated (Global Retirement Survey, 2019). Studies indicate that individuals have a lack of knowledge, interest, and awareness (Prast & van Soest, 2016) to actively involve themselves in pension planning and they postpone their decisions into the future (Thaler & Benartzi, 2004).

A significant discovery is that greater knowledge about pensions positively influences active engagement of individuals in pension decision-making (Debets et al., 2022). Without actively engaging with pertinent information about pensions, individuals typically lack the motivation to take timely and appropriate actions, such as start saving earlier or increasing savings, to assure their long-term financial well-being (Brüggen et al., 2019). According to Blakstad et al., (2018) people are often reluctant to think and plan for retirement. However, such an attitude is detrimental as it significantly impacts their future. Low engagement in pension planning can lead to challenges for participants, such as not contributing enough or starting to save for retirement early enough for their future. Therefore, they will have to rely only on state and occupational pensions, which will provide a basic income, but they commonly fail to guarantee income that can support the same standard of living enjoyed before pension. This can result in a pension gap, leading to financial difficulties and a lower standard of living in retirement. (Brüggen et al., 2019) Those who are more involved in pension planning have higher wealth and savings adequacy compared to those who are not (Thaler & Benartzi, 2004). Individuals need to set realistic expectations regarding the pension amounts they will receive in the future and recognize early on possible pension gaps, in order to take timely action to mitigate them.

This raises the topic of educating people, how to plan for retirement and find easy and understandable communication tools to do so. There is evidence that presenting financial information using visuals (Kothakota & Kiss, 2020; Schröder et al., 2022) and interactivity (Brüggen et al., 2019; Tang et al., 2011) may be a possible solution to overcome this obstacle, making the information more attractive and understandable (Abdalla et al., 2018; Chy & Buadi, 2023; Schröder et al., 2023). Many countries invest a significant amount of time and money into pension communication, but there is a lack of research on its effectiveness (Debets et al., 2022). There is a need to explore the use of data visualization, storytelling, and interactive design in pension communication (Schröder et al., 2023).

The aim of this study is to determine the effect of information communication methods on people's awareness, attention, confidence and pension planning behavior.

Therefore, in this study the focus is on using easy-to-understand visuals and interactivity, compared to information given by plain text or table format. For that, we formulated the following hypotheses: when presented with easy-to-understand visuals with partitioned steps in interactive navigation design, compared to the traditional overview given in table format, people are more likely to change their actual pension behavior (H1a), click more on provided advice links (H1b), are more confident in their decisions (H1c) and complete the task with less effort (H1d). In addition, an informative video about the details of the pension system is more effective in increasing awareness in pension literacy than similar information in text form (H2).

An online pension literacy experiment, with 2000 participants, was conducted<sup>1</sup>, which results were analyzed by the authors of this study to determine the effect of communication methods on awareness, confidence and pension planning behavior. In addition, we conducted an eye-tracking experiment in the Neuromarketing Laboratory of the University of Tartu Delta Centre, involving 40 participants, to have insights into attention and emotions. Four treatments were designed for the intervention in both experiments, including a pension navigation tool, a traditional table in A4 format, a narrative video, and a text presentation about the pension system in Estonia. The intervention in both experiments is divided into two parts, with the first part providing information about the Estonian pension system through either a video or text, and the second part displaying investment opportunities across pension pillars using a navigation tool or table.

The results revealed that using visuals and interactivity compared to text and table when presenting pension related information, has a positive impact of raising the awareness level of pension system. Additionally, individuals are more likely to make changes in their pension planning in the near future. We also found that if information is presented gradually, it reduces mental effort and makes it easier for individuals to understand pension-related information.

The rest of this study is structured as follows. Firstly, we present a summary of the literature regarding human behavior in the pension context and their awareness about the topic, as well as engagement in pension planning. Secondly, we focus on nudging communication, defining the appropriateness of this method for our study. Thirdly, we indicate the importance of visualizing financial information as a solution for increasing

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<sup>1</sup> The experiment design for this project was created in collaboration with the master's thesis supervisor to support a study commissioned by the Ministry of Social Affairs.

awareness, motivating to make changes, and searching for additional information regarding pension planning. Furthermore, we open the context of Estonian pension system, which is followed by description of our methodology, results and conclusion.

## **2. Literature review**

### **2.1. Human behavior in the pension context**

People's behavior in pension planning can be described through behavioral or traditional economic theory. Traditional economic theory posits that individuals, when adequately informed, behave rationally to maximize their self-interests. Based on this theory, discussions about implementing investment choices often assume that individuals are highly proficient decision-makers and capable of executing their investment plans (Tapia & Yermo, 2007). Modigliani (1975) illustrates economic theory through the life-cycle theory of consumption. According to this theory, households strive to maintain consistent levels of spending throughout their lives. In each period, they must decide how much to save and how much to spend, facing the challenge of optimization. However, actual household behavior may deviate from this ideal plan for two main reasons. Firstly, the task is complicated, leading households to miscalculate the best saving rate. Secondly, even when the correct saving rate is determined, households may struggle with self-control, finding it hard to resist the temptation of immediate consumption in favor of future needs. (Tapia & Yermo, 2007)

To provide a more thorough explanation of pension planning behavior, we should rely on the principles of behavioral economics. Behavioral economics combines psychology and economics (Mullainathan & Thaler, 2000) that illuminates the relationship between human behavior and economic decision-making, challenging the traditional assumptions of rationality within traditional economic theory. It focuses on how markets are affected when individuals with human limitations and complexities are involved. This theory assumes that individuals diverge from the standard economic model as its characterization may not always apply to the average worker (Mullainathan & Thaler, 2000; Armour & Daly, 2008). Behavioral factors, such as bounded rationality, bounded willpower, and bounded self-interest, are an important element of any complete descriptive theory, as saving for retirement requires both complex calculations and self-control. Bounded rationality means that human problem-solving is constrained by limited cognitive abilities. Similarly, bounded willpower refers to the tendency of people to make choices that do not align with their long-term interests. Additionally, bounded self-interest highlights that humans tend to prioritize helping others, even if it means sacrificing their own interests. (Mullainathan & Thaler, 2000)

In addition, an increasing body of research in behavioral economics indicates that individuals who are saving for retirement often make consistent mistakes resulting in decreased economic well-being over time (Tapia & Yermo, 2007). Therefore, behavioral public policy tools, such as behavioral interventions, should be implemented to direct the behavior and decision-making of individuals for their own benefit (Franklin et al., 2019). This approach ensures that the behavior of the population is directed towards the best outcomes in the most effective way (John, 2018).

Pension funds and policymakers globally face challenges in enhancing the engagement of pension plan participants (Blakstad et al., 2018). They have started to recognize the usefulness of incorporating principles from psychology and behavioral economics in understanding human decision-making (Hertwig & Grüne-Yanoff, 2017). A primary objective is to captivate individuals' attention, foster curiosity, prompt deeper reflection on the topic and affect people at a deeper level (Brüggen et al., 2019).

Significant progress has been made in developing strategies to enhance participant engagement in pension plans. These strategies involve various approaches, such as customizing choice architecture and communication strategies, using social norms and heuristics, fostering future-oriented thinking, segmenting participants based on beliefs and preferences, and employing nudges and framing techniques in communication efforts. (Blakstad et al., 2018) Eberhardt et al., (2021) have highlighted that nudging can be used to support individuals in making optimal decisions regarding their financial future and (Thaler & Benartzi, 2004) suggested that nudging through pension plans is a promising method to make people save more for their retirement.

## **2.2.Nudging in pension communication**

Thaler and Sunstein (2009) have popularized the nudge theory, a concept in behavioral economics, defining the term “nudge” as any element of choice architecture that influences individual’s behavior in a predictable manner, while still preserving choice freedom. Nudging is an intervention to guide people gently towards specific paths that will likely be advantageous for themselves and society (Stroecker, 2016; Sunstein, 2014, 2016). An intervention is any activity that attempts to change certain outcomes or existing processes (Franklin et al., 2019) and it must be simple and cheap to evade (Thaler & Sunstein, 2009). GPS is a good example of how nudges are used – it guides individuals in a particular direction, but it still gives them the freedom to choose their own route (Sunstein, 2014).

The nudging technique is widely used by policymakers to guide individuals with a lack of cognitive ability and motivation towards better decisions and improve their lives as well as society. One of the most common ways of nudging in the pension field is the use of default options. People lack the willpower to take action regarding pensions; therefore, default rules are used to determine what happens if people make no decision. Using default rules preferred to active choosing has two important advantages – saving individuals' time and attention from a subject that might not interest or engage them (Sunstein, 2017; Thaler & Benartzi, 2004). For example, automatic enrollment in savings plans offers an alternative way for increasing participation. According to the standard opt-in enrollment scheme, individuals must choose to join the savings plan if they want to contribute. However, with automatic enrollment, individuals are automatically registered in their employer's savings plan at a pre-set contribution rate, unless they make a different choice. (Beshears et al., 2010) Automatic enrollment is more likely to result in increased participation rates compared to a standard opt-in enrollment scheme. Studies have indicated that automatically enrolled individuals might hesitate to opt-out and stick with default settings (Butrica & Karamcheva, 2015). This has to do with the thought of losing part of savings. On the other hand, individuals may not want to opt-in due to their concern about a decrease in their earnings. (Sunstein, 2017)

Rubaltelli & Lotto, (2021) conducted a study in Italy to examine the impact of nudging on increasing retirement pension fund contributions. The website increased the default deposit from 10% to 20% and added options for users to compare. This change improved transparency and made it easier to view contribution rates. A pop-up reminder was also added to inform users that reducing contributions would result in a lower pension. The findings of the experiment revealed that altering the contribution determination structure on the online platform resulted in an increase in the percentage of invested income. Following the intervention (raising the default rate to 20%), a significant number of individuals chose to contribute more than the minimum rate of 10%. Interestingly, 63.58% of these individuals stuck with the highest stake (20%) without making any changes.

Nudging has gained popularity in both private and public institutions as it is cost-effective (Schmidt & Engelen, 2020) and has the ability to aid in achieving different goals, such as economic growth, through marketing and communication (Stroecker, 2016). In pension communication, people need to be informed about changes in government regulations, the pension system as well as economic environment. The most used method to send out pension-related information has been e-mail communication, but it has shown low

efficiency in engagement as people are not interested in this information and do not click additional provided links with more specific details. (Eberhardt et al., 2021) Approaches, such as the distribution of informative flyers via email to older individuals who already possess a pension account, have been tested by Clark et al. (2017). They have shown that nudging positively impacts on the likelihood of creating a pension plan, starting to plan for retirement and increasing confidence in retirement income. Therefore, it may be a good solution to use nudging to remind people about the significance of engaging in pension planning and making decisions for the future. In addition, framing techniques, such as goal framing (Eberhardt et al., 2021) and “fresh start” (Beshears et al., 2021), are found effective to present pension related information. In addition, Leandro-França et al. (2016) discovered that additional programs such as seminars and meetings have demonstrated the ability to enhance knowledge, positive attitudes towards retirement, and retirement planning.

Another technique for interventions, similar to nudging, is boosting. As discussed above, nudges target human behavior directly and require minimal user engagement. Boosts, on the other hand, focus on enhancing cognitive and motivational competencies to improve individuals’ own decision making and create longer lasting changes in behavior. (Hertwig & Grüne-Yanoff, 2017; Lorenz-Spreen et al., 2020) The focus of our experiment is not on the boosting approach, as our goal is not on increasing people's competence, but on designing interventions to target people’s behavior during the experiment. This is supported by the fact that nudges are the preferred strategy to obtain an immediate improvement (Caballero & Ploner, 2022) and are effective in situations where individuals lack the motivation or desire to change, as they require minimal cognitive and motivational effort (Lorenz-Spreen et al., 2020).

There are several other techniques similar to nudging (e.g. sludges, budes and shoves). Sludge is essentially the opposite of a nudge. It has a rather negative impact on optimal decisions as it makes it more complicated for individuals to reach their goals. For example, sludges can discourage beneficial behavior and promote self-defeating behavior, like putting money into a seemingly perfect but unrealistic investment opportunity. (Thaler 2018) This is the reason why we discarded this method since the purpose of our work is the opposite approach. Budes are government regulations that aim to counter the manipulative and deceptive practices of private organizations that use behavioral insights to increase their profits. Meanwhile, shoves involve strict regulations such as bans and mandates, which

enforce individuals toward a specific behavior (Nova & Lades, 2022). We do not use this approach in our design because we want to maintain choice freedom.

### **2.3. Visualizing financial information**

Studies on decision-making indicate that the presentation format can impact the decision-making results, including accuracy, confidence, and the alignment between accuracy and confidence (Tang et al., 2011). Therefore, it may be a good solution to focus on using visualization when nudging because there is proof that the use of visualization, interactive tools and storytelling have a positive effect in to captivate people's attention and enhance their comprehension of intricate information (Schröder et al., 2023). In our experiment we focus on the use of visualization in our design of experiment to determine the effect of visualization when nudging.

Many countries dedicate significant resources and considerable funds to increase the engagement of pension plan participants, with the aim of informing individuals and assisting them in making more informed pension-related decisions, but there is limited understanding of the effectiveness of such policies (Debets et al., 2022). According to Schröder et al. (2022), it is a challenge for the pension sector to communicate efficiently through the available communication channels and get people's attention.

Using visualization to present complex information is one of the opportunities to help people comprehend that information (Schröder et al., 2023). The human brain is more adept at processing and retaining visual information compared to textual information. (Potter et al., 2014) For example, Schröder et al (2022) conducted a user study to test if individuals understand information about pension funds better when using simple visual representation and animation. They found out that most of the test subjects, who had no prior knowledge of the pension fund's structure, were able to understand that structure after they had seen the visualization.

Schröder et al. (2023) have indicated that the use of visuals helps to make the information more interesting and eye-catching in exploring the topic for people with different education levels and backgrounds. In addition, Schlosser, (2003) has emphasized that increased interactivity leads to greater processing of information, and individuals are motivated to acquire information that is relevant to their decision-making process. Billari et al (2023) conducted an experiment using an internet-based literacy intervention program, including video presentations. The first outcome was that completing this program increased the likelihood of making changes regarding investment lines. Hence, we proposed **H1a**:

*people are more likely to change their actual pension behavior when presented with easy-to-understand visuals with partitioned steps in interactive navigation design, compared to the traditional overview given in table format.* Also, Billari et al (2023) findings revealed that participants showed interest in gathering more information about the topic after the intervention. Brüggem, Post, and Schmitz (2019) found that interactivity positively impacts participants' intentions as it significantly increased the number of clicked options. Based on the information above, using visuals and interactivity together can lead people to become more interested in the topic and search for information. As a result, we developed a **H1b**: *people click more on the provided advice links when presented with easy-to-understand visuals with partitioned steps in interactive navigation design, compared to the traditional overview given in table format.* Abdalla et al. (2018) and Tang et al., (2011) have referred in their research to different financial studies as interactivity enables a better understanding of the information, improves information acquisition and integration, increases confidence, accuracy, and calibration of decision makers, and improves option quality.

Based on the outcomes of Abdalla et al., (2018), Chy & Buadi, (2023) and Perdana et al., (2018) experiments, there should be more use of interactive data visualization tools in finance to nudge individuals to make more effective and better decisions comparing to static data visualization tools. Perdana et al., (2018) point out that these tools are especially valuable for non-professional investors when it comes to making investment choices, as they can reduce uncertainty and the bounded rationality of investors. Tang et al., (2011) explored the impact of visualization and interactive tools on confidence and accuracy as well as calibration between them. They found that there is minimal effect on confidence when the tasks were simple. However, interactive visualization tools improved individuals' confidence when the tasks were challenging. They also found that using interactive visualization helps enhance decision accuracy and confidence leading to better calibration. The experimental findings of Abdalla et al., (2018) indicate that visual tools improve the results in both accuracy and time efficiency when solving complex tasks. Therefore, we suggest **H1c**: *people are more confident regarding their decisions when presented with easy-to-understand visuals with partitioned steps in interactive navigation design, compared to the traditional overview given in table format.*

Kothakota & Kiss, (2020) conducted an experiment of using data visualization to improve understanding of finance. The responses of 1797 participants who completed an online survey were divided into one of three groups: the first group received a text-only

explanation of a financial concept, the second group received a combination of visualization and text explanation, and the final group had no intervention. The results show the positive impact of the combination of visualization and text explanation intervention on financial literacy compared to text-only intervention and no intervention. They found that if the information is presented visually and with text, it significantly reduces cognitive load and improves individual's performance. In addition, Liverence & Franconeri (2015) have suggested in their study that it can reduce cognitive load when using easy-to-understand visuals as visual attention is limited. Therefore, we propose **H1d**: *people complete the task with less effort when presented with easy-to-understand visuals with partitioned steps in interactive navigation design, compared to the traditional overview given in table format.*

Lusardi et al. (2017) used a video that presented financial information in their study. The result of the experiment revealed that the video was the most effective in increasing financial literacy and it also increased confidence compared to textual information. Therefore, we raised **H2**: *an informative video about the details of the pension system is more effective in increasing awareness in pension literacy than similar information in text form.*

Based on all the evidence above, using visuals and interactivity together is a promising method to present complex information, catch people's attention, increase interest in searching additional information and improve pension planning behavior. In the next chapter, we will focus on conducted online survey pension literacy experiment and eye-tracking experiment.

### 3. Materials and methods

#### 3.1. Pension system and communication in Estonia

The purpose of the Estonian pension system is to assist individuals maintain their current standard of living and monthly earnings upon reaching retirement age. Pension is a regular financial payment provided in the time of reaching a certain age or incapacity for work. The Estonian pension system is based on three pillars (*Pensionikeskus*, 2021):

**I pillar:** State pension (old-age pension or national pension)

**II pillar:** Mandatory-funded pension

**III pillar:** Supplementary funded pension

The state pension is paid to permanent residents or people who live in Estonia on the basis of temporary residence permit or right of residence and it is categorized into two types

of retirement pension. Residents who have worked in Estonia for at least 15 years are entitled to an old-age pension. The pension qualifying period is formed of various life experiences, such as studying, raising children and military duty. Those individuals who lack the necessary duration of work experience will receive a national pension, which is lower compared to an old-age pension. The funding for state pensions comes from the taxes paid by present taxpayers to support present retirees. Mandatory-funded pension is primarily based on pre-financing. This means that individuals contribute 2% of their pre-tax salary towards their future pension while they are employed. It can be said that the Estonian pension system nudges by automatically adding people born in 1983 and later to this pension pillar. Although individuals have the freedom to access their funds by simply submitting a request for withdrawal. From 2025, individuals will also have the voluntary option to increase their contributions to either 4% or 6% in the second pillar. In addition, the state always adds 4% to this from the social tax calculated from the employee's salary. (*Eesti.ee*, 2024) Supplementary funded pension is also a voluntary pillar by offering the flexibility to decide how much to contribute and giving the opportunity to change the payment amount when needed. In addition, with this pillar, it is possible to receive up to 20% income tax relief on contributions made during the year, as long as they don't surpass 15% of total income. This additional pillar supports maintaining a higher older age, accessing the accumulated funds when necessary and receiving tax-free monthly or quarterly payments for the rest of their lives.

(*Pensionikeskus*, 2021)

The residents of Estonia are passive regarding their retirement, and their awareness is low. Individuals don't understand the pension system and don't engage in retirement planning (*Sotsiaalministeerium*, 2022). Attempts have been made to support people in making difficult finance related decisions, emphasizing the importance of making wise choices and trying to convey the fundamentals of investing, but these efforts have proven insufficient (*Riitsalu*, 2019). The data indicates that people in Estonia lack the motivation to make contributions to the pillars. The total contributions to all pillars currently stand at approximately 8% of the GDP and it is expected to remain at this level in the future. Unfortunately, raising the pension replacement rate becomes challenging with this contribution level. In fact, as the number of pensioners increases, there is a possibility that the rate may even decrease. The rate was also negatively affected in 2021 when the option to participate in mandatory state pension was made voluntary. It reduced contributions but at the same time increased contributions to state pension. However, the combined effect of the

changes was rather negative. In conclusion, it is important to increase contributions to the pension system in order to increase pension system payouts. (*Sotsiaalministeerium*, 2022)

### 3.2. Methodology

#### 3.2.1. Online survey experiment

Online surveys are widely used in pension and other finance-related research. For example, van Rooij et al., (2007) examined risk/return preferences of 1000 Dutch employees in the pension domain and focused on determining whether workers are open to and capable of handling a wider range of retirement plan options. Main finding of their study was that risk aversion is high on average, especially in the pension domain. Pension literacy and retirement expectations were researched by Radl & Fernández, (2022). They conducted an online survey experiment with 1922 participants from the United States, Germany, and Spain. The main focus of this study was on the impact of information on the expected retirement age. In the studied countries, they found that retirement expectations are heavily impacted by the benefits treatment but not by the demographic treatment. Billari et al., (2023) conducted an online experiment with 1436 participants to investigate their designed internet-based, online literacy intervention program (Finlife) impact on increasing financial and demographic survival literacy. Their findings reveal that Finlife had a significant impact on increasing financial and demographic survival literacy. Furthermore, it motivated respondents to acquire additional information and become more active in financial decision-making.

#### 3.2.2. Eye-tracking experiment

Eye-tracking is a method that tracks participant's visual attention by recording eye movements such as sequence of gaze, eye fixation duration, saccades and pupil dilation for better understanding decision-making processes (Borozan et al., 2022; Duchowski, 2017; Liu & de Goeij, 2020) which is a fundamental cognitive process of human behavior (Wang & Ruhe, 2008). Table 1. presents a list of previous studies in eye-tracking for visual attention and decision-making.

Table 1

#### *Eye-tracking studies*

<b>Authors</b>	<b>Topic</b>	<b>Respondents</b>	<b>Measures</b>	<b>Key findings</b>
(Krejtz et al., 2016)	The potential effectiveness of interactive simulations compared to text	High school students (N=63).	Fixation duration (FD); Fixation count (FC)	Interactive simulation is effective in promoting attentive visual exploration and cognitive

	and book-style illustrations with textual description was investigated.		Learning completion time; Transition matrices.	processing of information, encouraging deeper learning.
Rojas et al., (2020)	Use of visual attention for evaluating consumer behavior.	Children aged 7-12 (N=28).	Total time fixation (TTF); Visit count (VC).	Measuring visual attention can provide insights into decision-making and reveal differences in behavior among a specific group of people.
Harvey et al., (2023)	Illustrating information overload in annuity decisions.	employees of a large public research institute (age 45 and 65) (N=31)	Fixation duration (FD)	Consumers tend to pay less attention and have a decrease in understanding when there is an abundance of complex information, leading to difficulties in choosing the best options available. A simple information sheet can help improve decision-making.
Król & Król, (2019)	Decision-making abilities can be evaluated more precisely by examining both the decisions made and the process.	Students (N=56)	Fixation count (FC); Fixation duration (FD); Total fixation time (TFT).	Eye movements show how people make economic decisions and can help tell the difference between luck and skill. It helps predict future performance.

Source: Authors

Visual perception stimulates the cognitive processes necessary for understanding information and problem-solving (Sharafi et al., 2020), and it leads visual attention to specific locations (Duchowski, 2017). Recorded information helps to see the acquisition of information and it allows us to interpret the decision-making process (Liu & de Goeij, 2020). Borozan et, Loreta and Ricardo (2022) research results show that there is growing interest in eye-tracking studies, and they point out the effectiveness of this method as a valuable resource for comprehending various aspects and processes of how people engage with

financial documents. Liu & de Goeij, (2020) came to a conclusion in their research that the study of visual attention, an essential part of decision-making (Orquin et al., 2021), is crucial when designing pension communication in order to present uncomplicated and understandable information, enabling better comprehension and informed decision-making.

### 3.3.Participants

In our study, we have two distinct samples - one for conducting an online behavioral experiment and the other for conducting an eye-tracking experiment. We will now present each data set individually.

#### 3.3.1. Online survey experiment participants

The online survey experiment involved 2000 respondents. Data was collected during the months of March and April through Norstat, which is a leading data collection platform in Europe. For this survey an online data collection solution, access to pre-profiled, highly motivated and available consumer panels, was ordered. (Norstat, 2024) Table 2 provides a comparison between the research sample and the population of Estonia based on demographic characteristics. The results indicate that there is insignificant difference between the sample and population ( $p>0.5$ ), signifying that the sample is pertinent. The table also reveals that most of the respondents are Estonians (68.4%), female (50.5%) and male (49.1%) respondents are almost equally divided, respondents are mainly in the age range of 25-64 and majority of them live in Tallinn (35.4%).

Table 2

*Comparison of the entire sample with the population*

#	Characteristic	Answer options	N	%	Pop %
1.1	Gender	Female	1010	50.5	52.6
		Male	981	49.1	47.4
		Other	6	0.2	-
		Don't want to answer	3	0.2	-
1.2	Age	18-24	205	10.3	11.1
		25-34	403	20.2	20.6
		35-44	496	24.8	24.0
		45-54	465	23.3	22.1
		55-64	431	21.6	20.4
1.3	Nationality	Estonian	1367	68.4	67.8
		Russian	508	25.4	22.5
		Ukranian	43	2.2	9.0
		Other	82	4.1	
1.4	County	Harjumaa	960	48.0	46.7

	Hiiumaa	12	0.6	0.6
	Ida-Virumaa	194	9.7	9.8
	Jõgevamaa	38	1.9	2.0
	Järvamaa	39	2.0	2.2
	Läänemaa	30	1.5	1.5
	Lääne-Virumaa	85	4.3	4.4
	Põlvamaa	35	1.8	1.8
	Pärnumaa	121	6.1	6.4
	Raplamaa	42	2.1	2.5
	Saaremaa	45	2.3	2.3
	Tartumaa	239	12.0	11.9
	Valgamaa	41	2.1	2.1
	Viljandimaa	64	3.2	3.3
	Võrumaa	52	2.6	2.5
	Living abroad	3	0.2	-
1.5	Residence type			
	Tallinn	707	35.4	33.2
	Bigger city (Tartu, Pärnu, Narva, Kohtla-Järve)	356	17.8	16.7
	Other city	368	18.4	-
	Rural-settlement	566	28.3	-
1.6	Education			
	Basic education or lower	225	11.2	19.4
	Secondary education or secondary special education based on basic education	1100	55.0	45.1
	Higher education, including applied higher education or secondary special education based on secondary education	675	33.8	37.4

Source: Authors

The results of chi square tests presented in Table 2 show that all groups divided by demographic characteristics are insignificant. at the 0.05 significance level (p-values in chi-square tests for nationality (.445), gender (.222), age (.141), location (.606), and education (.865)) Thus, participants of the study are well randomized.

Table 3

*Proportions of groups according to demographic characteristics and chi-square tests*

Categories		G1	G2	G3	G4	Control	Total	x <sup>2</sup> p
		N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	
Nationality	Estonian	273 (68.3)	280 (70.0)	257 (64.3)	277 (69.3)	275 (68.8)	1362 (68.1)	3.719 .445
Gender	Female	219 (54.8)	189 (47.3)	192 (48.0)	204 (51.0)	205 (51.2)	1009 (50.4)	5.708 .222
	18-24	40 (10.0)	45 (11.3)	42 (10.5)	47 (11.8)	31 (7.8)	205 (10.3)	

Age	25-34	66 (16.5%)	74 (18.5)	90 (22.5)	77 (19.3)	96 (24.0)	(20.2)	22.061 .141
	35-44	114 (28.5)	101 (25.3)	82 (20.5)	108 (27.0)	91 (22.8)	496 (24.8)	
	45-54	91 (22.8)	95 (23.8)	106 (26.5)	85 (21.3)	88 (22.0)	465 (23.3)	
	55-64	89 (22.3)	85 (21.3)	80 (20.0)	83 (20.8)	94 (23.5)	431 (21.6)	
Location	City residents	292 (73.0)	274 (68.5)	288 (72.0)	288 (72.0)	292 (73.0)	1434 (71.7)	2.720 .606
	Basic or lower	43 (10.8)	47 (11.8)	45 (11.3)	52 (13.0)	38 (9.5)	225 (11.3)	3.916 .865
Education	Secondary + secondary special	217 (54.3)	223 (55.8)	221 (55.3)	221 (55.3)	218 (54.5)	1100 (55.0)	
	Higher	140 (35.0)	130 (32.5)	134 (33.5)	127 (31.8)	144 (36.0)	675 (33.8)	

*Source:* Authors

### 3.3.2. Eye-tracking experiment participants

An eye-tracking experiment was conducted with a sample size of 40 participants. The respondents were randomly selected from the Delta Centre hallways and were invited to take part in the experiment on a voluntary basis. The participants were aged between 19-24 years and were equally distributed between males (50%) and females (50%). All respondents had completed secondary education and were pursuing a bachelor's degree. The student sample was used as this is the period when people generally begin their career journey and start thinking more about their future. At this stage of life, individuals should consider pension planning more seriously as it is a long-term goal. Therefore, it's important to consider what the expectations and possibilities are for pension and start making contributions as early as possible (Sotsiaalkindlustusamet, 2024). We did not use financial incentives to engage students.

### 3.4. Design & process

In the design of the intervention, we took as a basis the elements that have been pointed out in previous studies in order to arouse people's interest in pensions and help them better understand pension information. As a result, we decided to choose the following elements for the study: the use of easy-to-understand visuals and interactivity to present pension information. Based on these elements, we designed four treatments for our intervention for both experiments: pension navigation tool, traditional table in A4 format (see

Appendix A), narrative video, and text presentation (see Appendix B) about the pension system in Estonia. The idea of using navigation tool and video in this experiment came from an article written by Schröder et al., (2023). According to a study conducted by van Hekken & Das, (2019), the “navigation methapor” surpasses both visual-only and text-only representations regarding effective communication. The intervention in both experiments consists of two parts - providing information about the Estonian pension system (video or text) and displaying investment opportunities across pension pillars (navigation tool or table).

In the first part, information about the Estonian pension system is either given to the test subjects in the form of text or video. Both methods provide identical information, but the video incorporates relevant visuals to communicate the message more effectively to participants. The 48-second video presents a story about the pension system and available investment opportunities in the pillars, divided into six different slides. Text is a plain white picture presenting the same story as in the video, but without visuals and displayed at once. The visuals in the video show the planting of a seed and its consistent watering until it grows into a large apple tree. This metaphor represents the possibility of investing in pension pillars II and III, and the size of the tree symbolizes the expected pension amount. As time passes, the tree begins to bear fruit, signifying the accumulation of interest. The final slide portrays elderly individuals enjoying a leisurely beach vacation, suggesting that consistent savings can provide a comfortable retirement.

In the second part, participants are presented with a traditional table in A4 format, displaying the various investment options accessible in the pension system. Alternatively, participants receive pension navigation tool, which is an interactive visual tool designed and created by authors, to access the same information. Navigation tool design follows the nature of modern website/application designs, and it was made in Figma (application for interface design). Using this tool, participants can make choices to design their own future pension through an interactive experience. Both options cover all pension pillars, including pension pillars I, II, and III. The test subjects are required to make decisions on the amount they wish to invest in the pension pillars.

#### **3.4.1. Online experiment design & process**

The online survey experiment is commissioned by the Ministry of Social Affairs of Estonia. It consists of two parts, with the first part being aimed at gathering background information and asking pension-related questions, while the second part focuses on nudging intervention using four treatments. In this study we will focus on second part of this

experiment (see paragraph 3.5). All respondents were provided by Norstat to take part in an online survey. Randomly, 1/5 of them were sorted into one of these groups:

1. Group 1 received a pension system video and a pension navigation tool.
2. Group 2 received a pension system video and table.
3. Group 3 received a text about the pension system and pension navigation tool.
4. Group 4 received a text about the pension system and table.
5. Group 5/Control group received no additional intervention.

Participants in online survey experiment completed navigation tool without interactivity, which means they were presented with pictures and had to make their choices in the multiple-choice list. After reading the text or watching the video, participants were asked how informed they felt about the Estonian pension system. After completing the second part of the experiment in all groups, we asked all participants to estimate the sufficiency of the expected future pension amount and the probability that they would make changes to their pension plan in the next month. All the questions were asked on scale 1-5.

#### **3.4.2. Eye-tracking experiment design & process**

The eye-tracking experiment was conducted in the neuromarketing laboratory of the University of Tartu Delta Centre, and a randomized controlled trial method was used. Participants were required to read and agree to a consent form prior to the experiment. Following this, participants were seated behind a computer, with both the mouse and keyboard positioned within comfortable reach. The course of the experiment was then thoroughly explained to all participants, after which the eye-tracker calibration process was started. Participants were instructed to maintain their seating position throughout the entire experiment, to ensure accuracy. After this we proceeded with the experiment. Randomly, 1/4 of experiment participants were sorted into one of these groups:

1. Group 1 received a pension system video and a pension navigation tool.
2. Group 2 received a pension system video and a table.
3. Group 3 received a text about the pension system and pension navigation tool.
4. Group 4 received a text about the pension system and a table.

Participants in eye-tracking experiment completed navigation tool in its interactive form, to have maximum involvement. Navigation tool was navigated using mouse. Participants could read the text and tables at their own pace, and upon completion, they were required to press the space bar.

### 3.5. Approach to analysis

In this chapter, we will present methods that were used to analyze previously established hypotheses.

#### 3.5.1. Online survey experiment

In this work, we analyze the second part of the study to obtain the results of our interest, which was to explore the impact of the treatments on the awareness of Estonian pension system (awareness), probability of making changes in pension planning in near future (change probability), confidence in decision-making (sum sufficiency), and show interest to search additional information (clicks on links) about pension. We measured awareness level by asking: “*How informed do you feel about Estonian pension system?*”; change probability by asking: “*What is the probability that you will make changes regarding your pension in the next month?*”; and sum sufficiency by asking: “*Is the amount you reached sufficient for your retirement?*”. These are our dependent variables, which we measured using a Likert 5-point scale. Clicking on links shows if respondent clicked on link 1 or link 2.

To test hypotheses **H1a**, **H1b**, **H1c**, **H1d** and **H2** we conducted a statistical analysis in R software. To test these hypotheses at first, an analysis of means was conducted for the results obtained from the online questionnaire. For a better overview we organized all variables of interest into a matrix of 2x2 factorial design. We conducted t-tests between control group and treatment groups, setting “awareness”, “change probability”, “sum sufficiency” and “clicks on links” as dependent variables and groups (treatment + control) as independent variables to check for statistical significance. To define, if there is statistical significance between groups, and which groups specifically, regarding our dependent variables, we ran a one-way analysis of variance (ANOVA) with post-hoc Tukey HSD (Honestly Significant Difference). For more accurate data analysis we formulated regressions to analyze interaction effects with ANOVA.

#### 3.5.2. Eye-tracking experiment

The focus of this study is to analyze data of an online survey-based pension literacy experiment and provide additional insight on human behavior process by using eye-tracking and emotion measurement, making connections between eye-tracking attention metrics and theoretical constructs of interest (King et al., 2019). Eye-tracking experiment focus is to provide support with fixation metrics for **H1b**, which we will statistically test with online survey results and measure emotions and attention to test **H1d**. Eye-movements were tracked

and analyzed in Tobii Studio software using a Tobii X2-60 eye-tracker device. Two eye-movement metrics were chosen and used for this study – total fixation duration and fixation count. Total fixation duration shows duration across all fixations within area of interest (AOI) and fixation count shows a total number of fixations made in an AOI. To show pension navigation in its interactive form we had to record participants screen and later analyze data using dynamic AOIs.

To support **H1b**, how usage of visuals and interactivity affects clicking on provided links, we placed AOIs to the end card links (see Appendix 1/card #7). To test **H1d** we measure attention on key information points for decision-making in both the navigation tool and table. For that, we designated and focused on three AOI categories “total future pension” (shows the result of contributions); “Contribution/month (€)” (shows contribution amount from salary in euros); “Contribution/month (%)” (shows contribution amount from salary in percentages). For analysis, we grouped TFD and FC results of all navigation contribution cards (Appendix A/cards #1-6) and table (Appendix B) AOIs, that were presenting the same information. Longer fixation duration shows that processing information needs more cognitive effort (Rayner et al., 2007).

To test **H1d** furthermore, we measured “angry” emotion to define which tasks produced higher angry emotion and, therefore, higher cognitive load, indicating task difficulty (Talen & den Uyl, 2022). For emotions we analyzed each person’s average “angry” emotion. We conducted t-tests between navigation and table group average “angry” emotion, to check for statistical significance. Emotions were captured using a web camera and later analyzed in FaceReader software, which recognizes facial expressions.

#### **4. Results and analysis**

Online survey and eye-tracking experiments have different approaches to analysis, which means the results are presented separately but the most important outcomes are analyzed and synthesized in the discussions paragraph (see paragraph 5).

##### **4.1. Online survey experiment**

First, we will present the means and statistically tested differences between the control group and the pooled treatment groups (groups 1-4). Then, we will outline the mean results of our targeted variables for treatment groups. Following this, we will present the outcome of the analysis of the main variables and the outcomes for variable interaction effects between the treatment groups.

The study's outcomes reveal that there were notable differences in means and significances between the groups (Table 4). Participants of group 1 show remarkably higher levels of awareness ( $M=2.80$ ) and probability of change ( $M=1.93$ ) compared to those in the control group. This is supported by t-test analyses and the results show that there is statistical significance on awareness ( $t(646.68) = -3.71, p = <.01$ ) and change probability ( $t(651.28) = 3.71, p = <.01$ ) between the groups. No statistical significance was observed regarding sum sufficiency ( $t(678.29) = -0.62, p = .54$ ). Furthermore, the control group had a higher score in clicking on link 1 ( $M = 0.11$ ) and link 2 ( $M = 0.03$ ) and statistically significant difference was found in the variable of clicking on link 1 ( $t(516.23) = -3.22, p = <.01$ ), which means that treatment groups had no impact clicking on links. Therefore, we can reject **H1b**, which proposed: *people click more on the provided advice links when presented with easy-to-understand visuals with partitioned steps in interactive navigation design, compared to the traditional overview given in table format.*

Table 4

*T-test results and means of variables between control group and pooled treatment groups*

Variable	Mean (Group 0)	Mean (Group 1)	Test statistic	Degrees of Freedom	p-value
Awareness	2.63	2.80	3.71	646.68	<.01
Change probability	1.78	1.93	2.73	651.28	<.01
Sum sufficiency	2.34	2.31	-0.62	678.29	.54
Click on link 1	0.11	0.06	-3.22	516.23	<.01
Click on link 2	0.03	0.01	-1.91	477.40	.06

*Source:* Authors

The 2x2 matrix (Table 5) illustrates the mean (M) and standard deviation (SD) for different variables related to user interactions. Results indicate that participants had a greater likelihood of change probability in pension-related behavior when seeing video and navigation tool (GPS) ( $M = 2.08, SD = 1.16$ ). A one-way ANOVA demonstrated that there is significant difference of change probability level among treatment groups (ANOVA(3),  $F = 4.75, p <.01$ ). Level of awareness among participants was higher when they saw video and table ( $M = 2.90, SD = 0.84$ ). ANOVA test results indicate that there is significant difference of awareness level among treatment groups (ANOVA(3),  $F = 4.90, p <.01$ ). The data presented in the table indicates that the informative links were rather not clicked, as the means ranged

from  $M = 0.04$  to  $0.07$  and there is no significant difference among the groups (ANOVA(3),  $F = 1.12$ ,  $p = .34$ ). Additionally, we conducted ANOVA, to check for significant difference between text and video treatments. We found that the level of awareness ( $M = 2,88$ ) was higher after seeing the video. The result of the t-test shows the statistical significance on awareness level ( $t(1598) = 3.64$ ,  $p < .01$ ). It supports **H2**, which proposed: *an informative video about the details of the pension system is more effective in increasing awareness in pension literacy than similar information in text form*. Results reveal that participants rated estimated pensions sum sufficiency higher, when seeing video and table or text and table. ( $M = 2.38$ ,  $SD = 1.04$ ), but we did not find a statistically significant difference between treatment groups and sum sufficiency (ANOVA(3),  $F = 2.40$ ,  $p = .07$ ). Therefore, we can reject **H1c**, which proposed: *people are more confident in their decisions when presented with easy-to-understand visuals with partitioned steps in interactive navigation design, compared to the traditional overview given in table format*.

Table 5

*Means and standard deviations of different variables related to user interactions*

<b>Group (change probability)</b>	Video	Text	<b>Group (sum sufficiency)</b>	Video	Text
GPS	M = 2.08 SD = 1.16	M = 1.95 SD = 1.10	GPS	M = 2.24 SD = 1.16	M = 2.23 SD = 1.12
Table	M = 1.79 SD = 1.05	M = 1.92 SD = 1.08	Table	M = 2.38 SD = 1.04	M = 2.38 SD = 1.04
<b>Group (awareness)</b>	Video	Text	<b>Group (clicks on links)</b>	Video	Text
GPS	M = 2.85 SD = 0.89	M = 2.74 SD = 0.86	GPS	M = 0.07 SD = 0.26	M = 0.04 SD = 0.20
Table	M = 2.90 SD = 0.84	M = 2.70 SD = 0.84	Table	M = 0.07 SD = 0.25	M = 0.07 SD = 0.25

Source: Authors

ANOVA results indicate statistically significant difference in variables of change probability and awareness. To test which exact groups have significant difference we used post-hoc Tukey HSD tests (Table 7). The results reveal significant differences in awareness levels between the group who completed text and gps ( $M = 2.74$ ,  $SD = 0.86$ ) and the group who completed video and table ( $M = 2.90$ ,  $SD = 0.84$ ). Significant differences of awareness

level were also between text-table ( $M = 2.70$ ,  $SD = 0.84$ ) and video-table ( $M = 2.90$ ,  $SD = 0.84$ ) groups. Additionally, results reveal significant differences of change probability between video-table ( $M = 1.79$ ,  $SD = 1.05$ ) and video-gps ( $M = 2.08$ ,  $SD = 1.16$ ) groups. Based on these results regarding changing probability variable, we can support **H1a**, which suggests *people are more likely to change their actual pension behavior when presented with easy-to-understand visuals with partitioned steps in interactive navigation design, compared to the traditional overview given in table format*. No significant differences were observed between other groups.

Table 7

*Tukey HSD multiple comparisons of awareness and change probability level means*

Variable Groups	Awareness		Change probability	
	diff	p adj	diff	p adj
(video-table) – (video-gps)	0.06	.76	-0.29	<.01
(text-gps) – (video-gps)	-0.11	.31	-0.13	.32
(text-table) – (video-gps)	-0.15	.07	-0.16	.17
(text-gps) – (video-table)	-0.17	<.05	0.16	.17
(text-table) – (video-table)	-0.21	<.01	0.13	.32
(text-table) – (text-gps)	-0.04	.90	-0.03	.99

*Source:* Authors

Additionally, we did not discover any interaction effects. Results indicate that both treatments (groups 1-4) and awareness level independently influence the probability of change, but there is no evidence to suggest that their effects interact with each other (ANOVA(3),  $F = 4.78$ ,  $p = .43$ ). No interaction effect was found regarding awareness variable as well (ANOVA(3),  $F = 4.92$ ,  $p = .40$ ).

#### **4.2. Eye-tracking experiment results**

In this subchapter, we will present eye-tracking experiment main findings. Firstly, we will be highlighting the outcomes of AOI results of navigation tool and table. Then, we will reveal the durations of navigation and table solving time. Furthermore, we present the results of emotions. Figure 1 shows that AOI's in the table received more attention than the AOI's in the navigation tool. The average total fixation duration (TFD) of total future pension in the table was 3.96, contribution/month (€) was 6.54, and contribution/month (%) was 7.88. In

contrast, the navigation tool had an average TFD of 1.38 for the total future pension, 1.41 contribution/month (€) and 0.46 contribution/month (%).

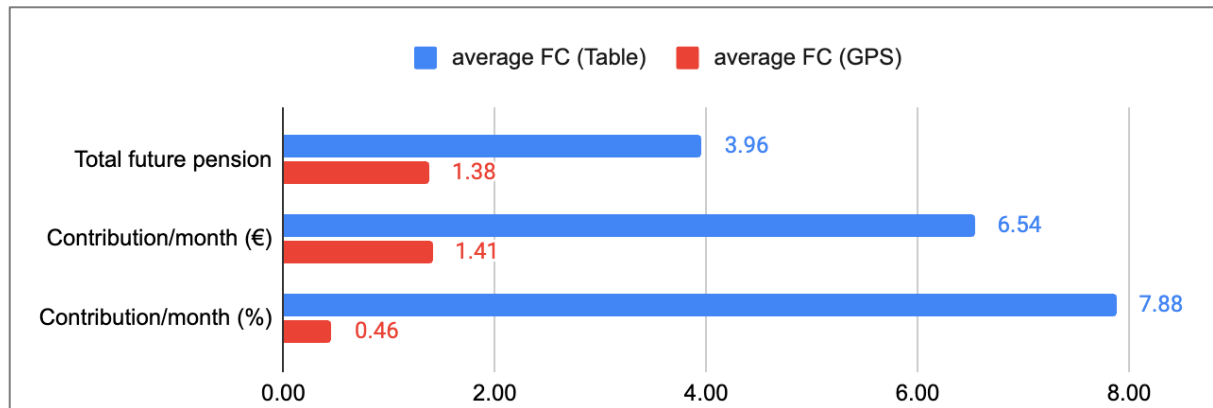


Figure 1. Average total fixation duration (sec) of navigation tool and table format AOI-elements.

Source: Authors

Figure 2 reveals that the average fixation count (FC) for all AOI's in the table were also higher compared to the navigation tool. The FC was 15 for total future pension, 29 for contribution/month (%), and 36 for contribution/month (%). In the navigation tool, the FC was 7 for total future pension, 6 for contribution/month (€), and 2 for contribution/month (%).

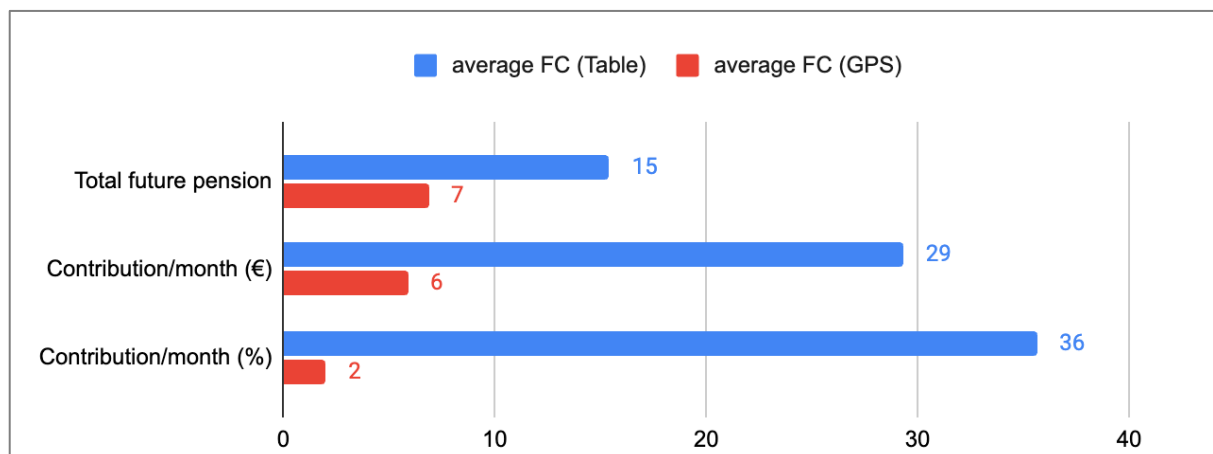


Figure 2. Average fixations count of navigation tool and table format AOI-elements.

Source: Authors

We also discovered that additional provided links received very low attention (Figure 3) in groups where the table was displayed (TFD – 0.65 sec, FC – 4). More attention got links, which were displayed in the navigation tool (TFD – 1.64 sec, FC – 9).

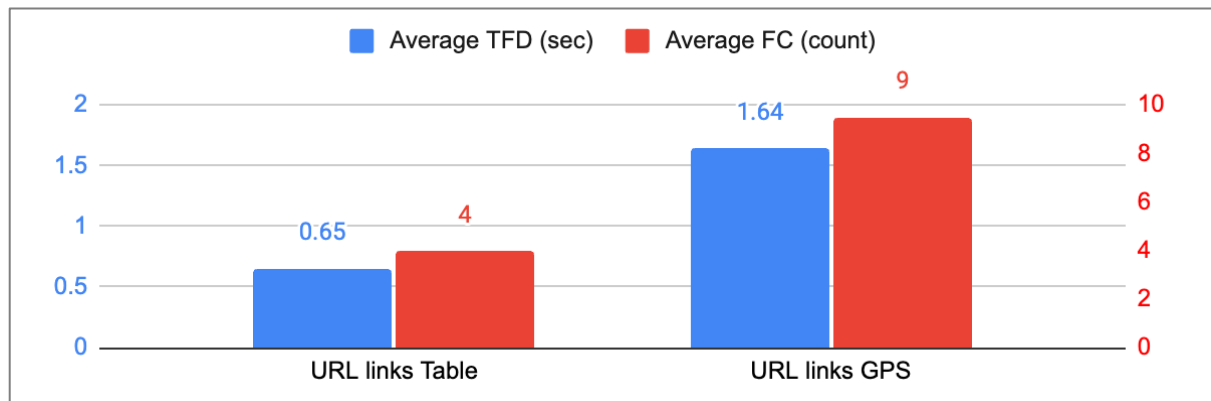


Figure 3. Average total fixation duration and fixation count of URL AOI-elements in table format and navigation tool.

Source: Authors

Then we measured the duration of solving the task. We found that participants completed the navigation tool task faster ( $M = 1.41$  min) compared to table format task ( $M = 2.03$  min). In addition to eye-tracking, we measured “angry” emotion. We found that the emotion was highest ( $M = 1.21$ ) during the table task compared to navigation tool task ( $M = 0.91$ ). T-test result indicate significant difference ( $t(36.68) = -2.54, p < .05$ ) between them. Therefore, we can support **H1d**: *people complete the task with less effort when presented with easy-to-understand visuals with partitioned steps in interactive navigation design, compared to the traditional overview given in table format.*

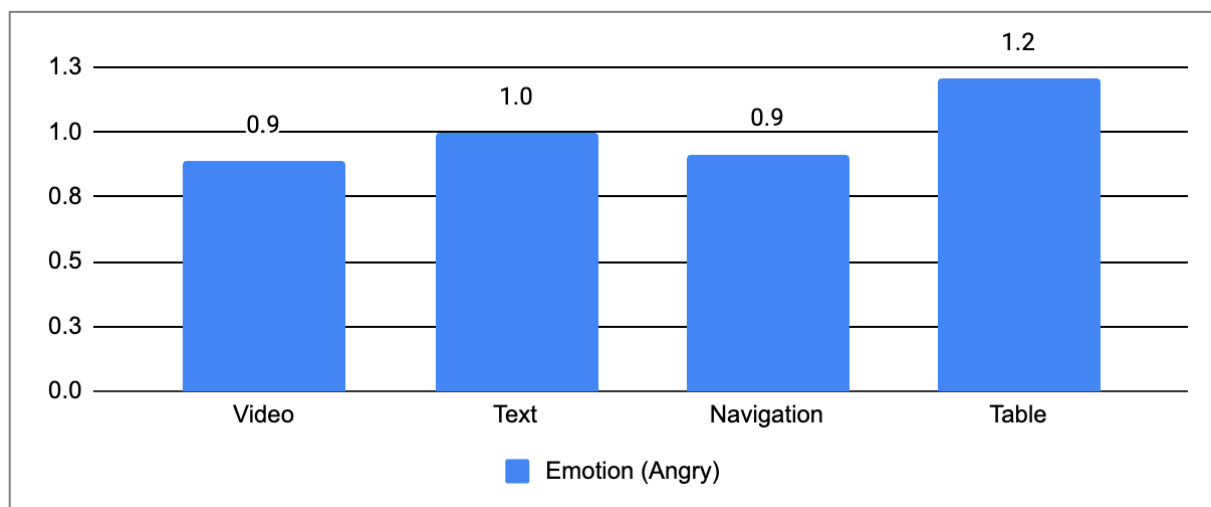


Figure 4. Average “angry” emotions in all treatments.

Source: Authors

## 5. Discussion

Previous studies have indicated the positive impact of using visual representation to present complex financial information (Schröder et al., 2023) and shown that communicating information through video is the most effective in increasing financial literacy (Lusardi et al., 2017). To evaluate the most effective way to communicate Estonian pension system information, we designed video narrative and text presentation treatments. We found a significant difference in awareness level for participants in the two treatment groups that included video. That means, video has the potential to communicate with people as raising their awareness.

People find pension planning complicated (Global Retirement Survey, 2019) and are not interested in involving themselves in pension planning (Prast & van Soest, 2016). Previous studies have indicated the need to use more interactive data visualization tools in finance as this could make information more attractive and understandable. For this study we designed two communication methods for pension planning – navigation tool and traditional table in A4 format. We discovered that people are more motivated to make changes in their pension planning in the near future when they see easy-to-understand visuals with partitioned steps in interactive navigation design, compared to the traditional overview given in table format.

Furthermore, the utilization of navigation tools resulted in quicker task completion in comparison to the table format. This may suggest that participants found it simpler to comprehend the information and make decisions faster as the information was presented

gradually. There is evidence that more complex tasks produce higher “angry” emotions (Talen & den Uyl, 2022). Results of our experiment reveal that participants who completed the traditional table scored the highest average “angry” emotion. That means, navigation tool requires less effort to complete the task compared to table. This aligns with the Kothakota & Kiss, (2020) research results, where visual and textual information presentation improved performance and required less effort.

Previous studies have demonstrated that incorporating interactive elements and visuals can increase people's engagement with a subject (Billari et al., 2023) and lead to search for more information (Brüggen et al., 2019). However, we found an opposite effect regarding the search for additional information as participants clicked more on the links that provided additional information about pensions in the control group. This may be because the control group did not receive any information about the pension system in Estonia. Eye-tracking results reveal that both links got more attention in the navigation tool compared to the table. Therefore, we can discuss that participants did see the opportunity to search for more information about pensions, but they did not click on them.

It is known that policymakers face challenges enhancing the engagement of pension plan participants (Blakstad et al., 2018). This study contributed to evaluating the most effective pension communication methods. Based on the results, we can propose that policymakers could use more visuals and video to reach people and increase their awareness and knowledge about the pension system. We can suggest policymakers can use similar interactive tool solutions to reduce cognitive load and motivate people to change their pension behavior.

When conducting an eye tracking experiment, it is important to acknowledge the potential limitations. One such limitation is the possibility of poor calibration, which may result in the inability to obtain eye-tracking results from the subjects. Another limitation of eye tracking is that it cannot always provide clear answers to all questions. While it can be useful in identifying where a person is looking and for how long, it cannot always reveal the underlying reasons. For example, looking at something longer can indicate analysis, liking or confusion. (Valtakari et al., 2021)

### **Conclusion**

There is limited research on pension communication methods, and policymakers are facing challenges in engaging more people in pension planning and in increasing overall pension literacy. The aim of this research is to investigate how different methods of pension

communication affect people's awareness, attention, confidence, and pension planning behavior to determine which methods are the most effective.

The study involved analyzing data from an online survey on pension literacy experiment in Estonia, as well as data from an eye-tracking experiment. The authors designed four treatments, which included visual and interactive elements, as well as more traditional methods, such as plain text and table in A4 format. The main findings of the study indicate that the use of visuals and interactivity has a notably positive effect on the results. Specifically, the video significantly enhanced people's awareness of the pension system and the navigation tool increased the likelihood of making changes in pension planning in the near future. In addition, the authors found that navigation tool reduced cognitive load when solving the task.

These findings are important for policymakers as they can implement these methods in communication strategies. Using visuals and interactivity in pension communication positively impacts people's pension behavior. Therefore, these communication methods can be helpful to increase engagement in pension planning.

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## Appendix A

### Navigation tool and table design

First, subjects read a text about a hypothetical person:

Try to imagine that you are 30 years old and currently earning a gross salary of €1,500. Below you will see how your choices affect the size of your pension in such a situation. NB! The following sums have been calculated using a simplified model, taking into account the expected retirement age and the future return on assets. The amounts generated by the model do not guarantee that exactly such monthly pension amounts will be realized.

All participants start from the same picture #1, where there is a choice whether to join the II pension pillar or not, and the starting position is 512 euros per month (expected future pension).

A turn to the left displays: does not join pillar II, amount = 512 euros per month. A turn to the right displays: join II pillar: 645 euros (contribution 30 eur per month).

If you don't join pillar II, picture #3 will be displayed.

If choose to join II pillar, then image #2 will appear. Image #2 has three options, going straight is 4% and the amount is 706 eur (contribution 60 eur per month), turning left 2% and 645 eur (contribution 30 eur per month), going right 6% and 767 eur (contribution = 90 eur per month).

Picture #3 - Picture #6 all have the same logic, but the amounts are different for all of them. Turning left gives you the option not to join pillar III, going straight you can contribute 5% (75 eur per month) and turning right you can contribute 10% (150 eur per month). Since the starting position is different in each of the four cases, all the amounts are also equally different.

The last image has many variations – There are displayed participant's choices (shows contribution to pillars), total future pension and an alternative betting option are displayed. After reaching the final destination, participants were directed to image #7, where are displayed the links that provide additional information.

Text of the final result:

You decided not to join the II or III pension pillar. Your pension continues to be collected in the first pension pillar. As a result your total future pension is €512/month. contributing €x

every sixth of the salary. Therefore, your pension will be  $y\text{€}$  higher than if you relied only on the first pillar pension. (€512)

You decided to join the II pension pillar by contributing  $\text{€}x$  of every sixth salary. Therefore, your pension will be  $y\text{€}$  higher than if you relied only on the first pillar pension. (€767, €706, €645)

You decided to join the III pension pillar by contributing  $x\text{€}$  of every sixth salary. Therefore, your pension will be  $y\text{€}$  higher than if you relied only on the first pillar pension. (€816, €664)

You decided to join the II and III pension pillars by contributing  $x\text{€}$  of every sixth salary. Therefore, your pension will be  $y\text{€}$  higher than if you relied only on the first pillar pension. (€949, €797, €858, €1010, €919, €1071)

Additional contribution text:

If you also contributed  $x\%$  of your gross salary to the II pension pillar, your total future pension would be  $x\text{€}/\text{month}$ . (€512, €664, €816, €645, €797, €949, €706, €858, €1010)

If you also contributed  $x\%$  of your gross salary to the III pension pillar, your total future pension would be  $x\text{€}/\text{month}$ . (€767, €919)

This is the maximum contribution to your future pension for these options. (€1071)

Final destinations:

Monthly pension 512 euros.

II does not join, III joins 5% = 664

II does not join, III joins 10% = 816

joins II 2%, does not join III = 645

joins II 2%, joins III 5% = 797

joins II 2%, joins III 10% = 949

joins II 4%, does not join III = 706

joins II 4%, joins III 5% = 858

joins II 4%, joins III 10% = 1010

join II 6%, not join III = 767

joins II 6%, joins III 5% = 919

joins II 6%, joins III 10% = 1071

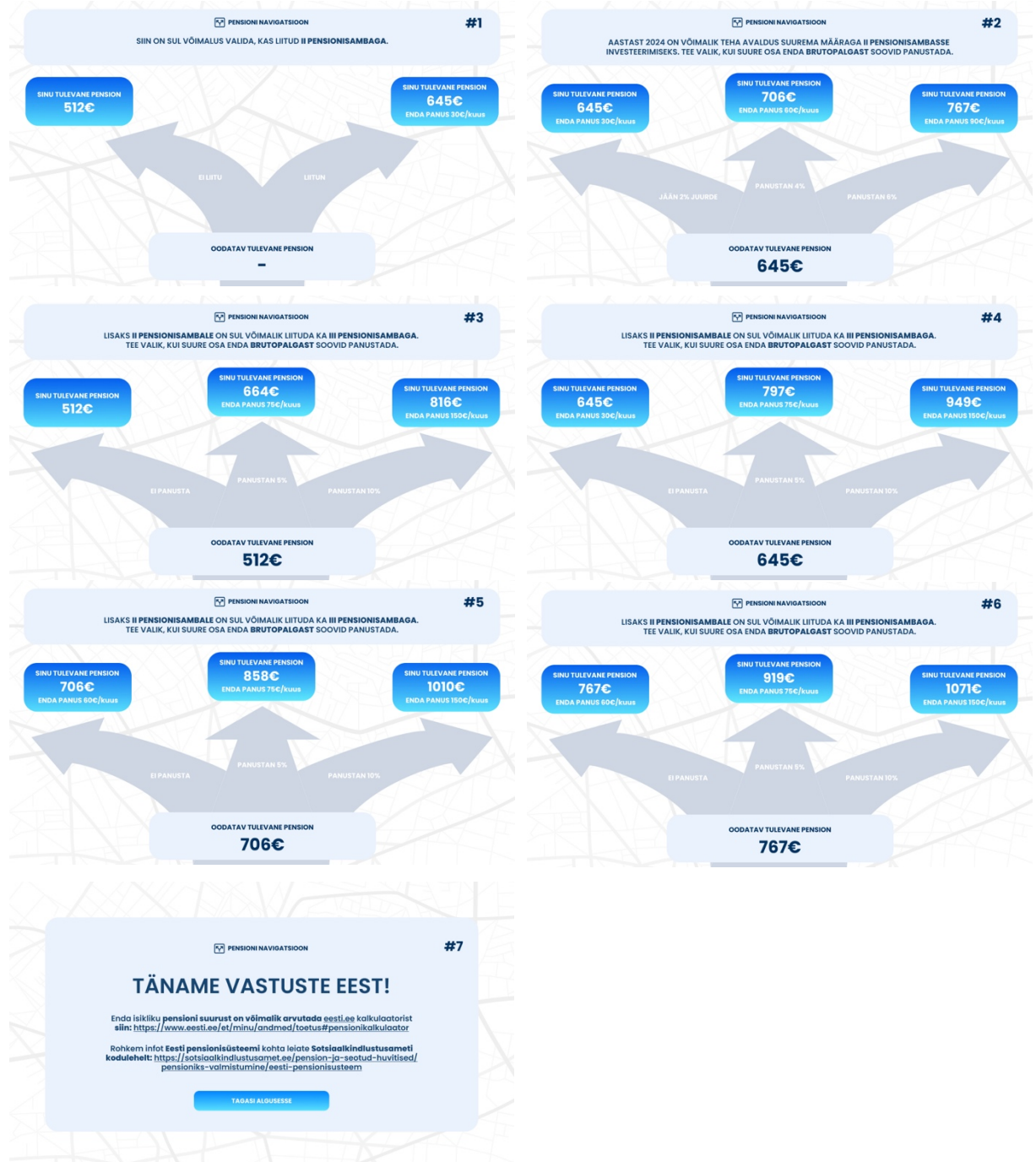


Figure 5. Navigation tool cards.

Source: authors

Proovi ette kujutada, et oled 30-aastane ning teenid parasjagu 1500 eurot brutopalka. Tabelis on näha, kuidas sinu valikud su pensioni suurus sellises olukorras mõjutavad. Palun tee oma valik (variandid 1-12), kui suures ulatuses soovid enda raha panustada.

NB! Järgmiselt välja toodud summad on arvatud lihtsustatud mudeliga eeldatavat vanaduspensioniiiga ning varade tuleviku tootlust silmas pidades. Mudeliga genereeritud summad ei garanteeri, et täpselt sellised igakuised pensioni suurused realiseeruvad.

Nr	Panus II sambasse	Panus III sambasse	Investeeritud summa kuus	I samba tulu kuus	II samba tulu kuus	III samba tulu kuus	Oodatav igakuine pension kokku
1.	-	-	-	512 €	-	-	512 €
2.	2%		30€	512 €	133 €	-	645 €
3.	-	5 %	75 €	512 €	-	152 €	664 €
4.	4%	-	60 €	512 €	194 €	-	706 €
5.	6%	-	90 €	512 €	255 €	-	767 €
6.	2%	5%	105 €	512 €	133 €	152 €	797 €
7.	-	10 %	100 €	512 €	-	304 €	816 €
8.	4%	5%	135 €	512 €	194 €	152 €	858 €
9.	6%	5%	165 €	512 €	255 €	152 €	919 €
10.	2%	10%	180 €	512 €	133 €	304 €	949 €
11.	4%	10%	210 €	512 €	194 €	304 €	1010 €
12.	6%	10%	240 €	512 €	255 €	304 €	1071€

Soovi korral saate pensioni kohta rohkem infot järgmistelt veebilehtedelt:

Enda isikliku pensioni suurus on võimalik arvutada eesti.ee kalkulaatorist siin:

<https://www.eesti.ee/et/minu/andmed/toetus#pensionikalkulaator>

Rohkem infot Eesti pensionisüsteemi kohta leiata Sotsiaalkindlustusameti kodulehelt:

<https://sotsiaalkindlustusamet.ee/pension-ja-seotud-huvitised/pensioniks-valmistumine/eesti-pensionisusteem>

**Figure 6.** Table format design.

*Source:* Authors

## Appendix B

### Video and text treatments design

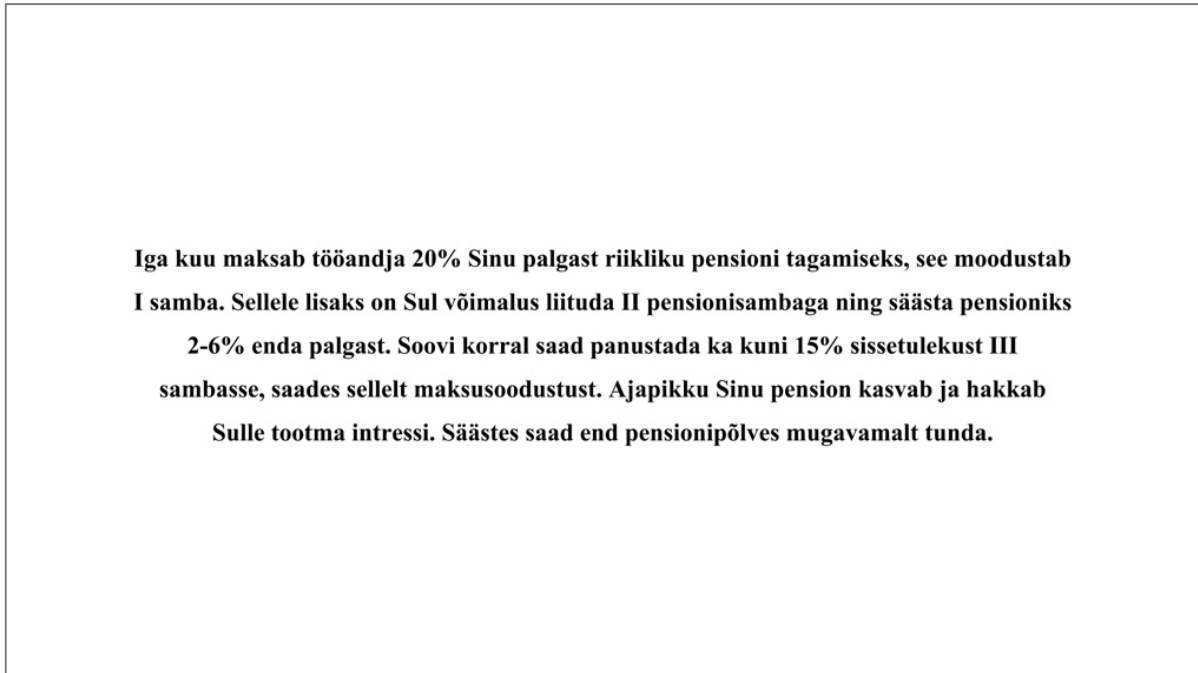


Figure 7. Pension system explaining text.

Source: Authors

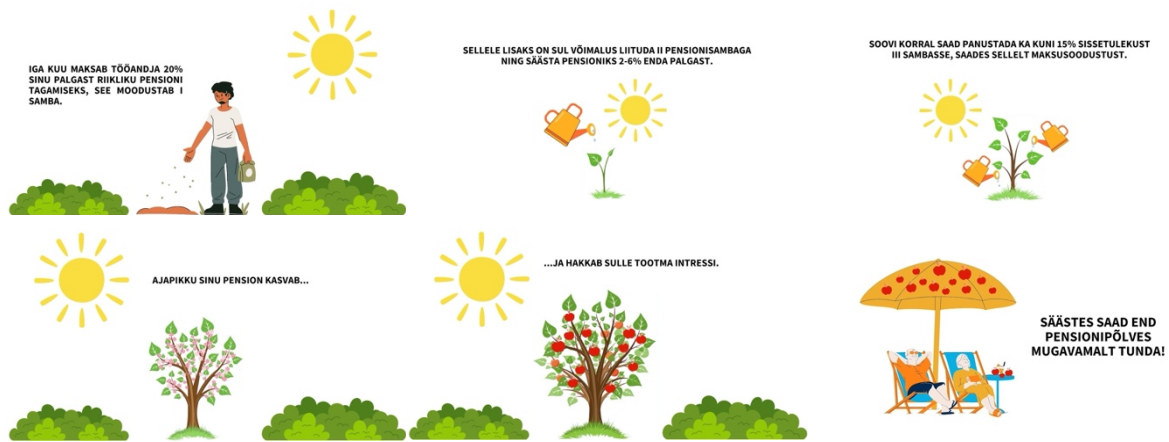


Figure 8. Pension system explaining video metaphor.

Source: Authors

## Appendix C

### Eye-tracking visualizations

Proovi ette kujutada, et oled 30-aastane ning teenid parasjagu 1500 eurot brutopalka. Tabelis on näha, kuidas sinu valikud su pensioni suurst sellises olukorras mõjutavad.

NBI Järgmiselt välja toodud summad on arvatatud lihtsustatud mudeliga eeldatavat vanaduspensioniga ning varade tuleviku tootlust silmas pidades. Mudeliga genereeritud summad ei garanteeri, et täpselt sellised igakuised pensioni suurused realiseeruvad.

Nr	Panus II sambasse	Panus III sambasse	Investeeritud summa kuus	I samba tulu kuus	II samba tulu kuus	III samba tulu kuus	Oodatav igakuine pension kokku
1.	-	-	-	512 €	-	-	512 €
2.	2%	-	30€	512 €	133 €	-	645 €
3.	-	5 %	75 €	512 €	-	152 €	664 €
4.	4%	-	60 €	512 €	194 €	-	706 €
5.	6%	-	90 €	512 €	255 €	-	767 €
6.	2%	-	10€	512 €	133 €	-	645 €
7.	25 panus	35 panus	Kuumakse	15 tulu kuus	25 tulu kuus	35 tulu kuus	Oodatav pension
8.	4%	5%	135 €	512 €	194 €	152 €	858 €
9.	6%	5%	165 €	512 €	255 €	152 €	919 €
10.	2%	10%	180 €	512 €	133 €	304 €	949 €
11.	4%	10%	210 €	512 €	194 €	304 €	1010 €
12.	6%	10%	240 €	512 €	255 €	304 €	1073 €

NBI Kui valik on tehtud, siis palun jätke **valiku number meelde** ning seejärel vajutage „tühikut“.

Soovi korral saate pensioni kohta rohkem infot järgmistelt veebilehtedelt:

Enda lähiki pensioni suurst on võimalik arvutada eesti.ee kalkulaatorist sinu <https://www.eesti.ee/et/2/minu/eesi-2024/valpensionikalkulaator> [Link1](#)

Rohkem infot Eesti pensionisüsteemi kohta leiad Sotsiaalkindlustusameti kodulehelt <https://sotsiaalkindlustusamet.ee/pea/teotud-huvitised/pensioniks-valmistumine/estli-pensionisusteem> [Link2](#)

Figure 9. Table AOI.  
Source: Authors

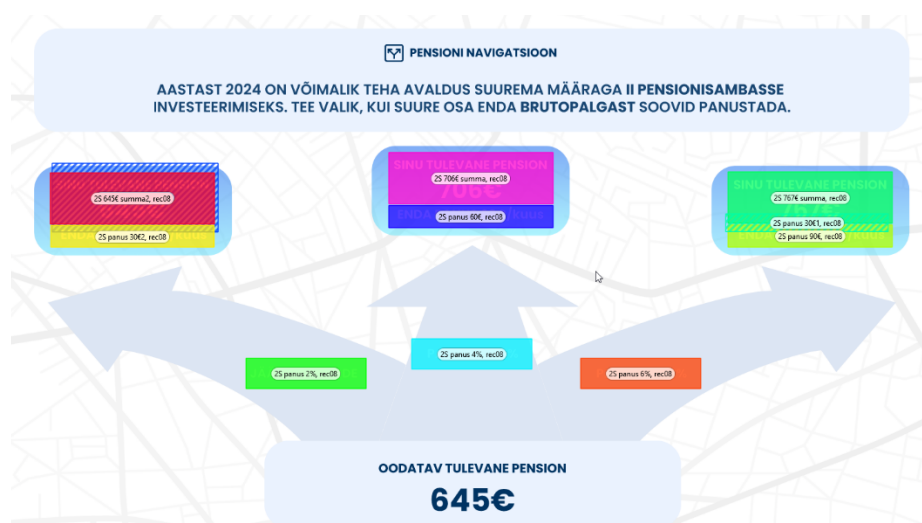


Figure 9. Navigation AOI.  
Source: Authors

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*Robin Talisaar ja Leo Daniel Sipria*  
21.05.2024