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Influence of cognitive capacity on stereotyping and discrimination

Master thesis

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Abstract

In this paper we examine the effect of cognitive capacity on stereotyping and discrimination. In our laboratory experiment, we attempt to lower the cognitive capacity by 6-digit code rehearsal and enhance it by glucose intake. We investigate if there are changes in the extent of stereotyping and discrimination under these treatments. After several tests, our results show a significant effect on stereotyping but no effect on discrimination. We observe that participants stereotype more under cognitive load and less after glucose intake. However, regarding discrimination we found insignificant and unambiguous outcome.

Keywords: stereotyping, discrimination, cognitive capacity, cognitive load, glucose intake

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*"It is time that we all see gender as a spectrum
instead of two sets of opposing ideals."*

-Emma Watson

Introduction

People are often inclined to differentiate among individuals based on personal opinion. This, often unreasonable inclination, can lead to a bias, which constraints us to see individuals neutrally. These biases can serve as tools to reduce the complexity of our world and allow us to use limited direct information to form beliefs or make actions. Therefore, they are aids to save cognitive effort needed to process information, which can be highly demanding and sometimes even impossible.

We are often biased against or for other people based on mostly instantly observable characteristics including gender, race, ethnicity, age, etc. (Fiske, 2010). The application of these categorical biases can easily lead to stereotyping and discrimination. On the one hand, stereotyping is cognitive process, which does not automatically result in action. Stereotyping is a tendency of thinking, leading to a simplified way of information processing. *"Stereotyping is the application of an individual's own thoughts, beliefs, and expectations onto other individuals without first obtaining factual knowledge about the individual(s)"* (Keene, 2011, p. 2). On the other hand, discrimination leads to an actual action for, or against individuals. Thus, discrimination is not anymore only a way of thinking, but a way of behaviour, which may be based on stereotypical ideas. (Fiske, 1998). Discrimination is defined by Correll et al. (2010) as a *„behaviour directed towards category members that is consequential for their outcomes and that is directed towards them not because of any particular deservingness or reciprocity but simply because they happen to be member of that category"* (p. 45). Stereotyping and discrimination are related concepts evolving due to biases by *"judging another individual or group of individuals prior to obtaining factual knowledge of the individual or group"* (Keene, 2011, p. 1).

In everyday life, we do not make strong distinction between stereotyping and discrimination. However, there is an unsettled discussion about the real connection between the two concepts in the existing literature. On the one hand, discriminatory behaviour is assumed to be directly driven by stereotypes (Stangor, 2012). But on the other hand, it is also possible that one can be without the other. For instance, according to Pluos (2002), only negative stereotypes lead to discrimination, but neutral and positive stereotypes do not. Moreover, discrimination can

happen unintentionally as well (Pluos, 2002). Either of these options is the case, we need to investigate stereotyping and discrimination separately since they are evolved by different circumstances as well as they result in different consequences.

Stereotyping and discrimination can lead to several social and economic consequences. Although the concept of stereotyping and discrimination seem to be similar and sometimes they are even applied interchangeably, they usually have different influences on our life. Unfortunately, the existing literature sometimes disregards this essential differentiation between the two phenomena and handle them as one issue. However, we can make distinction based on their impacts, for instance. On the one hand, stereotypes can function as a priming of our behaviour. Once a stereotype gets activated in our mind, we are inclined to behave according to the stereotype. As an example, it was demonstrated by several studies that women perform worse on challenging mathematical tasks when they are primed by the suggestion that the test aims to measure gender differences in mathematics abilities. Due to the stereotype of lower female math abilities, the behaviour becomes consistent with the suggested stereotype. In this case, stereotypes turn into self-fulfilling prophecies, in a way that expectations, about the individuals belonging to a certain group, come true (Synder et al. 1977). It means that self-fulfilling prophecies can lead to lower performance, resulting in an expectation-consistent behaviour. This usually arises unconsciously.

Furthermore, once we believe that women are less capable in leader positions than men, we are inclined to behave such a manner, which actually makes easier for men to fulfil these positions. This can cause hardships for women to reach these positions. From the women's point of view these hardships become natural and consistent with their beliefs. Since they believe that they are less capable leader than men, they will not target the leading positions.

People facing with stereotypes have to deal with another burden as well: "*the threat that their behaviour will confirm a negative stereotype*" (p. 618) known as stereotype threat (Steele, 1997). It causes anxiety and fear from that their performance is associated with their stereotypes. In case of positive stereotypes, it puts pressure on the person to perform as well as it is expected by others, and in case of negative stereotype, he/she has to disprove the stereotypes. This anxiety can easily hamper their performance (Conaway, 2005).

However, discrimination can have even more severe economic and social consequences than stereotyping. There are victims of discrimination in several areas of our everyday life such as "*employment, income, financial opportunities, housing, educational opportunities and medical*

care” (Stangor, 2012, p. 684). Discriminated people are deprived from the equal rights, resulting in lost opportunities and options in all areas of life. For instance, William and Rucker (1996) found that discrimination is the main reason for poverty and low availability of well-paid jobs among black people in more developed countries. Minorities with the same level of education and the same amount of experience have significantly lower chance to achieve prestigious job due to discrimination. Discriminated people have to face with unequal treatment during the application process regardless if it is about education, house purchase, socialization, etc. These difficulties can have considerable consequences on bridging social network, making discriminated people lagged behind. Moreover, it results in a mismatch between labour availability and employment opportunities. (Heath and McMahon, 1997). This means a great loss of human capital forfeiture of productive labour force due to organizational discrimination.

Gender discrimination can also have significant consequences regarding organizational performance. It was found by several studies that firms, which have three or more female on the board, perform 2,9% better regarding equity return and have 24% less governance cases such as bribery or fraud (Martin, 2016). It means that we need to be more conscious about the gender composition of the organizations and aim to encourage more women participation. Unfortunately, the glass ceiling effect still exist, meaning that men are more representative and have stronger position on the top of the hierarchy (Cotter et al., 2001). According to Egon Zehnder International (2012), in 2012 the proportion of women in corporate boards was only 15,6% relative to men in Europe.

In addition, organizational discrimination can also have some more tangible, more directly observable negative effects. For example, they have to face fines imposed upon the discovery of workplace discrimination, litigation expenses associated with the investigation as well as loss of production due to the discovery process. In addition, bad publicity can further hurt the reputation of the organization. (Mayhew, 2010).

Due to the fact that the list of severe social, economic and psychological consequences of stereotypes and discrimination is endless, social psychologist started to devote a greater attention to the underlying process of these phenomena. Comprehending the evolvement and process of stereotyping and discriminatory behaviour could provide some suggestions about the way to overcome (Ramiah et al, 2010). In this research, the evolvement of stereotyping and discriminatory behaviour will be examined from one specific side, namely the cognitive capacity. We will aim to reveal the connection between the cognitive energy and the presence

of stereotyping and discrimination. Therefore, the purpose of this research is to investigate *how the change in the cognitive capacity influences stereotyping and discrimination*.

In this research, we will apply laboratory experiments to reveal some phenomena regarding the relationship between cognitive capacity and stereotyping as well as discrimination. This method can provide an appropriate and highly controlled way of measuring the chances and circumstances of stereotyping and discriminatory behaviour under different cognitive capacity.

This paper is structured as follows: in section 2, the theoretical background and previous findings are discussed, in section 3 the hypothesis of this research are introduced and in section 4 we turn to the operationalization. In section 5, we embed the experiment into a context and introduce the location of the experiment. In section 6, the design of the experiment is explained in details. In section 7, we describe the implementation and the whole process of the experiment. In section 8, we turn to methodology section, where we discuss the variables and methods applied in the statistical analysis then in section 9 we show to the results derived from the experiment. Finally, we will conclude with some implications and discussions.

Theoretical background

System 1 and System 2

In order to understand the mechanism of stereotyping and discrimination, we need to delve into the field of psychology and cognitive sciences. To illustrate how they function, the introduction of cognitive system as it was discussed by Kahneman (2011) can be a helpful starting point. He divided our cognitive process into system 1 and system 2. System 1 is responsible for fast, automatic, intuitive, effortless, and uncontrolled actions. They are likely to occur due to the patterns of prior experiences. On the other hand, system 2 requires deliberate thinking, high level of cognitive effort and focus. They usually occur in unfamiliar situations.

When our attention is concentrated on one system 2 activity, it is possible that our mind does not have enough cognitive capacity left to perform another system 2 activity. The available cognitive energy is depleted, and in this situation system 1 can take over control. When system 1 is active instead of system 2, our behaviour can be considerably affected leading to an irrational behaviour (Kahneman, 2011).

Lateral prefrontal cortex

While the theory of Kahneman (2011) can help us to imagine this process, neuroscience can provide us a more scientifically based description of the connection between cognitive energy

and behaviour. They widely examine the capacity limitation of our cognition that has *its putative neural substrate* in “*lateral prefrontal cortex (LPFC)*” (Watanabe and Funahashi, 2014, p.1). LPFC is found to be essentially involved in controlling our behaviour. Neurons in LPFC are highly active during the process of behaviour planning and the evolvement of intentional actions. Moreover, LPFC is also highly active in complex situations, when we need to select to which aspect we devote our attention (Tanji and Hoshi, 2008). Watanabe and Funahashi (2014) apply the classical dual-task interference to support the idea of limited cognitive capacity. They found a decreased neuron activity in the LPFC under dual-task interference. In this situation, when subjects have to concentrate on two tasks, they noticed decreased information processing abilities backed by low neuron activity. This provides some indication for cognitive capacity limitations.

It means that our cognitive energy is a depletable resource, affecting the functioning of LPFC. Long term focus and high level of concentration will reduce the cognitive capacity available in LPFC. In this case, we will have difficulties with the execution of other tasks requiring effortful thinking and information processing. Rather, we will think in an intuitive or uncontrolled manner, which can lead to some irrational outcome regarding our controlled behaviour.

Biases

Since LPFC is responsible for our controlled behaviour, in a cognitively depleted situation when neurons are less active in LPFC, we may behave in a less socially desirable and acceptable way. This can be explained by cognitive tiredness, when we are unable to have the deliberate and controlled consideration over the situation. Thus, decision-making based on information in a particular social context can be distorted when our cognitive capacity is close to its limit. This implies that we are more exposed to intuitive and fast decision-making, which can make us to oversimplify the situation. This oversimplification and the cognitive exhaustion can be the origin of the biases. The application of biases can help us to reduce the complexity of the world when we do not have cognitive capacity to process all information. These biases are regarded as unconscious operations of our mind. However, the real origin of these unconscious biases are repeated conscious connections of distinct phenomena. “*Connections made often enough in the conscious mind eventually become unconscious. So ideas recede from consciousness into unconscious over time*” (Paul, 1998, p. 55). It means that the biases are created by automatic thinking, in cases when deliberate thinking is either not necessary anymore or not possible due to low cognitive capacity.

Stereotyping and discrimination under cognitive load

Just as in the case of biases, stereotypes are based on several, repeatedly recurring experiences (Keene, 2011). Thus, after a while, we make automatic connections without using system 2 thinking. It can be useful to apply shortcuts or heuristics of system 1 in order to be able to deal with the complexity of our social world. However, the role of system 2 is to consciously supervise the automatic system 1 and to provide a reflective judgement (Kahneman, 2011). A reduction in the cognitive capacity of our system 2 can affect this role and make us act without supervision. Therefore, stereotyping may occur without the supervision by system 2, and in this case we can rely only on our first intuitive opinion.

The question if stereotyping can be influenced by alteration of cognitive capacity depends on whether stereotyping is an effortful or effortless cognitive process (Bargh, 1994). If effortful thinking is needed to use stereotypes, then no stereotyping takes place in situations, when we have a low cognitive capacity, since we do not have the required capacity to be able to apply the stereotypes. However, if it is an automatic process, which does not require cognitive capacity, then stereotyping can be present under depleted cognitive capacity. This question is still unsettled in the literature.

Sherman et al. (2000) decomposed the process of stereotyping into four steps: “*Categorization, Stereotype activation, Stereotype application and Individuation*” (p. 151). They argued that *categorization*, which gives the basis of stereotyping, is the most likely to occur automatically. Thus, it is not influenced by available cognitive capacity. However, some other researchers found that categorization needs deliberate thinking and effort. Spears and Haslam (1997) argued that cognitive overload interferes with the memory to identify people with their categories, preventing stereotypes.

The debate if *stereotype activation* is automatic or effortful is also ongoing. Gilbert and Hixon (1991) drew a conclusion that cognitive overload prevents the use of stereotypes, meaning that stereotype application requires deliberate thinking. In their experiment, the group under cognitive load showed a lower level of stereotyping. On the other hand, Spencer et al. (1998), found a different outcome, showing that participants under cognitive load used stereotypes as well.

The last and the most widely-accepted idea is that the first three steps of the process of stereotyping (*Categorization, Stereotype activation and Stereotype application*) are regarded as automatic process, but the last step, the individuation (“*relying on individual rather than group*”

level attributes in forming impression and attempting to prevent stereotype application” (p. 151)) is effortful and cognitively demanding task (Sherman et al., 2000) This means that under cognitive load we will rely on our stereotypes more than without cognitive load since we do not have enough cognitive energy to prevent the generalization. For example, Wyner et al. (2000) proved that people under cognitive load have a decreased ability to refuse the stereotypes relative to people without the cognitive overload. In their experiment, people had to remember an 8-digit number, as an intervention to achieve a cognitively loaded mind, while making social decisions. During the decision-making, people did not have enough cognitive capacity any more to counteract with their stereotypes due to cognitive load invoked by the 8digit code. Even if they would have had the motivation, they were not able to reject stereotypes.

Whitley and Kite (2010) describe the situation in a more complex way by applying 2 steps. Firstly, cognitive overload can hinder the occurrence of stereotypes, since the working memory is too full to be able to activate the stereotypes. However, once in a case of low cognitive load the stereotypical thinking is activated, a high cognitive load condition will lead to the application of stereotypes since we do not have more capacity to prevent it. On the other hand, after activation, if we are under low cognitive load, we have enough cognitive resources to interfere with the application of it, meaning that we prevent ourselves from expressing stereotypes.

As it was introduced before, discrimination can be related to stereotyping but they can also work independent from each other. However, it is widely assumed in the literate that stereotypes can directly lead to discrimination since stereotyping gives the basis for discrimination. If the stereotyping actually lead to discrimination can depend on several factors (Stangor, 2012).

It is argued that one of the factors is the cognitive load. In this case, we do not have enough cognitive capacity to counteract with our stereotypes leading to discriminatory behaviour (Swim, 2007). On the other hand, Lowes (2013) found opposite effect. She was working with people in poverty since it is widely discussed that poverty can invoke several forms of cognitive overload and stress leading to a vicious circle of poverty trap. She found that subjects under high level of cognitive load made more rational and less discriminatory decisions, choosing the most adequate candidate for the hypothetical job. They decided based on productivity, ignoring the race. On the contrary, people under low cognitive load favoured their own race and made discriminatory selection of job candidates. This means that under cognitive overload people do not have enough capacity to apply stereotypes or prejudices but just automatically concentrate on given information (productivity) instead of searching for more in our memory.

Stereotyping and discrimination under glucose intake

The existing literature discusses the connection of stereotyping and discrimination with glucose enrichment less extensively. It is supposed that if we are able to enhance system 2 thinking, then we have more cognitive capacity to overrule system 1 by. Blood glucose was found to be a highly relevant determinant of the process of human thought. Dickinson et al. (2014) explains that glucose can have an impact on brain regions associated “*with executive function that are relatively more active during deliberate thought*”, (p. 5) meaning that glucose input can increase our cognitive capacity.

However, we have to consider that some researchers found that glucose can help us only in the case of complex task performance (Kennedy and Scholey, 2000). As stereotyping avoidance hardly can be considered as a complex task, it is questionable if glucose could have an impact. On the other hand, other researchers reported that controlling impulsive reactions as well as motivating ourselves are glucose depleting processes. For this reason, under low glucose level, we are inclined to behave in an interpersonally unacceptable manner or lose self-control. (Gailliot et al., 2007). Since avoiding the use of stereotypes requires motivation and self-control, we can expect that glucose enrichment could reconstitute the ideal level of cognitive capacity and provide enough energy for exercising self-control and motivation to refuse stereotypes.

For instance, Gailliot (2009), used glucose lemonade as an intervention to measure the effect on stereotyping. The intervention group as well as the control group, who was provided placebo, both had to write an essay about a regular day of a gay man. Then he looked at how many stereotypical words and ideas appeared in the essay. He found that participants who had additional glucose intake as a source of cognitive energy had enough resources to control the use of stereotypes and avoided the application of stereotypical gay concepts.

Furthermore, discriminatory behaviour also needs to be investigated in relation with stereotyping under glucose intake. It is expected that cognitive capacity enrichment, through glucose intake, can reduce discrimination, as an outcome of stereotyping. If discrimination is directly originated from stereotypes and stereotypes are actually evolved without effort, then we can expect less discrimination under glucose enrichment. Glucose gives energy to avoid stereotypes, leading to a lower level of discrimination as well, since the basis of discrimination is missing. Thus, under the condition of increased cognitive energy, we have enough self-control to counteract with our stereotypes, which can lead to the avoidance of discrimination as well (Gailliot et al. 2009).

Hypothesis

The discussion above highlights that there are several contradictions regarding the connection between cognitive capacity and stereotypes as well as discrimination. It is questionable if stereotyping is automatic or effortful activity. If it is automatic and effortless then under cognitive load when individuals do not have enough capacity left to think deliberately, stereotyping and discrimination can occur. In this case, people do not have energy for self-control to avoid biases. On the other hand, under the condition of enhanced cognitive capacity due to glucose intake, their cognition can function more effectively and they can interfere with stereotypical thinking and discriminatory behaviour.

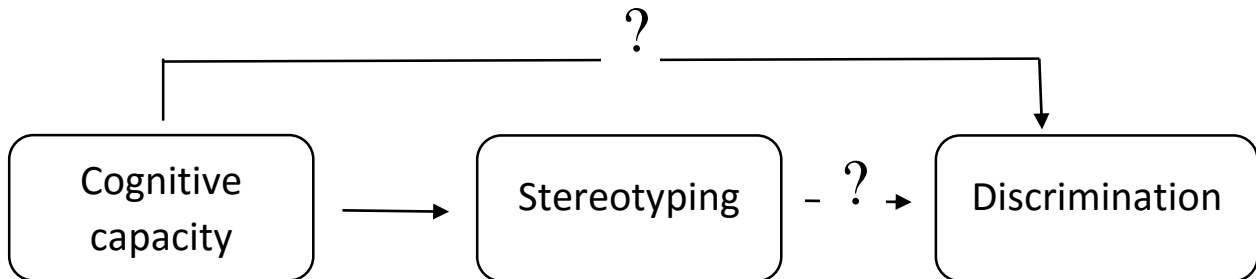
If stereotyping and discrimination are effortful information gathering activities, then under high cognitive load they will be prevented. People are cognitively busy and unable to perform another activity requiring high cognitive energy. On the contrary, under cognitive enhancement, discrimination can occur more, since they have enough capacity to observe stereotypical information and actually apply them to be self-consistent. However, when they have enough cognitive capacity, they also have enough energy to counteract with the stereotypes if they are motivated to do so. Thus, in this case, the presence of discrimination is ambiguous depending on people's motivation and intention.

As we can see, there are several ideas and presumptions about the relatedness of cognitive capacity and stereotyping and their connection to discrimination without clear agreement.

We can try to influence the cognitive capacity as an attempt to measure the effect of changes on stereotyping and discrimination. While, glucose empower effortful thinking by providing cognitive energy, cognitive overload interferes with it, since it reduces the available cognitive capacity. However, we do not know which direction of cognitive influence has a more considerable effect on stereotyping and discrimination.

In this research, we follow the idea of Sherman et al. (2000), and assume that stereotyping is an automatic process, which does not require deliberate thinking. This idea is more widely accepted in the literature. Regarding discrimination, the relationship is more ambiguous depending on the motivation and its connection with stereotyping. In this question, we assume that discriminatory behaviour is directly driven by stereotypes, as it was argued by Stangor (2012). However, the outcome regarding discrimination seems still highly ambiguous.

We assume that changes in cognitive capacity can directly change the extent of stereotyping, but its effect on discrimination is not clear. It can be either direct or work through stereotyping (Figure 1).



1. Figure – assumed connection between cognitive capacity, stereotyping and discrimination

Thus, based on these assumptions and the previous discussions, we can draw five different hypotheses, which will be tested with the experiment introduced in the following section.

Hypothesis 1:

Cognitive load will lead to a higher level of stereotyping

Hypothesis 2:

Cognitive load will lead to a higher level of discrimination

Hypothesis 3:

Glucose intake will lead to a lower level of stereotyping

Hypothesis 4:

Glucose intake will lead to a lower level of discrimination

Hypothesis 5:

Discrimination is directly driven by stereotypes

Operationalization

In this section, we will give a detailed explanation about the concept of cognitive load and background of glucose intake. Firstly, in order to artificially create a cognitively overloaded state of mind, we need to use up a significant portion of cognitive resources through exploiting

working memory (Sherman, et al, 2000). To achieve this, we make participants remember for a 6-digit number. These numbers are randomly, but carefully created to ensure that the code does not follow any pattern and there are no numbers repeated in the code (for example: 748153). This number has to be rehearsed at the end of the experiment (Sherman et al, 1998). It is stressed by offering additional payment that the rehearsal of the 6 digits at the end of the experiment has the highest priority during the experiment. In this way, we can assume that the memory is exhausted properly in order to arrive to a cognitive overloaded mind. Participants are not told the aim of this intervention.

On the other hand, in order to increase the capacity of system 2, we can provide some additional energy by glucose intake (Gailliot et al, 2009). The participants are requested to consume drink immediately after that they get informed that it is a simple lemonade with either sugar or sweetener in it. In this way, we could ensure that there is enough time for the glucose to be absorbed in the body and it is able to provide additional energy for the brain by the time they arrive to the experiment tasks. Glucose has time to be absorbed during reading the instruction and filling out the questionnaire before the experiment start. In order to avoid the conscious sense of differentiation based on the glucose intake, we also apply placebo drinks. The subjects are not told if they are exposed to glucose or just simple placebo drink. The participants, who are provided by real glucose, has to drink the combination of sugar, lemon and water, which is a simple refreshing lemonade. The rest of the subject drink placebo, in case the sugar is substituted by erythritol, which is a natural sweetener.

Context of the experiment

Our experiment was run in Hungary. In this study we focused on gender stereotyping and discrimination in particular. Gender stereotypes and discrimination is one of the most common type all around the world besides race and age. For example, gender discrimination was ranked as the second most widespread type in the USA, with 29,5 % of the total discrimination charges in 2015 (EEOC, 2015).

One of the most striking consequence of gender discrimination is pay gap. In Europe, governmental organizations put a significant emphasis on gender discrimination. Even though there are lot of effort to reduce the differences, we still have to face with a high level of gender pay gap, which is defined as “*the average difference in gross hourly earnings between women and men across the economy as a whole*” (European Commission, 2009, p. 2).

Regarding gender discriminating activities, Hungary has some striking features. Hungarian women had more than 20% lower earnings, than their men counterparts in 2014. Even more exasperating fact is that this percentage is not getting lower but it is on the increase. In 2010, the earning difference was estimated as only 16% (Tasnádi, 2015). Arguably, the major reason of this widening wage gap is workplace segregation. In Hungary, there is a noticeable tendency to be employed in different sectors and to do dissimilar works based on gender. It was observed that in Hungary the occupational and sectoral segregation are significantly above the EU average (Fodor, 2013). The Hungarian population is actually aware of these differences, since according to 45% of the Hungarians, gender discrimination is highly present in the country (Eurobarometer, 2007). In the European context, while in the time of communism all women worked in all their lifetime, the employment rate of women is one of the lowest in Hungary based on the 2012 statistics. Only 56% of working age women had a job in 2012. For this reason, the *National Strategy for the Promotion of Gender Equality* was set up as an attempt to improve the situation. However, while focus is on the employment level of the Hungarian women, they do not have any program targeting the workplace segregation (Fodor, 2013).

In addition, having little children can be considered as one of reasons for being unemployed, since it seems like Hungarian women do not return to work after giving birth. It was found that “*the gap between mothers’ and non-mothers’ participation in paid work is the second largest in the EU*” (Fodor, 2011, p. 6). This can be explained by the generous maternity leave of Hungary, which encourage women to stay at home. Even though it sounds as a caring action of the government, it may actually signal that “*patriarchal attitudes are persistent, while prejudices and stereotypes regarding the roles and responsibilities of women and men in the family and in society in general are deeply embedded in institutions and in society*” (Görgényi, 2013, p.1). Women are also faced with high level of workplace discrimination, under-representation in politics, lower agency regarding public as well as private decision-making and stereotypical display in media (Görgényi, 2013). All in all, the ranking of Hungary is continuously worsening on the *Global Gender Gap Index*. While in 2006, the country was ranked on the 55th place, by 2014 it worsened to the 93rd place overall, but regarding the political empowerment it was only on the 128th place out of 143 countries (World Economic Forum, 2014).

Our experiment was conducted in this country, in a university city, Szeged. Szeged is located in the Southern Great Plain region of Hungary, which is regarded as one of the poorest, the most under-developed region with a relatively high rate of unemployment and low wages. The

unemployment rate was 12% and the wages are only 78% of the country average (Központi Statisztikai Hivatal, 2012).

Experiment design

In this section, we provide all the information regarding the set-up of the experiment in details. Moreover, we explain the aim of each step and intervention. We also describe the way this experiment aims to measure the changes in the tendency of stereotyping and discrimination based on the interventions.

Interventions groups

In order to influence cognitive capacity, we apply two kind of interventions. One of them is to reduce the functioning and another one is to enhance the functioning of cognitive capacity. As it was discussed in the previous sections, while cognitive overload can interfere with the proper effortful way of thinking, glucose can enrich our cognitive capacity and helps us to think more rationally.

Based on these two interventions, we differentiate among one control group and two intervention groups (Table 1).

Cognitive load Glucose/placebo	YES	NO
Glucose	-	glucose intervention group
Placebo	cognitive load intervention group	control group

2. Table – intervention groups

Firstly, the control group provides us the basis, to which we can compare both interventions. In this group participants drink placebo drink containing only sweetener providing no additional mental energy and they are neither exposed to cognitive load by digits' rehearsal. In this condition, no intervention takes place and the cognitive capacity stays unaffected. The cognitive load intervention group also drinks placebo, however, they are requested to remember for the 6 digits. In this situation, they are under cognitive load but there is no aid from glucose intake, since placebo provides no additional energy. The glucose intervention group does not consume

placebo anymore, but glucose instead of the sweetener. On the other hand, they do not need to remember for the 6-digit code, meaning only an enhancement in the cognitive capacity by sugar. Under these different conditions, the participants go through the same experiment process.

Questionnaires and intervention implementation

The experiment starts with the consumption of the drinks (Appendix 1). The participants either drink glucose or placebo then are asked to fill out a questionnaire regarding the sweetness and the taste of the drink. In this way, we can check if there is recognition of the different drinks. Furthermore, they are asked about their socio-economic background, which information will be employed as control variables during the regression analysis afterwards. They are asked about their gender, age, study program, siblings' gender, mothers' and fathers' age and occupation and their own hometown (Appendix 2). Moreover, the time, which is needed to fill out these questionnaires, provides us some time to ensure that the glucose is absorbed in the body, as it was suggested by Gailliot (2009). After the questionnaires, the cognitive load intervention group is given the random 6-digit code, which they are requested to remember during the course of the experiment and rehearse at the end (Appendix 3). In case of perfect rehearsal, they are paid out an additional 400 Hungarian Forint (HUF). To avoid confusion and the sense of differentiation, different interventions are applied in separate experiment sessions. Therefore, we hold three sessions based on the 3 different interventions.

Experiment tasks

After this process of implementing the different intervention conditions, the actual experiment starts. There are two rounds. One is to measure stereotyping and the other one is to observe discrimination.

Measuring stereotyping

In the first round we intend to measure stereotyping behaviour under the different interventions. In order to measure stereotyping, participants get a paper in which either a male or a female person is introduced and indicated by a photo of him or her. Both the female and the male are given the same very short description. Under the photo, different attributes are given that describe the person in the photo. These attributes either stereotype-consistent or inconsistent for the given gender. The attributes given are the same for every participant, but we attach either a woman or a man photo and name. There are 30 adjectives or attributes from which 15 are stereotypically men related, like businessmen, breadwinner, football fan, etc., and 15 are stereotypically female adjectives, for instance emotional, dependent, caring, etc.

In each session, half of the group is given the women picture and the other half the men picture (Appendix 4). The subjects have 2 minutes to remember as many attributes as they can, then the paper is taken away from them. They are not requested to rehearse the adjectives immediately, but first they have to fill out the second experimental task (discrimination test). After filling out this discrimination test, they are provided a new sheet, where they can write down the adjectives and attributes they were able to keep in mind during the time. Obviously, the people who were provided a female picture beforehand, get an empty sheet with the female photo and name on it and who were given the men photo previously, are shown the male photo and name on the empty sheet (Appendix 5). It can be expected that after spending some time with the second task, subjects remember more adjectives related to a female person when they see the woman picture again and more stereotypically men attributes when they face with a man's photo. If people do not use gender stereotypes, there should not be a significant difference between the number of female and male related attributes remembered.

We can expect that in case of the cognitive load group, where they originally have to remember for the 6 digits, the participants are able to remember for less adjectives. These participants have less memory left to memorize a high number of adjectives besides the code. We correct for this in two ways. Firstly, we control for the amount of adjectives remembered in the analysis by including the variable of *number of adjectives* as a control variable in the regressions. Secondly, we will do not necessarily focus on the number of the stereotypical adjectives but the percentages of stereotypical adjectives of the total number of attributes rehearsed. Therefore, our first main dependent variable will be the *% of stereotypical attributes*, which is calculated by dividing the number of stereotypical attributes rehearsed by the total number of attributes rehearsed.

$$\frac{\text{Nuber of stereotypical attributes}}{\text{Total number of attributes reheased}}$$

Lastly, we also control for the gender of person in the photo applied in the stereotyping test. In this case, we can see if there is a difference depending on the gender described in the stereotyping test.

Measuring discrimination

In the second round we measure if there is presence or absence of discriminatory behaviour under the different conditions. We intend to induce a real- life- like situation in this round. We tell to the subjects that they have to hire one-one person to perform one-one task for them. These

tasks are stereotypically male or female exercises, which are expected to be performed better by one of the gender given the traditional gender roles.

The first task is to calculate and solve equations representing a stereotypically male mathematician. Men are widely considered better in mathematics relative to women as well as it was found that men associate themselves better with mathematics relative to females already in young age (Cvencek et al., 2013, 2015). On the other hand, women are regarded more related to literature and art subjects. Nosek and Banaji (2002) also found that female subjects identify themselves with liberal arts and literature more and try to avoid mathematical tasks. For this reason, another task, for which participants have to select a candidate, is to record book titles with writers. The other female related task is sewing a piece of material. According to Herring (2014), we have inherent stereotypical ideas as *“Boys like to build things and go fishing and want to be football players when they grow up. Girls like to sew, wear makeup, and want to be ballerinas”*. As male is associated with football and sport as well as regarded stronger than women, the other male task is running (see Appendix 6).

These tasks were executed beforehand by 6 voluntaries – 3 men and 3 women - to provide a real life background for this experiment. These voluntaries performed these task in couples in order to create a competitive environment. According to our measures, they took the tasks seriously and aimed to be the best. The volunteering candidates, who perform these 4 simple tasks, signed a form that they perform according to their best knowledge and capabilities and they contribute to the employment of their performance for further researches (Appendix 7). As opposed to the stereotypes, the male candidates performed more successfully in every single task than the female ones. In every task a man achieved the best results, and on average men did better as well. Female candidates were always in the middle range (Table 2).

Place	Mathematics	Running	Sewing	Literature
1.	male (#4)	male (#2)	male (#4)	male (#4)
2.	male (#2)	male (#6)	male (#6)	male (#2)
3.	female (#5)	female (#5)	female (#3)	female (#1)
4.	female (#1)	female (#3)	female (#5)	female (#5)
5.	female (#3)	female (#1)	female (#1)	female (#3)
6.	male (#6)	male (#4)	male (#2)	male (#6)

2. Table - score of the background experiment

Thus, for each job 6 candidates are offered. The participants can pick one-one candidate freely to perform each job. They should aim to pick the most productive person in each job regardless of the gender. We tell to the participants that on average the male candidates perform better in each task but they know nothing about the individual performances. Rationally, they should select a male candidate at each task since they are aware that men candidates perform better on average in these tasks. If they do not decide so, they rather consider gender roles and tend to discriminate based on stereotypical ideas.

Payoffs

Each participant is paid a participation fee of 300 Hungarian Forints (HUF) regardless of his/her performance. In the case of cognitive load intervention group, where the subjects have to rehearse the 6 digits, the participants can earn 400 HUF additionally if they are able to perfectly rehearse the number at the end of the experiment. In this way, we can ensure that the cognitive load intervention is actually in function, since subjects are incentivized by money to keep the number in mind. They are told that if they are not able to rehearse the number perfectly not only do not they get the 400 HUF, but the collected amount in the stereotyping test is also annulled.

In the stereotyping test, where they are asked to memorize the attributes of a female or a male, the participants are paid 30 HUF for each attributes they can write down at the end. This means that if someone is able to memorize all the 30 attributes, he/she can earn 900 HUF.

At the last task, in the discrimination task, a point system is set up. If they pick the candidate who performed the best they earn 6 points and 0 point if they choose the worst performer in that certain task. Therefore, the system is set up as follows:

#6 in the task – 0 point
#5 in the task – 0.5 point
#4 in the task – 1 point
#3 in the task – 2 point
#2 in the task – 4 point
#1 in the task – 6 point

3. Table – discrimination test payoffs

These points are translated into monetary outcome where 1 point is worth 50 HUF. Thus, in the 4 tasks, for which they have to pick a candidate, they can collect maximum of 24 points meaning 1200 HUF.

All in all, the maximum collectable amount in the case of cognitive load intervention 2800 HUF and in the other groups, it is 2400 HUF. On average, the participants are estimated to earn 1200 HUF. This amount is regarded significant in Hungary especially for students, giving enough motivation to perform well on the experiments. To symbolize the purchasing power of this amount, 1kilo bread costs around 230 HUF or a glass of beer costs 250 HUF in a regular pub, while the average hourly student salary is around 500-600HUF.

In table 4, there is a summary of the experiment design, indicating the process step by step.

Step 1	Randomization of participants into control group and the two intervention groups
Step 2	Consumption of glucose or placebo depending on the group
Step 3	Filling out questionnaire about the drink and socio economic background
Step 4	(Memorization of the 6 digit code in the cognitive load intervention group)
Step 5	Stereotyping test part1: memorization of the stereotypical adjectives
Step 6	Discrimination test: candidate selection for the 4 tasks
Step 7	Stereotyping test part2: writing down the remembered adjectives
Step 8	(Writing down the code in the cognitive load intervention group)
Step 9	Payment of participation fee and the additional earnings

4. Table - score of the background experiment

Implementation of the experiment

[Application for the experiment and further preparations](#)

The participants could sign up for the experiment through a widely advertised and posted Google docs application form (Appendix 8). They were requested to fill out their name, gender, age, e-mail address, availability, and most importantly they were asked if they have diabetes or sugar allergy due to the possible glucose intake intervention. None of the participants indicated such a condition.

Due to the possible ethical consideration of requested consumption of an unknown liquid during the experiment, an application form was submitted to the Ethics Committee Faculty of Law / Nijmegen School of Management in order to ensure that there will be no ethical complication

regarding this intervention. To the committee, we explained that we ensure that the participants do not have diabetes or sugar allergy in the application form and before the experiment starts as well. Moreover, the participants are informed that they either drink glucose or sweetener. In case of glucose intake, the dose of sugar given to the participants is equal to the sugariness of a can of Coca Cola. This amount is approximately 40 gram of sugar. This equals 96 kcal, which is only 4.8% of the suggested daily kcal intake. On the other hand, in the intervention groups where there was no glucose intake, the placebo liquid contained erythritol, which is natural sweetener containing 8 kcal in 40 grams.

This information was provided to the committee and all the condition of the experiment was introduced as well, based on which the proposal of the glucose intervention was approved by the Ethics Committee Faculty of Law / Nijmegen School of Management

Participants

The experiment was conducted at the University of Szeged. All participants were students of this university and we had one teacher in the sample as well. There were 67 participants in total, from which 40 were female and 27 were male.

The minimum age of the subjects was 18 and the maximum of 39, who was a teacher at the university. The mean age was 22,7 with a low level of standard deviation of 3,07. 25 of out of all the students were between age of 20 and 22, 14 were from the age range of 18-20 and 15 from 22-24. The rest of them were older than students from these ranges.

Most of the subject were originated from big cities, like Szeged or Budapest. Some of the students were from Serbian large cities like Senta or Subotica due to the close location of these Serbian areas. However, there were some smaller towns mentioned as place of origin as well, like Gyula or Hódmezővásárhely. There were only 7 people out of 67 coming from a village.

We also looked at the occupation of their parents. We categorize the parents' occupation as white collar workers, referring to highly educated knowledge workers or as blue collar workers, who has lower education level and employed as manual worker. In the other cases the participants' parents were old ages pensioners or passed away. Most of the participants had white collar mothers and fathers. However, there were more mothers with higher education than fathers in this sample.

The average of the mothers' age was 50 with the minimum of 38 and maximum of 66. The average age of the fathers was 53 with the minimum of 42 and maximum of 72. While all the

participants had their mothers alive, 4 of the subjects had no father any more, leaving us only 63 observations regarding father's age.

Most of the participants have brothers, and fewer of them have sisters. 10 of them has no siblings and 7 of them have both brothers and sisters.

All in all, we had a relatively small sample consisting 67 subjects.

The summary regarding the statistics of the participants can be found in Table 5.

Variable	Observation	percentage
Gender		
Female	40	59.70
Male	27	40.30
Age (mean)	22.70	
Place of origin		
City	33	49.25
Town	27	40.30
Village	7	10.45
Occupation of mother		
White-collar worker	43	64.18
Blue-collar worker	22	32.84
Occupation of father		
White-collar worker	31	46.27
Blue-collar worker	29	43.28
Age of mother (mean)	50.22	
Age of father (mean)	53.19	
Gender of siblings		
Male	27	40.30
Female	23	34.33
Both	7	10.45
None	10	14.93
Total number	67	

5. Table – participants' statistics

Experiment sessions

The 67 participants were divided into three experiment sessions. There were 26 in the control group, 22 in the cognitive load intervention group and 19 in the glucose intervention group. In the control group there were 16 females and 10 males. In the cognitive load intervention group, 12 females and 10 males and in the glucose intervention group, 12 females and 7 males. Thus, we had a higher proportion of women at each session, but men were not underrepresented at any session either.

The first session was held on the 18th May at 17.00, the second on the 19th May at 18.00 and the last one on the 20th May at 12.00. These times were set based on the availability of the participants and the experiment rooms, but relevant consideration was the timing of the main meals as well. We aimed to set the time of the experiment long time after meals in order to ensure that participants are not cognitively enriched by nutrient. In this case, glucose can make some difference relative to the control group by providing additional energy for the brain. Thus, in the evening sessions we ensured that the participants were before dinner and on the last session we aimed that the subjects were before their lunch. All participants arrived in time, thus the experiments started punctually and the sessions with the paying outs did not take longer than 40 minutes.

The experiments were held in simple classrooms. The experiments were led by the help of two auxiliary experimenters, who were students of the University of Szeged. They were responsible for handing out the papers, the drinks, looking after the orderliness of the experiment and they helped summing up the payoffs.

The process of the experiment

The experiment leaders set up the room in an appropriate way to be ready for the experiment beforehand, thus the experiment could start on time when the participants arrived. They were all provided a pen, an instruction paper and the glass of drink, which either contained erythritol or glucose depending on the intervention group. They were asked to take a seat at a predetermined place, in such a way to be able to keep track the personal number of the participants. Every participant was attached a personal number written on their instruction paper, which they received upon arrival. With the help of this personal number, which the subjects were asked to be aware of, we were able to identify each documents and attach them to its respondents. These personal numbers were written on each documents beforehand.

When everyone took a seat, the instruction was read out loud for the participants, which they could follow on their own copies as well. In the control group and the cognitive load intervention group, they were requested to consume the drink just after the instruction was read. After reading out the instruction, they received the questionnaire, for which they were offered a sufficient amount of time to everyone be able to fill out comfortably. After ensuring that everyone had enough time to fill out every question, we turned to the part of the real experiments with some time pressure.

In the cognitive load intervention group, they were firstly given a paper with the 6-digit code on it. They were provided half minute to memorize the numbers indicated on their paper. In order to ensure the fair game, we applied two prevention actions. Firstly, the pens were recollected with the questionnaires in order to make sure that they do not have any possibility to cheat and write down the number on a paper or their hand. Secondly, the papers were put on the tables facing down and they were allowed to turn only when everyone had the paper in front her/him. Thus, every participant had exactly half minute to memorize the code. The time was measured with stopper and after half minute they were asked to turn the paper down again and the 3 experimenters recollected the codes rapidly.

Obviously, in groups other than the cognitive load intervention group, this treatment was not implemented but we simply continued with the stereotype test after the questionnaire. Furthermore, regarding the instruction (Appendix 1) part 2 was left out and in their documents and the stereotype test was indicated as part 2.

For the first real exercise, they received the documents with the photo and adjectives (Appendix 4). They had 2 minutes to memorize as many attributes as they could then they were asked to turn down the paper again. After recollecting these documents, we distributed the papers for the discrimination test. In the case of cognitive load intervention group, they also received back the pen to fill out this test. They had 2 minutes to fill out this document as well. As the last step, they got the new sheet where they had to record the attributes which they were able to keep in mind. Moreover, in the case of the cognitive intervention group, they were provided place to rehearse their code as well (Appendix 5). They were also given 2 minutes for the attributes and code rehearsal and they were asked to put down the pen and turn down the paper again. We recollected this last document and they were asked for 5 minutes of patience for calculating and summing up their payoff.

They stayed seated, while the experimenters were calculating. Then, based on their personal number they were invited to the front desk, where we announced the amount of their payment. They were obliged to sign a form confirming that they received their payments. This form was written in Hungarian and English as well to ensure it is understandable and regarded as official in both Hungary and the Netherlands (Appendix 10). After receiving the payments and signing the confirmation form, the participants left the room.

Methodology

Variables

Based on the experiment, we create two dependent variables, namely stereotyping and discrimination. The main independent variable is the interventions and we have some control variables as well. In this section we discuss each variable separately.

Dependent variables

Stereotyping

Firstly, stereotyping is measured in %. It is measured how many percentage of the remembered adjectives are stereotypical. On average, participants remembered 12.3 attributes, from which 6,4 were stereotypical. This lead to a mean of this variable of 52%, meaning that on average the participants were not highly biased towards stereotypical adjectives. However, there is a considerable standard deviation of 14,8. This dependent variable has some extreme values as well giving us a minimum of 20% and a maximum of 100%.

Variable	Mean	Standard Deviation	Minimum	Maximum
% of stereotypical adjectives	51.60	14.86	20	100

6. Table - % of stereotypical adjectives

Discrimination

The other dependent variable is discrimination. This variable is a dummy variable, having either a 0 value or a value of 1 depending on if there is a discriminatory choice or not. Thus, if female candidate is chosen for sewing or the literature task, then it takes the value of 1. Since the participants were told that men performed better on average in every single task, we cannot observe if they discriminate while selecting the candidate for mathematics and running jobs. We are unable to precisely observe if they pick the man based on rational information of

performance differences or based on stereotypical ideas. For this reason, we focus on the other two tasks of sewing and book title recording. Especially, in the sewing task we have an overall high bias towards women candidates. From the 67 participants only 9 chose rationally a man. In the literature task this tendency is a bit more promising since 26 participants opted for a male candidate. However, 61.19% of them still picked a female candidate (Table 7).

Sewing task	Frequency	Percent
Female picked	58	86.57
Male picked	9	13.43
Total	67	100

Literature task	Frequency	Percent
Female picked	41	61.19
Male picked	29	38.81
Total	67	100

7. Table - discrimination choices in the sewing and literature task

In addition, discrimination can be measured differently, since we can merge the two tasks and examine them together as one dummy variable. When participants choose a female for both sewing and literature task, they strongly discriminate. If they pick a male at least for one of the tasks, then there is a moderate discrimination. Lastly, if they pick men for both of the tasks, then there is no discrimination taken place. In this way, we obtain a new variable, measuring the strength of the discrimination (Table 8)

	Sewing task	Female	Male
Literature task			
Female		Strong discrimination	Moderate discrimination
Male		Moderate discrimination	No discrimination

8. Table – the strength of discrimination as another variable measuring discrimination

Most of the participants strongly discriminated in this experiment. 54% of all participants picked a female for both exercises. Only 3 out of 67 subjects made the candidate selection fully rationally (Table 8).

Strength of Discrimination	Frequency	Percentage
Strong	36	53.73
Moderate	28	41.79
No	3	4.48
Total	67	100

9. Table – frequency of strong, moderate and no discrimination

Independent variable

The main independent variable is the treatment, which is also a dummy variable. This categorical dummy has 3 categories, namely the control, the cognitive load and the glucose groups. We have 26 observations in the control group, 22 in the cognitive load group and 19 in the glucose group (Table 10).

Treatment	Frequency	Percent
Control	26	38.81
Cognitive load	22	32.84
Glucose	19	28.36
Total	67	

10. Table - Independent variable: treatment

Control variables

In addition, there are several other background information about the participants, which can be applied as control variables. However, since there are some with no significant variation or plausible sense of differentiation, we do not include all of them in the regression analysis.

The first one is gender, which can be useful control variable, since different genders can have disparate attitudes towards different gender roles and stereotypes as it was discussed before. The next control variable is age as an interval variable. Age can be relevant variable, but in our case we have only students meaning a low variance in age. For this reason, we cannot expect

significant differences. However, we include in the regression, since even with low variation we can expect some results.

Other possible dummy control variable is the gender of siblings. For instance, regarding the gender of the siblings, we could expect that participants with both gender or no siblings use less stereotypes. Participants with either only female or only male siblings can be biased towards one gender and influence their picture about gender roles. Lastly, we can also look at the age of the parents as other interval control variables, since we can expect that older parents are more conservative, who stick more to the traditional gender roles. However, we include only the age of the mothers since we have some missing data regarding the age of father due to death. Including age of the father would further reduce our small sample. We assume that the age of mother can give enough estimation about the age of parents.

The statistics of the observations regarding these control variables can be found in Appendix 9.

Statistical analyses

Stereotyping

Firstly, we employ Mann-Whitney U Test, which helps us to compare two independent groups based on some differences measured on a nominal level. This can be only used in case of stereotyping dependent variable, since this test cannot be applied with categorical dependent variable. Moreover, the independent variable needs to be categorical or ordinal. Our independent variable is categorical consisting 3 categories (control, cognitive load and glucose), meaning that we are allowed to use this test.

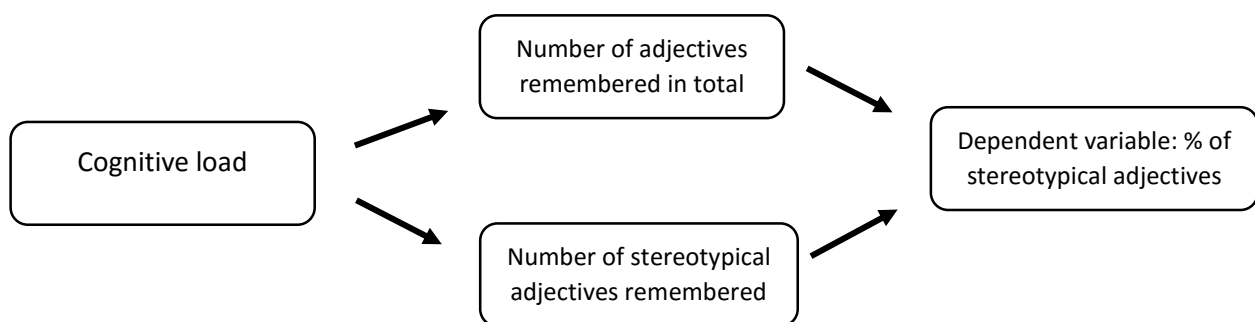
Secondly, we run several regressions in order to investigate the relationship among the variables. We can apply OLS regression in case of stereotyping, since the dependent variable has ratio measurement level. In these regressions, we have only 48 observations, since only the control group and the cognitive load intervention group are included. With *if* command we exclude participants who participated in the glucose intervention group. In this way, we ensure that we do not compare the cognitive load group to the other glucose group, but only to the control group.

On the one hand, we aim to investigate if there is an effect of cognitive load on stereotyping. Therefore, our null hypothesis is that cognitive load has no effect on stereotyping. Alternatively, our alternative hypothesis is that cognitive load has an effect on stereotyping

H_0 = Cognitive load has no effect on stereotyping ($H_0: \beta_0 = \beta_1$)

$H_{\text{alternative}}$ = Cognitive load has an effect on stereotyping ($H_A: \beta_0 \neq \beta_1$)

Here we analyse if cognitive load has an effect on the number of adjectives remembered in total and on the number of stereotypical adjectives. By their fraction we can indirectly see if there is an effect on stereotyping measured by the % of stereotypical adjectives rehearsed. We can see how cognitive load influence both the number of adjectives remembered in total and the number of stereotypical adjectives remembered. From these two measures we can calculate the % of stereotypical adjectives (Figure 2).



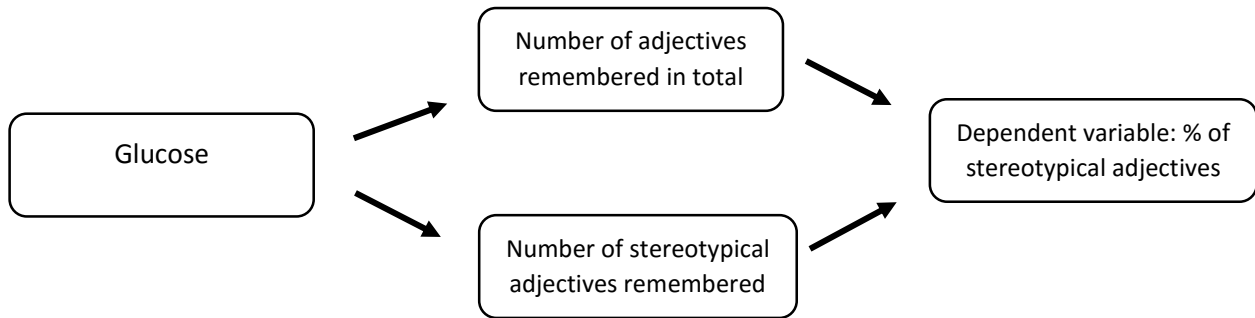
2. Figure – Connection between cognitive load and stereotype measures

On the other hand, we investigate at the glucose intervention group, when we enhance the cognitive capacity instead of exhaust. Here, we investigate if there is an effect of glucose intake on stereotyping. Therefore, the null hypothesis is that glucose intake has no effect on stereotyping. Alternatively, the alternative hypothesis is that glucose intake has an effect on stereotyping.

H_0 = Glucose intake has no effect on stereotyping ($H_0: \beta_0 = \beta_1$)

$H_{\text{alternative}}$ = Glucose intake has an effect on stereotyping ($H_A: \beta_0 \neq \beta_1$)

We would like to investigate if there is a change in the number of total adjectives remembered as well as the number of stereotypical adjectives rehearsed. Again, as an outcome of these two variables, we can see if glucose has an influence on the % of stereotypical adjectives rehearsed (Figure 3).



3. Figure – Connection between glucose and stereotype measures

Therefore, we analyse if either cognitive load or glucose as experiment treatments have an effect of stereotyping.

We can draw the following regression equation for this analysis:

$$STT_i = \beta_0 + \beta_1 TREAT_i + \beta_2 \#ADJ_i + \beta_3 SGEN_i + e_i$$

Where STT is stereotyping measured in % and related to the i th person, TREAT is the treatment group (control, cognitive load, glucose), in which the i th person participated in. ADJ is the total number of adjectives remembered in order to control for the amount of adjectives remembered. SGEN is indicating if the i th participant got a female or a male person in the stereotyping test. Additionally, we include some other less relevant control variables in the regressions. Lastly, e measures the random error term for that person.

Discrimination

In the case of our other dependent variable, we need to estimate logit regressions, since our discrimination dependent variable is on a categorical measurement level.

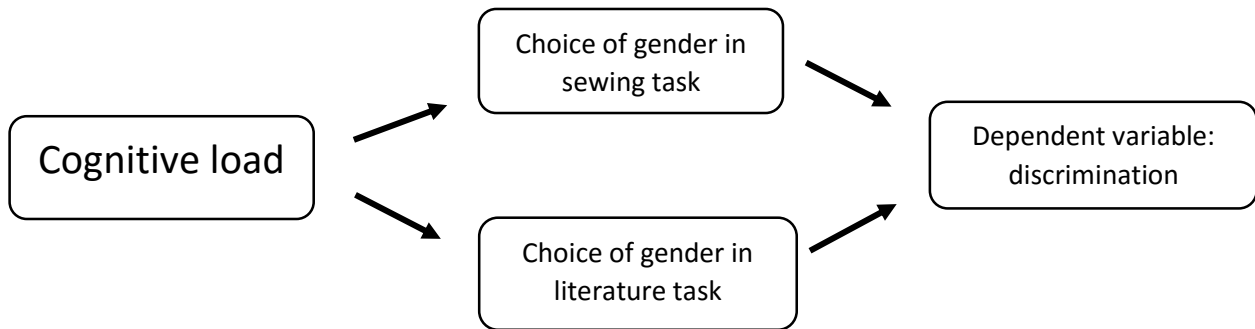
Relying on our third hypothesis, we expect that cognitive load can affect discrimination. Therefore, our null hypothesis is there is no effect of cognitive load on discrimination and our alternative hypothesis is that there is an effect of cognitive load on discrimination.

H_0 = Cognitive load has no effect on discrimination ($H_0: \beta_0 = \beta_1$)

$H_{\text{alternative}}$ = Cognitive load has an effect on discrimination ($H_A: \beta_0 \neq \beta_1$)

We investigate if there is a difference in the gender choice under cognitive load regarding candidate selection for the sewing task and literature task. If they choose at least for one of the

task a female candidate, we obtain some evidence for discriminatory selection based on gender roles (Figure 4).



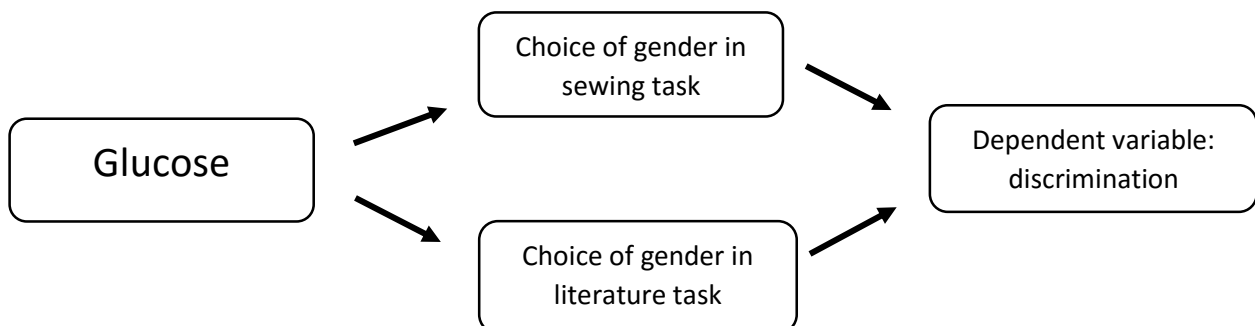
4. Figure – Connection between cognitive load and discrimination

As the next step, we analyse the effect of the opposite treatment on discrimination. We would like to see if glucose intake can provide some aid to apply less discrimination. Here, our null hypothesis is that there is no effect of glucose intake on discrimination. Thus, our alternative hypothesis is that there is an effect of glucose intake on discrimination.

H_0 = Glucose intake has no effect on stereotyping ($H_0: \beta_0 = \beta_1$)

$H_{\text{alternative}}$ = Glucose intake has an effect on stereotyping ($H_A: \beta_0 \neq \beta_1$)

In this last analysis, we would like to measure the differences in the choice for candidates under glucose enrichment. We would like to examine if glucose make people choose based on productivity information and pick the gender who is indicated better leaving behind their ideas about traditional gender roles.



5. Figure – Connection between glucose and discrimination

Thus, we investigate if there is a change in the candidate choice under different experiment treatments, namely under cognitive load and glucose.

For this purpose, the second regression equation we look at is the following:

$$\text{DISCR}_i = \beta_0 + \beta_1 \text{TREAT}_i + e_i$$

Where DISC is the dependent variable indicating the discrimination level of the i th person, TREAT is the treatment, which the i th person exposed to. Lastly, e measures the random error in the equations.

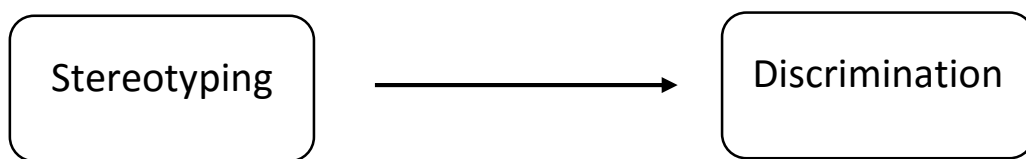
Relationship between stereotyping and discrimination

As a last, additional test we investigate the relationship between stereotyping as discrimination. We would like to see if changes in cognitive capacity can directly influence discrimination or there is an indirect effect and it works through stereotypes. If discrimination works through stereotyping, we may not see a direct effect of cognitive capacity on discrimination. It is probable that stereotypes can be influenced by cognitive capacity, which results in changes of discriminatory behaviour. To examine if stereotyping can lead discrimination, we run OLS regression with discrimination as dependent and stereotyping as independent variable.

Our null hypothesis of this analysis is that stereotyping does not affect to discrimination and the alternative one is that stereotyping affect to discrimination.

H_0 = Discrimination is not directly linked to stereotyping ($H_0: \beta_0 = \beta_1$)

$H_{\text{alternative}}$ = Discrimination is directly linked to stereotyping ($H_A: \beta_0 \neq \beta_1$)



6. Figure – Connection between glucose and discrimination

Our equation to estimate the effect of stereotyping on discrimination is as follows:

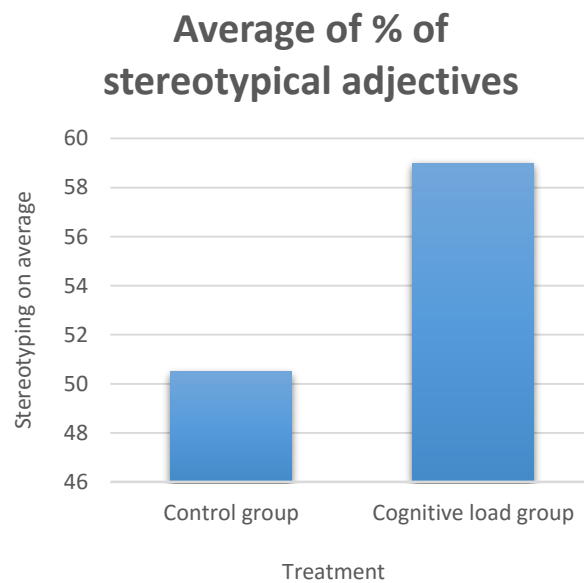
$$\text{DISCR}_i = \beta_0 + \beta_1 \text{STT}_i + e_i$$

We use statistical program of STATA version 13 for performing the necessary tests.

Results

Stereotyping and cognitive load

As a first step, we ran a Mann-Whitney test with the % of stereotypical adjectives remembered as a dependent variable and cognitive load treatment as independent variable. We obtained a significant outcome applying 5% significance level. This means that there is a significant difference between the group where cognitive load intervention was applied relative to the control group. In figure 7, this difference between the control and cognitive load group is illustrated.



7. Figure – the difference between control group and cognitive load group regarding the % of stereotypical adjectives remembered

We can also apply OLS regression to support this result. We run the regression using % of stereotypical adjectives variable as dependent and cognitive load treatment as independent variable. As we discussed before, we have only 48 observations in these regressions, since observations from the glucose group is excluded. When we run the regression without control variables, we obtain significant outcome only at 10 % significance level, $p = 0.063$ (Table10). We obtain the expected positive sign. It means that there is positive relationship between cognitive load and stereotyping. People under cognitive load apply relatively more stereotypes than without this intervention.

The advantage of OLS regression is that we are able to include other variables, the most importantly the *number of total adjectives remembered* and the *gender of person described in the stereotype test*. Thus, in the next regression we control for the number of adjectives remembered in total and for the gender given in the stereotype test. We do not identify any

changes in the significance of the treatment variable. The p-value still shows a significant outcome only under 10% significant level (Table 10).

Lastly, we include other control variables in order to see if there is any change in the significance. We include *gender*, *age*, *gender of siblings* and *age of mother* as control variables. Including these variables, we can notice an increase in the R-squared to 45% and the independent variable becomes highly significant, $p = 0.007$ (Table 10). Thus, we can explain 45% of all the variations in the dependent variable by the independent and control variables. Regarding the control variables, age is found to be highly significant. It has a negative sign, indicating that with aging, we stereotype less. In addition, all the sibling dummies turned out to be significant, all with positive sign. It suggests that participants, who has both female and male siblings use less stereotypes relative to participants with none or only one gender of sibling. It can be because their gender role perspective is not biased to the one gender, since there is no dominance of one single gender. However, such a notion would require further investigation. The rest of the control variables do not seem to be influential on stereotyping.

	% of stereotypical adjectives	% of stereotypical adjectives	% of stereotypical adjectives
Cognitive load	8.469 (1.91)*	8.565 (1.91)*	11.594 (2.90)***
Adjectives remembered		0.375 (0.58)	-0.784 (1.14)
Male stereotype test		4.534 (1.02)	-0.576 (0.14)
Female			7.377 (1.53)
Age			-2.105 (2.55)***
Female siblings			23.475 (2.98)***
Male siblings			21.373 (2.79)***
No siblings			17.488 (1.71)*
Age of mother			0.914 (1.95)*
_cons	50.504 (16.81)***	43.796 (5.09)***	35.880 (1.74)*
R^2	0.07	0.10	0.42
N	48	48	48

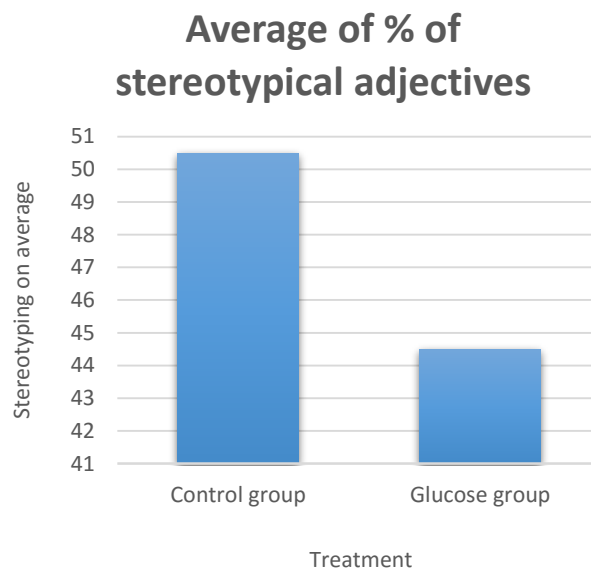
* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

10. Table - regression outcome: % of stereotypical adjectives under cognitive load

All in all, we obtain significant outcomes regarding the cognitive load treatment, particularly when we also add the control variables. The independent variable turned out to be highly significant at 1% significance level in the regression including control variables. It gives as some indication that we can reject the first null hypothesis stating that there is no effect of cognitive load on stereotyping. It means that, we derived some evidence in order to support our first hypothesis; *cognitive load will lead to a higher level of stereotyping*.

Stereotyping and glucose

Following the same steps, we investigate if there is a relation between the percentage of stereotypical attributes rehearsed and the glucose intervention. Thus, firstly we run a Mann-Whitney test to see there is a difference between the glucose intervention group and the control group. This test turns out to be significant at 5% significance level. In figure 8, this difference between the control and glucose group is illustrated.



8. Figure – the difference between control group and glucose group regarding the % of stereotypical adjectives remembered

We employ regressions for further investigations. Regression without control variables shows a significant independent variable only at 10% significance level (Table 11). As a next step, we add the number of total adjective remembered in order to control for the amount of adjectives people able to remember in this group. In addition, we also include the gender of the person introduced in the stereotyping test. In this case, we can notice some change regarding the significance of the treatment variable. The result indicates a more significant outcome, $p < 0.05$ (Table 11).

Finally, we add the control variables. There is an increase in R-squared, but it is not regarded significantly high. In this case, we have an R-squared of 24%. Moreover, our treatment is not significant any more in case we include all the control variables (Table 11).

	% of stereotypical adjectives	% of stereotypical adjectives	% of stereotypical adjectives
Glucose	-5.956 (1.81)*	-7.583 (2.19)**	-5.613 (1.42)
Adjectives remembered		0.856 (1.52)	0.603 (0.89)
Male stereotype test		-0.300 (0.09)	-1.202 (0.31)
Female			2.840 (0.68)
Age			0.258 (0.29)
Female siblings			13.117 (2.21)*
Male siblings			11.399 (1.87)**
No siblings			9.375 (1.49)
Age of mother			-0.056 (0.14)
_cons	50.504 (23.56)***	40.510 (5.56)***	28.243 (1.40)
R ²	0.07	0.12	0.24
N	45	45	45

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

11. Table - % of stereotypical adjectives under glucose intervention

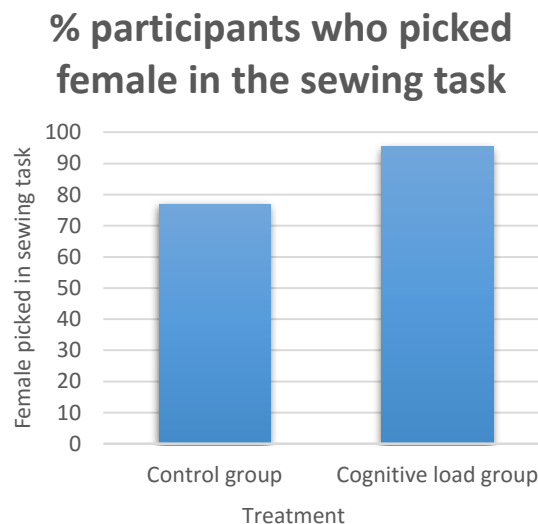
We get the expected negative sign in all cases, meaning that there is a negative relationship between stereotyping and glucose intake. Thus, participants, who has enhanced cognitive energy by glucose have the tendency to apply relatively less stereotypes. We found highly significant difference between the control group and the cognitive load group only without the additional control variables. Therefore, we can partly reject our second null hypothesis. We gained some support for our second hypothesis regarding the effect of glucose on stereotyping, stating that *glucose intake will lead to a lower level of stereotyping*.

Discrimination and cognitive load

In this section we turn to the investigation of our second main dependent variable, the discrimination variable.

Since our discrimination variables are dummy variables, logit regression analyses are applied in this section. Firstly, we look at the two variable, where discrimination can be easily observed, namely the sewing task variable and the literature task variable. As it was explained before, we would like to observe if participants opt for a male or female candidate even though they were explicitly informed that men perform better on average indicating a higher productivity. Thus, these dummies take the value of 0 or 1 depending on the gender picked. If a female was picked, then there was gender discrimination. First, we look at the relationship between the sewing task discrimination and the cognitive load treatment.

In figure 9, we can notice a higher percentage of participants who opted for a female candidate in the sewing task, indicating a tendency of increased discrimination under cognitive load. In the case of cognitive load group only one person selected for a man, while in the control group five of them.

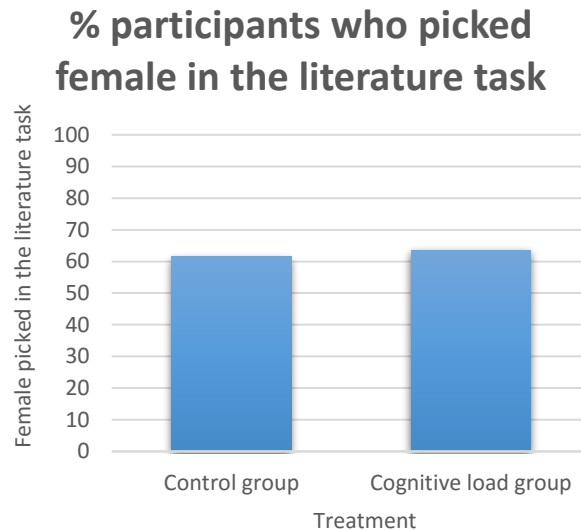


9. Figure – the difference between control group and cognitive load group regarding gender choice in sewing task

However, regressing cognitive load treatment on discrimination, measured by sewing task candidate selection, we obtain an insignificant result. (Table 12).

We also add the control variables to see if there are any changes in the outcome. The independent variable stayed insignificant. Regarding the control variables, none of them turn out to be significant (Table 12). This reflects that there is no connection between this form of discrimination and cognitive load or any other variables included in the regression.

As the next step, we investigate the effect of cognitive load on discrimination by the outcome of the literature task. In figure 10, we can see that there is no significant difference between control group and cognitive load group regarding the gender choice in the literature task. In cognitive load group only 2% more opted for a female.



10. Figure – the difference between control group and cognitive load group regarding gender choice in literature task

Our regression of cognitive load treatment on the literature task supports figure 10. It shows a highly insignificant result. Adding the control variables does not change this outcome. Moreover, neither of the control variables show significance. (Table 12).

	Discrimination by sewing task	Discrimination by sewing task	Discrimination by literature task	Discrimination by literature task
Cognitive load	1.841 (1.64)	1.911 (1.59)	0.090 (0.15)	-0.126 (0.19)
Female		-0.298 (0.29)		-0.892 (1.26)
Age		-0.224 (1.08)		0.110 (0.82)
Female siblings		-17.920 (0.01)		-15.799 (0.01)
Male siblings		-16.388 (0.01)		-16.431 (0.01)
Age of mother		-0.014 (0.12)		-0.068 (0.89)
No siblings				-15.518 (0.01)
_cons	1.204 (2.59)***	24.161 (0.01)	0.470 (1.17)	18.003 (0.01)
<i>N</i>	48	48	48	48

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

12. Table - sewing task dummy and literature task dummy under cognitive load

Now, we apply the other discrimination variable, which measure the strength of the discrimination. We use a dummy, created by the combination of the sewing task and literature task, as we described in the variable section before. We differentiate among strong, moderate and no discrimination.

As we can see the situation did not change, and neither of the moderate discrimination nor the strong discrimination dummy become significant (Table 13).

	Moderate discrimination	Moderate discrimination	Strong discrimination	Strong discrimination
Cognitive load	-0.714 (1.20)	-0.703 (1.07)	0.870 (1.46)	0.874 (1.31)
Female		0.532 (0.77)		-0.649 (0.93)
Age		0.038 (0.30)		-0.024 (0.19)
Female siblings		16.068 (0.01)		-16.422 (0.01)
Male siblings		15.467 (0.01)		-15.985 (0.01)
No siblings		14.055 (0.01)		-14.324 (0.01)
Age of mother		0.038 (0.51)		-0.057 (0.74)
_cons	0.154 (0.39)	-18.389 (0.01)	-0.310 (0.78)	19.353 (0.01)
<i>N</i>	48	48	48	48

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

13. Table - regression outcome: strong and moderate discrimination under cognitive load

As we can see none of the variables in these regressions turn out to be significant. Thus, we can conclude that cognitive load does not have a direct effect on discrimination, measured by our method. There is no difference between the control group and the cognitive load intervention group regarding discrimination.

There is originally a high level of discrimination already without cognitive load. As a background check, we can see the proportion of people discriminating in the cognitive load group relative to the control group: 42% of the participants in the control group strongly discriminated (Table 14 down). On the other hand, we can see a slightly higher discrimination in the case of cognitive load intervention (Table 14 up). In this case, 64% of the participants discriminated strongly, which seems considerably higher, but not enough to get a significant regression outcome.

Strong discrimination in cognitive load group	Frequency	Percentage
NO	8	36.36
YES	14	63.64
TOTAL	22	100

Strong discrimination in control group	Frequency	Percentage
NO	15	57.69
YES	11	42.31
TOTAL	26	100

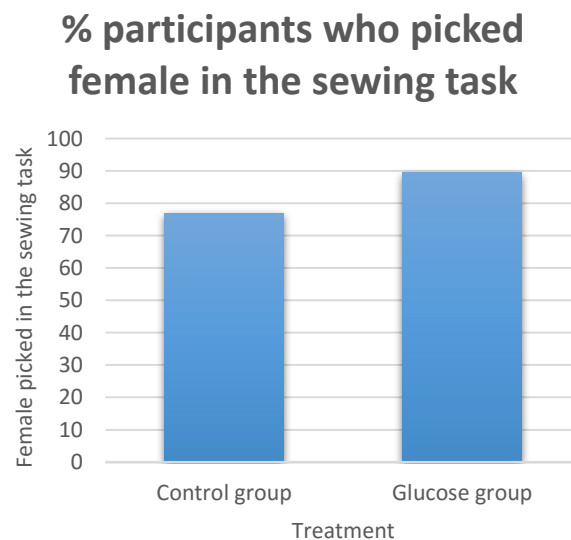
14. Table - frequency of strong discrimination in the cognitive load group (up) and in the control group (down)

Even though, we failed to obtain significant outcome, we can see a tendency of stronger discrimination in the cognitive load group, indicating some evidence for the plausibility of our third hypothesis. However, we still have to accept our null hypothesis that there is no direct effect of cognitive load on discrimination. We failed to find evidence for the third hypothesis stating that *cognitive load will lead to a higher level of discrimination*.

Discrimination and glucose

Here, we go through the same investigation as we have done in the previous subsection, but now we place glucose intervention as the main independent variable.

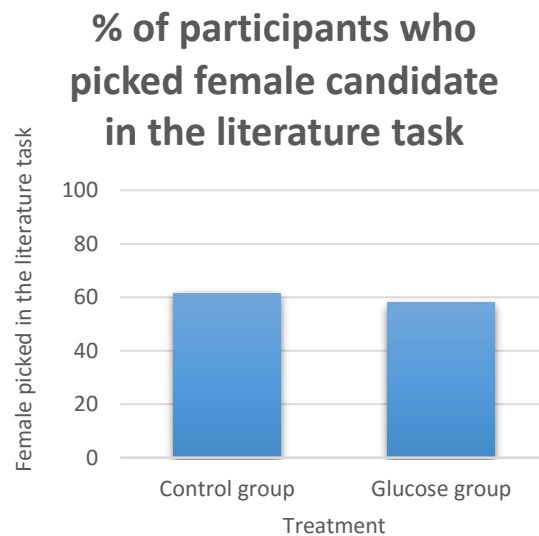
In figure 10, we can see that under glucose treatment even more participants selected female candidate indicating a higher discrimination.



10. Figure – the difference between control group and glucose group regarding gender choice in sewing task

We are unable to find any significant outcome in the regression either, meaning that glucose could not help to discriminate less. Just as in the previous regressions, none of the control variables are significant (Table 15).

We also examine the relationship between the literature task, as the other measure of discrimination, and glucose intake. In figure 11, we can see again that there is no difference between the two groups. The glucose group has only 4% lower discrimination relative to the control group.



11. Figure – the difference between control group and glucose group regarding gender choice in the literature task

We obtain the same outcome, showing a highly insignificant treatment variable. Our glucose treatment does not have any effect on discriminatory choices. In case of the literature task, adding the control variables makes the outcome still insignificant. As opposed to the sewing task, in the case of literature task we get the expected negative sign even though we do not have significant results (Table 15).

	Discrimination by sewing task	Discrimination by sewing task	Discrimination by literature task	Discrimination by literature task
Glucose	0.936 (1.06)	1.133 (1.12)	-0.152 (0.25)	-0.440 (0.62)
Female		-0.437 (0.45)		-0.463 (0.64)
Age		-0.120 (0.58)		0.120 (0.72)
Female siblings		-0.440 (0.32)		-1.103 (0.82)
Male siblings		1.942 (1.16)		-1.249 (0.94)
No siblings		0.624 (0.38)		-0.818 (0.58)
Age of mother		-0.070 (0.63)		-0.101 (1.33)
_cons	1.204 (2.59)***	7.315 (1.49)	0.470 (1.17)	4.301 (1.10)
<i>N</i>	45	45	45	45

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

15. Table - regression outcome: sewing task variable and literature variable under glucose intervention

Now we look at the additive effect of the sewing and literature task to measure discrimination. We examine if there is an effect of glucose on the strength of discrimination, measured by the merged outcome of sewing and literature tasks. We investigate if glucose can help to eliminate strong discrimination or at least moderate it. However, we find is no significant change relative to control group (Table 16).

	Moderate discrimination	Moderate discrimination	Strong discrimination	Strong discrimination
Glucose	-0.927 (1.47)	-0.549 (0.70)	0.629 (1.03)	0.318 (0.43)
Female		0.009 (0.01)		-0.389 (0.52)
Age		0.107 (0.58)		-0.035 (0.20)
Female siblings		18.300 (0.01)		-2.372 (1.75)*
Male siblings		16.979 (0.01)		-1.163 (0.89)
No siblings		16.313 (0.01)		-0.897 (0.64)
Age of mother		0.045 (0.53)		-0.082 (1.08)
_cons	0.154 (0.39)	-21.771 (0.01)	-0.310 (0.78)	6.383 (1.58)
N	45	45	45	45

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

16. Table - regression outcome: strong and moderate discrimination under glucose intervention

We also look at the frequency of strong discrimination in the control group and in the glucose intervention group. We can see that the number of strong discrimination is identical, but since we have more observation in the control group, there is lower discrimination percentagewise. In the control group there is only 42% of strong discrimination (Table 17 down), while in the glucose group this is 58% (Table 17 up). This means that glucose intake led to an even higher level of discrimination.

Strong discrimination in glucose group	Frequency	Percentage
NO	8	42.11
YES	11	57.89
TOTAL	19	100

Strong discrimination in control group	Frequency	Percentage
NO	15	57.69
YES	11	42.31
TOTAL	26	100

17. Table - frequency of strong discrimination in the glucose group (up) and in the control group (down)

All in all, we obtained enough evidence to conclude no direct effect of glucose on discrimination. Therefore, we have to accept our null hypothesis again and conclude no significant effect of glucose intake on discriminatory behaviour. As opposed to our hypothesis that *glucose intake will lead to a lower level of discrimination*, we even find a higher percentage of strongly discriminating participants relative to the control group.

Stereotyping and discrimination

Lastly, we consider an additional analysis to examine if stereotyping and discrimination are directly linked. Due to the fact that we obtained significant outcomes regarding stereotyping but insignificant in the case of all discrimination regression, we can assume that participants, who were stereotyping, do not necessarily discriminate under the same treatment. In order to evaluate the link from stereotyping to discrimination, we run a regression, where our dependent variable is discrimination and the independent variable the stereotyping (% of stereotypical adjectives rehearsed). Firstly, we run the regressions without control variables. Applying the sewing task and the literature task variable as dependent variables, as measures of discrimination, we do not obtain significant outcome. Adding control variables, does not influence the outcome. The stereotype variable stays insignificant (Table 18). Therefore, we have to accept our null hypothesis that *stereotyping has no effect on discrimination*.

This means that there is no direct link from stereotyping to discrimination, and people who apply stereotypes do not automatically discriminate. Stereotyping and discrimination might be influenced by different factors and situation. However, our measure of stereotyping and discrimination are not directly related. We apply unrelated experiment tasks for the examining stereotyping and discrimination. This can be one of the reasons for this insignificant outcome.

	Discrimination by sewing task	Discrimination by sewing task	Discrimination by literature task	Discrimination by literature task
Stereotyping	-0.003 (0.14)	-0.014 (0.41)	-0.011 (0.66)	0.016 (0.74)
Control group		-1.359 (1.61)		0.458 (0.77)
Adjectives remembered		0.134 (0.82)		0.062 (0.70)
Male stereotype test		-0.214 (0.24)		0.269 (0.46)
Female		-1.084 (0.97)		-0.824 (1.26)
Age		-0.015 (0.10)		0.144 (1.19)
Female siblings		-0.100 (0.07)		-1.904 (1.43)
Male siblings		1.676 (1.00)		-2.074 (1.59)
No siblings		0.945 (0.53)		-1.205 (0.88)
Age of mother		-0.073 (0.76)		-0.091 (1.44)
_cons	2.037 (1.56)	5.912 (1.28)	1.037 (1.12)	2.105 (0.61)
<i>N</i>	67	67	67	67

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

18. Table - regression outcome: effect of stereotyping on discrimination

Summary of results

Our analyses indicate a significant effect of cognitive capacity on stereotyping. Firstly, we obtained a significant outcome for all tests measuring the effect of cognitive load treatment on stereotyping. For this, reason we found evidence for our first hypothesis stating that *cognitive load will lead to a higher level of stereotyping*.

Secondly, enhancement of cognitive capacity by glucose intake also showed a significant influence on stereotyping without the additional control variables. We obtained significant treatment variable in the first regressions, but insignificant in the last one. Thus, our hypothesis that *glucose intake will lead to a lower level of stereotyping* is partly supported.

Regarding the two hypotheses about the effect on discrimination, we were not able to find any evidence. We found a positive relationship between cognitive load and discrimination, but the regression does not give us significant treatment variables. Thus, we can notice a tendency for higher discrimination under cognitive load, indicated by a high increase in the % of participants who strongly discriminate relative to the control group. However, as we do not have a significant p-value of cognitive load treatment in our regressions, we have to accept our null hypothesis. We were unable to obtain enough proof for our hypothesis that *cognitive load will lead to a higher level of discrimination*.

We have the same conclusion regarding the effect of glucose intake on discrimination. No significant outcomes can be found during the regression analyses. Thus, we accept our last null hypothesis and reject the hypothesis that *glucose intake will lead to a lower level of discrimination*.

Lastly, we neither find a direct link between discrimination and stereotyping. Regressing our stereotyping variable on different discrimination measures do not result in significant outcomes. It seems that people who use stereotypes do not necessarily discriminate. However, our measure of stereotyping and discrimination are not related to each other. This may cause this insignificant outcome regarding the link between stereotyping and discrimination in our research. Thus, we did not obtain enough support for our last hypothesis either that *discrimination is directly linked by stereotypes*.

Variables	Hypotheses	Supported/ not supported
Stereotyping and cognitive load	<i>cognitive load will lead to a higher level of stereotyping</i>	Supported
Stereotyping and glucose	<i>glucose intake will lead to a lower level of stereotyping</i>	Partly supported
Discrimination and cognitive load	<i>cognitive load will lead to a higher level of discrimination</i>	Not supported
Discrimination and glucose	<i>glucose intake will lead to a lower level of discrimination</i>	Not supported
Stereotyping and discrimination	<i>discrimination is directly driven by stereotypes</i>	Not supported

20. Table – Summary of results

Conclusion and discussion

This study aimed to highlight some implications regarding stereotyping and discrimination from a specific point of view. We examined if changes in cognitive capacity have an effect on stereotyping or discrimination. In the previous literature, the focus was on only one direction of cognitive capacity as well as only either stereotyping or discrimination was considered. In this study, we aimed to evaluate both the effect of cognitive load and cognitive enrichment to obtain an overall overview about their implication on stereotyping and discrimination. In addition, while previous studies concentrate on only either stereotyping or discrimination, we also included both of them with a clear distinction. In this way, we could examine if stereotyping or discrimination can be more significantly influenced by cognitive capacity. Therefore, our research provides an overall picture regarding the connections among cognitive capacity, stereotyping and discrimination.

We have done this by laboratory experiments. We attempted to decrease the cognitive capacity of the participants by making them remember for a 6-digit code, and increased their cognitive capacity by glucose intake. Under these interventions, we measured if there is a different level of stereotyping and discrimination.

Our results confirmed that cognitive capacity can have some influence on stereotyping, but less on discrimination. While, under cognitive load people apply more stereotypes, after the enhancement of cognitive capacity by glucose participants stereotype less. On the other hand, we could not achieve such an unambiguous outcome regarding discrimination. Based on our regression analyses, we failed to obtain any significant results regarding the effect of cognitive capacity on discrimination.

However, this outcome considering discrimination had been expected, since the presence of discrimination can be ambiguous depending on our motivation and intention towards others. While stereotyping, is more consistently considered as automatic process occurring under low cognitive capacity, the question if discrimination is automatic or effortful is unanswered in the previous literature. In other words, we apply stereotypes when we do not have enough cognitive energy to gather all information about the person, thus we need to oversimplify and observe only limited information. This oversimplification helps us to reduce the complexity, but it can also result in stereotyping in the same time.

Furthermore, if discrimination is seen as the direct consequence of stereotyping, then we could observe more discrimination under cognitive load and less under glucose intake. In this case, discrimination is an automatic process when we simply rely on stereotypes, instead of searching for more relevant information. Thus, we simply do not have enough cognitive capacity to counteract with our stereotypes leading to discriminatory behaviour. However, according to another idea regarding the evolvement of discrimination, the application of stereotypes is actually an effortful action. It requires deliberate thinking to apply the stereotypes about a person. Therefore, under cognitive load discrimination would not appear, since our mind is too constrained to concentrate on additional information. In addition, drawing an unambiguous conclusion about the relationship between cognitive capacity and discrimination is more difficult due to personal characteristics and intentions towards others. We have a different level of motivation and self-control to avoid discrimination against others, which can be affected not in the same extent by changes in our cognitive capacity.

All in all, as stereotyping does not result in actions towards others but it is simply a tendency of thinking, we are less inclined to control it. However, some people can be inclined to control their actions towards others to avoid socially unacceptable behaviour like discrimination. Although, this motivation to avoid discrimination can depend on the situation, on the targeted individual, or on intentions, etc.

This could be one of the reasons, why we obtained a significant result regarding stereotyping, but a highly inconsistent and insignificant outcome in case of discrimination. However, there are several other possible explanations for the inconsistency of our discrimination results. Firstly, the method we used to measure discrimination can be inefficient. The order of the tasks in the discrimination test could be an influencing factor, since the first two were men tasks and the last two were female tasks. The candidate selection for the tasks could be led by a bias, called *gambler's fallacy*. If participants rationally picked men for mathematics and running task, they can mistakenly believe that the chance of superiority of a man in the next task is not the same. They believe that an event can be influenced by the previous event, making them switch to a female irrationally. They believe that after two men, it is not possible to pick a man again.

Secondly, the pictures of the candidates could affect the choice as well. It is possible that some faces were more sympathetic than others. However, we attempted to eliminate such a problem by using small pictures with all smiling faces not to influence the impression. In addition, it is

also possible that the participants picked random without considering the gender, since they did not have detailed information about the productivity.

We also should take into consideration that picking a female is not totally irrational. Some participants could be risk lovers and take a risk of picking a woman for a possible higher reward. Since they were only aware of the average performance, they still could risk that a woman was the best in the certain task.

Finally, in the case of stereotyping test, we have to consider the different abilities to remember words, as a limitation of our method. Different people have different capabilities to memorize words and it is possible that some adjectives are easier to remember. However, if some adjectives are inherently more difficult to memorize, then all the participants should have difficulties with them. In order to control for this, we added the number of total adjectives as a control variable as well as we examined the percentage of stereotypical adjectives remembered instead of the absolute numbers.

Moreover, since our methods to measure stereotyping and discrimination were unrelated, the outcome regarding relationship between stereotyping and discrimination was not unexpected. The measures applied in the experiment were relying on different situation and context. This can be one of the reasons why no effect on stereotyping and on discrimination were found. In order to attempt to find a direct link from stereotyping to discrimination, more directly connected experimental tasks should be set up. This link could be further researched in future experiments.

In general, it is hard to directly measure stereotyping and discrimination. For this reason, we could measure the extent of stereotyping and discrimination only indirectly in our experiment. There are several other methods can be applied to examine stereotyping and discrimination, but, there is no best approach exist.

Even though our method to measure the connection between cognitive load, stereotyping and discrimination is not without limitations, we can conclude some implications. Most importantly, people need cognitive energy to suppress their stereotypes. This can be crucial especially during decision-makings in social situations. We have to ensure that individuals have enough cognitive capacity during judging people. If people do not have energy to gather all the relevant information about the person, but they rely on an oversimplified picture, that can result in an undesirable and inefficient social outcome. We cannot observe the real value and productivity of the person but we make judgement based on the category she or he belongs to

if do not have cognitive capacity. Therefore, we have to ensure that people, who decide about the destiny of people in social situation like hiring or education, are cognitively enriched and focused. These people should be cognitively free of other demanding task in order to avoid stereotypes and be able to rationally evaluate the characteristics of the people. This could be particularly important in case when stereotyping is explicitly leading to discrimination. However, we need more research dealing with the relationship between stereotyping and discrimination to see when stereotypes directly lead to discrimination.

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Appendices

Appendix 1: instruction of the experiment

Welcome everyone. Thank you for participating in this experiment.

The experiment contains four parts and it will take about 30 minutes. You will be paid 300Ft of participation fee and you can earn a significant amount of additional money depending on your decisions.

Please stay quiet during the experiment and do not communicate with your fellow students. Please also turn off your mobile phone and put it away to your bag.

When you finish with experiment, stay at your seat and wait for the experimenter to call you to the front to collect your earnings.

PART 1

In the first part of the experiment, you will consume a drink. You will be asked to evaluate the taste of the drink in a questionnaire. Furthermore, you will be asked to answer some socio-economic background questions.

PART 2

In the second part we will test your memory. You will get a form with a 6-digit code written on it. From then on, the priority is to remember for the following 6-digit code until the really end of the experiment. If you can perfectly rehearse the full code, you will earn additional 400 Ft but if not, then your earnings of the 3. part will be 0, regardless of your achievement.

PART 3

In this third part of the experiment you are asked to memorize as many attributes of the person in the picture as you can. You are given 2 minutes to memorize all the attributes then the sheet will be taken away from you and we turn to the fourth part. For each attribute you can rehearse at the end of the experiment you will earn additional payment of 30 Ft. Thus, if you can remember for all 30 attributes, you can earn 900 Ft. Do not forget that if you cannot rehearse the code of part 2 your earning is 0 in this round.

PART 4

In the last part you will get a sheet where you have to indicate some candidate selection choices. You are going to hire personal to perform 4 different jobs for you. Your payoff of this round will depend on the performance of your selected candidates in the certain tasks. You will be offered 6 different candidates for each jobs from whom you can select one for each jobs. The 6 candidates are real people whose performance was actually measured and administrated beforehand in each tasks. Their performance is translated into “productivity” which determines your monetary outcome of this experiment. However, their personal performance is not revealed for you. We only provide the relative averages of genders in each tasks.

So, you need to pick a person based on minimum information and your intuition. If you select someone to “complete” the task for you whose performance was actually the worst, you earn 0 points. If you pick the best performing person for the task you earn 6 points. You can earn increasing amount of points by picking a better and better person in the following way:

if you select person ranked #6 (worst) in the task – you earn 0 point

#5 in the task – 0.5 point

#4 in the task – 1 point

#3 in the task – 2 point

#2 in the task – 4 point

#1 (best) in the task – 6 point

These point are translated into monetary outcome in the following way:

1 point = 50 FT

Your points from the 4 tasks are added together and translated into monetary payoff at the end of the experiment. It means that if you can pick the best performing person in each task you can earn 1200FT.

All in all, in case of maximum performance you can earn: $300+900+1200+400=2800$ Ft!

Let's start the experiment now!

Appendix 2: questionnaire

Number of the participant: _____

Experiment questionnaire

Please fill out the following questionnaire regarding the drink you just consumed and some other personal background information.

How did you like the drink from the scale of very terrible to the very delicious?

Very terrible Very delicious

How sweet was the drink from the scale of not sweet at all to the very sweet?

Not sweet at all Very sweet

Could you guess how much sugar was in the drink from the scale of nothing to a full table spoon?

Nothing Full table spoon

Your age _____

Your gender female male

Your occupation/ field of study _____

Number of brother and sisters and their gender _____

Mother's age _____

Mother's occupation _____

Father's age _____

Father's occupation _____

Your home town _____

Appendix 3: 6 digit code

Number of the participant: _____

Part 2: remembering 6 digit code

In the second part we will test your memory. From then on, the priority is to remember for the following 6-digit code until the really end of the experiment. If you can perfectly rehearse the full code, you will earn additional 400 Ft but if not, then your earnings of the 3. part will be 0 regardless of your achievement.

your code to remember is: _____

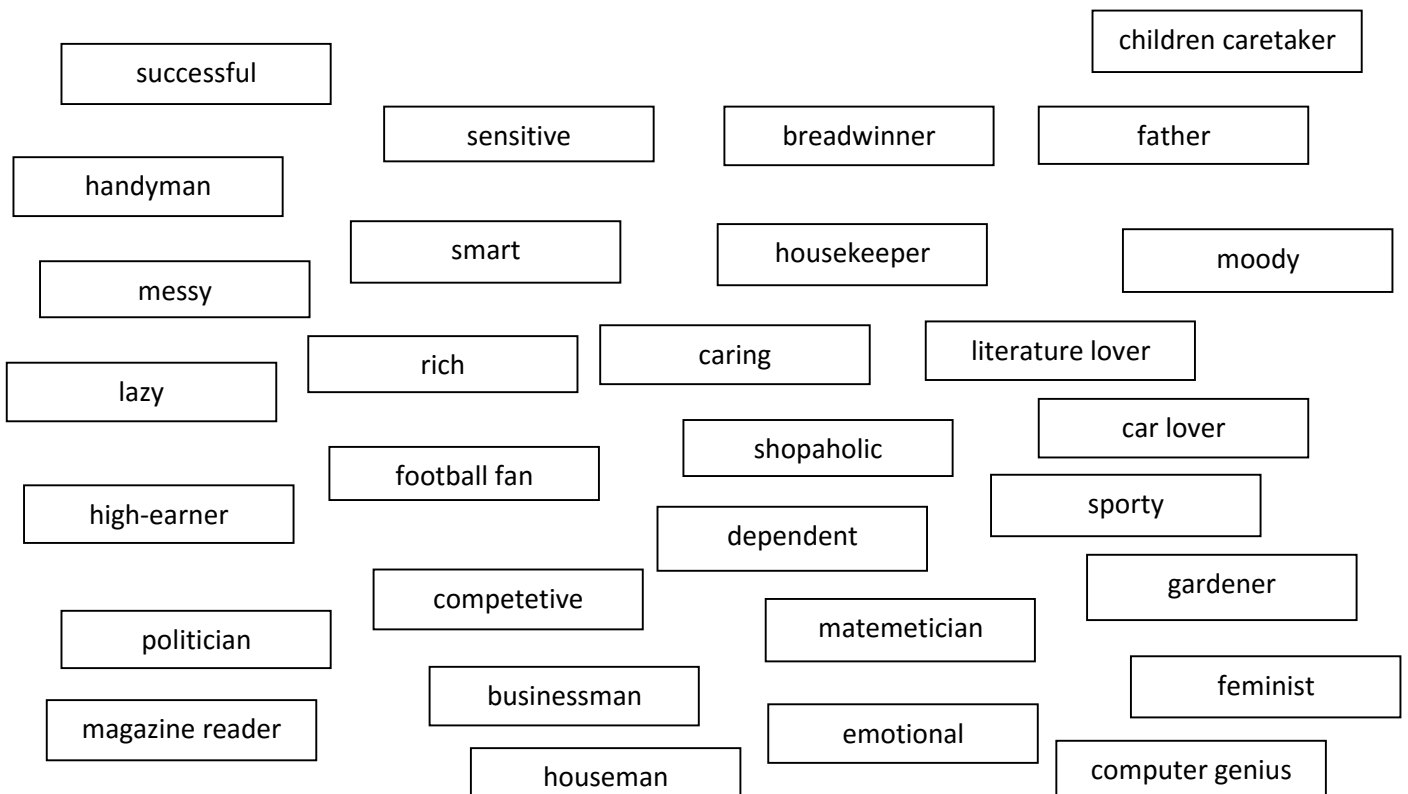
Appendix 4/a: stereotyping test (male)

Number of the participant : _____

Experiment part 3

In this third part of the experiment you are asked to memorize as many attributes of the person in the picture as you can. You are given 2 minutes to memorize all the attributes then the sheet will be taken away from you and we turn to the fourth part. For each attribute you can rehearse after filling out the fourth part you will earn additional payment of 30 Ft. Thus, if you can remember for all 30 attributes, you can earn 900 Ft. Do not forget that if you cannot rehearse the code of part 2 your earning is 0 in this round.

This is Tivan from Turkey, who has 3 children:



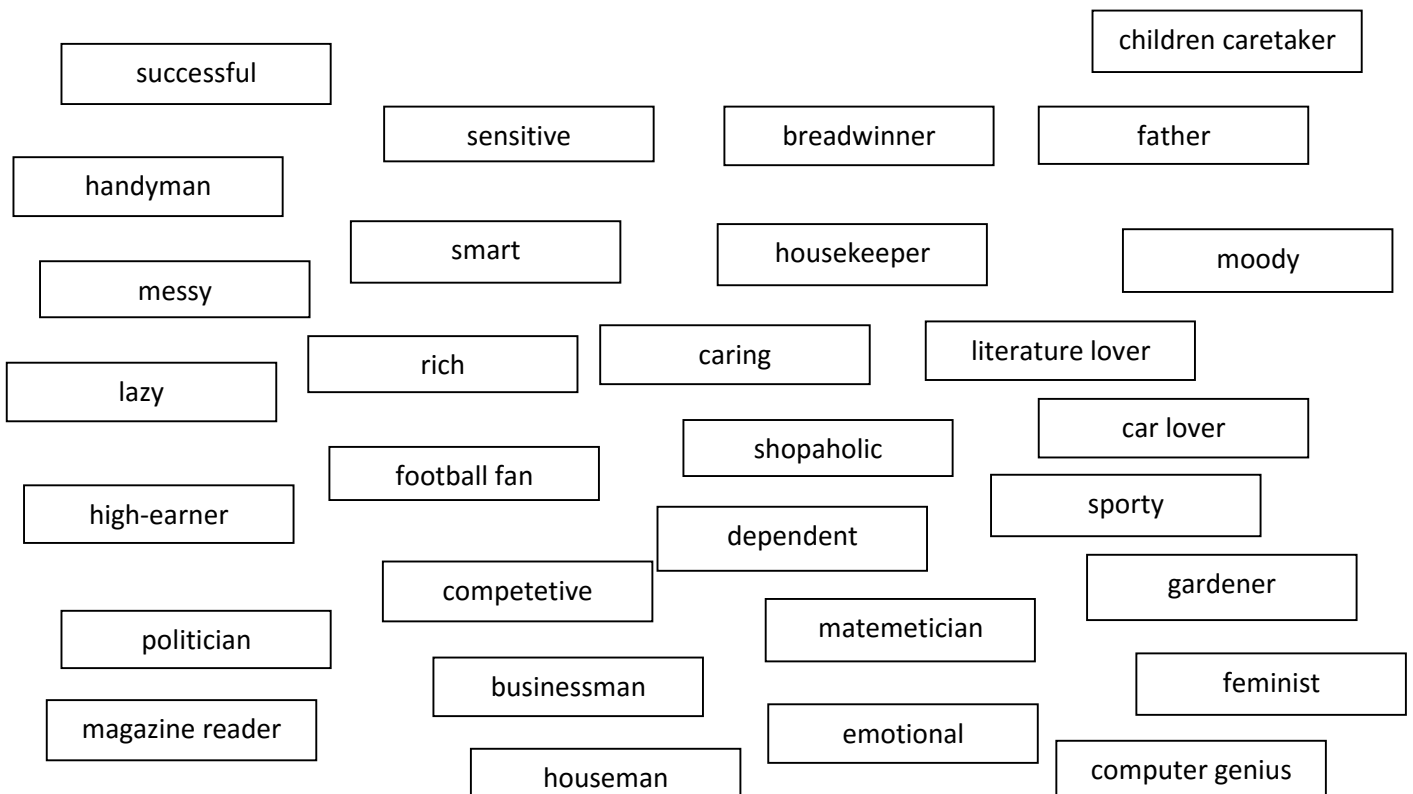
Appendix 4/b: stereotyping test (female)

Number of the participant : _____

Experiment part 3

In this third part of the experiment you are asked to memorize as many attributes of the person in the picture as you can. You are given 2 minutes to memorize all the attributes then the sheet will be taken away from you and we turn to the fourth part. For each attribute you can rehearse after filling out the fourth part you will earn additional payment of 30 Ft. Thus, if you can remember for all 30 attributes, you can earn 900 Ft. Do not forget that if you cannot rehearse the code of part 2 your earning is 0 in this round.

This is Ajnácska from Turkey, who has 3 children:



Appendix 5/a: rehearsal (male)

Number of the participant : _____

Rehearsal of attributes

Write down as many attributes of Tiván (From Turkey with 3 children) as you can.



Attributes :

_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

And now please write down the 6-digit code that you were asked to memorize in part 2:

Appendix 5/b: rehearsal (female)

Number of the participant : _____

Rehearsal of attributes

Write down as many attributes of Ajnácska (From Turkey with 3 children) as you can.



Attributes :

_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

And now please write down the 6-digit code that you were asked to memorize in part 2 :

Appendix 6: discrimination test

Number of the participant : _____

Experiment part 4

In the last part you will get a sheet where you have to indicate some candidate selection choices. You are going to hire personal to perform 4 different jobs for you. Your payoff of this round will depend on the performance of your selected candidates in the certain tasks. You will be offered 6 different candidates for each jobs from whom you can select one for each jobs. The 6 candidates are real people whose performance was actually measured and administrated beforehand in each tasks. Their performance is translated into “productivity” which determines your monetary outcome of this experiment. However, their personal performance is not revealed for you. We only provide the relative averages of genders in each tasks.

So, you need to pick a person based on minimum information and your intuition. If you select someone to “complete” the task for you whose performance was actually the worst, you earn 0 points. If you pick the best performed person for the task you earn 6 points. You can earn increasing amount of points with picking a better and better person in the following way:

#6 in the task – 0 point

#5 in the task – 0.5 point

#4 in the task – 1 point

#3 in the task – 2 point

#2 in the task – 4 point

#1 in the task – 6 point

These point are translated into monetary outcome in the following way: 1 point = 50 FT

Your points from the 4 tasks are added together and translated into monetary payoff at the end of the experiment. It means that if you can pick the 4 best performing person in each task you can earn 1200FT.

Task 1

You are hiring a person to perform mathematical calculations and equation solving for you. The better mathematician you pick the higher your payoff will be.

Please indicate below with the number which candidate you would like to use to perform this task for you based on the following information:

Boys performed better on average, but you do not know the individual performance, it is possible that the best performer is from the other gender



#1



#2



#3



#4



#5



#6

The number of the mathematician you select: # _____

Task 2

Now you are hiring a person who needs to run for you to earn money. The better sport person you pick the higher your payoff will be.

Please indicate below with the number which candidate you would like to use to perform this task for you based on the following information:

Boys performed better on average, but you do not know the individual performance, it is possible that the best performer is from the other gender



#1



#2



#3



#4



#5



#6

The number of the sport person you select: # _____

Task 3

Now you are hiring a person who needs to sew for you. The better sewer you pick the higher your payoff will be.

Please indicate below with the number, which candidate you would like to use to perform this task for you based on the following information:

Boys performed better on average, but you do not know the individual performance, it is possible that the best performer is from the other gender



#1



#2



#3



#4



#5



#6

The number of the sewer you select: #

Task 4

Now you are hiring a person who needs to collect book titles with its writers. The better literature person you pick the higher your payoff will be.

Please indicate below with the number, which candidate you would like to use to perform this task for you based on the following information:

Boys performed better on average, but you do not know the individual performance, it is possible that the best performer is from the other gender



#1



#2



#3



#4



#5



#6

The number of the literature person you select: #_____

Appendix 7: background exercises

Experiment background exercises

In the following you will be asked to execute 4 simple task, which will provide a basis for further experiments. The first task is going to measure your mathematical skills, the second one will assess your physical abilities by sprint, the third one will observe your literature knowledge and in the last task you will be asked to sew a piece of material. These tasks will be timed to provide some comparable outcomes among subjects.

There are no consequences of the score on these exercises but you are kindly requested to perform the task according to your best knowledge and capabilities.

Now we turn to the first task.

TASK 1

Please solve the most possible calculation tasks and equations in 3 minutes. Wrong answer yield for 0 points, the first 4 yields for 1 point, the next 4 for 2 points and the last 4 equations yields for 3 points.

1. $6+8+11-5 =$

5. $14+28/4-17 =$

9. $36/3+X-14= 3$

2. $2*3*2*4 =$

6. $3*3^2 + \sqrt{121} =$

X=

3. $9*8-22+18 =$

7. $16/5-3,5 =$

10. $X/3*5-11= 44$

X=

4. $32/8*11-4=$

8. $3,45*2*2-2=$

11. $24/ X^2+13 = 19$

X=

12. $\sqrt{X+3} * \sqrt{X} = 24$

X=

TASK 2

In this second round you are asked to run a certain predetermined (≈ 100 m) sprint for time measured by stopper. You are asked to run the fastest possible in order to reach the best result.

Sprint time: _____second _____millisecond

TASK 3

Please write down as much book titles with its writers as possible in 4 minutes

1. Writer: Title:
2. Writer: Title:
3. Writer: Title:
4. Writer: Title:
5. Writer: Title:
6. Writer: Title:
7. Writer: Title:
8. Writer: Title:
9. Writer: Title:
10. Writer: Title:
11. Writer: Title:
12. Writer: Title:
13. Writer: Title:
14. Writer: Title:
15. Writer: Title:
16. Writer: Title:
17. Writer: Title:
18. Writer: Title:
19. Writer: Title:
20. Writer: Title:
21. Writer: Title:
22. Writer: Title:
23. Writer: Title:
24. Writer: Title:
25. Writer: Title:
26. Writer: Title:
27. Writer: Title:
28. Writer: Title:
29. Writer: Title:
30. Writer: Title:
31. Writer: Title:
32. Writer: Title:
33. Writer: Title:
34. Writer: Title:

TASK 4:

Please sew the side of this 20 cm long material with approximately 1 cm distant stitches as fast and as precise as possible.

Sew time: _____sec

Please confirm with your signature that you performed these exercises according to your best knowledge and abilities and you contribute to the public application of your results as the background for further experiment.

Name: _____

Date: ____/____/____

Signature _____

Thank you for your collaboration,

Bettina Nyeste

[Appendix 8: application form for the experiment](#)

Application for experiment

Dear applicant!

We are conducting a research from Radboud University Nijmegen and we are searching for participants from University of Szeged. During the experiment, we are investigating the influences of cognitive capacity by executing two simple choice tasks.

If you have diabetes or sugar allergy, please indicate at the application, because there is a chance that you will be requested to consume a drink containing sugar.

The experiment takes approximately 30 minutes. Everyone will be paid participation fee and during the course of the experiment you can earn a significant amount of additional money. On average you can receive 1000-1400 Ft, depending on your performance and on the session you are participating, but the best player can earn even 2800 Ft.

Your details will not be available for anyone except for the experimenter.

Place of experiment: SZTE BTK building

Date of experiment: will be announces soon

***compulsory**

Name *

Gender *

- Male
- Female

How old are you? *

E-mail address *

We will contact with you through this email address to inform you about the date of experiment.

What days are you certainly not available between 11 May and 22 May?

Do you have diabetes or sugar allergy? *

- Yes
- No

Other comments:

Appendix 9: statistics of participants

Variable	Category	Number of observations	% of observations
Gender	Male	40	59.70
	Female	27	40.30
Siblings	Both	7	10.45
	Female	23	34.33
	Male	27	40.30
	No	10	14.93

Variable	Number of observation	Mean	Standard Deviation	Minimum	Maximum
Age	67	22.70	3.07	18	39
Mother's age	67	50.22	5.27	38	66
Father's age	63	53.19	5.97	42	72

Appendix 10: experiment payment report

Kísérleti jegyzőkönyv (Experiment payment report)

Ezennel megerősítem, hogy a részvételi díjat és a kísérletben összegyűjtött további pénznyereség összegét átvettem.

(Hereby, I declare that I received the participation fee and the additional payment)

Név (Name): _____

Összeg (Payment): _____ Ft

Dátum (Date): ____ / ____ / ____

Aláírás (Signature): _____