UNIVERSITY OF LJUBLJANA
SCHOOL OF ECONOMICS AND BUSINESS

MASTER'S THESIS

THE INFLUENCE OF INDIVIDUAL PERSONALITY AND PHYSICAL CHARACTERISTICS ON RISK TAKING

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INTRODUCTION

Risk aversion or risk taking behaviour is one of the most basic properties of human behaviour in economic sense. The earliest research of the human perception of risk is dated back to the 18th century with Bernoulli (1954) describing the St. Petersburg Paradox. The next major breakthrough happened with mathematically defining the axioms of expected utility theory, which formulated rational behaviour under uncertainty (Neumann & Morgenstern, 1944). As a response to prevailing neo-classical economic theory at the time – efficient market hypothesis, Kahneman and Tversky (1979) offered prospect theory, which explains behavioural aspect of decision making under uncertainty. This was followed by a lively debate and formed two camps of economists, behavioural and neoclassical. Today, behavioural economics is recognized as an important aspect in explaining all sorts of economic puzzles, even the most controversial anomalies on financial markets.

Despite its obvious importance and broad use in several financial models in the past several decades, few economists have addressed the question of where does risk aversion come from (Zhang, Brennan & Lo, 2014). An array of different demographic factors (such as age, gender, education and race) have showed statistical significance on different aspects of risk taking (Faff, Hallahan & McKenzie, 2009; Fisher & Yao, 2017; Halek & Eisenhauer, 2001). In the late 20th century, psychologists focused on risk aversion as a personality trait and also on other personality traits that might have an effect on risk taking behaviour. The most common significantly confirmed trait was sensation seeking, which is described as the need for new, various, and complex sensation and experiences and the willingness to take physical and social risks for the sake of such experiences (Zuckerman, 1979, 2007).

Physical characteristics of an individual have been linked with financial success and social reputation, however the effect on risk taking behaviour remains poorly discussed and studied. For example, body height has shown to have an effect on the annual income (Lundborg, Nystedt & Rooth, 2014) and the effect of the ratio between face height and width was thoroughly researched and proved several relations to personality traits, cognitive skills and even financial success of the company (Re & Rule, 2016; Wong, Ormiston & Haselhuhn, 2011). Other recent studies focused on the influence of steroid hormone level, especially stress hormone cortisol and testosterone (Cueva et al., 2015). There are some findings that go even deeper into the prenatal hormone influence, which is also related to some adult physical and psychological characteristics (Jeevanandam & Muthu, 2016; Stenstrom, Saad, Nepomuceno & Mendenhall, 2011).

Although topic of risk propensity has been widely researched, specific aspects of financial risk tasking remain unknown. The purpose of master's thesis is to examine and present the possible effect of certain personality and physical characteristics on risk taking behaviour.

This would help to understand how personality traits of investors in financial markets affect their risk aversion and their investment strategies. Similarly, it would identify some other factors, which are the consequence of biological predispositions, and might play an important role in defining ones' behaviour later in life. The first part of the thesis is theoretical background presenting past work in the field of behavioural finance and research on factors related to risk taking. The second part is empirical, where I present an experimental study and its' results. With performing the experimental study, I address the following research questions:

- To what extent do participants make decisions in line with the prospect theory or expected utility theory in a lottery choice task?
- What effect do demographic factors have on risk taking behaviour?
- Which personality traits have the largest impact on a persons' risk aversion?
- Is there any correlation between physical characteristics and risk taking behaviour?

Master thesis starts with theoretical framework of decision making under risk. I summarize basic concepts of expected utility theory, risk aversion and prospect theory. I conclude the chapter with the most common behavioural biases that appear in decision making under uncertainty. The next part is literature review, where I first summarize main works on relation between demographic and risk taking, specifically gender, education and age. Next, I focus on research that describe the impact of different physical characteristics on behaviour, namely, steroid hormone level, prenatal exposure to androgen hormones, facial width to height ratio and body height. Lastly, I describe past work on personality traits and propensity to take risk. Empirical part follows, where I first pose the hypothesis of the research, then present the experiment design with methodology, sample descriptive statistics and results of hypotheses testing. In addition, some intriguing findings that were not part of fundamental hypotheses are gathered in further analysis. As last part of empirical part I state limitations of the experimental study and discuss the results. I end the thesis with conclusion.

1 DECISION MAKING UNDER UNCERTAINTY

Financial theory describes human behaviour when faced with uncertainty or risk. The difference between the two terms was clarified by Knight (1921). Risk has a measurable probability of each possible outcome and the number of possible outcome is known, whereas for uncertain event we cannot determine neither. For the development of both theories presented in this chapter (expected utility theory and prospect theory), hold the assumptions of known probabilities of outcomes, even though the term uncertainty is used in some cases. The initial prevailing theory of decision making in risky situations followed the paradigm of *homo economicus*, a rational individual, who always obtains the highest possible well-being. In the late 20th century, the field of research expanded to psychology and breakthrough

findings of A. Tversky and Kahneman (1974) defined a new theory, which explained a number of phenomena which were until then considered anomalies.

1.1 Expected utility theory

Neoclassical economics is the dominant paradigm for traditional finance models. In this setting, individuals and firms behave as self-interested agents who optimize to the best of their ability and limited resources (Ackert & Deaves, 2010). Weintraub (2007) described the fundamental assumptions about people as the following:

1. People have rational preferences among possible outcomes or states of nature.
2. People maximize their utility and firms always maximize profits.
3. People make independent decisions having full and relevant information.

In the real world, certainty is fairly rare, especially in financial decision making, where we always deal with uncertainty about outcomes. The first attempts to describe rational behaviour under risk were made in 18th century by Daniel Bernoulli who noticed that people do not always maximize monetary gain (the expected value of prospect), but rather maximize their utility. He defined the diminishing marginal utility, which implies the utility function should be an increasing but concave function of wealth (Bernoulli, 1954).

Neumann and Morgenstern (1944) mathematically defined the expected utility theory: $E(U) = \sum p_i U(x_i)$, where $E(U)$ is expected utility, p_i is probability and $U(x_i)$ the function of utility. To derive the theory, the following five axioms must hold (Pennacchi, 2007):

1. Completeness

For any two lotteries a and b it holds $a \geq b$ or $a \leq b$ or $a \sim b$.

It means that the individual either prefers a to b, or is indifferent between a and b, or prefers b to a, and therefore an individual has well defined preferences and is always able to decide between any two alternatives.

2. Transitivity

If $a \geq b$ and $b \geq c$, then $a \geq c$.

This axiom assumes that individual has consistent preferences across any three options, so when a lottery is preferred to b and b lottery is preferred to c, this implies that a is also always preferred to c. As an individual decides according to the completeness axiom, the individual also decides consistently.

3. Continuity

If $a \geq b \geq c$, there exists some $p \in [0,1]$ such that $p * a + (1 - p) * c \geq b$

When individual chooses between three lotteries and when a lottery is preferred to b and b lottery is preferred to c, a possible combination of that a and c should exist, in which the individual is indifferent between the mix of a and c and the lottery b.

4. Independence

$a > b$ if for all $p \in [0,1]$ and all c: $p * a + (1 - p) * c > p * b + (1 - p) * c$. Additionally, for any two lotteries a and d, $a \sim d$ if for all $p \in [0,1]$ and all c: $p * a + (1 - p) * c \sim p * d + (1 - p) * c$.

Independence of irrelevant alternatives pertains to well-defined preferences as well, it means that if you are indifferent between a and b events, you will still be so if a and b appear inside a lottery. When two lotteries are mixed with an irrelevant third one, the same order of preference will be maintained as when the two lotteries are presented independently of the third one.

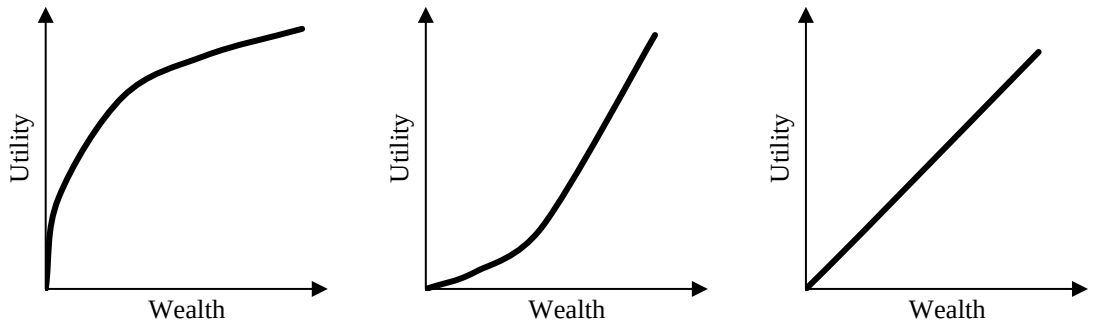
5. Dominance

If L_1 is compound lottery $p_1 * b + (1 - p_1) * c$, and L_2 is $p_2 * b + (1 - p_2) * c$, then it holds that if $b > c$, then $L_1 > L_2$ if and only if $p_1 > p_2$.

The last axiom follows from completeness and independence axioms. All of the five axioms characterize preferences, which show, that between any two (or more) arbitrary lotteries, the one with higher expected utility is chosen (Pennacchi, 2007).

The theory differentiates between three risk behaviours: risk aversion, risk neutrality and risk seeking. In most circumstances people avoid risk, however, they are prepared to take risk when they are compensated for it. Risk preference is defined by the shape of utility function. Risk averse individuals' preferences imply that the utility of expected value of a prospect is greater than the expected utility of the prospect and the shape of the utility function is concave. In contrast, risk seekers' utility of the expected value of a prospect is less than the expected utility of the prospect and the utility function is convex. Risk neutral individuals only care about expected values and risk does not matter. Utility of the expected value of the prospect is equal to the expected utility of the prospect and the utility function is linear. The level of wealth at which the individual is indifferent between a particular prospect and a certain wealth level is called certainty equivalent. For risk averse people, the certainty equivalent is equal to expected utility of the prospect whereas for risk seeking, it is less than the expected utility of the prospect. Risk neutrality implies that the certainty equivalent is equal to expected value of the prospect (Ackert & Deaves, 2010).

Figure 1: Utility functions for risk aversion, risk seeking and risk neutrality



Source: Adapted from Ackert and Deaves (2010).

A given utility function expresses a measure of risk aversion. However, the expected utility functions are not uniquely defined, so the widely used Arrow-Pratt measure of risk aversion remains constant with respect to affine transformation. The measure is also known by name coefficient of absolute risk aversion and was derived from risk premium defined by Pratt (1964): $U(W-\pi)=E[U(W+\epsilon)]$; where W is wealth, π is the risk premium and ϵ is a particular lottery. Risk premium represents maximum amount that individual is prepared to pay in order to avoid a particular risk. When considering the case of a very small ϵ, the derived measure of risk aversion equals: $R_A(W)=-\frac{U''(W)}{U'(W)}$, where U' and U'' are the first and second derivative of a utility function. The more concave is the utility function, the higher is the risk premium and higher is the risk aversion (Pennacchi, 2007).

1.2 Prospect theory

In contrast to expected utility theory, which is normative theory, prospect theory is defined as positive theory. The difference between the normative and positive theory is, that the first determines a certain way according to which reasonable individuals should act and the other observes what individuals actually do and bases models accordingly (Ackert & Deaves, 2010). Kahneman and Tversky (1979) stated that expected utility theory cannot fully explain the observed decision making process under risk and were therefore stimulated to develop their behavioural model which is now known as prospect theory. Key aspects of observed behaviour are:

1. Depending on the nature of the prospect, one individual can sometimes exhibit risk aversion and sometimes risk seeking.
2. Individuals' prospect valuations do not depend on the level of wealth, but on gains and losses relative to a reference point (usually status quo).
3. Individuals are averse to losses since losses hurt more than gains satisfy.

Tversky and Kahneman (1981) observed that people are changing the risk preference behaviour depending on the nature of the prospect with the following problem. Participants in the research were asked to choose between a pair of concurrent decisions:

Decision (1): Choose between P1 (certain gain of 240 USD) and P2 (0.25 probability of gain of 1000 USD; 0.75 probability of 0 gain)

Decision (2): Choose between P3 (certain loss of 750 USD) and P4 (0.75 probability of loss of 1000 USD; 0.25 probability of 0 loss)

In Decision (1), 84 % of the participants chose P1, which shows risk averse behaviour. However, in Decision (2), 87 % of the participants chose P4, which is consistent with risk seeking. The fact that people chose decision pair of P1 and P4 contradicts the expected utility theory, but is explained with prospect theory.

The dependence of individuals' prospect valuations on the reference point rather on the level of wealth was similarly depicted with a decision pair problem (Tversky & Kahneman, 1986). Respondents answered to the following:

Decision (1): Assume you own 300 USD more than today. Choose between P5 (certain gain of 100 USD) and P6 (0.50 probability of gain of 200 USD; 0.50 probability of 0 gain)

Decision (2): Assume you own 500 USD more than today. Choose between P7 (certain loss of 100 USD) and P8 (0.50 probability of loss of 200 USD; 0.50 probability of 0 loss)

When adding the initial increase in wealth to both decision choices, we see, that decisions (1) and (2) are in fact the same. In both decisions one chooses between 400 USD certain gain and a lottery with a 50 % chance of gain of 500 USD and 50 % chance of gain of 300 USD. This means that prospects P5 and P7 are equal and prospects P6 and P8 are equal. By the expected utility theory it would follow that if P5 is chosen, this means that in the second P7 will be chosen. However, the choices made were inconsistent. 72 % of the participants selected P5 and 64 % of the participants selected P8.

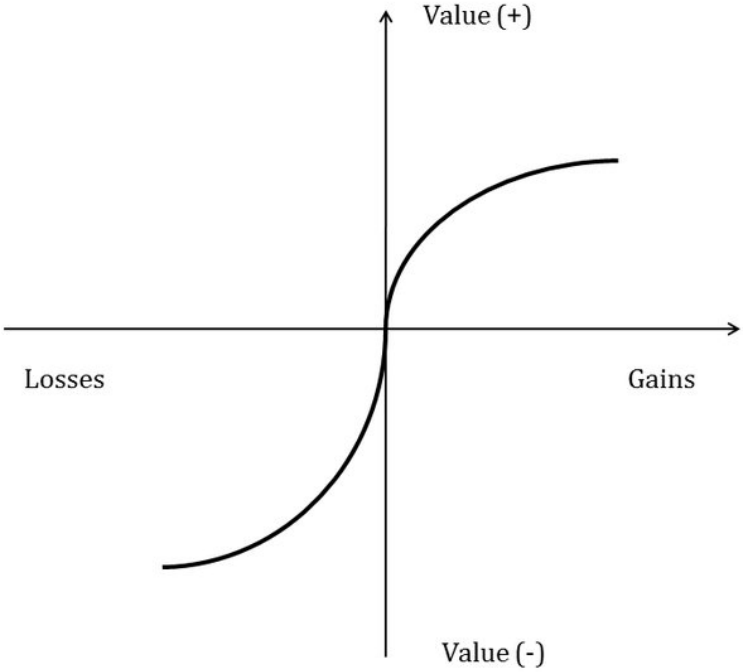
Losses loom larger than gains, which describes loss aversion, is the third key aspect. Tversky and Kahneman (1992) posed the next question problem:

Choose the value x, at which you would be indifferent between P9 (certain loss (or gain) of 0) and P10 (0.50 probability of x USD; 0.5 probability of loss of 25 USD).

The average response of this problem was 61 USD, which shows that people have high aversion to loss. Under risk neutrality, the answer would be 25 USD. We observe that typically requested value, under which indifference is induced, is more than two times higher.

Described three key aspects necessitate the characteristics of a value function (Figure 2) in prospect theory. Value function is concave in the positive domain, when people exhibit risk aversion and convex in the negative domain, when people exhibit risk seeking. Abscise axis of the value function represents changes in wealth (reference point), rather than wealth itself. Individuals dislike losses more than they like gains, therefore the curve is steeper for losses than for gains. Concavity of the value function in the positive domain implies that individuals behave risk averse when faced with a risky choice with positive prospects and prefer choices with lower expected utility but with a higher certainty. On the other hand, convexity of the value function in the negative domain implies that individuals behave risk seeking when faced with a risky choice with negative prospects and again prefer choices with lower expected utility as long as at least some probability exists that loss will be avoided.

Figure 2: A hypothetical value function of prospect theory

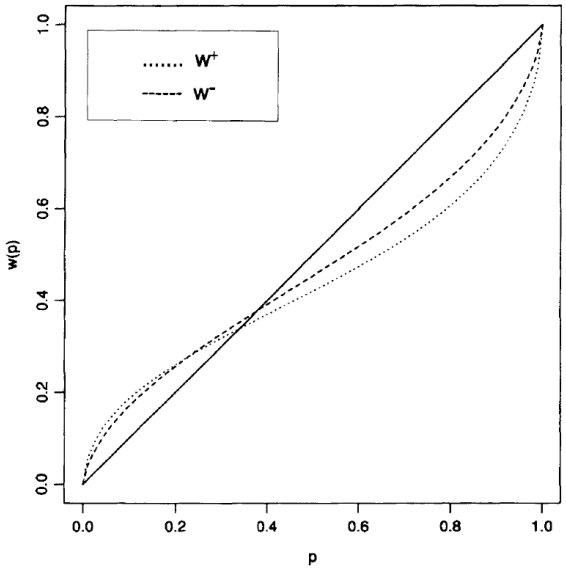


Source: Adapted from Kahneman and Tversky (1979).

The function also does not use simple probability but rather decision weights, which are a function of probabilities. This is the consequence of the observed overweighting of low-probability events. Amos Tversky and Kahneman (1992) argue that people value what is certain relative to that what is merely probable, therefore, they overweight certain outcomes in comparison with highly probable ones. This phenomenon is named certainty effect and

forms the weighting function. It causes a steeper slope in the neighbourhood of probability being equal to one. Similarly, people also tend to overweight the lowest probabilities, which implies that the weighting function is steeper in the neighbourhood of zero. This can be seen in Figure 3, which shows that for both, negative and positive prospects, people overweight low probabilities and underweight high probabilities. The slope of the function is relatively flat for intermediate probabilities, which shows that in this area of probabilities, people are more insensitive to probability difference. Weighting functions for gains and for losses are quite close, although the curve for gains is a bit more curved, which implies that risk aversion for positive prospects is greater than risk seeking for negative prospects for moderate and high probabilities (Ackert & Deaves, 2010).

Figure 3: Weighting function for gains (w^+) and losses (w^-)



Source: Amos Tversky and Kahneman (1992)

1.3 Behavioural biases in decision making

1.3.1 Mental accounting

Mental accounting describes the need to put different expense events in separate mental accounts based on certain characteristics of expense. It eases the process of decision making and is observed in everyday life – for example when people determine a monthly budget for entertainment expenditure. The money is not nominally placed in different accounts, it is just the mental construct, and however it does have an effect on financial decision making. This also contradicts the traditional belief that funds are substitutable. Mental accounting has some positive effects, since it helps exert self-control, but also negative effects, an example would be behaviour on the stock market. A stock investor whose particular stock has dropped in price is reluctant to sell the stock since this would mean closing the account, which is a painful experience because of loss aversion and regret avoidance. When selling

the stock with a loss, investor feels a strong negative emotion – regret (Ackert & Deaves, 2010). Shefrin and Statman (1985) describe this investor behaviour as disposition effect. It is explained either by prospect theory together with mental accounting or by regret aversion coupled with self-control issues. Fear of triggering regret leads to holding onto the loosing stocks and desire for the feeling of pride leads to selling the winning stocks and realizing the gains. The concept of mental accounting was first defined in detail by Thaler (1999). He describes three components of mental accounting.

The first captures the perception of outcomes (or framing), decision making and subsequent evaluation, observed when consumer incorporates the value of the "deal" into purchase decision. Mental accounting represents the topical account framing, which is illustrated by the following example of jacket purchase. People were asked to imagine that they are about to buy a jacket that costs (125 USD) [15 USD] and salesman informs them that the same jacket is available for a price of (120 USD) [10 USD] in a store located 20 minute drive away. The decision problem was if they are prepared to drive to the other store to save 5 USD. People decided to take the drive when they were presented with the price 15 USD and not to take the drive when the price of the jacket was 125 USD (Tversky & Kahneman, 1981, p. 459). Decision making process under mental accounting includes the concept of transaction utility, which is defined as the difference between the amount actually paid for a certain good and the 'reference price' for the same good. Thaler (1985) described this concept with the example of different price of the same product an individual is prepared to pay. The question was formatted as: if you are lying on the beach on a hot day and thinking about how much you would enjoy your favourite bottle of beer – how much would you be prepared to pay for it in (a fancy resort hotel) [a small, run-down grocery store]? One group of respondents was asked a price of a beer they would pay in a fancy resort hotel and the other in a small, run-down grocery store. Respondents gave different answers for the two versions (median responses for resort was 2.65 USD and for a store 1.50 USD). The difference in the prices arises from the different reference prices for a beer in the two presented selling spots. A second component is budgeting, which assigns specific activities to specific account. The typical examples would be grouping of expenses into categories (e.g. food, clothes, rent, etc.) and limiting them to specific budgets, allocating wealth to accounts (e.g. investment, pension, 'rainy day') or dividing income into categories (e.g. regular or windfall). Classical economic theory assumed such accounts to be perfectly substitutable, but in reality they are not, so they should be considered.

The third component concerns the frequency of the evaluation or balancing of accounts, whether the account is evaluated on a monthly or on a yearly basis does make a difference in decision making. Different decisions are also made when some events are looked at and evaluated as individual events or if they are grouped together with other events (Thaler, 1999).

1.3.2 Framing

Decision frame describes a decision makers' view on the presented problem and it is affected by presentation, the person's perception of the question and personal characteristics (Ackert & Deaves, 2010). First documented research paper on the phenomenon of framing was written by A. Tversky and Kahneman (1981). They show that minor changes in the formulation of choice problems causes significant shifts of preference of decision makers. Shift in decision can be caused either by different framing of acts, contingencies and outcomes or by nonlinear values and decision weights. Framing effects were depicted with the example of a survey question posed to several groups of respondents. Participants of the survey were asked to imagine that a deadly disease has spread through some region and 600 people are affected by it. There are two possible treatments: Treatment A, which would result in 400 deaths (200 lives saved) and Treatment B with a 1/3 chance of 0 deaths (600 lives saved) and 2/3 chance of 600 deaths (0 lives saved). The question was posed to two groups of respondents, one was presented with the setting outside the brackets (negative framing) and the other with what is shown inside the brackets (positive framing). Treatment A was chosen by 22 % of respondents when presented with negative setting in terms of number of people dead and by 72 % of respondents when presented with positive setting in terms of number of people saved, even though both problems are exactly the same.

Framing effects were proved to be large and systematic and they occur in different settings – in choices about human life or financial matters. In some settings, problem is presented in a way that encourages a particular reference point. However, in many cases, the reference point is chosen by the decision maker in it depends on whether the perception of the outcome is positive or negative. There are two approaches of choosing the reference point: integration and segregation. In the first case, a decision maker considers all previous gains or losses in particular situation and is more risk seeking. In the case of segregation, the decision maker views at a situation one at a time and is less inclined to accept risk. These two approaches are depicted with the example of betting on horse tracks described by A. Tversky and Kahneman (1981). Supposing that an individual has lost 140 USD at horse track today and now considers betting another 10 USD on a horse with 15:1 odds, which brings the possibility of winning 150 USD in the case if this horse wins the race. If the reference point is status quo, the outcomes of the bet are seen as 150 USD gain and 10 loss. However, many people choose integration approach, which means that all the losses over the day are included in the framing. In this case, a person sees the bet as the possibility to return to the reference point or to increase the loss for 10 USD, making it 150 USD in total. This framing is inducing more risk seeking behaviour and causes selecting the bets with low odds that normally would not be selected. This was even confirmed with an observation that most of the long shot bets are made on the last race of the day.

Thaler and Johnson (1990) described path-dependent behaviour with the breakeven and house money effects. When risk taking is increased after the occurrence of a loss, this is called a breakeven effect, which is also described with the above mentioned example of betting on horse track. However, risk taking is sometimes increased also after a realized gain. This phenomenon is known as house money effect and is often observed in casinos when gamblers are more willing to take risks after they have won.

1.3.3 Heuristics and biases

Often, decisions about uncertain outcome have to be made with limited time and information. During the course of evolution, people have developed shortcuts or heuristics to make the decision as fast as possible. In some cases, especially when used outside the usual domain, heuristics lead to bias and this is why they are an important part of research in risk taking behaviour (Ackert & Deaves, 2010). Some of most commonly observed and mentioned heuristics that lead to bias are presented below.

Representativeness

Despite the fact that many financial decisions are based on probability assessment, people have difficulties in proper evaluation of probability. Representativeness has many manifestation, one of them being conjunction fallacy, where decision maker makes a mistake when not differentiating between simple probability of event A and joint probabilities of events A and B. The assessment of the probability is based on how much A resembles B, when similarity is high, probability of both events happening is judged to be high and vice versa when similarity between A and B is low. For example, people naturally assess that the probability of winning the lottery and being happy is higher than the probability of just winning the lottery. The opposite is true, obviously, since at the same moment of winning the lottery some other unfortunate event could happen which would make the winner not happy (Tversky & Kahneman, 1974).

Another example of representativeness is base rate neglect. When presented with a random process with two possible outcomes and the known distribution of the sample of outcomes, an additional information can lead decision makers to neglect the general (base) information about the share of outcomes when assessing the probability of an event. Hot hand phenomenon describes a belief that the conditional distribution should look like the sample. The expression comes from sports, where it is commonly judged that the current players' statistics affect the probability of success at the next try. Gamblers fallacy, on the other hand, describes thinking that even small sample should look like the population. The fallacy is observed in playing games of chance, where some players expect the odds to turn in their favour based on the law of large numbers (Ackert & Deaves, 2010).

People also tend to overestimate predictability, which is seen in predicting a correlation between two variables that do not have any logical reasoning for correlation (Kahneman & Tversky, 1973). When data are easier to remember and process, availability heuristic occurs. More recent events come to mind faster and lead to believing in greater likelihood of occurring again. This is called recency bias. Salience bias is observed when people focus on prominent information that stands out and ignore others (Ackert & Deaves, 2010).

Anchoring

Decision makers in some cases depend on initially given value to make the final judgement or estimation. Initial value can come from framing of the problem or it can sometimes be some completely unrelated value. Tversky and Kahneman (1974) performed two experiments to research the anchoring behaviour. In the first one, they asked participants to compute the product of the numbers from one to eight in 5 seconds. One group of participants was showed a multiplication problem which started with the number 1, and the other in reverse order, starting with number 8. Participants were forced to provide a rough estimate of the result due to lack of time to do the actual computation. Median estimate of the first group was 512 (sequence of numbers started with 1) and of the second 2,250 (sequence of numbers started with 8). This effect comes from framing of the value in contrast with the following example, where anchoring to unrelated value is observed. In the other experiment, a roulette wheel was spun to stop either on 10 or 65 and after, respondents had to guess the share that African countries represent in United Nations, which is obviously completely irrelevant of the number that was shown on the roulette wheel at random. However, participants who previously saw number 10 guessed lower values (mean value was 25 % share) than participants, who saw number 65 (mean value was 45 % share).

The occurrence of anchoring has been proved in different experiment settings and it is explained by two views. The first explanation is the uncertainty of the true value. The greater is the uncertainty, the greater is the range of true value interval and people cling to any given information. The other view finds reasoning in cognitive laziness. It is easier to focus on the anchor than make an effort of moving away from the anchor value (Tversky & Kahneman, 1974).

Overconfidence

People overestimate their abilities, knowledge and the precision of their information and are excessively sanguine of their future and their ability of influencing it. Miscalibration is the tendency to overestimate the precision of own knowledge (Tversky & Kahneman, 1974). It is measured using calibration tests, where participants answer the questions with confidence intervals. The range of the interval provided is find to be too narrow and the true value lies

within the interval less often than what would be implied by accurate sense of limitations (Ackert & Deaves, 2010).

Other observed strains of overconfidence are also better-than-average effect, illusion of control and excessive optimism. Better-than-average effect is observed when individuals are asked to rate themselves on a certain skills relative to the average and the majority of the sample rates themselves as above average (when in fact only 49.9 % of the sample or population can be better than the average). Illusion of control is revealed when people believe they have more control over events than is objectively true. Excessive optimism is related to illusion of control and it occurs as setting too high probabilities to favourable outcomes given the historical values (Ackert & Deaves, 2010).

2 REVIEW OF LITERATURE ON FACTORS OF INFLUENCE ON RISK TAKING

Literature examines many factors of influence on the risky behaviour of individuals. My main focus lies on financial risk taking and in this context I explore literature and past research on demographic, personality and physical characteristics as variable factors. Demographic and personality factors have been widely researched and literature offers strong background and various hypotheses. Some physical factors in relation to risk taking however, offer limited sources of past research and literature, so I present research that have studied correlation of physical characteristic to other traits, which are related to risk taking. To offer comprehensive overview, I selected papers in which different measurements of risk tolerance are used and which sometimes offer contradictive conclusions.

2.1 Demographic factors

Demography of a person is a fairly easily obtainable and measurable data and therefore offers numerous research in the topic, however, the results are often inconclusive and can differ substantially. When analysing one of the demographic factors, others are always included in the model as controlling variables. Therefore, I often rely on the findings of the same paper in relation to different demographic factors.

2.1.1 Gender

Gender is frequently tested demographic of risk taking behaviour. The usual assumption is that women have lower tendency to take risks than men and this hypothesis is strongly supported by literature, which we describe in detail below. Women were found more risk averse in several settings, as in everyday life situations on the matter of health and physical safety, when making personal financial decisions, and also when dealing with decision

making in professional work context. Even though, the results of studies researching risk taking behaviour in the fields of health and safety are more or less uniform, this is not the case for studies researching financial risk taking behaviour, where the strength of the correlation between risk and gender is often more dependent of other variables, included in the model (Maxfield, Shapiro, Gupta & Hass, 2010).

As stated above, commonly observed result of women's higher risk aversion could actually be a consequence of other variables than biological characteristics. Dwyer et al. investigated revealed risk preferences on a sample of 2000 surveys filled by female and male non-professional mutual fund investors. They found that women take less risky decision in investing in mutual funds, however, knowledge of financial markets and investments has proved as a very important variable, which had, when added to the regression, significantly diminished the effect of gender. This finding suggested that there is a possibility that the lower risk tolerance of women is a consequence of other factors, namely the difference in knowledge level among men and women (Dwyer, Gilkeson & List, 2002). Subject was further researched by Fischer and Yao who conducted multivariate analyses and controlled gender variable with age, income and saving horizon. Data sample used was The Survey of Consumer Finance 2013, where more than 2000 respondents evaluated their willingness to take financial risk in saving or investing on a scale from no risk, average, above average and substantial risk expecting corresponding returns. This answer was used as a measure of financial risk taking. The model shows women are more risk averse than men, even after including variables age, income and saving horizon. However, authors further demonstrated that the gender difference in risk tolerance did not result from gender itself, but rather from differences in the relationship between the independent variables and risk tolerance for men and women. For instance, income uncertainty variable showed negative effect on higher risk tolerance for women, whereas it showed positive effect on higher risk tolerance for men. This shows the different response of women and men to uncertain income. Similarly, higher net wealth is more positively related with men having high risk tolerance. None of the demographic and expectations variables significantly differed form women and men, when the regression was run on logistic model. Findings of the empirical analysis showed that the economic and demographic characteristics are in fact moderator variables in the relationship between gender and risk tolerance (Fisher & Yao, 2017). Same survey question has shown interesting result more than two decades earlier, when Sung and Hanna (1997) also performed an empirical analysis of The Survey of Consumer Finance (1992). Research was focused towards several factors of influence on risk taking. The model included marital status variable (single or married) and the results suggest that risk tolerance of married couples is similar to risk tolerance of households headed by a single male and both are significantly higher from risk tolerance of households headed by a single female (Sung & Hanna, 1997).

To leave other variables aside and to focus strictly on the gender effect, Borghans, Golsteyn, Heckman and Meijers (2009) conducted an experiment with high school students, which represent an uniform group at least in terms of age, education and marital status. This enabled the researchers to also control for IQ and psychological traits. The experiment was designed in a way that participants were placing their bets on which colour of ball will be randomly drawn from an urn. Four urns were presented in randomized order and they differed gradually in their degree of ambiguity. The urn, which tested for risk aversion, had a 0, 5 probability of guessing the correct colour (the number of balls inside the urn was known and equal). Other urns included ambiguity, which means that participants only knew the total number of balls inside the urn, but not exactly what is the distribution of each colour. Different levels of ambiguity enabled to observe the changes in reservation prices. The results show that women, on average, have lower reservation prices and therefore are more risk averse than men. However, in this setting, women showed less ambiguity aversion, especially in initial response to change in ambiguity. Including the psychology traits in the model, explained some portion of gender gap for risk aversion but none of the difference in ambiguity aversion.

Similarly, Hibbert, Lawrence and Prakash (2008) were also interested if the gender difference in risk aversion really exists or if the difference is caused by gender biases in the level of education or in the knowledge of finance. Their research was therefore conducted using uniform sample that includes two differential factors for risk aversion: the level of education and the knowledge of finance. Survey asking for details about the riskiness of personal investment portfolio was sent out to professors of Finance and English at several US universities. Authors find that individuals with the same level of education, after controlling for other demographic variables (age, income, debts, race and the number of children in the household), single women are no more risk averse than their male peers. The financial knowledge variable showed no effect on risk aversion. Gender difference however, was significant at the extreme risk classes – women were found less likely to invest in the asset class that they subjectively assess as the most risky.

Literature also indicates that the gender behavioural differences might affect financial decisions in professional setting as well. Palvia, Vähämaa and Vähämaa (2015) researched the gender effect on bank capital ratio and default risk. The analysis included banks in the US during the period of financial crisis. They found that small banks led by female CEO were less likely to fail in the time of crisis. This was related with holding more conservative capital (female-led banks held about 5-6 % more equity capital than male-led banks) which could be understood that female CEOs were more risk averse. However, in general, there was no correlation found between gender of the leaders of the bank and bank failure. The correlation between gender and likelihood of failure for small banks may indicate that female lower risk tolerance and conservatism can decrease the default risk of smaller banks that are

less able to absorb external shocks and are not faced with stringent market and regulatory oversight.

2.1.2 Education

Another typically researched demographic variable in relation with risk aversion is the education level an individual has obtained. By general belief, education positively correlates with financial risk taking, since it increases an individual's ability to evaluate risks inherent to the investment process (Hallahan, Faff & McKenzie, 2004). Hypothesis was confirmed by the empirical analysis on demographic characteristics influencing risk taking in financial matters by Grable (2000). Risk tolerance was measured as an index consisting of 20 responses to financial risk related situations and the survey was filled out by random sample of faculty staff. The analysis showed that higher level of education relates to lower risk aversion. Sung and Hanna (1997) also came to the similar conclusion in the already mentioned empirical analysis of the data from The Survey of Consumer Finance from 1992 (see chapter 2.1.1 for more details).

Education correlated positively with risk taking also in empirical analysis of a significantly large Australian data base from psychometric attitude test that generate a standardized Risk Tolerance Score (RTS) from 25 questions. Research was focused on the role of demographic factors in personal financial risk tolerance (Hallahan et al., 2004). Gibson, Michayluk and van de Venter et al. (2013) replicated the empirical model used by Hallahan et al. (2004) on a different data base and found no effect of education on personal financial risk tolerance. The measurement of risk tolerance was obtained in the same matter as the first analysis, but in different time period (2009 and 2010). Another variable showed as correlated to higher risk tolerance and that is the level of subjective investment knowledge.

However, in the broader context of risk, it can be argued that the causation relationship between education and risk aversion is unclear. In other words, individual's choice of education level could be affected by his risk aversion or risk aversion could be affected by the education level. Halek and Eisenhauer (2001) were seeking for influence of various demographic factors on risk aversion. Risk aversion was measured as Arrow-Pratt measure of relative risk aversion and modelled from the total face value of all the term life insurance policies on the head of the household retrieved from Health and Retirement Study data sample. The results showed that individuals with high school or college degree have higher risk aversion than the ones that did not finish their education, but at the margin, years of education variable is positively correlated with risk taking behaviour. Authors emphasized that the causality of the two variables still remains unclear.

2.1.3 Age

Researchers commonly hypothesize that risk aversion rises with age, which is also consistent with the usual investment regime, where individuals who are close to retirement invest in less risky instruments, whereas younger population has a more long term and risky (in sense of variability of portfolio value) regime. Research done by Halek and Eisenhauer (2001) (see chapter 2.1.2 for more details) showed statistically significant negative effect of age on risk tolerance when measured from face value of the term life insurance policy. Authors specifically focused on respondents who are over 65 years old and discovered that this is the point in age when relative risk aversion increases the most. Similarly, Sung and Hanna (1997) only found significant negative impact to risk tolerance for the population aged 45 to 54 and over 55. However, when the variable years to retirement was added to the model including the whole sample, both variables, age and years to retirement, showed no significant results.

In contrast, Grable (2000) came to the opposite result, in the survey study conducted among professors and faculty employees (see chapter 2.1.2 for more details), where older respondents had higher risk tolerance. Faff, Hallahan and McKenzie (2009) demonstrated negative relationship between age-squared and risk tolerance, which indicates that risk tolerance first increases with age and then decreases.

Dohmen, Falk, Golsteyn, Huffman and Sunde (2017) investigated how risk attitudes change over the life course. They emphasised the difficulties in recognizing the age patterns due to possible effects of cohorts and period of observation. Empirical analysis was conducted on two data samples – one from Germany and one from Netherlands, both including survey subjective assessment of willingness to take risks in financial matters. The results indicate that risk taking behaviour decline with age when controlling for calendar time and cohort effects. Authors state the possible implication of this result could be that as the population is aging, society is becoming more risk averse.

2.2 Physical characteristics

Human physical traits are often researched in relation with psychological characteristics and further, with personality traits, leadership skills, workplace success and social reputation. Numerous physical traits have shown correlations with leadership skills. Recent studies have showed that male leader's specific physical trait, facial width, can have an effect on the financial success of the company he leads (Wong et al., 2011). Another physical characteristic, body height is significantly related to measures of social esteem, leader emergence, and performance (Judge & Cable, 2004). Both mentioned traits are also known to be correlated with the level of steroid hormone, namely testosterone. In the following

subchapter, I focus on the literature and past research papers done in relation with the mentioned physical traits.

2.2.1 Steroid hormone level

Among the trending topics in the modern behavioural finance is the effect of investors' level of specific hormones. Emotions can cause behaviour which is not in line with rational expectations theory and that is often observed during financial market bubbles and crashes when investors make irrational risk-reward choices. However, it is possible that the observed fear or euphoria on the market is caused by shifts of confidence or risk tolerance, which can in fact be a consequence of elevated steroid hormone level of investors (Coates, Gurnell & Sarnyai, 2010). In the following part I focus on the connection between hormone level and risk taking behaviour.

Hormones are signalling molecules produced by glands which target different organs of the human body through circulatory system. Major classes of hormones are amines (e.g. adrenalin and noradrenalin), peptides and proteins (e.g. oxytocin and leptin) and steroids (e.g. testosterone, estradiol and cortisol). Steroids affect various processes in human body, such as metabolism, growth, immune function, memory, mood, cognition and behaviour. Therefore, when seeking for biological factors of influence on individuals' risk propensity, the level of steroids is the common researched factor. Steroids help in coordinating body response to situations such as fight, mating, feeding, search and struggle for status, which to some extent resemble situations on financial markets. Steroid hormones (cortisol, testosterone and estradiol) mainly target the brain in regions which are involved in financial decision-making and in emotional or irrational response to financial signals. Among those regions are hippocampus, prefrontal cortex and amygdala. Hippocampus is responsible for novelty detection and for creation of declarative memory. In contrast, prefrontal cortex is essential for working memory, the cognitive mechanism that allows keeping small pieces of information active for a limited period of time. The amygdala is connected with fear and emotions and also with memories conditioned with fear (Coates et al., 2010).

Since testosterone affects sexual behaviour and competitive encounters, researchers started to examine its effect on financial risk-taking. Coates and Herbert (2008) proved that traders do have elevated testosterone level on days they make higher than average profit. Research was done on seventeen young male high frequency traders. Testosterone levels were extracted from saliva samples, which were taken twice a day (at 11.00 and 16.00) for eight business days. Participants were working as usual, they positioned securities in European and US bond and equity markets but held their positions for a short period of time. However, just as in the education variable, the causation of testosterone level and profitability of the portfolio is unclear. Authors could not determine whether the profits were raising testosterone levels or vice versa. One more interesting finding comes from the same research

- when looking only at morning measured levels, it was found that on days with above average level of testosterone the profitability was higher than on days with below average testosterone level. This result suggests that moderate levels of testosterone did not encourage highly risky behaviour but were instead optimizing performance, at least in case of high-frequency trading (Coates & Herbert, 2008).

Another study of naturally occurred levels of steroids was done in an experimental trading design with real monetary rewards. Participants were male and female and were trading amongst themselves. Salivary samples for measuring levels of cortisol and testosterone were taken before and after each trading session. An experimental design was previously used to analyse stock market bubbles in the laboratory. A group of typically 10 participants traded assets in a computerized bilateral exchange. At the beginning they were given a certain amount of cash and assets. Each experimental market had 15 trading periods, which lasted for 2 minutes. After each trading period, all of the assets were randomly assigned either positive or negative dividend. The distribution of dividends was known and the expected value of the distribution was zero. Laboratory experiment imitates actual financial markets where several participants trade assets as buyers and sellers determining the price in a series of several bilateral exchanges. What is important here is, that in both (actual and laboratory) settings, the behaviour of one investor, affects other investors' behaviour. This characteristic plays an important role in situations of extremely volatile price movements, such as during bubbles or crashes, when herding and momentum trading happen. Given the design of the experimental trading, risk measurement was derived from the number of transactions. This comes from a preposition that traders who have higher frequency of trading are also willing to accept or offer aggressively priced assets and have therefore higher risk tolerance. Regression showed high correlation between cortisol level and trading activity in men and insignificant result for testosterone and trading activity interaction. Similarly for women, the results for both hormones were insignificant. Additionally, authors were interested in the effect of hormones on the overall market price stability. Aggregate price volatility in the market was measured as normalized absolute deviation, which is the sum of the deviations of prices from the fundamental value in every market transaction and it does not take into account just prices, but also trading amounts. First measurement of cortisol (before first trading period) was significantly correlated with normalized absolute deviation. There was no correlation between cortisol or testosterone levels measured after trading period and normalized absolute deviation in any of the markets. Together, the associations found in this experiment confirmed the hypothesis that cortisol does have an effect on trading behaviour in the direction of higher risk taking and mispricing at the market level. Authors added a remark that it is possible, that cortisol and testosterone levels were elevated before the trading session because of anticipatory stress of participants. Therefore, the possibility that elevated testosterone has significant effects on trading behaviour cannot be excluded (Cueva et al., 2015).

Nofsinger, Patterson and Shank (2018) measured testosterone and cortisol levels of finance graduate students in laboratory experiment financial trading simulation tasks. Experiment design included portfolio asset allocation task and a series of portfolio rebalancing tasks. In the first task, authors were measuring risk as expected portfolio return of a diversified portfolio and found that higher levels of testosterone and cortisol are associated with lower levels of expected return for both and therefore, with lower risk. Similarly, cortisol also negatively affects diversification (measured as number of assets in portfolio and as sum of squared allocations). In contrast, testosterone levels did not appear to be related to the diversification variables. With the rebalancing task, participants were tested for adjustments to portfolio risk and for buying or selling of losers or winners, which analyse two common investment biases: trend following and loss aversion. By measuring excess expected return the regression showed significant impact of higher testosterone level on higher risk taking than was required to reach the goal. Loss aversion was examined by analysing negative return assets within the portfolio. Majority of participants bought more of the losing asset rather than simply holding their current position, which is inconsistent with the disposition effect of holding on to the loosing asset to avoid regret. This can be explained by the fact, that the task was designed around portfolio return, not a specific asset return. Subjects with higher levels of cortisol, thus more stressed, purchased more of the losing assets. Finally, the study also reports a link between testosterone level after the experiment and the outcome of the participants' portfolio task. Participants got the final returns of their portfolio and were ranked within the group. Testosterone levels changed the most with the highest returns. This is an important result since it can lead to a cycle, when investors tend to be more optimistic, buy more stocks and behave more risky.

2.2.2 Prenatal androgen hormone exposure

All of the above mentioned papers used saliva samples to measure the current steroid hormone level. In modern research there exists another commonly used measure method which serves as a proxy for prenatal androgen exposure - 2D:4D ratio. This represents the ratio of length of index finger and ring finger, typically measured from the mid-point of metacarpophalangeal crease (crease the closest to wrist) to the mid-point of the tip of the fingers.

2D:4D ratio has various implications in medicine and it is related to number of psychological, behavioural and physiological traits of human. Ratio of 2D:4D was found to correlate negatively to testosterone and positively to oestrogen in the foetus, the digit ratio remains constant since birth and is not influenced by the adult hormone levels. Since the hormones testosterone and oestrogen play crucial role in determining the ratio value, gender is obviously the factor of influence. When comparing, men have lower ratios than women. In research so far, digit ratios have been shown to be correlated with various characteristics, such as numerical competencies, spatial skills, handedness, cognitive abilities, academic

performance, sperm counts, personalities and prevalence of obesity, migraine, eating disorders, depression, myopia, autism etc. (Jeevanandam & Muthu, 2016).

Coates, Gurnell and Rustichini (2009) measured 2D:4D ratios of 44 high-frequency financial traders and followed their financial success (P&L). This specific group of profession was chosen because traders must possess specific cognitive characteristics, such as confidence, ability to process information quickly and higher risk taking preference. Authors predicted that traders with a lower 2D:4D, which means higher exposure to androgen hormones, would make greater long-term profits and would remain in the business for a longer period of time. The measure of financial performance was individual traders' profit and loss (P&L) statement, which is objectively measured by the companies' back office. Hypothesis was confirmed, the results showed that the lower a trader's 2D:4D ratio, the greater his P&L; the same holds for rank-ordered P&L. When adding other variables into the model, years of experience was found to be significant. Model predicted approximately equal contribution of 2D:4D and experience to an individual trader's P&L. Authors have deepened the study with researching the reasons for the digit ratio effect. Seventeen participants of this study had already participated in another study (Coates & Herbert, 2008), where salivary samples were taken and level of steroid hormone was measured. When combining the results of both studies, they discovered that 2D:4D predicted the magnitude of the difference of P&L on days with high testosterone and P&L on days with low testosterone. This finding suggests that prenatal androgen exposure may affect a traders' performance through changes in circulating testosterone (Coates, Gurnell & Rustichini, 2009).

Another study focused on several aspects of risk taking - social, recreational, ethical, health and financial. Again, 2D:4D was used as a proxy for prenatal testosterone level proxy, however, they also measured additional digit ratio, that is rel2, which is a ratio of second digit and the sum of all other four fingers' lengths. Risk propensity was assessed with domain-specific risk-taking behaviour scale, where each of the five domains contained 10 five-point Likert-type items assessing one's likelihood of engaging in a given risky activity. Sample size was greater than 400 and participants were university students. The analysis showed significant negative correlations between 2D:4D and financial risk in men sub-sample. There were no significant correlations for female sub-sample, for either measure of digit ratio. Authors emphasise the importance of ethnicity control in digit ratio research, since the model with included ethnicity variable or sub-sample gave much more significant results (Stenstrom et al., 2011).

Apart from 2D:4D ratio, there are also other ways to measure or to infer about pre-birth exposure to testosterone. One of the markers is a natural phenomenon that occurs with some twin births, and is known as the "Twin Testosterone Transfer" (TTT) hypothesis which was confirmed by several studies of humans. Evidence reported that female twin who shares a womb with a male twin, shows elevated testosterone levels, as well as the masculinization

of anatomical, physiological, and some behavioural traits (Slutske, Bascom, Meier, Medland & Martin, 2011). Based on the conclusive results proving the TTT hypothesis, Cronqvist, Previtero, Siegel and White (2014) conducted broad research using the data from world's largest twin registry Swedish Twin Registry (STR) and other sources which provided demographic, financial and survey data. The sample size was almost 35,000 and it consisted of dizygotic twins and compared female twin with a male co-twin with female twin with female co-twin. Several measures of financial risk taking were used. The first was the share of risky assets out of all financial assets (Risky Share). Second measure was the volatility of the risky financial assets portfolio, calculated for each twin and each year using 12 monthly return observations, annualized and value-weighted (Portfolio Volatility). Third main proxy was defined as fraction of risky assets held directly in stocks, as opposed to mutual funds (Proportion Stocks). Further on, other used measures were: the decision to participate in the stock market, the share of risky assets conditional on participation, the volatility of the entire financial portfolio, consisting of risk-free and risky investments, proportion of all financial assets invested directly in stocks, the number of sales transactions in a given year relative to the number of portfolio positions at the beginning of that year, investments in lottery stocks and investor's preference for skewness. Based on the three main risk-taking proxies (Risky Share, Portfolio Volatility, and Proportion Stocks), it was confirmed that men take more risk than women, and females with male co-twins take more risk than females with female co-twins. Similar pattern was found in almost all financial risk measures. Model included controlling variables age and family status (whether or not a female had other male siblings). Authors also researched gender gap with including male sample and compared the results with both groups of female twins. The model shows that for Risky Share, female with male co-twin has on average a 38.6 % smaller gender gap compared with a female in the control group (with a female co-twin). To improve robustness of the model, other controlling variables were added, such as social interaction among twin siblings, presence of other male siblings and sample selection. Paper on a large data sample from real environment shows that differences in individuals' prenatal environment can explain heterogeneous financial decision making later in life. An exogenously increased exposure to testosterone in pre-birth time is therefore associated with higher financial risk taking and the masculinization of financial behaviour in adulthood.

2.2.3 Facial width to height ratio

Human facial width to height ratio, in literature referred to as fWHR, represents the ratio of two distances, distance between the left and right zygion (bizygomatic width) and the distance between the upper lip and mid-brow (upper facial height). Facial WHR is a sexually dimorphic trait (men tend to have larger fWHR than women) and is not related with body size (Weston, Friday & Liò, 2007). The ratio has proved as correlated with behavioural aggression in men. Study was done in a way that participants were randomly shown photographs of men with neutral face expression and were asked to estimate on a scale of 1

to 7 how aggressive would this person be if provoked. Additionally, photographed men were tested for their actual aggression behaviour with a laboratory task. Facial WHR showed to be highly correlated with both, perceived aggression from others and actual aggression behaviour (Carré, McCormick & Mondloch, 2009). This result shows that fWHR is linked to certain personality or behavioural trait and based on this finding, other group of researchers posed a hypothesis that this can have broader effect on financial success of organizations.

Wong, Ormiston and Haselhuhn (2011) confirmed the hypothesis and therefore found a link between a CEOs' fWHR and the firms' financial results. Sample consisted of 55 publicly traded Fortune 500 organizations from a range of industries, including computer manufacturing, transportation, and retail and which on average, had generated 38 billion USD in sales and had 119,684 full-time employees. All CEOs in the sample were male. Measures of fWHR were taken from photographs and firm's performance was assessed by calculating the return on assets (ROA). Controlling variables included in the model were CEO age, past financial performance and firm size. Results supported their hypothesis - CEOs' facial WHR is positively related to firms' financial performance and it explains approximately 7 % of the incremental variance in firms' return on assets.

Another study examined whether the CEO's fWHR could predict his risk taking behaviour and therefore the riskiness of his firm's financial and investment policy. Sample consisted of more than 500 male CEOs. The dependent variable, total risk of the firm, was measured as the standard deviation of the daily stock returns over the fiscal year. Additional dependent variables were the financial leverage ratio, number of completed acquisitions in which more than 50 % of target shares were acquired and in which the deal value was at least five million USD and, the Vega of CEO compensation package. The model, which included a series of controlling variables, showed that the CEO's fWHR is significantly positively associated with stock return volatility, idiosyncratic risk, financial leverage ratio, acquisitiveness, and the Vega of CEO compensation. These findings suggest that a CEO's personal and physiological traits can be one of the key predictors of the riskiness of corporate financial and investment policy (Kim & Kamiya, 2015).

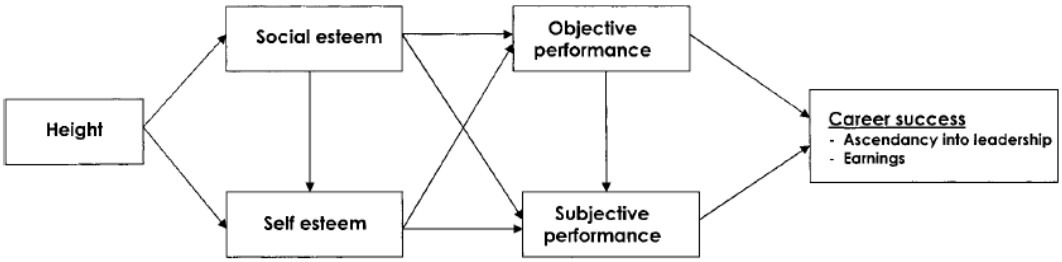
2.2.4 Body height

To my knowledge, there has been little or no research on correlation between physical height and risk taking behaviour, so I present other related traits. Studies in social sciences consistently find positive association between body height and their social status, which includes income, career success and cognitive and non-cognitive skills.

Judge and Cable (2004) presented a theoretical model that shows through which mediating processes height affects career success. It starts with the effect that body height has on how

individuals regard themselves (self-esteem) and how individuals are regarded by others (social esteem). Social esteem and self-esteem then affect individuals' job performance and also the evaluation of their performance done by supervisors, which has a direct effect on success in their careers. Relationships that are directly suggested or implied by the model were included in hypotheses and tested with meta-analysis of the literature. The results indicated that physical height is significantly related to measures of social esteem, leader emergence and performance. There was a stronger correlation (although not significant) of height to success for men than for women. Authors also present large-sample studies which prove that height is positively related to income after controlling for sex, age and weight. Other interesting and important finding of this study is that, it does not appear that the advantages of height are caused by a possible link between height and intelligence. The results also show that the height and income correlation does not decline over time and that height is more predictive of earnings in occupations that may rely on appearance and stature as a means of achieving success.

Figure 4: Theoretical model of the relationship between height and career success



Source: Judge and Cable (2004)

As shown above, and also in various studies, height does have an effect on career success and thus also on income. The cause of this linkage is the main object of research in the two studies conducted using the same data source. Case and Paxson (2008) attribute the height and income correlation to cognitive skills whereas Persico, Postlewaite and Silverman (2004) stress the importance of non-cognitive (or social) skills. The second study found that the correlation between adult height and earnings per hour among white men is essentially explained by body height in adolescence period. In addition, they showed that cognitive test scores in childhood do not affect the magnitude of the association between height and earnings. Instead, the link between teen height and adult earnings comes from participating more in activities that build social skills during adolescence. On the other hand, Case and Paxson (2008) argue that positive correlation found between height and earnings, does not prove the causal height effect, but rather the height is correlated with cognitive ability via some underlying third factor which affects both height and earnings. The study uses wider inclusion criteria and shows that common environmental and nutritional factors during childhood affect growth and cognitive development. Authors also present evidence on the association of boy's heights at age 16 with the economic status of their fathers; the

correlation between height and cognitive test scores from very early ages and that test scores in childhood predict the timing of the adolescent growth spurt. These are the arguments that indicate that adolescent height serves as a marker of much more than teen social experience.

Based on both above presented studies, Lundborg, Nysted and Rooth (2014) conducted a research on large sample of Swedish men to seek for reasons why tall people tend to earn more. Regression results showed that on average, 10 centimetres in height translates into 6 percent higher annual earnings among Swedish men. Mechanism of the model included three categories of causes: control factors (family background and cognitive skills), mediating factors (non-cognitive skills) and preferential treatment (discrimination). Their results show that multiple causes answer the question of why tall people earn more. They confirm finding of Case and Paxson (2008), that not controlling for cognitive skills in the model, severely biases the estimate of the height premium upward. However, they also confirm the hypotheses by Persico, Postlewaite and Silverman (2004) that non-cognitive skill mediates a substantial part of the estimated height premium when controlling for cognitive skill and family background. This results emphasize the role of nutritional and social conditions during early stages of life. For instance, if shorter children are discriminated against by being excluded from participating in social activities or taking on responsibilities which builds non-cognitive skills, such as leadership, then this shortage of non-cognitive abilities can have an effect later in life (Lundborg et al., 2014). This is an interesting angle from the perspective of risk propensity and could offer a new hypothesis that physical height might be related with risk taking behaviour through non-cognitive skills.

Schick and Steckel (2015) focused on the effect of cognitive and non-cognitive skills on height premium. Data observations were part of British National Childhood Development Study, a longitudinal study, which observed participants right after birth and then six times more, the latest observation being done at the age of 42. The evidence of the analysis suggested that cognitive ability and social skills play an equally important role in explaining the relation between height and earnings. When controlling for both skills, height premium for male was reduced by approximately 75 percent and for female 100 percent.

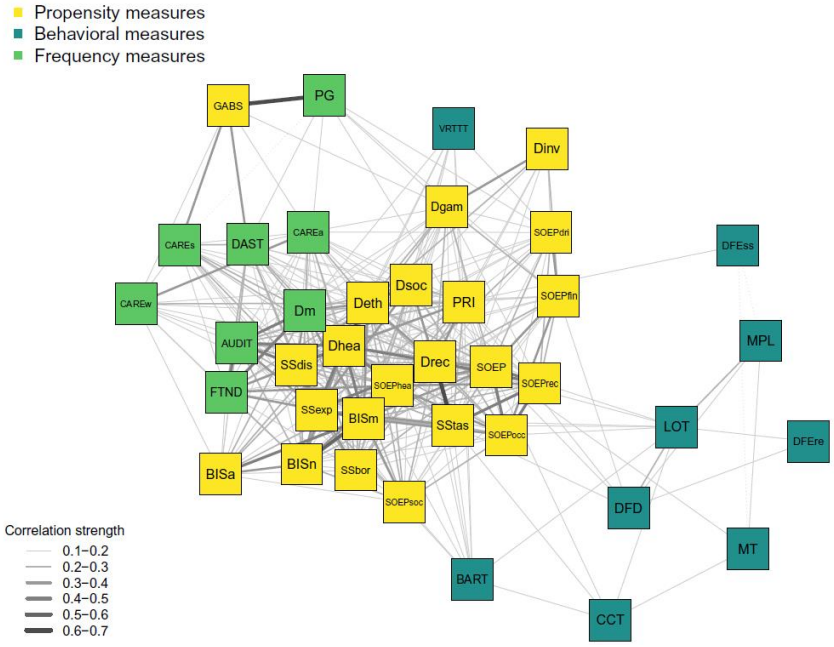
2.3 Personality traits

Psychology science treats the individuals' risk preference as a stable personality characteristic or psychological trait. This belief implies that a given individual will always behave according to his predetermined risk preference across a range of situations (Figner & Weber, 2015), however this is not confirmed by empirical results, where individuals' are found having different risk preferences towards financial, social, health, ethical or recreational matters (Stenstrom et al., 2011).

The issue of the risk preference classification as a personality trait was researched in detail by Frey, Pedroni, Mata, Rieskamp and Hertwig (2017). In their research article they examined whether self-reported risk preferences (obtained through propensity measures), revealed risk preferences (obtained through behavioural measures), and assessment of the engagement in actual risky activities (obtained through frequency measures) capture the same underlying general construct of stable risk preference. All types of tested preferences and correlations between them are depicted in Figure 5. For a concept to be defined as a personality trait, it must hold that it is consistent over time (varying only in specific life stages or at momentary shocks, but with rank-ordered stability). Therefore, the authors further focused on the temporal stability of risk preference. Additionally, they examined the convergent validity of different measures of risk taking behaviour, in other words, the correlations among different measure method. The research included a sample of over 1500 participants in two study centres. Self-reported risk preferences were assessed with a series of five questionnaires (including Domain-specific risk-attitude scale and Sensation Seeking Scale), revealed preferences with eight behavioural tasks (including monetary incentivised Lottery choice, Multiple price task, Balloon Analogue Risk Task, etc.) and actual current and past risky activities were measured by six scales (including Drug Abuse Screening Test, Encounter with risky situations, Pathological gambling, etc.). Sub-sample of 109 participants repeated the test 6 months later, to enable observation of the temporal stability of risk preferences. Altogether, research includes 39 measures, repeated testing and relatively large sample size, considering other related research. The results revealed substantial gap between stated (or self-reported) and behavioural preferences. Also, the frequency measures' correlations with the behavioural measures were substantially weaker than those with propensity measures. This pattern suggests that behavioural measures of risk preference follow a unique variance, which is not related to propensity and frequency measures. To check the temporal stability, test-retest reliability method was used, where retest represents data obtained from repeat test 6 months later. General factor of risk, combined from all measures, proved to be reliable over time. This provides some support for the idea of risk preference as a psychological personality trait with a certain degree of temporal stability.

To address conceptual issue of measuring risk preference in economics and psychology, three aspects must be analysed; in addition to above mentioned temporal stability and convergent validity, also predictive validity. Predictive validity refers to what extent can we forecast a behaviour from a psychological trait. Current evidence suggests no advantage of revealed (behavioural) over stated (self-reported) preference measures in forecasting real-world outcomes. Stated (self-reported) risk preference, can be considered as a moderately stable, general psychological trait, thus representing an important variable to consider in psychological and economic theories and research. Nevertheless, the measurement of risk preference needs more attention and further research, specifically the behavioural one (Mata, Frey, Richter, Schupp & Hertwig, 2018).

Figure 5: Network plot of correlations between risk-taking measures



Source: Frey, Pedroni, Mata, Rieskamp and Hertwig (2017)

If I now put my focus to other personality traits that may be related to risk tolerance (regardless if the latter is treated as a personality trait or not), the most related trait is sensation seeking, which has been consistently found to be a factor of impact to risk taking behaviour (Zuckerman, 1994). Sensation seeking is defined as "the need for varied, novel, and complex sensation and experiences and the willingness to take physical and social risks for the sake of such experiences" (Zuckerman, 1979, p. 10).

Zuckerman (2007) recognizes one general factor of risk preference that includes most forms of risk taking – mostly social and health related areas, such as smoking, drinking, drugs, sex, reckless driving, and minor criminal behaviour. Financial risk taking is assumed mostly in gambling and men possess higher level than women. Apart from risk preference, risk appraisal is also a significant factor in predicting individuals' risky behaviour. Risk appraisal tells the degree of how risky do individuals subjectively assess certain activity or behaviour. It shows negative correlation to sensation seeking, individuals that score highly on sensation seeking scale have low risk assessment even for activities they have never experienced before. Sensation seeking trait may be the common factor of all of the different kinds of risk taking. Other personality traits that affect risk taking are impulsivity and aggression, although to a lesser degree than sensation seeking. Anxiety is related to sensation seeking as a state, however it does not affect risky behaviour as a personality trait.

A. Wong and Carducci (1991) researched to what extent is the relationship between sensation seeking and financial risk taking (related to gambling) reflected to risks in everyday financial matters, such as personal financial decisions in banking, insurance and career. They classified a sample of undergraduate students as high or low sensation seekers using Sensation Seeking Scale: Form V (SSS) defined by Zuckerman (1979). Then, the participants were asked to make a series of everyday financial decisions with varying degrees of risk. The results showed significant differences in female and male SSS scores, which is consistent with normative standards of the scale. Main hypothesis was confirmed, high sensation seekers within each gender group tend to take greater financial risks.

Borghans et al. (2009) researched gender, IQ and personality effect on risk and ambiguity aversion (see chapter 2.1.1 for details of the research). Several measures of personality were collected, among them also the BIG 5 (Openness, Conscientiousness, Extraversion, Agreeableness, Neuroticism) from Goldberg (Goldberg, 1992). The results of the study show that individuals who are less agreeable, less neurotic and who have more ambition are less risk averse. Psychological traits are not correlated with ambiguity aversion.

Puri and Robinson (2007) posed an interesting thesis and investigated the relation between optimism and economic choice, which includes financial risk tolerance. Dispositional optimism is a psychological trait defined as a positive general outlook towards the future. Database used was again The Survey of Consumer Finance (also used by (Fisher & Yao, 2017; Sung & Hanna, 1997)). Fairly abstract trait of optimism was measured as life expectancy miscalibration, which is the difference between subjective perception of respondents' own life expectancy and life expectancy from actuarial tables, controlling for factors that can affect a person's life span (e.g. smoking). Financial risk taking was measured with a survey question, in the same manner as in Fisher and Yao (2017). The results showed that optimism is significantly positively correlated to risk taking, however, the correlation is low, less than 10 %. Optimism is also related to economic decision making, it affects portfolio choices and savings decisions; moreover, optimistic individuals tend to buy individual stocks.

3 EMPIRICAL RESEARCH USING EXPERIMENTAL STUDY

With an aim to complement past research on the topic of human propensity to take risks in financial matters, I have conducted an experimental study approved by Research Ethics Committee of the School of Economics and Business, University of Ljubljana. The experiment consisted of three parts, which will be presented together with methodology in subchapter 3.2, and was primarily focused on research questions described below.

3.1 Research questions

The formation of hypotheses followed past empirical findings in research described in chapter 2 and aimed to test both, established theories and possible other, so far not well researched, factors of risk taking. Research questions were also designed with feasibility, time and financial constraints of the experiment in mind.

The first three hypotheses were developed with a purpose of checking the consistence of results with prospect theory (Kahneman & Tversky, 1979).

Hypothesis H1: Risk aversion is related with the financial amount of possible pay-outs.

Hypothesis H2: When choosing among two different lottery choices, one does not always follow the lottery with higher expected value of pay-out.

Hypothesis H3: Risk aversion is higher in situations where only positive pay-out is possible and lower in situations where the pay-out can also be negative.

As described in chapter 2.1, demographic factors are commonly found to be related with risk aversion (Faff et al., 2009; Fisher & Yao, 2017; Halek & Eisenhauer, 2001; Hibbert et al., 2008; Sung & Hanna, 1997). Therefore, I pose the following three hypothesis in relation with gender, age and education.

Hypothesis H4a: Women have higher risk aversion than men.

Hypothesis H4b: Risk taking behaviour diminishes with age.

Hypothesis H4c: People with higher education have lower risk aversion.

Level of androgen hormones, such as cortisol, oestrogen and testosterone, significantly impacts risk taking (Coates et al., 2010; Coates & Herbert, 2008; Cueva et al., 2015; Nofsinger et al., 2018). Some studies even showed that the exposure to testosterone in womb could have an impact on later risk propensity of an individual (Jeevanandam & Muthu, 2016; Stenstrom et al., 2011). In order to test the relation between prenatal testosterone exposure and risk aversion, I propose hypothesis H5.

Hypothesis H5: Higher or lower level of prenatal exposure to testosterone hormone is positively or negatively correlated with risk taking.

Other physical characteristics have not yet been shown correlated to financial risk taking, despite being correlated with behaviour, personality, earnings and social status (Judge

& Cable, 2004; Kim & Kamiya, 2015; Lundborg et al., 2014; E. M. Wong et al., 2011). To further explore reasons for the proven correlation, I pose hypotheses H6a and H6b.

Hypothesis H6a: Face width to height ratio (fWHR) is correlated to risk aversion.

Hypothesis H6b: Body height is correlated to risk aversion.

Risk aversion was also widely researched as a personality trait (Frey et al., 2017) and in relation with other personality traits (Borghans et al., 2009; Figner & Weber, 2015; A. Wong & Carducci, 1991; Zuckerman, 2007). With hypothesis H7, I will check which personality traits are related to risk propensity.

Hypothesis H7: Individuals' personality traits are correlated with risk taking.

3.2 Experimental design

Preparation of experiment started with the proposal of the experiment design at the Research Ethics Committee of the SEB LU, which was prepared in cooperation with principal researcher Full Professor Aljoša Valentinčič, PhD. In the introduction of the proposal we provided basic information such as title of the research, researchers' names, key words and executive summary. Then, we defined the Research Plan with research problem and questions. This was followed by a description of the research methods that will be used and timeline of the experimental study. In the next part, sample selection was presented with the estimated number of participants, description of inclusion and exclusion criteria, and process of invitation for cooperation. We explained how possible candidates for participants will be informed of the research and compensation scheme. Special attention was put on the personal data processing and protection of all the processed and obtained data. Therefore, we specifically defined that all of the obtained data will be protected by key number before processing and then stored at the SEB LU premises. We also prepared the Informed Consent form for participants which contained all information regarding the testing procedure and personal data protection. Lastly, an estimation of possible risks and benefits of participating in the experimental study was provided. All of the above mentioned information were summarized in the proposal and explained in detail in attached appendices. All questionnaires and tasks, which are described below in detail, were reviewed and approved by Research Ethics Committee of SEB LU. Written approval was issued on 17.05.2019 by President of Research Ethics Committee of SEB LU Associate Professor Mitja Kovač, PhD.

As mentioned, experiment consisted of three parts. In the first part of the research, participants were faced with lottery choice tasks with different known probabilities and pay-outs, where the design of the tasks followed the procedure described by Holt and Laury (2002). The second part consisted of various questionnaires assessing risk propensity,

demographic characteristics and some personality traits. In the last part of the experiment, physical characteristics of the participants were measured by scanning their right hand, taking portrait photo and measuring body height. The methodology will be presented separately for each part of the experiment.

Participation in the study was voluntary and self-selected, since I promoted the research through social media channels, namely Facebook and LinkedIn and focused on students of School of Economics and Business, University of Ljubljana. Application to participate was available as online form. After an individual filled in the form, he or she was provided with Informed Consent which contained basic details on the purpose of the experiment and its' timeline. Altogether, 52 applicants filled in the form and out of that, 40 participants then actually attended the experiment study.

Experimental study was taking place in a computer lab at School of Economics and Business and was done in four different groups of nine to eleven participants. Besides me, also a teaching assistant and an employee of the faculty were present to help with the technical procedures, such as handing out the forms, taking measurements and photographing. Before starting the study, signed informed consent forms were collected and all participants were informed about the standards of personal data protection. Member of the Research Unit of SEB LU handed out the code numbers, under which participants' data are saved for the purpose of research. It was assumed that all participants had adequate knowledge of Slovene, which was the primary language of the experiment, and at least basic knowledge of English, since part of questionnaire was provided in English. All three parts of experiment were finished in 60 to 70 minutes.

Experiment part 1: Lottery pay-out tasks

Lottery pay-out tasks were designed as a set of choices between outcomes with different probabilities and pay-outs, based on Holt and Laury (2002). Altogether, there was six tasks, of which each requires ten choices between different lotteries. Tasks can be divided in three pairs. Task number 1 and task number 2 have the same probabilities in all ten choices, however the pay-outs of the second task are multiplied by ten. Similarly, in task number 3 and task number 4, where the participant has to decide between a certain low pay-out and a gamble on possibility of a high pay-out or no pay-out, the probabilities stay the same in each decision, only the pay-outs are multiplied by ten in the task number 4. Tasks number 5 and 6 are constructed in the exact same way as tasks number 3 and 4, however, all of the pay-outs are now negative. Tasks, as seen by the participants, are presented in Appendix 2 on pages 2 to 6.

Before starting the experiment, a practice run was done to ensure that everybody is familiar with the procedure. Participants were informed that they will solve several tasks and that

there is a possibility to win monetary reward (in the form of 40 EUR gift certificate for sport equipment store), which will be given to the person, who gets the highest sum of pay-outs. All participants present in the computer lab started marking their first choices in task 1 at the same time. Simultaneously with filling out the survey on the computer, they were also filling out the paper form, which was handed out to them and which had the exact same content as the task on computer. The purpose of double marking the choices was of practical nature. To disable later correction of the choices made, it was not possible to return to previous question in the online survey. Participants would very likely forget all ten choices they have made just seconds ago, so they wrote down their choices and were therefore able to follow the result of the random draw. After everyone in the group have filled in the online form for the first exercise (and confirmed their choice with clicking "Next question"), I have conducted a random draw of a number from 1 to 10, using https://www.random.org. Only the choice of lottery made under this randomly selected number counted as a basis for a pay-out. I then played both lotteries with assigned probabilities and each participant marked their pay-out on the paper form. The procedure was repeated in the same manner for each task. Participants did not know how many tasks they will solve or how large next pay-outs are going to be. After drawing for all six tasks was completed and participants knew all of their pay-outs, they were asked to sum them and to hand out the paper forms. I confirmed the correctness of the calculation and that the choices made on paper form match the choices filled in online form. In case of several participants having the same sum of pay-outs, random draw was conducted to determine a winner. The recipient of the reward was announced immediately.

Experiment part 2: Questionnaires

Questionnaires were filled out by each participant individually. The purpose of the questionnaire was to determine demographic characteristics, individuals' risk taking and certain personality traits. With demographic questions, data about participants' gender, age, education and income level were obtained. I attempted to measure self-reported or self-assessed risk propensity by asking about their everyday decisions regarding uncertain situation. Questions included topics of lottery, insurance, participation in stock exchange, investing in cryptocurrencies, choice of an elective course, playing a risky card game, reservation probability, reservation price and life expectancy. When forming the questions, I kept in mind that participants of the experiment will be predominantly students, who do not yet make financial decisions in sense of retirement savings or investment portfolio, but more commonly decide on whether or not pay for the lottery ticket, take out insurance or invest a portion of income into cryptocurrencies. This question set was followed by two personality tests. Zuckerman – Kuhlman Personality Questionnaire was developed in attempt to define basic factors of personality by Alternative Five-Factorial Model, which defines five factors of personality as Impulsive-Sensation Seeking, Neuroticism-Anxiety, Aggression-Hostility, Activity, and Sociability (Raad & Perugini, 2002, pp. 377–396). I

used a shortened (50 question) cross-cultural version of the questionnaire, validated by Aluja et al. (2006). At the time, there is no validated Slovenian translation available, so the language of the test was English, however, I did provide translation for some words of complex vocabulary. The other questionnaire for observing personality traits was Sensation Seeking Scale – V, which was developed by Zuckerman (1994), who then also researched the relation between risky behaviour and sensation seeking (Zuckerman, 2007). The test consists of four subscales: Thrill and Adventure Seeking, Experience Seeking, Disinhibition and Boredom Susceptibility. In the same manner as ZKPQ test, this test was also conducted in English.

Experiment part 3: Measurements

When participant finished with questionnaire, he or she was invited to provide a scan of their right hand, which enabled measuring the 2D:4D ratio. All participants were asked if they have ever broken their index or ring finger, as this would be an exclusion criteria. Al responds to this question were negative. Each participant placed their right palm facing downwards to the scanner glass together with their code number for identification. Measurements from the scans were done using software Autometric. Length of each digit finger was defined as the distance between fingertip and first basal crease (both at middle point), as described in Neyse and Brañas-Garza (2014). I conducted two sets of measurement and used mean value for further processing, since the correlation between the two measurements was higher than 0.90.

The next measurement was portrait photo, which enabled measurement of fWHR. Participants were instructed to look straight into the camera, hold the code number in a away that it is visible and remove glasses. Usually two or three photographs per person were taken, to have a better choice of a suitable sets of measurement. Before starting the measurements, I manually edited the photos to ensure that all participants' faces are aligned. I also enlarged some photos to be able to measure more precisely. I used ImageJ software to measure the width between left and right zygion (bizygomatic width), which was usually the width between both ears and height, which was the distance between the upper lip and mid-brow. Ratio of both measured distances represents fWHR. I repeated the measurement once and reached the desired correlation of both measurements over 0.90, so I calculated the mean value.

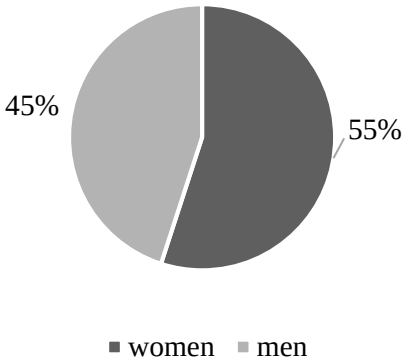
The last measurement was body height, which was measured with stadiometer. This equipment is standardly used also in medical examinations. Participants removed their shoes, stepped under the perpendicular slat and I measured the height with one millimetre precision.

3.3 Results

3.3.1 Sample description

As already mentioned, target group for the experimental study were the students of SEB LU, however the application form for participating was publicly available, so this sample cannot be viewed as uniform. Below, I graphically depict demographics of the sample (n=40).

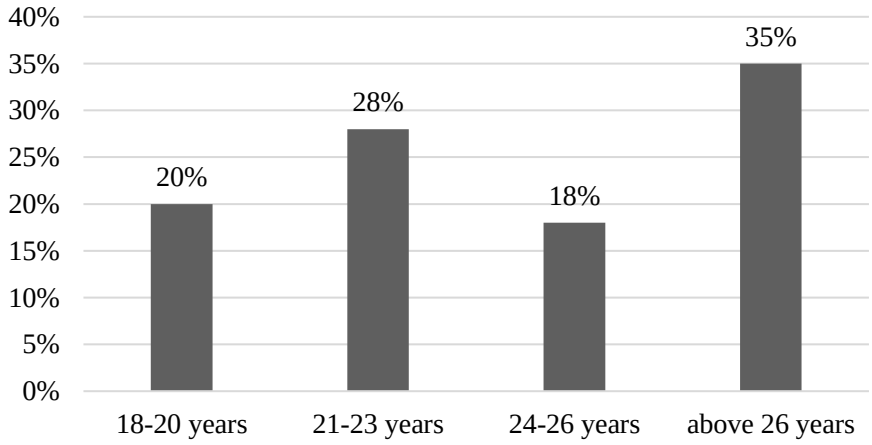
Figure 6: Distribution of sample by gender



Source: own work.

22 women and 18 men participated in the experimental study. The share of female participants in the sample was 55 %, so both groups of gender were sufficiently represented to enable statistical testing based on this demographic characteristic.

Figure 7: Distribution of sample by age

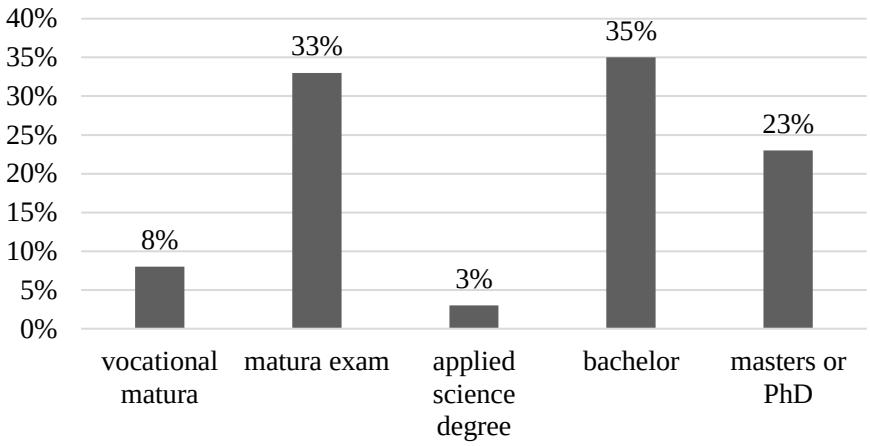


Source: own work.

Distribution diagram of sample age in Figure 7 shows that more than one third of the sample is older than 26 years. This means that the real age of this group of participants is unknown.

Sample can be divided into two similarly represented age groups: below 24 years (48 %) and above 24 years (53 %). The age of 24 was selected because the average age of graduates in Slovenia in 2018 was 24.3 years (Statistical Office of the Republic of Slovenia, 2019). Therefore, we can interpret the age of 24 as the age when young generation is gaining financial independence and becomes more cautious about their financial decisions.

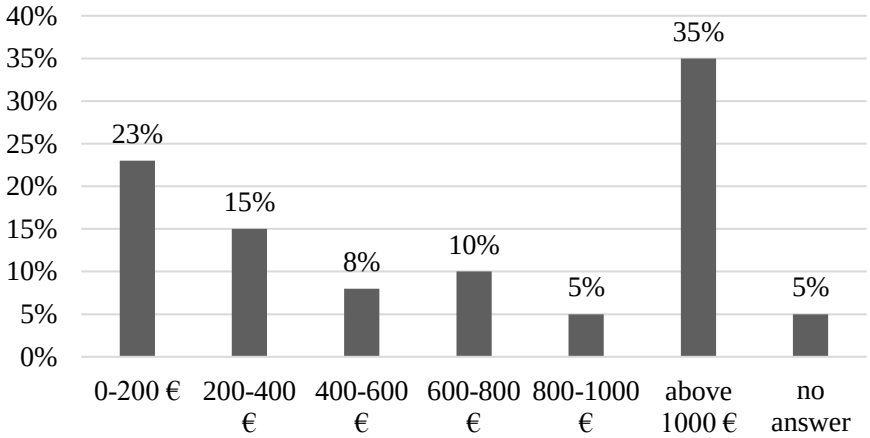
Figure 8: Distribution of sample by education



Source: own work.

More than half of the sample participants have obtained at least bachelor degree. The education variable is connected and dependent on the age in this particular sample.

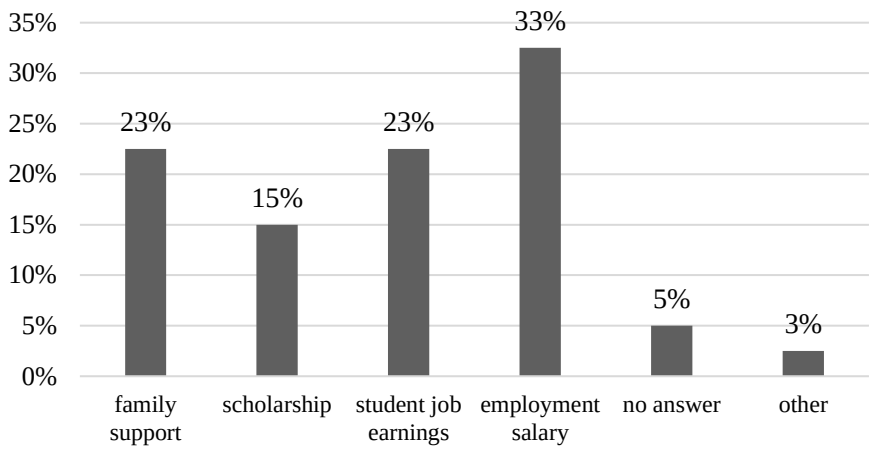
Figure 9: Distribution of sample by income amount



Source: own work.

More than one third of the sample earns more than 1000 EUR monthly, which again hides a range of values, and leaves the true earnings unknown. 23 % of the sample participants earn less than 200 EUR per month.

Figure 10: Distribution of sample by income source



Source: own work.

Employment salary represents the main source of income for one third of the sample, which is approximately the same as the share of participants who are older than 26 years. 9 participants are dependent on family financial support and the same number of participants get the biggest share of their income from working a student job. 15 % of sample receives scholarship.

3.3.2 Hypotheses testing

Dependent variable in all hypotheses is risk aversion, which is measured with two different variables. The first variable (*risk_task*) represents the average number of 'safe' choices that a particular participant has made in the first part of the experiment (see Appendix 2, Questions 1.-6.). Safe choice is defined as the choice that is certain as opposed to gamble (in cases of Questions 3.-6.) or the choice that has higher pay-out in case of 'bad' state of nature (Questions 1. and 2.). For Hypothesis H1, choices in the first task were compared to choices in the second and choices in the third task were compared to choices in the forth task. Similarly for Hypothesis H3, choices in the third task were compared to choices in the fifth and choices in the forth task were compared to choices in the sixth task. The second variable (*risk_question*) is a sum of participants' self-reported survey responses about their everyday decisions regarding uncertain situation. Questions included topics of insurance, lottery, investing in stocks, investing in cryptocurrencies, choosing an elective course and playing a risky card game. In summing the individual responses, one variable (Lottery) was reverse coded and all variables were given the same weight in calculation. For both dependent variables it holds, that the higher the value, higher the risk aversion (and lower the risk taking).

Hypothesis H1: Risk aversion is related with the financial amount of possible pay-outs.

H_0: $\mu_{\text{number of safe choices\_1}} = \mu_{\text{number of safe choices\_2}}$
H_1: $\mu_{\text{number of safe choices\_1}} \neq \mu_{\text{number of safe choices\_2}}$

Since, two samples are dependent, I used the following test statistic for paired samples for hypothesis proving (Rovan, Korenjak-Černe & Pfajfar, 2012, p. 34):

$$t = \frac{\bar{d} - A_0}{se(\bar{d})} \tag{1}$$

Based on two-tail t-test for paired two sample with means, I cannot reject H_0 that decisions made in situations with low pay-outs are significantly different from decisions made in situations with high pay-outs. Test was repeated for two datasets, the first being mean difference of answers between tasks 1 and 2, and the second, mean difference of answers between tasks 3 and 4. Therefore, there is not enough evidence to conclude that risk aversion is related with the financial amount of possible pay-outs. Test statistics can be seen in Appendix 3.

Hypothesis H2: When choosing among two different lottery choices, one does not always follow the lottery with higher expected value of pay-out.

The way that hypothesis is formed causes some more abstract thinking and does not offer a straightforward statistics test. Therefore, I calculated the share of decisions that contradicted the decision under expected value. The expected value of each pay-out in the six tasks was calculated and compared to the pair pay-out. Then, I determined which of the pay-outs of one choice pair had larger expected value and compared it to the decision choice of each participant. Given that each participant made 10 choices in each of the 6 tasks and multiply this with sample size, we get to the number of 2400 choices made. Out of this, 41.38 % of the choices were different from the one that would follow the rule of higher expected value. Even though the majority of choices were aligned with higher expected value, the number of choices that were not in line with this theory is high enough to conclude that people do not always choose the lottery with higher expected value of pay-out.

Hypothesis H3: Risk aversion is higher in situations where only positive pay-out is possible and lower in situations where the pay-out can also be negative.

H_0: $\mu_{\text{number of safe choices\_3}} \leq \mu_{\text{number of safe choices\_5}}$
H_1: $\mu_{\text{number of safe choices\_3}} > \mu_{\text{number of safe choices\_5}}$

I used the same testing method as for Hypothesis H1, equation (1). Based on two-tail t-test for paired two sample with means, I reject (α=0.05) H_0 that people are equally or less risk averse in making decisions in situations with positive pay-outs than in situations with negative pay-outs. Test was repeated for two datasets, the first being mean difference of answers between tasks 3 (positive pay-outs) and 5 (negative pay-outs), and the second, mean difference of answers between tasks 4 (positive pay-outs) and 6 (negative pay-outs). Compared sets of two samples had the same absolute amount of pay-out and same given probabilities. Test statistics can be seen in Appendix 4.

Hypothesis H4a: Women have higher risk aversion than men.

In this case, samples are independent, therefore, I first test for the equality of variances of two samples.

H_0: $\sigma^2_{\text{risk\_task- women}} = \sigma^2_{\text{risk\_task- men}}$
H_1: $\sigma^2_{\text{risk\_task- women}} \neq \sigma^2_{\text{risk\_task- men}}$

I used F-test with the following equation (Rovan, Korenjak-Černe & Pfajfar, 2012, p. 35).

$$F = \frac{s_1^2}{s_2^2} \tag{2}$$

Since F-test showed no evidence of unequal variances, t-test assuming equal variances was used to test the arithmetic means of the two samples (Rovan, Korenjak-Černe & Pfajfar, 2012, p. 34):

$$t = \frac{(\bar{y}_1 - \bar{y}_2) - A_0}{se(\bar{y}_1 - \bar{y}_2)} \tag{3}$$

H_0: $\mu_{\text{risk\_task- women}} \leq \mu_{\text{risk\_task- men}}$
H_1: $\mu_{\text{risk\_task- women}} > \mu_{\text{risk\_task- men}}$

Based on t-test for two sample assuming equal variances, I cannot reject H_0, which implies that there is not enough evidence to conclude that women are more risk averse than men. I repeated the test also on another dependent variable, *risk_question*, where again, I cannot reject the null hypothesis. Test statistics can be seen in Appendix 5.

Hypothesis H4b: Risk taking behaviour diminishes with age (older people have higher risk aversion).

H_0: $\mu_{risk\_task\text{-}old} \leq \mu_{risk\_task\text{-}young}$
H_1: $\mu_{risk\_task\text{-}old} > \mu_{risk\_task\text{-}young}$

I divided the sample into two groups, below 24 years old and above 24 years old. The reason for this decision is explained in the chapter 3.3.1 Sample description. Only by observing mean values of two sample groups, we see that older age group has lower mean value of the variable *risk_task*, which measures risk aversion. Therefore, also based on t-test for two sample assuming equal variances (see equations (2) and (3) for specific testing procedure), I cannot reject H_0 and conclude that there is not enough evidence that would support that older people have higher risk aversion or that risk taking behaviour decreases with age. To further examine the result, I performed an analysis of variances among all 4 age groups and confirmed that variances do significantly differ, which implies that the opposite hypothesis could be tested, where H_0 might have been rejected. I also repeated the test for another dependent variable *risk_question*, where the F-test for variances showed unequal variances and t-test again could not offer enough evidence to reject H_0. Test statistics can be seen in Appendix 6.

Hypothesis H4c: People with higher education have lower risk aversion.

H_0: $\mu_{risk\_task\text{-}high\_ed} \geq \mu_{risk\_task\text{-}low\_ed}$
H_1: $\mu_{risk\_task\text{-}high\_ed} < \mu_{risk\_task\text{-}low\_ed}$

Based on t-test for two samples assuming equal variances, I reject (α=0.05) H_0 that people with higher level of obtained education have higher or equal risk aversion than less educated people. Education in this setting refers to the level of formally obtained education, where low education is considered as finished high school (up to level V), and high education as applied sciences degree or higher (level VI or higher). To more specifically test also for differences between all groups of education level, I performed the analysis of variances. This test confirmed that variances do significantly differ. Test statistics can be seen in Appendix 7.

Hypothesis H5: Higher or lower level of prenatal exposure to testosterone hormone is positively or negatively correlated with risk taking.

Prenatal exposure to testosterone is measured as 2D:4D ratio, which is sexually dimorphic trait so I analysed data separately for women and men. Pearson correlation coefficient for both gender was negative, however insignificant. Identified negative correlation implies that higher the 2D:4D ratio, thus higher the level of prenatal exposure to testosterone, lower the

risk aversion. Correlations were measured for both dependent variables and SPSS output can be seen in Appendix 8.

Hypothesis H6a: Face width to height ratio (fWHR) is correlated to risk aversion.

Pearson correlation coefficient was checked for both dependant variables of risk measurement, but there is no statistical significance. SPSS output can be found in Appendix 9.

Hypothesis H6b: Body height is correlated to risk aversion.

Similarly as for H6a, correlation was checked for both dependant variables of risk measurement, but there is no statistical significance. SPSS output can be found in Appendix 9. I then divided the sample into two groups according to deviation of body height from average height of Slovenian female and male population. The most recent available statistics for height of Slovenian population comes from 2017 and is equal to 181.5 cm for men aged 16-24 years, 180.1 cm for men aged 25-34 years, 166.7 cm for women aged 16-24 years and 166.8 cm for women aged 25-34 years (Statistical Office of the Republic of Slovenia, 2018). I used mean value of both age groups for each gender separately, as I assume that this was the age of the majority of the sample. Then I subtracted the calculated mean value from measured body height and got two sample groups, one with body height below average and one with body height above average. I performed a t-test for hypothesis:

H_0: $\mu_{\text{risk\_task- big}} \geq \mu_{\text{risk\_task- small}}$
H_1: $\mu_{\text{risk\_task- big}} < \mu_{\text{risk\_task- small}}$

Based on t-test for two sample assuming equal variances, I cannot reject H_0, which implies that there is not enough evidence to conclude that higher people are less risk averse. Test statistics are available in Appendix 9.

Hypothesis H7: Individuals' personality traits are correlated with risk taking.
Correlation matrix (shown in Appendix 10) shows statistically significant correlations between ZKPQ subscale Neuroticism-Anxiety and both dependent variables (*risk_task* with 0.05 level and *risk_question* with 0.01 level of significance). All of the Sensation Seeking subscales and the Sensation Seeking Score are correlated with *risk_question* variable, which confirms the hypothesis.

All of the tested hypotheses are summarized in Table 1 below.

Table 1: Summary of hypotheses testing

Hypothesis		Dependent variable used	Testing method	Results	Status
H1	Risk aversion is related with the financial amount of possible pay-outs.	risk_task (number of safe choices in task 1 and task 2; number of safe choices in task 3 and task 4)	Two-tailed t-test for paired two sample with means	p-value: 0.09 p-value: 0.22	I cannot confirm that decisions made in situations with low pay-outs are different from decisions made in situations with high pay-outs.
H2	When choosing among two different lottery choices, one does not always follow the lottery with higher expect value of pay-out.	risk_task	Calculating the share of the choices that were different from the highest expected value	41.38% share	People do not always choose the lottery with higher expected value of pay-out.
H3	Risk aversion is higher in situations where only positive pay-out is possible and lower in situations where the pay-out can also be negative (prospect theory).	risk_task (number of safe choices in task 3 and task 5; number of safe choices in task 4 and task 6)	Two-tailed t-test for paired two sample with means	p-value: 0.09 p-value: 0.22	People are more risk averse when making decisions in situations with positive pay-outs than in situations with negative pay-outs.
H4a	Women have higher risk aversion than men.	risk_task	t-test for two sample assuming equal variances	p-value: 0.39	I cannot confirm that women are more risk averse than men.
		risk_question		p-value: 0.43	
H4b	Risk taking behaviour diminishes with age.	risk_task risk_question	t-test for two sample assuming equal variances	p-value: 0.09	I cannot confirm that older people are more risk averse than younger, however there is some variability among age groups.
			ANOVA	p-value: 0.01	
H4c	People with higher education have lower risk aversion.	risk_task risk_question	t-test for two sample assuming equal variances	p-value: 0.02	People with higher level of obtained education have lower risk aversion than less educated people.
			ANOVA	p-value: 0.04	
H5	Higher or lower level of prenatal exposure to testosterone hormone is positively or negatively correlated with risk taking.	risk_task risk_question	Pearson correlaton coefficient	/	Pearson correlation coefficient for both gender was negative, however insignificant.

Table 1: Summary of hypotheses testing (continued)

Hypothesis		Dependent variable used	Testing method	Results	Status
H6a	Face width to height ratio (fWHR) is correlated to risk aversion.	risk_task risk_question	Pearson correlaton coefficient	/	No correlation or direction of correlation was found.
H6b	Body height is correlated to risk aversion.	risk_task risk_question	Pearson correlaton coefficient	/	Pearson correlation coefficient for body height was negative, however insignificant.
			t-test for two sample assuming equal variances	p-value: 0.42 p-value: 0.93	
H7	Individuals' personality traits are correlated with risk taking.	risk_task	Pearson correlaton coefficient	See Appendix 10.	Correlation to ZKPQ subscale Neuroticism-Anxiety.
		risk_question			Correlation to Sensation Seeking subscales and the Sensation Seeking Score.

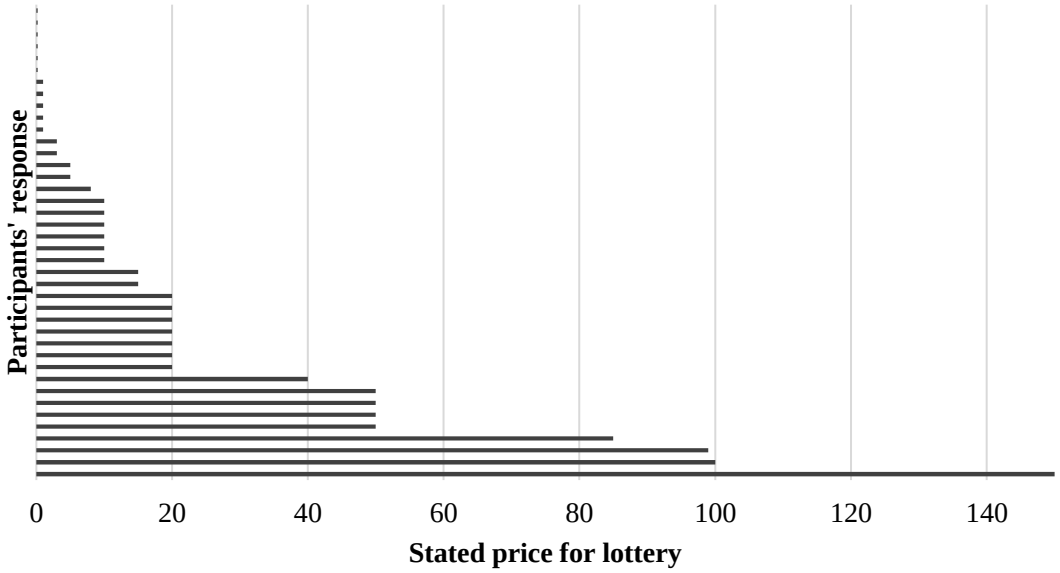
Source: own work.

3.3.3 Further analysis

Besides the initially posed hypotheses, some interesting possible extensions for research have come up during performing the experimental study. Since experiment has been conducted in four groups at different time and different lottery draws, it is sensible to check for fixed effect of the group participant was part of. Analysis of variance showed that there is not enough evidence to conclude that any of the variance would significantly differ from other. SPSS output is available in Appendix 11.

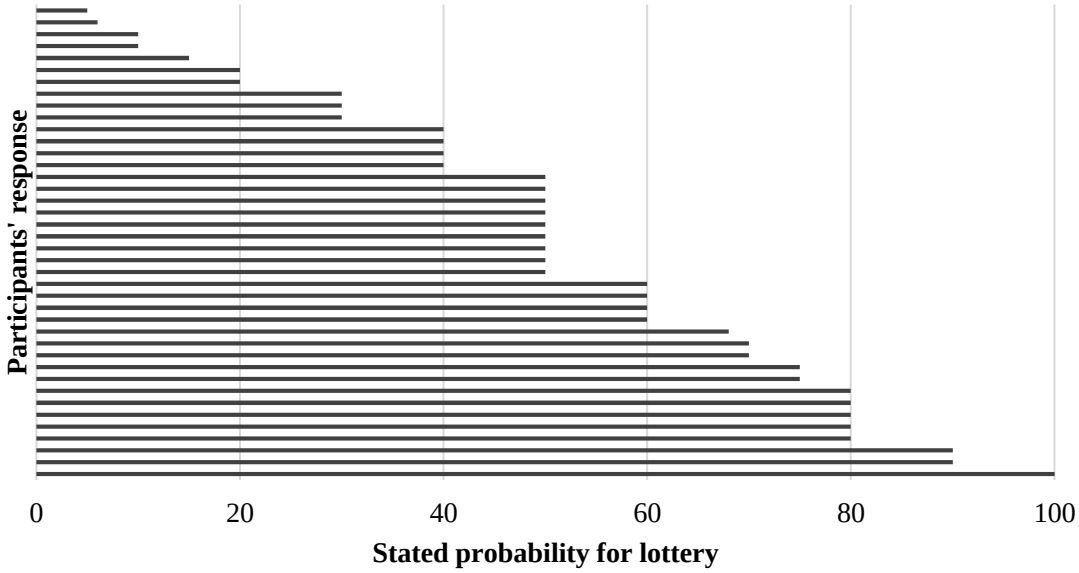
In financial terms, reservation price represents the maximum amount that the consumer is prepared to pay for a certain product or service given his utility function. In general it holds, that higher the reservation price, higher the risk aversion. The questionnaire also included one question asking for reservation price and one for reservation probability (see Appendix 2, page 8, Q15 and Q16). The task for determining the reservation price was to state the maximum price that you would be prepared to pay for a lottery ticket to participate in a lottery with a 10 % chance to win 1,000 EUR. The average answer for both questions was significantly different from the mathematically expected values. Responses are depicted in Figure 10 and Figure 11.

Figure 11: Reservation price responses for expected value of 100



Source: own work.

Figure 12: Reservation probability responses for expected probability of 5 %

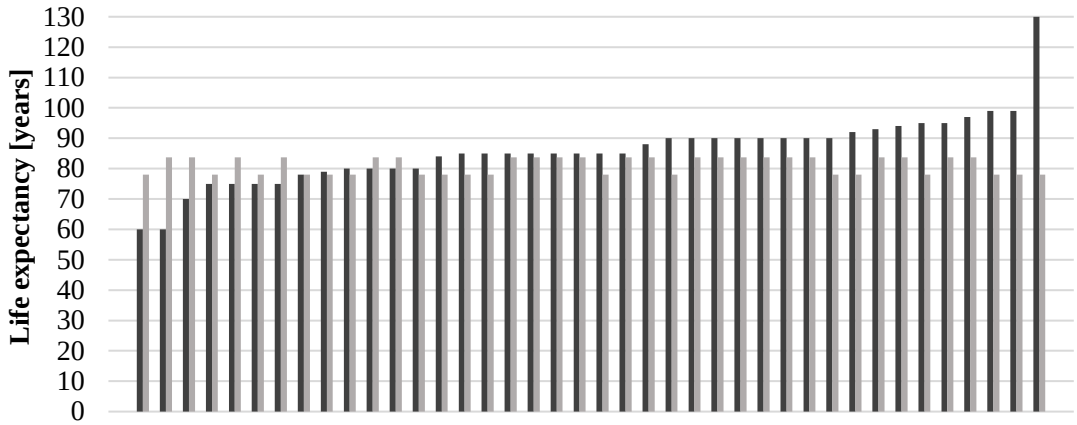


Source: own work.

Mathematical expectation for the question of reservation price equalled to 100, whereas mean value of response was 23.33; even more extreme case is observed for reservation probability – expected value was 5 % and the mean value of response was 51.60 %. I checked for correlation of these two measures with dependent variables (measures of risk aversion), but there was no significant correlation found (see Appendix 12).

Based on findings of Puri and Robinson (2007), another interesting research question appeared; and that is if the subjective life expectancy as a measure of optimism is related to risk aversion. Participants were asked to state how many years they expect to live. Given answer was subtracted from the life expectancy at birth for Slovenia (2017: women: 83.66; men: 78.05) (Statistical Office of the Republic of Slovenia, 2018). I used the last available data for life expectancy at birth, since data set does not include the information about birth year of participants. I assess that the method is appropriate, since each years' life expectancy at birth is the common information in mass media and therefore this is the value that most people keep in mind when thinking about life expectancy. The stated life expectancies, together with the actual life expectancy by gender, are shown in Figure 12.

Figure 13: Subjective and actual life expectancy



Source: own work.

I tested for correlation between the deviations of subjective measure of life expectation from the actual life expectation and measures of risk aversion. There was no significant correlation found, as seen in Appendix 12.

3.4 Discussion and limitations

The main purpose of the research was to explore possible correlations between some physical and personality factors on risk aversion. The results showed no correlation between physical factors (2D:4D, fWHR and body height) and risk taking, however correlation was significant for several personality factors. I found some results which have not commonly appeared in other research. I could not confirm that risk aversion is related to the height of financial reward. This could be caused by the fact that participants considered the lottery task as a game and therefore did not adapt their behaviour through the course of the task. Some interesting findings come from demographic characteristics, where there was no

significant difference between men and women risk perception, older participants were actually less risk averse and so were participants with higher education. Note, that the latter two variables were highly correlated in this sample. Inconclusive results for all three physical characteristics either imply that there is no relation to financial risk taking behaviour or that the limitations that I describe below, biased statistical testing. All of the personality traits for the Sensation Seeking Scale are correlated with only one of the variables for measuring risk aversion, which might confirm the appropriateness of at least one measure variable. To present the results in an objective manner, the limitations of the experimental study have to be considered.

The first limitation is the sample size. Since the experiment was designed in a way that all participants had to attend one of the suggested timeslots, this diminished the number of students who were willing to participate and had time in particular time period, which obviously differs from gathering responses via survey (the most common method of observing risk behaviour).

Carrying out experiment is also time and finance consuming, so there were some limitations related to time and cost. Namely, when determining monetary incentives for lottery pay-out tasks, it was impractical to reward each participants the exact amount of earned cash and apart from that, Slovenian Tax Law limits the highest amount of untaxed reward in games of luck or random draws to 42,00 EUR. For practical reasons, we decided to reward only one participant per group. To limit the time of one experiment session, we conducted the experiment in four groups.

One of the biggest challenges of research in field of risk perception is the measurement of the term. In this setting, two measures were used, adapted to students. However, the first measure, derived from lottery pay-out tasks, might have been perceived by the students as a game of chance where they have nothing to lose and therefore this decisions do not accurately describe decisions in uncertain situations in real life. The second measure consisted of limited number of questions, for which I also allow the debate about possible exclusion or inclusion of some other information regarding financial decision making.

As for demographic questionnaire, the standard set of questions was used. Assuming that participants will be Slovene students, since I promoted the experiment in Slovene language, concentrated to student pages and the experiment took place in faculties' computer lab, factor variable for age was used, where the highest interval is above 26 years old. During the experiment sessions I noticed that a share of participants appeared to be over ten years older than 26. A continuous variable for age would have been more suitable. I also observed that two participants might not be of Caucasian race, but I cannot confirm it, because this demographic was not included in the set of questions. Race is an important factor for the analysis of 2D:4D ratio.

I also noticed that the fWHR measurements would be more precise if the distance between the camera and the object would remain constant for all experiment groups and if participants would be instructed to adapt their hairstyle in a way that both ears are visible when looking straight into the camera.

CONCLUSION

People make conscious and subconscious decisions under risk every day, many of them are decisions that influence their financial position or in professional context, strategic position of an organization. This thesis, as many other research works, focused on the reasons behind the decision making process in situations of risk or uncertainty and aimed to determine the impact of some demographic, physical and personality characteristics.

Literature review showed that, despite the topic of demography of the risk aversion being widely investigated, there is still a lot of open issues to further research. For example, the difference between women and men risk aversion is well documented and empirically supported, however, the reasons for the existing gender gap remain the focus of the debate. Biological factors, to which I put focus in chapter 2.2, may explain part of the reason, though the results are not uniform. Risk aversion is one of the stereotypical traits attributed to women and there might be a chance that the societal pressure and expectations cause women to develop higher levels of risk aversion and vice versa for men. Contradicting findings of Hallahan et al. (2004) and Gibson et al. (2013) show the need to further investigate the role of the highest level of obtained education in financial risk taking behaviour. It might be, that level of education is only a general predictor, and the financial knowledge would be a much more specific marker of a persons' willingness to take financial risks. Another issue that would need further research, is the causality of the two observed variables – education and risk aversion. Based on the findings of Dohmen et al. (2017), deeper insight is needed in finding the specific age or period in life span, when risk tolerance starts to diminish. I also have not come across a literature examining the age and personality factor in relation with risk taking in professional setting – it would be interesting to investigate the relation between factors of personality and age of a CEO and the riskiness of financial decisions of the company. Research of physical traits relating to risk propensity is relatively limited, compared to demographic and psychological traits and with steroid hormone level being an exempt. There is definitely a need to perform the analyses on bigger samples and to place the findings in a setting that will help understand the investor behaviour and the impact on a market level. Additionally, it would be intriguing to check for impact of CEOs' physical characteristics (e.g. fWHR, 2D:4D and stature) on company profitability and other ratios.

The findings in this thesis show that participants in the experimental study followed the prospect theory and displayed loss aversion, but did not change the behaviour with higher pay-outs. There was a significant share of choices of lottery with a lower expected value. Gender effect to risk aversion was insignificant, so was age, which was in fact reverse of the hypothesised claim, risk aversion in fact diminished with age. I explain this surprising result with low dispersion of sample age. Consistently with the existing literature, education showed as significant factor of impact on risk taking (higher educated people have lower risk aversion). No physical characteristic showed any significant correlation to risk taking behaviour. Sensation Seeking Scale factor with subscale *Thrill and Adventure Seeking* and *Experience Seeking* and ZKPQ measure of *Neuroticism-Anxiety* have the most significant impact on risk aversion.

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APPENDICES

Appendix 1: Povzetek (Summary in Slovene language)

Naklonjenost oziroma nenaklonjenost tveganju je ena osnovnih vedenjskih značilnosti pri sprejemanju finančnih odločitev. Najzgodnejše raziskave odnosa do tveganja segajo v 18. stoletje, ko je Bernoulli (1954) opisal Paradoks St. Peterburg. Naslednji večji preboj se je zgodil z matematično definicijo teorije pričakovane koristnosti, ki je opredelila racionalno vedenje v negotovih situacijah (Neumann & Morgenstern, 1944). Kot odziv prevladujoči neoklasični teoriji učinkovitih trgov (EMH), sta Kahneman in Tversky (1979) ponudila teorijo izgledov, ki pojasnjuje vedenjske vidike odločanja v negotovih situacijah. Sledila je burna razprava in delitev ekonomske znanosti na dva tabora, vedenjskega in neoklasičnega. Danes dognanja vedenjske ekonomije pomembno prispevajo k pojasnjevanju raznih ekonomskih ugank, vključno z najbolj razvpitimi anomalijami na finančnih trgih.

Kljub temu, da ima posameznikova nagnjenost k tveganju velik vpliv na vedenje in da se je odnos do tveganja kot spremenljivka pojavljal tudi v mnogih finančnih modelih v zadnjih desetletjih, se je le nekaj raziskav osredotočilo na sam izvor odnosa do tveganja (Zhang, Brennan & Lo, 2014). Na nagnjenost k tveganju statistično značilno vplivajo različni demografski dejavniki (kot so starost, spol, izobrazba in rasa) (Faff, Hallahan & McKenzie, 2009; Fisher & Yao, 2017). V poznem dvajsetem stoletju so znanstveniki s področja psihologije pričeli z raziskovanjem nagnjenosti k tveganju kot osebnostne lastnosti in povezavo med odnosom do tveganja in ostalimi osebnostnimi lastnostmi. Najpogosteje potrjena povezava obstoja med nagnjenostjo k tveganju in iskanjem čutnih spodbud, ki je opisano kot potreba po novih, raznovrstnih in kompleksnih občutjih ter pripravljenost k fizičnim in družbenim tveganjem zavoljo teh občutij (Zuckerman, 1979, 2007).

V vedenjski ekonomiji in sorodnih vedah se v zadnjih letih veliko pozornosti posveča tudi raziskovanju vpliva fizičnih in bioloških človeških lastnosti na vedenje in proces odločanja. Med pomembnejšimi raziskovanimi dejavniki vedenjskih financ je tako tudi vpliv prisotnosti in ravni hormonov kortizola in testosterona pri posameznikih pri sprejemanju tveganih finančnih odločitev (Cueva et al. 2015). Ker je natančno merjenje vsebnosti hormonov kompleksno in zahteva večja finančna sredstva, se mnogi raziskovalci poslužujejo metode 2D:4D, ki meri razmerje med dolžino kazalca in prstanca desne dlani. Nižja vrednost količnika nakazuje večjo prenatalno izpostavljenost testosteronu v maternici in tako vpliva na vrsto bioloških in vedenjskih značilnosti posameznika. V eksperimentu z visokofrekvenčnimi trgovci je bila odkrita negativna korelacija med vrednostjo 2D:4D in dobičkonosnostjo (P&L) portfelja posameznega trgovca na finančnem trgu (Coates, Gurnell & Rustichini, 2009). Kot statistično značilna se je v preteklih raziskavah že pokazala tudi korelacija med fWHR kazalnikom, ki meri razmerje med višino in širino obraza, in finančno uspešnostjo podjetja (Wong et al. 2011). Lundborg, Nystedt in Rooth (2014) so dokazali korelacijo med telesno višino in višino letnega dohodka pri moških.

Namen magistrskega dela je preučiti in predstaviti možen vpliv določenih osebnostnih in fizičnih lastnosti posameznika na nagnjenost k tveganju. To bo pripomoglo k razumevanju kako osebnostne lastnosti vlagateljev na finančnih trgih vplivajo na njihov odnos do tveganja in izbrane naložbene strategije. Dodatno bodo raziskani tudi drugi dejavniki, ki so posledica bioloških predispozicij in bi lahko igrali pomembno vlogo pri določanju vedenja posameznika v različnih življenjskih obdobjih. V prvem delu magistrskega dela predstavim teoretično ozadje, ki opisuje preteklo delo na področju vedenjskih financ in opravim pregled dosedanjih raziskav različnih dejavnikov ki vplivajo na posameznikov odnos do tveganj. V empiričnem delu predstavim izvedeno eksperimentalno študijo in njene rezultate. Izvedena eksperimentalna študija naslavlja naslednja raziskovalna vprašanja:

- V kolikšni meri posamezniki sprejemajo odločitve v skladu s teorijo izgledov ali s teorijo pričakovane koristnosti v nalogah izbire med dvema loterijama?
- Kakšen vpliv imajo demografski dejavniki na odnos do tveganja?
- Katere osebnostne lastnosti imajo največji vpliv na odnos do tveganja?
- Ali obstaja kakšna povezava med fizičnimi lastnostmi in odnosom do tveganja?

Eksperimentalna študija je bila izvedena v maju 2019 na Ekonomski fakulteti v Ljubljani s soglasjem Etične komisije za znanstvenoraziskovalno delo EF UL in pod nadzorom odgovornega raziskovalca dr. Aljoše Valentinčiča. Eksperiment je bil sestavljen iz treh delov. V prvem delu raziskave so se udeleženci soočali z nalogami izbire loterije z različnimi znanimi verjetnostmi in izplačili, pri čemer je načrtovanje nalog sledilo postopku, ki sta ga opisala Holt in Laury (2002). Drugi del je bil sestavljen iz različnih vprašalnikov, ki so ocenjevali nagnjenost k tveganjem, demografske značilnosti in nekatere osebnostne lastnosti. V zadnjem delu eksperimenta so bile fizične lastnosti udeležencev izmerjene s skeniranjem desne roke, fotografiranjem portretnih fotografij in merjenjem telesne višine.

Rezultati študije kažejo, da so udeleženci eksperimentalne študije pri odločanju med dvema loterijama sledili teoriji izgledov in pokazali odpor do izgub, vendar vedenja niso spreminjali glede na višino izplačil. Znaten delež odločitev med dvema loterijama je bil v neskladju s teorijo o izbiri loterije z višjo pričakovano vrednostjo, udeleženci so se v 41,38 % primerih odločili za loterijo z nižjo pričakovano vrednostjo. Statistično neznačilen je bil vpliv spola na nagnjenost k tveganju, prav tako vpliv starosti, ki pa se je dejansko pokazal kot nasproten od hipoteze, nagnjenost k tveganju se je s starostjo zviševala. Ta presenetljiv rezultat bi lahko sicer bil posledica statistične porazdelitve starosti vzorca. V skladu z obstoječo literaturo se je izobraževanje pokazalo kot pomemben dejavnik vpliva na odnosa do tveganja (visoko izobraženi ljudje imajo manjšo naklonjenost tveganju). Nobena od testiranih fizičnih značilnost ni pokazala pomembne povezave s tveganjem. Kazalnik iskanja čutnih spodbud (s podskalama vznemirjenja in pustolovščine ter izkušenj) in ZKPQ merilo nevrotičnosti-tesnobe imata najpomembnejši vpliv na odnos do tveganja.

Appendix 2: Experiment questionnaire

Spoštovani!

Pred vami je vprašalnik, ki ga je pripravila študentka magistrskega programa Kvantitativne finance in aktuarstvo na Ekonomski fakulteti v Ljubljani. Namen vprašalnika je raziskati dejavnike, ki vplivajo na posameznikovo nagnjenost k tveganjem. Vprašalnik je sestavljen iz več delov. V prvem delu so naloge, pri katerih se boste odločali med sodelovanjem v dveh različnih loterijah. Te naloge boste reševali vsi hkrati, zato počakajte na nadaljnja navodila po vsaki rešeni nalogi. Na obrazec, ki je pred vami, si sproti beležite vaše dobitke ali izgube. Cilj nalog je, da zaslužite čimveč, saj bo oseba, ki bo imela najvišjo vsoto vseh dobitkov, prejela nagrado v vrednosti 40,00 EUR. Drugi del vprašalnika sestoji iz vprašanj za določitev vaših demografskih značilnosti in preferenc tveganja. Tretji del vprašalnika je namenjen določitvi vaših osebnostnih lastnosti. Prosim vas, da odgovorite na vsa vprašanja.

Vprašanja in naloge so odvisne od vaših lastnih mnenj, odločitev in občutkov. Ni pravilnih ali napačnih odgovorov - odgovarjajte kar se da iskreno. Sodelovanje v eksperimentu je povsem prostovoljne narave; vaša identiteta je zaščitena s šifro in z odgovori se bo ravnalo v skladu z usmeritvami Evropske komisije za etiko v raziskovanju.

V primeru vprašanj in nejasnosti se lahko obrnete na avtorico vprašalnika Petro Cirar (petra.cirar94@gmail.com) ali na mentorja red. prof. dr. Aljošo Valentinčiča (aljosa.valentincic@ef.uni-lj.si). S klikom na ukaz 'Naslednja stran' boste začeli z izpolnjevanjem.

Vnesite svojo šifro in počakajte na nadaljnja navodila.

Naloga 1: V spodnjih desetih možnostih lahko izbirate med sodelovanjem v loteriji A in loteriji B. Ena izmed možnosti bo izžrebana in odigrani bosta loteriji A in B s pripadajočimi verjetnostmi. Vaš bo dobitek, ki pripada izbrani loteriji. Pri vsaki možnosti označite katero od dveh loterij izberete.

		loterija A	loterija B	
1.	10% verjetnost za 2,00€ 90% verjetnost za 1,60€	○	○	10% verjetnost za 3,85€ 90% verjetnost za 0,10€
2.	20% verjetnost za 2,00€ 80% verjetnost za 1,60€	○	○	20% verjetnost za 3,85€ 80% verjetnost za 0,10€
3.	30% verjetnost za 2,00€ 70% verjetnost za 1,60€	○	○	30% verjetnost za 3,85€ 70% verjetnost za 0,10€
4.	40% verjetnost za 2,00€ 60% verjetnost za 1,60€	○	○	40% verjetnost za 3,85€ 60% verjetnost za 0,10€
5.	50% verjetnost za 2,00€ 50% verjetnost za 1,60€	○	○	50% verjetnost za 3,85€ 50% verjetnost za 0,10€
6.	60% verjetnost za 2,00€ 40% verjetnost za 1,60€	○	○	60% verjetnost za 3,85€ 40% verjetnost za 0,10€
7.	70% verjetnost za 2,00€	○	○	70% verjetnost za 3,85€

	loterija A	loterija B	
	30% verjetnost za 1,60€		30% verjetnost za 0,10€
8.	80% verjetnost za 2,00€ 20% verjetnost za 1,60€	○	○	80% verjetnost za 3,85€ 20% verjetnost za 0,10€
9.	90% verjetnost za 2,00€ 10% verjetnost za 1,60€	○	○	90% verjetnost za 3,85€ 10% verjetnost za 0,10€
10.	100% verjetnost za 2,00€ 0% verjetnost za 1,60€	○	○	100% verjetnost za 3,85€ 0% verjetnost za 0,10€

Preden kliknete 'Naslednja stran' zapišite svoje odločitve na obrazec.

Počakajte na žreb.

Naloga 2: V spodnjih desetih možnostih lahko izbirate med sodelovanjem v loteriji A in loteriji B. Ena izmed možnosti bo izžrebana in odigrani bosta loteriji A in B s pripadajočimi verjetnostmi. Vaš bo dobitek, ki pripada izbrani loteriji. Pri vsaki možnosti označite katero od dveh loterij izberete.

	loterija A	loterija B	
1.	10% verjetnost za 20€ 90% verjetnost za 16€	○	○	10% verjetnost za 38,5€ 90% verjetnost za 1€
2.	20% verjetnost za 20€ 80% verjetnost za 16€	○	○	20% verjetnost za 38,5€ 80% verjetnost za 1€
3.	30% verjetnost za 20€ 70% verjetnost za 16€	○	○	30% verjetnost za 38,5€ 70% verjetnost za 1€
4.	40% verjetnost za 20€ 60% verjetnost za 16€	○	○	40% verjetnost za 38,5€ 60% verjetnost za 1€
5.	50% verjetnost za 20€ 50% verjetnost za 16€	○	○	50% verjetnost za 38,5€ 50% verjetnost za 1€
6.	60% verjetnost za 20€ 40% verjetnost za 16€	○	○	60% verjetnost za 38,5€ 40% verjetnost za 1€
7.	70% verjetnost za 20€ 30% verjetnost za 16€	○	○	70% verjetnost za 38,5€ 30% verjetnost za 1€
8.	80% verjetnost za 20€ 20% verjetnost za 16€	○	○	80% verjetnost za 38,5€ 20% verjetnost za 1€
9.	90% verjetnost za 20€ 10% verjetnost za 16€	○	○	90% verjetnost za 38,5€ 10% verjetnost za 1€
10.	100% verjetnost za 20€ 0% verjetnost za 16€	○	○	100% verjetnost za 38,5€ 0% verjetnost za 1€

Preden kliknete 'Naslednja stran' zapišite svoje odločitve na obrazec.

Počakajte na žreb.

Naloga 3: V spodnjih desetih možnostih lahko izbirate med sodelovanjem v loteriji A in loteriji B. Ena izmed možnosti bo izžrebana in odigrani bosta loteriji A in B s pripadajočimi verjetnostmi. Vaš bo dobitek, ki pripada izbrani loteriji. Pri vsaki možnosti označite katero od dveh loterij izberete.

		loterija A	loterija B	
1.	100% verjetnost za 0,20€	○	○	50% verjetnost za 3€ 50% verjetnost za 0€
2.	100% verjetnost za 0,40€	○	○	50% verjetnost za 3€ 50% verjetnost za 0€
3.	100% verjetnost za 0,60€	○	○	50% verjetnost za 3€ 50% verjetnost za 0€
4.	100% verjetnost za 0,80€	○	○	50% verjetnost za 3€ 50% verjetnost za 0€
5.	100% verjetnost za 1,00€	○	○	50% verjetnost za 3€ 50% verjetnost za 0€
6.	100% verjetnost za 1,20€	○	○	50% verjetnost za 3€ 50% verjetnost za 0€
7.	100% verjetnost za 1,40€	○	○	50% verjetnost za 3€ 50% verjetnost za 0€
8.	100% verjetnost za 1,60€	○	○	50% verjetnost za 3€ 50% verjetnost za 0€
9.	100% verjetnost za 1,80€	○	○	50% verjetnost za 3€ 50% verjetnost za 0€
10.	100% verjetnost za 2,00€	○	○	50% verjetnost za 3€ 50% verjetnost za 0€

Preden kliknete 'Naslednja stran' zapišite svoje odločitve na obrazec.

Počakajte na žreb.

Naloga 4: V spodnjih desetih možnostih lahko izbirate med sodelovanjem v loteriji A in loteriji B. Ena izmed možnosti bo izžrebana in odigrani bosta loteriji A in B s pripadajočimi verjetnostmi. Vaš bo dobitek, ki pripada izbrani loteriji. Pri vsaki možnosti označite katero od dveh loterij izberete.

		loterija A	loterija B	
1.	100% verjetnost za 2€	○	○	50% verjetnost za 30€ 50% verjetnost za 0€
2.	100% verjetnost za 4€	○	○	50% verjetnost za 30€ 50% verjetnost za 0€
3.	100% verjetnost za 6€	○	○	50% verjetnost za 30€ 50% verjetnost za 0€
4.	100% verjetnost za 8€	○	○	50% verjetnost za 30€ 50% verjetnost za 0€
5.	100% verjetnost za 10€	○	○	50% verjetnost za 30€ 50% verjetnost za 0€
6.	100% verjetnost za 12€	○	○	50% verjetnost za 30€

		loterija A	loterija B	
				50% verjetnost za 0€
7.	100% verjetnost za 14€	○	○	50% verjetnost za 30€ 50% verjetnost za 0€
8.	100% verjetnost za 16€	○	○	50% verjetnost za 30€ 50% verjetnost za 0€
9.	100% verjetnost za 18€	○	○	50% verjetnost za 30€ 50% verjetnost za 0€
10.	100% verjetnost za 20€	○	○	50% verjetnost za 30€ 50% verjetnost za 0€

Preden kliknete 'Naslednja stran' zapišite svoje odločitve na obrazec.

Počakajte na žreb.

Naloga 5: V spodnjih desetih možnostih lahko izbirate med sodelovanjem v loteriji A in loteriji B. Ena izmed možnosti bo izžrebana in odigrani bosta loteriji A in B s pripadajočimi verjetnostmi. Vaš bo dobitek, ki pripada izbrani loteriji. Pri vsaki možnosti označite katero od dveh loterij izberete.

		loterija A	loterija B	
1.	100% verjetnost za -0,20€	○	○	50% verjetnost za -3€ 50% verjetnost za 0€
2.	100% verjetnost za -0,40€	○	○	50% verjetnost za -3€ 50% verjetnost za 0€
3.	100% verjetnost za -0,60€	○	○	50% verjetnost za -3€ 50% verjetnost za 0€
4.	100% verjetnost za -0,80€	○	○	50% verjetnost za -3€ 50% verjetnost za 0€
5.	100% verjetnost za -1,00€	○	○	50% verjetnost za -3€ 50% verjetnost za 0€
6.	100% verjetnost za -1,20€	○	○	50% verjetnost za -3€ 50% verjetnost za 0€
7.	100% verjetnost za -1,40€	○	○	50% verjetnost za -3€ 50% verjetnost za 0€
8.	100% verjetnost za -1,60€	○	○	50% verjetnost za -3€ 50% verjetnost za 0€
9.	100% verjetnost za -1,80€	○	○	50% verjetnost za -3€ 50% verjetnost za 0€
10.	100% verjetnost za -2,00€	○	○	50% verjetnost za -3€ 50% verjetnost za 0€

Preden kliknete 'Naslednja stran' zapišite svoje odločitve na obrazec.

Počakajte na žreb.

Naloga 6: V spodnjih desetih možnostih lahko izbirate med sodelovanjem v loteriji A in loteriji B. Ena izmed možnosti bo izžrebana in odigrani bosta loteriji A in B s pripadajočimi verjetnostmi. Vaš bo dobitek, ki pripada izbrani loteriji. Pri vsaki možnosti označite katero od dveh loterij izberete.

		loterija A	loterija B	
1.	100% verjetnost za -2€	○	○	50% verjetnost za -30€ 50% verjetnost za 0€
2.	100% verjetnost za -4€	○	○	50% verjetnost za -30€ 50% verjetnost za 0€
3.	100% verjetnost za -6€	○	○	50% verjetnost za -30€ 50% verjetnost za 0€
4.	100% verjetnost za -8€	○	○	50% verjetnost za -30€ 50% verjetnost za 0€
5.	100% verjetnost za -10€	○	○	50% verjetnost za -30€ 50% verjetnost za 0€
6.	100% verjetnost za -12€	○	○	50% verjetnost za -30€ 50% verjetnost za 0€
7.	100% verjetnost za -14€	○	○	50% verjetnost za -30€ 50% verjetnost za 0€
8.	100% verjetnost za -16€	○	○	50% verjetnost za -30€ 50% verjetnost za 0€
9.	100% verjetnost za -18€	○	○	50% verjetnost za -30€ 50% verjetnost za 0€
10.	100% verjetnost za -20€	○	○	50% verjetnost za -30€ 50% verjetnost za 0€

Q13 - Naslednja vprašanja se nanašajo na vaše demografske značilnosti. Odgovori so anonimni.

Spol - Spol:

○ Ženski
○ Moški

Starost - Starost:

○ 18-20 let
○ 21-23 let
○ 24-26 let
○ nad 26 let

Izobrazba - Najvišja stopnja dosežene izobrazbe:

○ poklicna matura
○ splošna matura
○ višja ali visoka šola
○ diploma (UN)
○ specializacija, magisterij, doktorat

Dohodek - Povprečni mesečni neto dohodek (štipendija, žepnina, študentsko delo, dohodek iz zaposlitve, ...):

◯ 0-200 €
◯ 200-400 €
◯ 400-600 €
◯ 600-800€
◯ 800-1000 €
◯ nad 1000 €
◯ ne želim odgovoriti

VirDoh - Katera izmed spodnjih kategorij v povprečju predstavlja vaš največji vir dohodka?

◯ žepnina staršev
◯ štipendija
◯ zaslužek študentskega dela
◯ dohodek iz zaposlitve
◯ ne želim odgovoriti
◯ Drugo:

Q14 - Naslednja vprašanja se nanašajo na vaše preference pri sprejemanju tveganj v vsakdanjem življenju. Odgovori so anonimni.

Loterija - Kako pogosto igrate igre na srečo (loterija, nakup srečk, športne stave, ipd.)?

◯ nikoli
◯ redko (enkrat letno ali manj)
◯ občasno (večkrat na leto)
◯ redno (vsaj enkrat mesečno)
◯ ne želim odgovoriti

ZavOdp - Kako pogosto ob nakupu letalskih kart, najemu avtomobila ali ob plačilu turističnega aranžmaja sklenete zavarovanje za primer odpovedi?

◯ nikoli
◯ občasno
◯ vedno
◯ ne opravljam tovrstnih nakupov
◯ ne želim odgovoriti

ZavTur - Kako pogosto ob potovanju v tujino sklenete turistično zavarovanje?

◯ nikoli
◯ občasno
◯ vedno
◯ ne potujem v tujino
◯ ne želim odgovoriti

PricDoba - Koliko let menite da boste živeli?

Q15 - Predpostavljajte, da je v igri loterije na voljo 1000 EUR z verjetnostjo 10%. Največ koliko bi bili pripravljeni plačati za sodelovanje v loteriji?

Q16 - Predpostavljajte, da imate na voljo 100 EUR v gotovini. Namesto tega, lahko izberete loterijsko srečko. Loterija ima nagrado 2000 EUR, vendar verjetnost za dobitek še ni določena. Najmanj koliko visoka (v odstotkih) bi morala biti verjetnost dobitka, da bi se odločili za sodelovanje v loteriji, namesto da bi vzeli 100 EUR v gotovini?

IzbPred - Predstavljajte si, da si izbirate izbirni predmet za naslednji semester. Za predmet, o katerem razmišljate, je splošno znano, da je v veliko pomoč pri razumevanju področja, ki ga študirate, prijatelj pa vam pove, da je predmet izredno težak. Kaj bi storili?

○ Predmet bi izbral.
○ Predmeta ne bi izbral.

RdecaCrna - Igrate igro v paru, kjer ima vsak eno črno karto in eno rdečo karto. Če oba igralca obrneta črno karto, bosta oba prejela plačilo v višini 5€. Če oba obrneta rdečo karto, bosta oba prejela plačilo v višini 3€. Če pa eden obrne rdečo karto, drugi pa črno, bo igralec, ki je obrnil rdečo karto dobil 8€, igralec, ki je obrnil črno pa 0. Katero karto bi obrnili?

○ rdečo
○ črno

Borza - Ali ste s svojim premoženjem kdaj sodelovali na borzi (pri nakupu finančnih inštrumentov ali tujih valut)?

○ da
○ ne
○ ne želim odgovoriti

Kripto - Ali ste svoje premoženje kdaj vložili v kriptovalute?

○ da
○ ne
○ ne želim odgovoriti

Q25 - Za vsako od naslednjih trditev označite ali drži ali ne drži.
Spodaj lahko najdete prevod v slovenščino tistih besed, ki so označene z *.

	Drži	Ne drži
I do not like to waste time just sitting around and relaxing.	◯	◯
I lead a busier life than most people.	◯	◯
I like to be doing things all of the time.	◯	◯
I can enjoy myself just lying around and not doing anything active.	◯	◯
I do not feel the need to be doing things all of the time.	◯	◯
When on vacation I like to engage in active sports rather than just lie around.	◯	◯
I like to wear myself out with hard work or exercise.	◯	◯
I like to be active as soon as I wake up in the morning.	◯	◯
I like to keep busy all the time.	◯	◯
When I do things, I do them with lots of energy.	◯	◯
When I get mad, I say ugly things.	◯	◯
It's natural for me to curse* when I am mad.	◯	◯
I almost never feel like I would like to hit someone.	◯	◯
If someone offends me, I just try not to think about it.	◯	◯
If people annoy me I do not hesitate to tell them so.	◯	◯
When people disagree with me I cannot help getting into an argument with them.	◯	◯
I have a very strong temper.	◯	◯
I can't help being a little rude to people I do not like.	◯	◯
I am always patient with others even when they are irritating.	◯	◯
When people shout at me, I shout back.	◯	◯
I often do things on impulse.	◯	◯
I would like to take off on a trip with no preplanned or definite routes or timetables.	◯	◯
I enjoy getting into new situations where you can't predict how things will turn out.	◯	◯
I sometimes like to do things that are a little frightening.	◯	◯
I'll try anything once.	◯	◯
I would like the kind of life where one is on the move and travelling a lot, with lots of change and excitement.	◯	◯
I sometimes do "crazy" things just for fun.	◯	◯
I prefer friends who are excitingly unpredictable.	◯	◯
I often get so carried away by new and exciting things and ideas that I never think of possible complications.	◯	◯
I like "wild" uninhibited* parties.	◯	◯
My body often feels all tightened up for no apparent reason.	◯	◯
I frequently get emotionally upset.	◯	◯
I tend to be oversensitive and easily hurt by thoughtless remarks and actions of others.	◯	◯
I am easily frightened.	◯	◯
I sometimes feel panicky.	◯	◯
I often feel unsure of myself.	◯	◯
I often worry about things that other people think are unimportant.	◯	◯
I often feel like crying sometimes without a reason.	◯	◯

	Drži	Ne drži
I don't let a lot of trivial things irritate* me.	◯	◯
I often feel uncomfortable and ill at ease for no real reason.	◯	◯
I do not mind going out alone and usually prefer it to being out in a large group.	◯	◯
I spend as much time with my friends as I can.	◯	◯
I do not need a large number of casual friends.	◯	◯
I tend to be uncomfortable at big parties.	◯	◯
At parties, I enjoy mingling with many people whether I already know them or not.	◯	◯
I would not mind being socially isolated in some place for some period of time.	◯	◯
Generally, I like to be alone so I can do things I want to do without social distractions.	◯	◯
I am a very sociable person.	◯	◯
I usually prefer to do things alone.	◯	◯
I probably spend more time than I should socializing with friends.	◯	◯

*** curse - preklinjati; * uninhibited - neomejen; * irritate - razdražiti.**

SSSV - Please indicate which of the following scenarios you would prefer.
Spodaj lahko najdete prevod v slovenščino tistih besed, ki so označene z *.

I prefer quiet parties with good conversation	◯	◯	I like “wild” uninhibited parties
There are some movies I enjoy seeing a second or even a third time	◯	◯	I can't stand watching a movie that I've seen before
I can't understand people who risk their necks climbing mountains	◯	◯	I often wish I could be a mountain climber
I dislike all body odors	◯	◯	I like some of the earthy body smells
I like the comfortable familiarity of everyday friends	◯	◯	I get bored seeing the same old faces
I prefer a guide when I am in a place I do not know well	◯	◯	I like to explore a strange city or section of town by myself even if it means getting lost
I dislike people who do or say things just to shock or upset others	◯	◯	When you can predict almost everything a person will do and say he or she must be a bore
I don't mind watching a movie or a play where I can predict what will happen in advance	◯	◯	I usually don't enjoy a movie or play where I can predict what will happen in advance
I have tried marijuana or would like to	◯	◯	I would like to try some of the new drugs that produce hallucinations
I would not like to try any drug which might produce strange and dangerous effects on me	◯	◯	I would like to try some of the new drugs that produce hallucinations
A sensible person avoids activities that are dangerous	◯	◯	I sometimes like to do things that are a little frightening

I dislike “swingers” (people who are uninhibited and free about sex)	◯	◯	I enjoy the company of real “swingers”
I find that stimulants make me uncomfortable	◯	◯	I often like to get high (drinking liquor or smoking marijuana)
I order the dishes with which I am familiar so as to avoid disappointment and unpleasantness	◯	◯	I like to try new foods that I have never tasted before
I enjoy looking at home movies or travel slides	◯	◯	Looking at someone's home movies or travel slides bores me tremendously
I would not like to take up water skiing	◯	◯	I would like to take up the sport of water skiing
I would not like to try surf boarding	◯	◯	I would like to try surf boarding
When I go on a trip I like to plan my route and timetable fairly carefully	◯	◯	I would like to take off on a trip with no preplanned or definite routes or timetable
I prefer the “down to earth” kinds of people as friends	◯	◯	I would like to make friends in some of the “far out” groups like artists or “punks”
I would not like to learn to fly an airplane	◯	◯	I would like to learn to fly an airplane
I prefer the surface of the water to the depths	◯	◯	I would like to go scuba diving
I stay away from anyone I suspect of being “gay or lesbian”	◯	◯	I would like to meet some persons who are homosexual (men or women)
I would never want to try jumping out of a plane - with or without a parachute	◯	◯	I would like to try parachute jumping
I prefer friends who are reliable and predictable	◯	◯	I prefer friends who are excitingly unpredictable
I am not interested in experience for its own sake	◯	◯	I like to have new and exciting experiences and sensations even if they are a little frightening / unconventional or illegal
I enjoy spending time in the familiar surroundings of home	◯	◯	I get very restless if I have to stay around home for any length of time
I don't like the feeling I get standing on the high board (or I don't go near it at all)	◯	◯	I like to dive off* the high board
I like to date members of the opposite sex who share my values	◯	◯	I like to date members of the opposite sex who are physically exciting
Heavy drinking usually ruins a party because some people get loud and boisterous	◯	◯	Keeping the drinks full is the key to a good party
The worst social sin* is to be rude	◯	◯	The worst social sin* is to be a bore
It's better if two married persons begin their sexual experience with each other	◯	◯	A person should have considerable sexual experience before marriage
Even if I had the money I would not care to associate with flight rich	◯	◯	I could conceive of myself seeking pleasures around the world with the “jet

persons like those in the “jet set”*			set”*
I dislike people who have their fun at the expensive of hurting the feelings of others	◯	◯	I like people who are sharp and witty even if they do sometimes insult others
There is altogether too much portrayal of sex in movies	◯	◯	I enjoy watching many of the “sexy” scenes in movies
Something is wrong with people who need liquor to feel good	◯	◯	I feel best after taking a couple of drinks
People should dress according to some standard of taste / neatness and style	◯	◯	People should dress in individual ways even if the effects are sometimes strange
Sailing long distances in small sailing crafts is foolhardy*	◯	◯	I would like to sail a long distance in a small but seaworthy sailing craft
I find something interesting in almost every person I talk to	◯	◯	I have no patience with dull or boring persons
Skiing down a high mountain slope is a good way to end up on crutches*	◯	◯	I think I would enjoy the sensations of skiing very fast down a high mountain slope

*** dive off - skočiti v vodo;* social sin - družbeni greh; * jet set - oznaka za življenjski stil premožnih, ki veliko in pogosto potujejo za užitek; * foolhardy - nepremišljeno;* crutches - bergle.**

Appendix 3: Test statistics for H1

t-Test: Paired Two Sample for Means

	Number of safe choices_1	*Number of safe choices_2*
Mean	5.1250	5.5250
Variance	2.4199	2.4096
Observations	40.0000	40.0000
Pearson Correlation	0.5561	
Hypothesized Mean Difference	0.0000	
df	39.0000	
t Stat	-1.7279	
P(T<=t) one-tail	0.0460	
t Critical one-tail	1.6849	
P(T<=t) two-tail	0.0919	
t Critical two-tail	2.0227	

t-Test: Paired Two Sample for Means

	Number of safe choices_3	*Number of safe choices_4*
Mean	3.8250	4.1500
Variance	3.3276	1.6179
Observations	40.0000	40.0000
Pearson Correlation	0.4868	
Hypothesized Mean Difference	0.0000	
df	39.0000	
t Stat	-1.2541	
P(T<=t) one-tail	0.1086	
t Critical one-tail	1.6849	
P(T<=t) two-tail	0.2173	
t Critical two-tail	2.0227	

Appendix 4: Test statistics for H3

t-Test: Paired Two Sample for Means

	Number of safe choices_3	*Number of safe choices_5*
Mean	3.8250	5.3500
Variance	3.3276	6.5410
Observations	40.0000	40.0000
Pearson Correlation	-0.0030	
Hypothesized Mean Difference	0.0000	
df	39.0000	
t Stat	-3.0659	
P(T<=t) one-tail	0.0020	
t Critical one-tail	1.6849	
P(T<=t) two-tail	0.0039	
t Critical two-tail	2.0227	

t-Test: Paired Two Sample for Means

	Number of safe choices_4	*Number of safe choices_6*
Mean	4.1500	5.7500
Variance	1.6179	3.2179
Observations	40.0000	40.0000
Pearson Correlation	-0.1180	
Hypothesized Mean Difference	0.0000	
df	39.0000	
t Stat	-4.3650	
P(T<=t) one-tail	0.0000	
t Critical one-tail	1.6849	
P(T<=t) two-tail	0.0001	
t Critical two-tail	2.0227	

Appendix 5: Test statistics for H4a

F-Test Two-Sample for Variances

	avg_ men	*avg_ women*	*risk_question - men*	*risk_question - women*
Mean	4.8056	5.0758	8.2076	8.6364
Variance	1.0106	0.9278	3.2505	2.5281
Observations	18.0000	22.0000	18.0000	22.0000
df	17.0000	21.0000	17.0000	21.0000
F	1.0892		1.2857	
P(F<=f) one-tail	0.4210		0.2893	
F Critical one-tail	2.1389		2.1389	

t-Test: Two-Sample Assuming Equal Variances

	avg_ men	*avg_ women*	*risk_question - men*	*risk_question - women*
Mean	4.8056	5.0758	8.2076	8.6364
Variance	1.0106	0.9278	3.2505	2.5281
Observations	18.0000	22.0000	18.0000	22.0000
Pooled Variance	0.9649		2.8513	
Hypothesized Mean Difference	0.0000		0.0000	
df	38.0000		38.0000	
t Stat	-0.8655		-0.7989	
P(T<=t) one-tail	0.1961		0.2146	
t Critical one-tail	1.6860		1.6860	
P(T<=t) two-tail	0.3922		0.4293	
t Critical two-tail	2.0244		2.0244	

Appendix 6: Test statistic for H4b

F-Test Two-Sample for Variances				
	avg_old	*avg_ young*	*risk_ question - old*	*risk_ question - young*
Mean	4.7063	5.2281	8.0952	8.8283
Variance	1.1553	0.6426	3.7905	1.6111
Observations	21.0000	19.0000	21.0000	19.0000
df	20.0000	18.0000	20.0000	18.0000
F	1.7978		2.3527	
P(F<=f) one-tail	0.1081		0.0367	
F Critical one-tail	2.1906		2.1906	

t-Test: Two-Sample Assuming Equal Variances			t-Test: Two-Sample Assuming Unequal Variances	
	avg_old	*avg_young*		
Mean	4.7063	5.2281	8.0952	8.8283
Variance	1.1553	0.6426	3.7905	1.6111
Observations	21.0000	19.0000	21.0000	19.0000
Pooled Variance	0.9124		/	/
Hypothesized Mean Difference	0.0000		0.0000	
df	38.0000		35.0000	
t Stat	-1.7250		-1.4231	
P(T<=t) one-tail	0.0463		0.0818	
t Critical one-tail	1.6860		1.6896	
P(T<=t) two-tail	0.0927		0.1635	
t Critical two-tail	2.0244		2.0301	

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
risk_task	Between Groups	9,551	3	3,184	4,117	,013
	Within Groups	27,837	36	,773		
	Total	37,388	39			
risk_question	Between Groups	5,721	3	1,907	,657	,584
	Within Groups	104,448	36	2,901		
	Total	110,170	39			

Appendix 7: Test statistics for H4c

F-Test Two-Sample for Variances

	izob_visoka	*izob_nizka*
Mean	4.6736	5.3824
Variance	1.0471	0.5374
Observations	24.0000	17.0000
df	23.0000	16.0000
F	1.9484	
P(F<=f) one-tail	0.0864	
F Critical one-tail	2.2443	

t-Test: Two-Sample Assuming Equal Variances

	izob_visoka	*izob_nizka*
Mean	4.6736	5.3824
Variance	1.0471	0.5374
Observations	24.0000	17.0000
Pooled Variance	0.8380	
Hypothesized Mean Difference	0.0000	
df	39.0000	
t Stat	-2.4424	
P(T<=t) one-tail	0.0096	
t Critical one-tail	1.6849	
P(T<=t) two-tail	0.0192	
t Critical two-tail	2.0227	

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
avg_safe	Between Groups	13,092	4	3,273	4,715	,004
	Within Groups	24,296	35	,694		
	Total	37,388	39			
risk_question	Between Groups	22,447	4	5,612	2,239	,085
	Within Groups	87,723	35	2,506		
	Total	110,170	39			

Appendix 8: SPSS output for H5

Correlations

		risk_task_women	2d4d_women	risk_task_men	2d4d_men
risk_task_women	Pearson Correlation	1	-,075	-,138	,357
	Sig. (2-tailed)		,741	,584	,146
	N	22	22	18	18
2d4d_women	Pearson Correlation	-,075	1	,332	-,324
	Sig. (2-tailed)	,741		,179	,189
	N	22	22	18	18
risk_task_men	Pearson Correlation	-,138	,332	1	-,324
	Sig. (2-tailed)	,584	,179		,190
	N	18	18	18	18
2d4d_men	Pearson Correlation	,357	-,324	-,324	1
	Sig. (2-tailed)	,146	,189	,190	
	N	18	18	18	18

Correlations

		risk_question_women	2d4d_women	risk_question_men	2d4d_men
risk_question_women	Pearson Correlation	1	-,147	,483*	,073
	Sig. (1-tailed)		,257	,021	,387
	N	22	22	18	18
2d4d_women	Pearson Correlation	-,147	1	,078	-,324
	Sig. (1-tailed)	,257		,380	,095
	N	22	22	18	18
risk_question_men	Pearson Correlation	,483*	,078	1	-,033
	Sig. (1-tailed)	,021	,380		,449
	N	18	18	18	18
2d4d_men	Pearson Correlation	,073	-,324	-,033	1
	Sig. (1-tailed)	,387	,095	,449	
	N	18	18	18	18

*. Correlation is significant at the 0.05 level (1-tailed).

Appendix 9: Test statistics for H6a and H6b

SPSS output for H6a and H6b

Correlations

		risk_task	risk_question	fWHR	BodyHeight
risk_task	Pearson Correlation	1	,148	-,054	-,200
	Sig. (1-tailed)		,181	,370	,109
risk_question	Pearson Correlation	,148	1	,040	-,010
	Sig. (1-tailed)	,181		,402	,475
fWHR	Pearson Correlation	-,054	,040	1	,450**
	Sig. (1-tailed)	,370	,402		,002
BodyHeight	Pearson Correlation	-,200	-,010	,450**	1
	Sig. (1-tailed)	,109	,475	,002	

**. Correlation is significant at the 0.01 level (1-tailed).

F-Test Two-Sample for Variances

	risk_task - big	*risk_task - small*	*risk_question - big*	*risk_question - small*
Mean	4.8335	5.0877	8.4223	8.4668
Variance	1.1053	0.8129	2.9636	2.8265
Observations	21.0000	19.0000	21.0000	19.0000
df	20.0000	18.0000	20.0000	18.0000
F	1.3598		1.0485	
P(F<=f) one-tail	0.2582		0.4627	
F Critical one-tail	2.1906		2.1906	

t-Test: Two-Sample Assuming Equal Variances

	risk_task - big	*risk_task - small*	*risk_question - big*	*risk_question - small*
Mean	4.8335	5.0877	8.4223	8.4668
Variance	1.1053	0.8129	2.9636	2.8265
Observations	21.0000	19.0000	21.0000	19.0000
Pooled Variance	0.9668		2.8987	
Hypothesized Mean Difference	0.0000		0.0000	
df	38.0000		38.0000	
t Stat	-0.8166		-0.0825	
P(T<=t) one-tail	0.2096		0.4674	
t Critical one-tail	1.6860		1.6860	
P(T<=t) two-tail	0.4192		0.9347	
t Critical two-tail	2.0244		2.0244	

Appendix 10: SPSS output for H7

		risk_task	risk_question	ZKPQ_aktivnost	ZKPQ_agrsov	ZKPQ_impulz	ZKPQ_nevroanks	ZKPQ_sociabilnost	SkupnoSSS	TAS	ES	Dis	BS
risk_task	Pearson Correlation	1	0,148	0,028	0,031	0,042	,296*	-0,031	-0,023	0,040	-0,170	0,096	-0,022
	Sig (1-tailed)		0,181	0,432	0,425	0,400	0,032	0,425	0,445	0,403	0,147	0,279	0,447
risk_question	Pearson Correlation	0,148	1	-0,002	0,231	-0,257	,508**	-0,106	-,631**	-,550**	-,498**	-,303*	-,364*
	Sig (1-tailed)	0,181		0,495	0,076	0,055	0,000	0,258	0,000	0,000	0,001	0,029	0,010
ZKPQ_aktivnost	Pearson Correlation	0,028	-0,002	1	-,295*	-0,100	-0,113	-0,087	-0,113	-0,097	0,034	-,376**	0,119
	Sig (1-tailed)	0,432	0,495		0,033	0,269	0,244	0,296	0,243	0,277	0,418	0,008	0,232
ZKPQ_agrsov	Pearson Correlation	0,031	0,231	-,295*	1	-0,026	,445**	-0,042	0,012	-0,214	-0,120	0,061	,345*
	Sig (1-tailed)	0,425	0,076	0,033		0,437	0,002	0,400	0,471	0,092	0,231	0,355	0,015
ZKPQ_impulz	Pearson Correlation	0,042	-0,257	-0,100	-0,026	1	-0,138	,480**	,654**	,596**	,509**	,416**	0,254
	Sig (1-tailed)	0,400	0,055	0,269	0,437		0,197	0,001	0,000	0,000	0,000	0,004	0,057
ZKPQ_nevroanks	Pearson Correlation	,296*	,508**	-0,113	,445**	-0,138	1	-0,001	-,364*	-,367**	-,342*	0,003	-,270*
	Sig (1-tailed)	0,032	0,000	0,244	0,002	0,197		0,497	0,011	0,010	0,015	0,494	0,046
ZKPQ_sociabilnost	Pearson Correlation	-0,031	-0,106	-0,087	-0,042	,480**	-0,001	1	0,137	0,086	,292*	0,108	-0,124
	Sig (1-tailed)	0,425	0,258	0,296	0,400	0,001	0,497		0,199	0,298	0,034	0,254	0,224
SkupnoSSS	Pearson Correlation	-0,023	-,631**	-0,113	0,012	,654**	-,364*	0,137	1	,830**	,638**	,616**	,652**
	Sig (1-tailed)	0,445	0,000	0,243	0,471	0,000	0,011	0,199		0,000	0,000	0,000	0,000
TAS	Pearson Correlation	0,040	-,550**	-0,097	-0,214	,596**	-,367**	0,086	,830**	1	,417**	,470**	,353*
	Sig (1-tailed)	0,403	0,000	0,277	0,092	0,000	0,010	0,298	0,000		0,004	0,001	0,013
ES	Pearson Correlation	-0,170	-,498**	0,034	-0,120	,509**	-,342*	,292*	,638**	,417**	1	0,039	0,253
	Sig (1-tailed)	0,147	0,001	0,418	0,231	0,000	0,015	0,034	0,000	0,004		0,405	0,057
Dis	Pearson Correlation	0,096	-,303*	-,376**	0,061	,416**	0,003	0,108	,616**	,470**	0,039	1	0,213
	Sig (1-tailed)	0,279	0,029	0,008	0,355	0,004	0,494	0,254	0,000	0,001	0,405		0,093
BS	Pearson Correlation	-0,022	-,364*	0,119	,345*	0,254	-,270*	-0,124	,652**	,353*	0,253	0,213	1
	Sig (1-tailed)	0,447	0,010	0,232	0,015	0,057	0,046	0,224	0,000	0,013	0,057	0,093	

**. Correlation is significant at the 0.05 level (1-tailed).*

***. Correlation is significant at the 0.01 level (1-tailed).*

Appendix 11: SPSS output for fixed effects

Descriptives

risk_task

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean Lower Bound	95% Confidence Interval for Mean Upper Bound	Minimum	Maximum	Between-Component Variance
group 1		10	4,8500	,7389	,2337	4,3214	5,3786	3,5000	5,5000	
group 2		11	4,8333	1,0301	,3106	4,1413	5,5254	2,1667	6,1667	
group 3		10	4,9500	1,1029	,3488	4,1610	5,7390	3,3333	7,0000	
group 4		9	5,2222	1,1180	,3727	4,3628	6,0816	3,8333	7,8333	
Total		40	4,9542	,9791	,1548	4,6410	5,2673	2,1667	7,8333	
Model	Fixed			1,0065	,1591	4,6314	5,2769			
	Random				,1591[a]	4,4477[a]	5,4606[a]			-,0709

a. Warning: Between-component variance is negative. It was replaced by 0.0 in computing this random effects measure.

Test of Homogeneity of Variances

		Levene Statistic	df1	df2	Sig.
risk_task	Based on Mean	,416	3	36	,743
	Based on Median	,459	3	36	,713
	Based on Median and with adjusted df	,459	3	32,346	,713
	Based on trimmed mean	,414	3	36	,744

ANOVA

risk_task

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	,916	3	,305	,301	,824
Within Groups	36,472	36	1,013		
Total	37,388	39			

Appendix 12: SPSS output for Reservation price, Reservation probability and Deviation from Life Expectancy

Correlations

		risk_task	risk_question	Lot_price	Lot_prob	LifeExp_dev
risk_task	Pearson Correlation	1	,145	-,105	-,147	-,186
	Sig. (2-tailed)		,372	,521	,364	,251
risk_question	Pearson Correlation	,145	1	,133	,194	-,143
	Sig. (2-tailed)	,372		,413	,232	,379
Lot_price	Pearson Correlation	-,105	,133	1	-,528**	,129
	Sig. (2-tailed)	,521	,413		,000	,427
Lot_prob	Pearson Correlation	-,147	,194	-,528**	1	-,177
	Sig. (2-tailed)	,364	,232	,000		,275
LifeExp_dev	Pearson Correlation	-,186	-,143	,129	-,177	1
	Sig. (2-tailed)	,251	,379	,427	,275	

**. Correlation is significant at the 0.01 level (2-tailed).