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EDITOR'S NOTE

It is with great pride and happiness we present the eighth issue of Koç University Undergraduate Psychology Journal (KUUPJ). I am very excited for this publication that we bring to you readers today because this is a result of long-time efforts of the journal staff and the authors. Like in every issue before this, a great deal of time and hard work has been put into these pages you are about to read. I would like to thank each of our editors for their time and efforts. And I would like to congratulate three of our associate editors- *Dila, Ece* and *Sezin*, who commenced their graduate lives as of last September. We are also very grateful for the support of our graduate editors for their contributions in many valuable ways.

In this issue, we are proud to publish five articles from three different universities. I would like to thank to each author whose works made this issue possible. I would also like to remind once again that we are doing this work to encourage more undergraduate students, who have barely set forth on their academic pathways, to engage with the pursuit of doing and writing about research. I hope these efforts will help students like ourselves to reach off to new academic heights as they become worthy members of the international scientific community in their careers.

It is with the greatest support of our dear advisors Dr. Tilbe Göksun and Dr. Fuat Balcı we were able to come together and this far in this journey. I would like to thank them and our college dean Prof. Aylin Küntay, who always supported us at every step. With respect to the beginnings and established paths, we are proud of where we are now and excited about our future as KUUPJ. We hope the growth will never end.

Editor-in-chief
Y. Kağan Porsuk

Action Planning According to A Plastic Hand: Rubber Hand Illusion Disrupts Different Types of Actions Equally

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We have to know where our limbs are in order to accurately plan and to execute actions. Rubber Hand Illusion causes a disruption in proprioception (awareness of the location of one's limbs) which causes a delay when a person decides to execute an action with the affected hand. We asked whether this delay would be different among different action types. We invited 40 adults (24 females, 16 males) to our laboratory and induced the rubber hand illusion on them. They were then asked to either perform a grasping task to an object (external reach task) or to touch their unstimulated hand (bodily task). We have shown that the Rubber Hand Illusion does disrupt the action initiation process, causing a delay in the action completion times. Yet we found no significant difference in the disruptions of actions with different natures. An interesting finding this study revealed was that males had an underrating bias on their illusion levels. We found that although males experienced a longer delay on their actions, hence a more vivid illusion, their subjective ratings of the illusion were lower compared to that of females. Implications for future research are discussed.

Keywords: proprioception, action, agency, body ownership, gender, rubber hand illusion

When we think of illusions, we immediately think of visual misjudgment of bistable images like the famous spinning dancer illusion (Liu, Tzeng, Hung, Tseng & Juan, 2012) or the rabbit-duck illusion (Kelley & Kelley, 2013). However, the illusions of the mind are not limited to illusions of vision. People can experience illusions about their own body perception as it happens in the Rubber Hand Illusion (RHI). RHI occurs when a rubber hand is placed in the anticipated location of a person's hand, while their corresponding real hand is hidden from their sight (Kalckert & Ehrsson, 2014; Botvinick & Cohen, 1998). Both the rubber hand and the actual hand are stroked synchronously with paintbrushes. After as quick as 10 seconds (Kalckert & Ehrsson, 2014; Ehrsson, Spence & Passingham, 2004), the person starts to mislocate the sensation of the paintbrush strokes as if they are coming from the rubber hand, and develops ownership of the rubber hand. This phenomenon is being exhaustively used to get a better understanding of our body perception and our bodily self-consciousness (Blanke, 2012). One of the areas this illusion is being used is to understand the role of body perception in the process of action

planning and initiation (Zopf, Truong, Finkbeiner, Friedman & Williams, 2011). The aim of our study is to expand the literature by examining the possible differences in the disruptions of action processes that carry different goals. With the RHI we are disrupting two unimanual (relating to one hand) actions that have different endpoints: either a grasp for an external object or a touch to one's own body parts.

Body perception is a visual, tactile and a proprioceptive ability (Makin, Holmes & Ehrsson, 2008) in which we perceive our body as ours (Marotta, Zampini, Tinazzi & Fiorio, 2018). Proprioception refers to our awareness and knowledge about the locations of our limbs in space, and it is crucial for the brain to determine the correct direction, distance, and force when initiating an action (Holmes, Snijders & Spence, 2006). RHI causes an illusory shift in the perceived hand location causing a spatial disparity between visual and somatosensory hand position, a phenomenon known as proprioceptive drift (Dempsey-Jones & Kritikos, 2019, p.351). As we saw in the findings of Kammers et al. (2009), when the 'drift' happens we both give

perceptual judgments (telling distance) and carry motor responses (grasping an object) errorfully.

Peri-personal space is also another key term linked with the RHI. It refers to the space that is in immediate proximity of our skin, all over our body, which humans have a neural representation for, at a single neuron level (for a review, see Graziano & Gross, 1998). It has been reported that during RHI, this neural representation is formed in accordance with the artificial hand, indicating a complete adoption of the rubber hand, and a tactile extinction of the real hand (Farne, Pavani, Meneghello & Ladavas, 2000). It is important to understand that this representation, or ‘encoding’, is done in a hand-centered manner, and the visuo-tactile perception of the hand’s location is crucial for this encoding (Brozzoli, Gentile & Ehrsson, 2012).

We both have the feeling and the knowledge that we own a body (ownership), which we believe to have control over (agency) (Kammers, Rose & Haggard, 2011; Ma & Hommel, 2015). We often take these abilities for granted (Kilteni, Maselli, Kording & Slater, 2015), and we never notice how important they are for our ‘selfhood’ (Suzuki, Garfinkel, Critchley & Seth, 2013) until we lose them. For example, rare disorders such as Guillain-Barre Syndrome or somatoparaphrenia can cause people to lose their proprioception or their sense of ownership of their body parts (McNeill, Quaeghebeur & Duncan, 2010). In this regard, what RHI means to proprioception studies is similar to what transcranial magnetic stimulation (TMS) means to lesion studies. Without the need for locating patients with rare syndromes or lesions, we can study proprioception by disrupting it for a brief period of time. Thanks to this role of RHI, it is being exhaustively used for body perception studies.

Countless studies have been conducted to discover the required methodologies for getting the most vivid illusion during RHI. Shortly after Botvinick & Cohen (1998) discovered RHI, another version was found that included motion. This version included an apparatus that moved the corresponding finger of the rubber hand when the participant moved their finger that is hidden from their view, and it has

proven to induce even a stronger illusion (Kalkert & Ehrsson, 2014; Dummer et al., 2009). Other studies have focused on the distance factor of the illusion; whether or not the distance between the real hand and the rubber hand being larger or smaller, changes the vividness of the illusion. It was Lloyd (2007) who discovered the spatial limits of the illusion first, and she concluded that the illusion started to decay significantly after a 30cm limit. Later on, Kalkert & Ehrsson (2014) replicated the findings of Lloyd (2007) and extended the findings by claiming that the most optimal level of illusion was reached when there was only 12 cm of distance between the rubber hand and the hidden real hand. On a recent study, age was discovered as a moderating factor of RHI; younger and older adults experience a more vivid illusion compared to middle-aged adults (Marotta et al., 2018).

When we look at the stroking factor of the illusion, synchrony emerges as the most important factor. Any kind of asynchrony between the strokes immediately eliminates the illusion (Botvinick & Cohen, 1998; Kalkert & Ehrsson, 2012; Ocklenburg et al., 2011; Kalkert & Ehrsson, 2014). Apart from the synchrony, Stralen et al (2014) discovered that affective touch, defined as soft and slow touch with an emotional component, enhances RHI, considering its high social importance for mammals.

Lastly, handedness was found to be important for experiencing RHI, such that the illusion deepens significantly when applied on the non-dominant hand of the participant (Dempsey-Jones & Kritikos, 2019). Lefties experience a significantly deeper proprioceptive drift when their right hand is being subject to RHI; and the situation is vice versa for the righties (p.357-358). Considering humans, like other mammals, show a preference to one of their hand (Annet, 2004), and this hand is the right hand for 90% of the population (Oldfield, 1971), most researchers have decided to use a left rubber hand in their studies.

Rubber Hand Illusion experiments have been extended to many other fields. In social psychology, it was shown that implicit prejudice against darker skin people reduces your chances of experiencing a

vivid RHI experience with artificial hands of darker skin tones (Lira et al., 2017). However, if you manage to have body ownership over the dark skin hand, it increases your positive attitude toward darker skin individuals (Farmer, Maister & Tsakiris, 2014). Cognitive neuroscience was also interested in the Rubber Hand phenomenon. Many brain-imaging studies have been conducted during RHI that show activity in motor areas (Ehrsson, Spence & Passingham, 2004; Capelari, Uribe & Brasil-Neto, 2009), and areas related with proprioception (Ehrsson, Holmes & Passingham, 2005) indicating that the brain accepts the rubber hand as a part of the body and incorporates it into the neural system. One interesting study discovered that when the rubber hand was under threat of physical harm (from a hammer or a needle), the brain started to give threat-evoked cortical responses that are commonly associated with anxiety (Ehrsson, Wiech, Weiskopf, Dolan & Passingham, 2007). There was also cortical activity in the motor areas reflecting “an urge to withdraw the artificial hand” during the threat (p.9829).

Rubber Hand Illusion is a phenomenon that can also be used in practical research. Research showed that RHI could be induced on upper limb amputees, and that they could experience ownership of the hand, which has important implications for prosthetic rehabilitation research (Ehrsson et al., 2008). It is interesting that the somatic illusion even works in the participants that were born without a limb (Ehrsson et al., 2008). Subsequent literature has shown that supernumerary limbs (e.g. three or more arms) can be incorporated into healthy adults (Newport, Pearce & Preston, 2010). Hence, there is no requirement of any previous experience of having that many arms. Yet, it is important to note that the somatic version of the illusion in which the participants are blindfolded cannot be experienced by blind individuals due to their different representation and processing of external cues (Petkova, Zetterberg & Ehrsson, 2012).

Our current study is interested in action, and how it relates to the RHI. Previously, it was shown that RHI alters the grasping positions when the

incorporated hand is smaller or bigger than the participant's hand (Marino, Stucchi, Nava, Haggard & Maravita, 2010). People change their way of grasping according to their ‘new’ hand and fail to update its position with visionary cues because there is no visual input about the hand (Zopt et al., 2011; Holmes et al. 2006; Redding & Wallace, 2002). Similarly, most types of action processes have been observed to be disrupted, affecting either the reaction time or the accuracy of the actions (Kammers et al., 2009; Zopt et al., 2011; Holmes et al., 2006; Marino et al., 2010).

Our first hypothesis is that rubber hand will cause a significant delay in the completion times of action tasks. What the literature lacks is an examination of different action types, and how actions with different natures respond differently to the disruption of RHI. It is yet unclear that, whether or not some actions would be disrupted less (preservation) compared to others. The purpose of this study is to expand the literature by providing an analysis of differences in the disruptions of two different actions: bodily actions and external actions. Our second hypothesis is that during RHI, actions including one’s own body will be preserved better, hence experience less disruption. As it is the case with many neurological conditions, even when action process is severely damaged, actions including one’s own body manage to be preserved (e.g. Balint’s Syndrome (for a review, see Hausser, Robert & Giard, 1980)).

Method

Participants

The final sample consisted of 40 participants, 26 being female and 14 being male. Participants are currently studying at Koç University and the age range is determined as 18-40. Thirty-six right-handed participants (23 female) and four left-handed participants (2 female) aged between 18 and 35 years gave written consent to participate in the study. All the participants were undergraduate students who participated in the experiment to get credits for their courses. 20 of them were assigned to the bodily task

which required them to touch their right hand with their left hand after inducing the illusion, and 20 of them were assigned to grasping task which required them to grasp to a coffee cup that was positioned in front of them after inducing the illusion.

Measures & Materials

The RHI materials were specifically chosen for the objectives of this study. A cardboard plate (90cm x 62cm), 2 identical brushes to induce the stimulation. A 100cm long tripod was placed on top of the desk, recorded the whole process from a bird's eye view. A pair of rubber gloves was given to every participant to maintain a congruent look with the rubber hand which was also placed in a glove. A blanket was also used to cover the participants' arms.

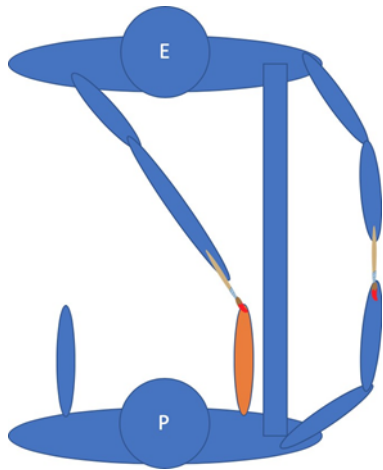


Figure 1 - A classical RHI experimental set-up.

Procedure

Testing took place in the Koç University Social Minds lab. Participants were given the consent form and were seated comfortably at a chair behind a desk. They were asked to take off all jewelry before the start of the experiment. This was done to keep the visual congruence with the artificial hand as high as possible. A pair of rubber glove was given to the participants to preserve a congruent look with the artificial hand. On the desk, a cardboard plate (90 cm x 62 cm) was placed on one side of the table. Participants were positioned in a way that their left-hand remained on the left side of the cardboard plate and that their vision of their left hand was inhibited

by the cardboard plate. While their left was hidden from their sight, a rubber hand was placed on the anticipated location of their hand. A blanket was put over the participants' right hand and over the arms that will connect it to the rubber hand. This way, a continuous body image causing no distractions in the visual perception of the body was preserved. A 100 cm long tripod was used as a support to hold the cardboard plate standing; and the attached recorder on the top, recorded the whole process. Before starting the experiment, an alarm sound was introduced to the participants regardless of which experimental group they are in. They were told that when they heard the alarm they would be asked to do a task (bodily task, grasping task) depending on the experimental group they were in. The participants were asked to do a practice trial by touching their right hand with their left hand or by grasping to the coffee cup in front of them which was placed 13 cm away from the artificial hand. This trial was done to prevent confusion due to misunderstood instructions which could potentially affect the response time. Each trial (grasping or bodily task) was recorded on a video to calculate their completion time of the action tasks under normal circumstances. The illusion was induced on the participant by synchronously brushing the left hand of the participant and the artificial hand. The synchronicity of the stimulation was monitored by the experimenter. The direction of the stroking was always from the knuckle to the fingertip. The stimulation of brushing was induced on every participant for 5 full minutes. After 5 minutes, the alarm that the experimenter had set went off and the participant completed the task he or she was instructed to complete. The whole process was videotaped. Illusion self-report scores, the response times and delay times were coded.

Results

First, we conducted two paired sample t-test to analyze the mean difference between participants' reaction times in both groups (grasping and bodily task) when the illusion was not induced on participants and the illusion was induced on

participants. According to the results of paired sample t-test there was a significant difference between the reaction time of the control condition ($M = 1.97$, $SD = 0.44$) and the reaction time of the illusion condition ($M = 3.39$, $SD = 1.59$) in the grasping task, $t(19) = 4.27$ $p < .05$.

Furthermore, a second paired sample t-test has shown a significant difference between the reaction time of the control condition ($M = 1.65$, $SD = 0.53$) and the illusion condition ($M = 3.98$, $SD = 2.07$) in the bodily task, $t(19) = 5.29$ $p < .05$. The results of the two paired-sample t-tests supports, our first hypothesis.

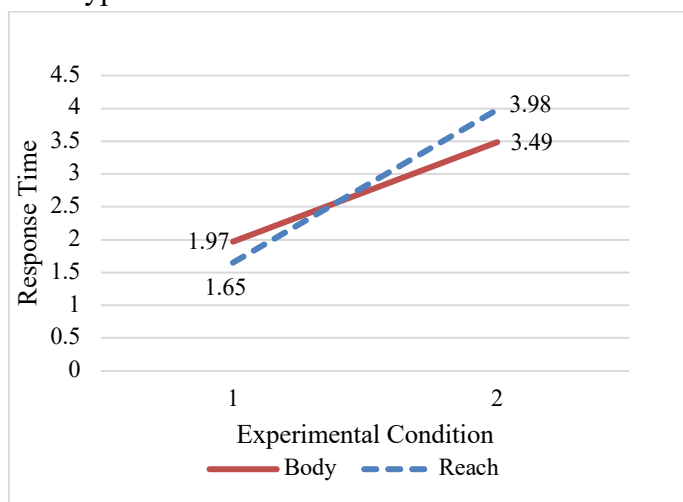


Figure 2: Interaction plot (test type v reaction time)

Secondly, we conducted an independent sample t-test to analyze whether there was a significant difference between the groups' (bodily task group and grasping task group) reaction times after the illusion was induced on participants. According to independent sample t-test, there are no significant differences between reaction times on the illusion was induced in body tasks ($M = 3.98$, $SD = 2.07$) and reaction times on the illusion was induced in grasping tasks ($M = 3.39$, $SD = 1.59$), $t(38) = 1.001$ $p = .32$ so, $p > .05$. So, hypothesis 2 is not supported by our data.

For further investigation, we also decided to conduct an independent sample t-test to find whether there was a significant interaction between participants' sexes and their delay times. According to the results, there is no significant difference between males' delay times ($M = 1.98$, $SD = 1.88$)

and females' delay times ($M = 1.82$, $SD = 1.76$), $t(38) = .27$ $p = 0.79$, so $p > .05$. We also wanted to conduct an independent sample t-test to examine if there was any significant interaction between participants' sexes and their illusion scale scores. Considering the independent sample t-test results, ($M = 41.5$, $SD = 13.65$ and $M = 49.3$, $SD = 14.47$) there is no significant effect based on these results $t(38) = 1.66$, $p = .11$ so, $p > .05$. However, the illusion scale scores of the female group are higher than that of the male group. Lastly, we calculated Pearson's product-moment correlation coefficient to find whether there was a significant relationship between participants' delay times and their illusion scale scores. According to the Pearson correlation coefficient, $r(40) = .549$, $p < .001$. Pursuant to Pearson correlation coefficient, there is a moderate positive correlation.

Discussion

In this experiment, an illusion called the Rubber Hand Illusion took place when the participant's hand was hidden from their view and it was stimulated simultaneously with a rubber hand placed in the anticipated location of their hand. After as quick as 10 seconds (Kalkert & Ehrsson, 2014; Botvinick & Cohen, 1998; Lloyd, 2007) participants began to feel as the rubber is a part of their body.

The results of our study were congruent with the previous literature on RHI and action, especially with the finding that RHI disrupted the action process which was observable on the reaction times and accuracy of the participants (Kammers et al., 2009). Participants completed the tasks twice, once in the control condition and once after the illusion was induced on them. There was a statistically significant delay while the participants were completing the tasks under the illusion condition. We failed to prove our second hypothesis suggesting that bodily tasks would be more preserved; meaning that they were expected to be disrupted less compared to external tasks. However, both tasks were disrupted, and there was no significant difference between them in terms of how much they were disrupted. We found that the reaction times of the participants were significantly

longer in the condition where the RHI was induced on them, compared to the condition that the illusion was not yet introduced (control condition).

In order to test our second hypothesis, we examined the statistical difference between the delay time of the bodily task and the delay time of the grasping task; and checked the interaction with the illusion condition. In this context, contrary to our expectations, there were no significant interaction between the type of action and the illusion. Both actions were disrupted similarly without any statistical significance between them. Therefore, we have failed to support our second hypothesis. In addition, it was observed that there was no significant interaction between the gender and delay periods of the participants. Also, there was no significant interaction between the gender and the illusion scores of the participant.

In our study, we also collected data based on the preferred hand of the participants. According to our data, we observed that only 4 of the participants were left-handed. These left-handed participants were divided equally among the two task conditions of the experiment by chance. Considering our 40 people sample; the 4 left-handed participants constituted a 10% minority; which was consistent with the prevalence of left handed people in the population which is approximately 10% (Oldfield, 1971). Therefore, we have obtained both random sampling and random assignment successfully, regardless of our low sample size.

Even though the participants were asked to take off their jewelry to preserve a congruent hand image, the size of their hand could also have an effect on the degree of illusion felt by the participant. Participants with hands significantly larger or smaller than our rubber hand model had a tendency to experience a less vivid illusion. Although this was not statistically measured nor tested, it was an interesting observation of the researchers. Another observation that was recorded was, 15 of the participants in the research experiment had already heard of the rubber hand illusion and were aware of the popularity and prevalence of the experiment on social media and other platforms. Despite the fact that 15 of the

participants knew about the experiment, their illusion and vividness scores were not affected, and the proprioceptive drifts of the participants did not change. Knowing the experiment does not have a significant effect on the vividness of the illusion that the subject declares.

Yet another mere observation was about the relationship between the age and the vividness of the illusion. According to a previous study, the participants' illusion declarations and the experience of the illusion vary with the age of the participants, being lowest on middle-aged participants (Marotta et al., 2018). Of course, the number of middle-aged participants in our study is not enough to support this argument considering that we had only one middle-aged participant, but based on our observations, our middle-aged participant's declaration of illusion vividness was very low. However, there was no significant difference in the delay in his action task.

The strength of our study is that we referred to the findings of the previous literature to induce the maximal illusion on our participants. We used a left rubber hand, considering that 90% of the population is right-handed; and the illusion is stronger when the non-dominant hand is stimulated. We have tried to keep distance between the rubber hand and the real hand as short as possible. We used paintbrushes to deliver affective touch to our participants. We sustained a synchrony between strokes to deepen the illusion. And finally we have used a young adult sample, which was observed to be an age group where illusion tend to be the strongest.

Limitations of our study also exist. One of our key limitations is that the devices we had in our experiment cannot measure histamine reactivity (Barnsley et al., 2011), temperature recording (Kammers, Rose & Haggard, 2011) and Galvanic skin response (Hägner et al., 2008) of the participants which would help to objectively decide whether or not they are experiencing the illusion. Normally, in the illusion, the participant's left arm begins to cool down on an observable level (Kammers, Rose & Haggard, 2011), while their histamine reactivity and skin conductance start to increase. We had to rely on self-report and a crude measurement device such as a

video camera. Since we depended on self-report, illusion measurements (self-report scale filled out by the participants) remained subjective. We observed some bias while these reports were being given. People experiencing the illusion gave fewer points to the illusion rating scale. However, people who have not experienced the illusion gave higher scores than they should be giving, making us think that they were trying to be a good subject. Also, we have a sample size related limitation. The sample size of this study could have been higher to support the interaction effect of illusion and task type. In studies with a larger sample size, we think that the interaction effect that we cannot see in this study could be significant.

For future research, we recommend the researchers to test whether females have better introspection compared to males. We have found that males displayed more delay in completing action tasks, hence an objectively more vivid illusion, while their subjective rating remained lower compared to females on the Kalkert & Ehrsson RHI Scale (2014). Our sample size and design weren't suitable to statistically demonstrate this effect. Future research could achieve significant results by eliminating material-based limitations in design and increasing the sample size.

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Memory Retrieval and Its Relationship with Emotion Regulation

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Emotions are usually defined as subjective experiences which are regulated by several mechanisms. Emotion regulation is a mechanism that control *which* emotion is experienced, *when* it is experienced and *how* it is experienced. One of the emotion regulation process is memory retrieval: voluntarily or involuntarily recall, emotional states of individuals are affected. In this study, we examined the effect of memory retrieval and specific emotion regulation strategies – cognitive reappraisal and expressive suppression- on memory recall as well as on memory characteristics that are retrieved later on. Results showed that memories are valance of the memories varied significantly in their characteristics such as emotional intensity, specificity and richness in terms of contained details. Also, emotion regulation strategies used in order to regulate emotions generated by a memory has a significant effect on memories recalled later on. For future researches, the interaction between emotional valance of memories and use of different emotion regulation strategies could be furtherly examined.

Keywords: memory, emotion regulation, cognitive reappraisal, expressive suppression

In the literature, emotions are defined as subjective experiences which are regulated by several mechanisms (Gross J., 2002). Emotions include behavioral, cognitive and physiological aspects (Gross, 1998a, Barrett, 2007, Gross, 2012), and affect decision making (Oatley, 1986), motor functions (Frijda, 1986) and the way individuals interact with their environment (Schwarz, 1983). Emotion regulation is a mechanism that controls which emotions are being experienced, and when they are being experienced. This process can be automatic or controlled, conscious or not, and it can affect emotion generation in different ways: some strategies focus on the period before emotions are generated, whereas some others control the expression of emotions and response tendencies (Gross, 1998b, 2002). Here we investigate whether emotion regulation strategies have an effect on memories later recalled regarding memory characteristics such as emotional valance and intensity.

Two emotion regulation strategies we focused on in this research are cognitive reappraisal and expressive suppression. These two strategies are the most commonly used in the researches and have an established background to study on. Also, the reason why we focus on these two strategies is that their role in the emotion regulation is distinctive as cognitive

reappraisal happens before emotions are generated whereas expressive suppression occurs after emotions are generated.

Cognitive reappraisal is defined as the evaluation of the event while disregarding its emotional content or the re-evaluation of the event in terms of a more positive or less negative way (Gross J. J., 1998b). Since this process comes before emotions are fully generated, it can affect emotional and other response tendencies (Gross, 2002; Cutuli, 2014). It was observed that cognitive reappraisal decreases negative emotions as well as cognitive, behavioral and physiological reactions (Sheppes Scheibe, Suri, & Gross 2011). The second emotion regulation strategy that we focused in this study is expressive suppression. It concerns the suppression of the emotions that are being experienced (Gross J. J., 1998b). It is claimed that this strategy has no positive effect on the generation of neither emotions nor on other response tendencies (Gross J. J., 1998b). On the opposite, individual's efforts to prevent expressing these emotions lead to increase in physiological reactions (Gross, 2002; 1998a).

Expressive suppression has various negative consequences such as disruptions in social performance, discrepancies between the emotions that are felt and expressed, difficulties in forming

emotional relationships, and negative views of the self and avoidant behaviors (Gross, 1998b, Cutuli, 2014). In sum, it seems that cognitive reappraisal results with more positive and less negative consequences whereas expressive suppression gives rise to less positive emotions. Emotion regulation was investigated in the memory literature as well. It was found that recalled autobiographical memories have an effect on generated emotions as well as emotional state. Those emotions can change individual's mood or improves the current mood which is the function of the memory as an emotion regulation tool. Also, these memories generate emotions which are progressed by emotion regulation strategies as well.

It has been shown that positive memories which include positive emotions such as happiness, excitement or joy last longer in the individual's mind than negative memories which contain negative emotions such as sadness, anger or guilt as their emotional effect passed faster than positive ones (Berntsen, 1996). Further, it has been shown that people who expressed negative emotions showed fewer depressive symptoms than people who suppressed those emotions (Wisco, 2010). However, whether different emotion regulation strategies have a distinctive effect on memory retrieval regarding characteristics of these memories as well as emotions produced by these retrievals is not clear. For instance, the effect of using cognitive reappraisal or expressive suppression on the memory that is just recalled and the emotions generated by this retrieval has not been studied.

In this research, we investigated the effect of different emotion regulation strategies on the retrieval of autobiographical memories. Specifically, we focused on two questions. We examined whether emotional valance of the memories was congruent with individual's current mood or these memories are used as an emotion regulation tool which can alter or improve the current mood individual is in. For instance, people may recall positive memories to regulate their negative mood, however, the use of different emotion regulation strategies – cognitive reappraisal or expressive suppression- may have distinctive effects on memory retrieval later on. Our

second question focused on whether there is a distinction in memory characteristics based on the emotion regulation strategy that is applied by the individual. We hypothesize that not only memory retrieval but the characteristics of it such as how accessible the memory is, whether it has a reliving effect, its imagery and emotional intensity will play a crucial role in emotion regulation. We expect that participants who used cognitive reappraisal to remember positive memories than expressive suppression group, also intensity of memories will differ regarding valance of the cues used. Participants who used cognitive reappraisal for positive events will remember more intense and positive memories than positive-suppression group. And as expected, participants who saw negative cues and used suppression as the strategy will recall more negative and intense memories than negative-reappraisal group.

Method

Participants

A sample of 77 psychology undergraduate students (60 females) from Kadir Has University participated in exchange of one extra credit from several lectures.

Measures & Materials

Affective Pictures

3 negative and 3 positive attachment related pictures were taken from IAPS database.

Emotion Regulation Questionnaire (ERQ)

The questionnaire consisted of 10 questions that measure the use of specific emotion regulation strategies (e.g. How do you control and regulate your emotions?), cognitive reappraisal (e.g. I control my emotions by changing the way I think about the situation I'm in.) and expressive suppression (e.g. I keep my emotions to myself. The questionnaire was developed by (Gross, 2003), and we used the Turkish adapted version (Eldeleklioglu, 2015). The internal consistencies were .78 for the reappraisal and .73 for

the expressive suppression subscales. Test-retest reliabilities were .74 for the reappraisal and .72 for the expressive suppression subscales.

Negative Mood Regulation Questionnaire (NMRQ)

The NMRQ is composed of 16 questions that target participants' ability to regulate their negative moods (e.g. I'll feel better when I understand why I feel bad, I can do something to feel better.). It was standardized by Vatan (Vatan, 2015). In the reliability study, the Cronbach alphas for the total scale and subscales were between .79 and .90. Most of the item total correlations were higher than .30.

Autobiographic Memory Characteristics Questionnaire

The questionnaire measures various aspects of memory such as its emotional valence and intensity, its reliving effect, its imagery etc. It was developed by Rubin (2003), and the standardized Turkish version was constructed by Gülgöz and Rubin (2001).

Procedure

Upon arrival, participants filled out the ERQ and NMRQ. Following this, they completed the Affective Picture task where they were shown negative or positive pictures. Participants were instructed to look at each picture and then recall the first memory that comes to their mind. They were asked to write down the memory they just retrieved. After this session, participants were informed that for 90 seconds they had to follow the instructions given by the experimenter and had to regulate their emotions about the memory that they recalled. For the suppression group, the instruction was 'try to not express the emotions you feel, in other words suppress your emotions' as in Turkish '*Anket bir sonraki aşamaya geçene dek hatırlamış olduğunuz anıya odaklanmanızı istiyoruz. Ancak bu anıyı düşünürken bu anının sizde uyandırmış olduğu duyguları dışarıya göstermemeniz, başka bir deyişle bastırmanız gerekiyor*', whereas for the reappraisal group, it was 'try to think of the memory you just recalled in a more positive or less negative way', in

Turkish '*Anket bir sonraki aşamaya geçene dek hatırlamış olduğunuz anıya odaklanmanızı istiyoruz. Ancak bu anıyı düşünürken olayı farklı açılardan bakarak olabildiğince olumlu ya da daha az olumsuz yaklaştırmaya çalışın*'. After this section, they were asked to recall another memory that comes to their mind without any instructions and they filled a memory characteristics questionnaire.

Results

Two-way ANOVA analysis indicated that there was a statistically significant difference in memory characteristics based on valence of the memory, $F(21,42) = 2.36, p=.009$. This correlation of valence with memory characteristics was as accordingly for emotional intensity $F(1,62) = 5.68, p= .020$, specificity $F(1,62) = 15.25; p < .001$; richness, $F(1,62) = 6.34, p= .014$; involuntary recall, $F(1,62)=18.00, p < .001$; thinking about memory, $F(1,62) = 14.11, p < .001$; talking, $F(1,62) = 4.90, p= .031$; closure of the event, $F(1,62) = 3.76, p < .05$; effect of memory on self, $F(1,62) = 17.31, p < .001$. People reported greater intensity level of emotions felt when memory experienced for negative memories ($M= 4.44, SE=.16$) than positive ones ($M=3.87, SE= .18$), related with this finding, individuals recalled more specific ($M=2.94, SE=.11$), and detailed ($M=2.05, SE=.13$), memories than individuals retrieved positive memories ($M= 2.31, SE=.12$); ($M=1.57, SE=.14$). Also, negative memories were correlated with higher involuntary recall ($M=3.43, SE= .17$), thinking ($M=3.39, SE= .19$) and talking ($M=3.12, SE=.19$) of the event than positive ones ($M=2.34, SE=.19$); ($M= 2.32, SE= .21$); ($M=2.47, SE=.22$). Accordingly, when asked how much time you think it passed after the event -of memory-, participants reported that negative memories ($M= 56.15, SE= 4.50$) were much closer to today than positive memories ($M= 41.35, SE= 5.75$). Moreover, individuals reported that negative memories ($M= 3.24, SE= .18$) were more related with the definition of self than positive memories ($M= 2.08, SE= .21$).

The effect of emotion regulation strategy used was significant on memory characteristics, $F(21,42) = 1.80, p=.05$; accordingly for visual imagery, $F(1,62) = 10.76, p=.002$, reliving, $F(1,62) = 5.35, p < .029$. People who used reappraisal as emotion regulation strategy scored higher on visual imagery ($M=4.68, SE=.11$) than people who used suppression ($M= 4.13, SE=.13$). About positive memories, reappraisal group reported higher reliving ($M= 3.94, SE=.31$), auditory ($M= 3.94, SE=.32$) and imagery ($M= 4.63, SE=.20$) levels than suppression group ($M= 2.83, SE=.36$); ($M= 3.00, SE=.37$); ($M= 4.00, SE=.23$). On the interaction of valence and emotion regulation strategy, suppression of positive memories ($M= 2.83, SD= 1.34$) was the lowest on reliving scores whereas participants scored the highest on reliving in suppression of negative memories group ($M= 4.00, SD= 1.00$).

Discussion

Firstly, the effect of emotional valence on memory characteristics was observed clearly. Negative events were more specific and richer in detail. Also, negative memories had higher emotional intensity level than positive memories. Correlated with this result, individuals who recalled negative memories recalled these memories more frequent, thought and talked about them more often. Individuals who recalled negative memories reported that these memories had higher impact on them in terms of how they defined themselves than individuals who recalled positive memories. The correlation between emotional intensity of memories and those memory characteristics was congruent with literature. Incompatible with our expectations, individuals recalled more specific and intense negative memories when compared to positive memories. One of the reasons of this could be individuals recalled everyday events in positive group, but negative group remembered highly intense memories like funeral, loss of someone or accident. One of the explanations is even though intensity and valence of cues were standardized, negative cues may direct participants to recall more intense and trauma-

like memories whereas positive cues impel participants to remember mostly normative or everyday life events. Maybe, because of the valence distinction, tendency of people to remember an event is mostly positive ones in order to change their negative mood or improve the current positive mood of theirs, so positive events were highly accessible as retrieval of a memory is a way of emotion regulation. Because of this effect, people recalled highly intense and specific negative events as negative memories that are low in intensity were not accessible.

As expected, imagery and reliving effect of memories were correlated with used emotion regulation strategy. Reappraisal-group had higher imagery scores than suppression-group. Because suppression-group tried to prevent to think about the event, generated emotions and their expression; this leads to lower imagery level on memories that were recalled after. This effect was expected but having this effect on memory after using emotion regulation strategy showed that the use of specific emotion regulation strategy has an effect on not only the retrieved memory but also retrieval of memories later on.

Emotional valence of memories and use of emotion regulation strategy affected reliving effect of memories that were recalled later. Negative-suppression group showed higher reliving scores, which may indicate that even though people suppressed their emotions, it had no effect on emotion generation. Thus, it may impact differently as it increased reliving effect of memories. On the other hand, positive-suppression group indicated the lowest reliving scores as they were able to suppress positive emotions which resulted in lower emotionality levels. This may show the interaction between emotional valence of the memory and emotion regulation. People were able to suppress emotions generated by positive memories which leads to retrieval of memories that were low on reliving, but suppression of negative emotions leads to high levels of reliving. Also, this pattern was observed in various memory characteristics such as emotional intensity, involuntary recall and thinking about memories.

As shown, memory retrieval and use of emotion regulation strategies to regulate emotions generated by those memories have various effect on memory recall later on and characteristics of those memories. For future research, the interaction between emotional valance of memories and use of different emotion regulation strategies could be furtherly examined. Also, clinical implications as well as research on clinical groups could be studied. The effect of traumatic experiences on emotion regulation, other memories' and their processing is an interesting yet not persuaded area.

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Self-Esteem and Feedback Type: How People Perceive Feedback Accuracy

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We receive positive or negative feedback on a daily basis and give different affective and cognitive reactions to those feedbacks. There are many theories on how people differ in their reactions to feedback. This study investigates the relationship between feedback type and how individuals perceive this feedback depending on their self-esteem levels. We ask (1) whether people with high self-esteem judge positive feedback as more accurate, (2) whether people with low self-esteem judge negative feedback as more accurate. One-hundred Koç University students aged between 18 and were first separated into two according to their self-esteem levels, measured via Rosenberg Self-Esteem Scale. Participants then received feedback on their performance on an anagram test. Based on their ratings of accuracy of the feedback, we found that regardless of their level of self-esteem individuals perceived positive feedback as more accurate than negative feedback. This study confirms the previous findings of the main effect of feedback type on individuals' response to the feedback. It also expands the previous findings to a different cultural sample.

Keywords: self-esteem, feedback type, perceived feedback accuracy, self-consistency, self-enhancement

Feedback is a significant part of human communication as people receive evaluations on their performance on a daily basis. With many different purposes, people get different types of feedback in their daily life and their affective and cognitive responses to those feedbacks are influenced by several different motives (Ilgen, Fisher & Taylor, 1979). Self-esteem of the recipient is an important motive as argued by self-verification and self-enhancement theorists (Woo & Mix, 1997). Since the feedback has many different aspects based on situational factors, the origin of feedback and its behavioral outcomes are important issues of social psychology. In our research, we investigate the effect of self-esteem on the relationship between feedback type and perceived accuracy (acceptance) of the feedback.

Initially, we should emphasize the reciprocal nature of the feedback process. Feedback is an element of interpersonal communication; therefore, it is affected by the complex components of the communication process (Ilgen, Fisher & Taylor, 1979). Source, recipient and the nature of the message are different factors affecting the processing of feedback (Ilgen, Fisher & Taylor, 1979). Since the processing of feedback is a reciprocal relationship between these elements, it is useful to understand the

phenomenon with the components that affect the process.

Individuals process feedback within four sequential stages (Ilgen, Fisher & Taylor, 1979). Firstly, they perceive the feedback; secondly, acceptance of the feedback occurs; thirdly, they create the motivation to respond to the feedback, and lastly, they create a response to the feedback (Ilgen, Fisher & Taylor, 1979, p. 352). Even though we divided the process into four stages, we need to emphasize the sequential and continuous relationship on the processing. In this respect, the stages mentioned above are affected by many different variables, and the variables that affect the acceptance of feedback should be identified. The acceptance of feedback happens in the second stage of feedback processing which comes after the identification of the source of the feedback and the nature of the message by the recipient (Ilgen, Fisher & Taylor, 1979). At this point, it is crucial to clarify the term of acceptance. The concept of acceptance is not related to the truth of the messages, because the acceptance occurs whether the recipient's belief about the feedback is correct or not (Ilgen, Fisher & Taylor, 1979, p. 356). Consequently, the recipient processes the feedback based on the characteristics of the

source, the nature of the message and its own characteristics.

The characteristics of the source of the message have many implications on the acceptance of feedback. In his broad research, Giffin (1967) claimed that there are numerous different source characteristics that affect the acceptance process. The characteristics of the recipient also have effects on the acceptance of feedback. For example, Feather (1968) claimed that the locus of control of the recipients has a strong effect on feedback acceptance. In addition to locus of control, age can be another factor that may affect feedback acceptance. Regarding this, research showed that age was an important moderator; older people reject the feedback they get more consistently than younger people (Meyer & Walker, 1961).

In addition to the factors that we mentioned above, the nature of the feedback can also be very influential on the acceptance of feedback. People always seek and accept positive feedback more readily than negative one (Ilgen, Fisher & Taylor, 1979). According to the study of Halperin et al. (1976), people accept positive feedback without searching for its source. However, the probability of acceptance of negative feedback is very low, and it is highly dependent on the status of the resource. Yet, some researchers suggest that under specific circumstances individuals may be motivated to favor negative feedback (Korman, 1976). In his research, Korman (1976) showed that people who have bad self-concepts accept the negative feedback more since they seek consistency. Therefore, it is important to emphasize the relationship between recipient's characteristics and nature of the feedback.

There is a plethora of research explaining the different motives behind the different reactions to evaluations from several perspectives. One of the key concepts that is relevant for explaining the reaction to different types of feedback is self-concept, because it is an important part of recipient characteristics (Jussim, Yen & Aiello, 1995). People are not mere recipients of feedback, because they actively evaluate the feedback according to their self-concepts (Jussim, Yen & Aiello, 1995). Baumeister (1999) provided the following self-concept definition: "The individual's belief about himself or herself, including the person's attributes and who and what the self is" (p. 247). Self-

concept is thus conceptualized as the dynamic core of personality, as it is consisted of characteristics which differentiate a person as a unique individual (Hilgard, 1949). Self-consistency and self enhancement theories better connect the idea of perceived feedback accuracy to an individual's self-concepts.

Self-consistency theory is one of the main theories which investigates the relationship between an individual's self-concepts and the type of feedback. It suggests that individuals seek information which confirms their existing beliefs about the self (McFarlin & Blascovich, 1981). Relating it to acceptance of feedback, people are likely to favor feedback consistent with their already existing self-concepts in order to maintain those self-views (Jussim, Yen & Aiello, 1995). Self-consistency theory suggests that the general preference for the positive rather than negative evaluations should be stronger among people with positive self-expectancies, since they will presumably regard positive evaluations as more congruent with their self-image (Woo & Mix, 1997). This theory helps us understand that a person with high self-esteem may find a positive feedback accurate not only because it is flattering, but because it is congruent with their positive self-concepts. Whereas a person with low self-esteem may find a negative feedback more accurate, as they are more likely to have more negative self-concepts.

The other major theory which aims to explain the relationship between feedback type and the recipient's characteristics is the self-enhancement theory. It suggests that people seek favorable feedback regardless of their self-concepts and self-esteem levels (Swann, Pelham & Krull, 1989). Thus, self-enhancement theory proposes contradictory suggestions to that of self-consistency theory. It emphasizes the basic human need of viewing oneself as favorably as possible (Kwang & Swann, 2010). People are motivated to maintain positive self-conceptions, even in the cases where these motivations lead to biases, where people perceive themselves as better than average (Heck & Krueger, 2016). This theory is also important for our research because it underlines the idea that feedback type can have a main effect on perceived feedback accuracy. Especially in affective responses, regardless of the

self-esteem level, positive feedback may be perceived as accurate simply because it boosts self-esteem (Woo & Mix, 1997).

In contrast to what self-enhancement suggests, there is also a mass of research suggesting that self-esteem plays an important part in this process. (Jones, 1973; Shrauger, 1975; Swann et al., 1987). Self-esteem can be conceptualized as an individual's assessment of their own worth and value (Leary, Baumeister, 2000). Thus, this definition entails the idea that individuals actively judge their own value, criticize their own self-concepts in the face of a variety of tasks. Moreover, social psychological and personality research assume that people have a fundamental motive to preserve their self-esteem: they either confirm, boost or maintain their self-esteem through different mechanisms. (Jones, 1973).

Self-verification and self-enhancement theories are two important process by which people seek to preserve their self-esteem (Swann, Pelham & Krull, 1989). Feedback is also one important domain where individuals are confronted with an evaluation which may affect their self-esteem in a positive or negative manner. By using these different processes, individuals make their own judgements about the feedback and proceed to reorganize their self-concepts or leave them unchanged (Swann, Pelham & Krull, 1989). From this point, Swann, Pelham, and Krull (1989) expand their research on the effects of self-enhancement and self-verification on self-views of individuals. According to their study, all people want to receive positive feedback when it is about their positive self-conceptions, which is consistent with the self-enhancement theory; and all people want to receive unfavorable feedback when it is about their negative self-conceptions. This study provides us with a valuable insight that these two theories are both relevant to the acceptance of feedback, and they underline the difference between people with more overall positive self-concepts and those with more overall negative self-concepts.

Furthermore, Swann (1990) more fully reconciles self-consistency and self-enhancement theories by arguing that individuals' desire to self-evaluate cannot be explained by a single motive. Even though two theories make competing

predictions, they are not enough to explain people's motives on their own. There are many other motives that influence people's preference for evaluation and feedback. This author argues that people with generally more positive self-views, a positive feedback will be both self-enhancing and self-consistent. It means that for such people, both theories are consistent with their preference of favorable feedback over unfavorable. He aims at tying these two constructs together by suggesting that in some cases, where people have the need to boost their feelings of self-worth, they might benefit from self-enhancement processes. Whereas in other instances they might seek to preserve their self-concepts, here they will benefit from self-consistency processes. The dominance of one process over the other will be emphasized by the nature of the situation the individual is in. Swann makes a valuable contribution to the literature by criticizing the past views that advocate for one side of the discussion. He claims that there are many different motives that shape people's preferences for feedback and evaluation. He emphasizes that there are also cognitive processes that underlie people's motives. Thus, the efforts to prove the truthfulness of one theory over the other will not yield meaningful results, as people can have seemingly contradictory motives. This insight proposed by Swann is of vital importance for our study because we also argued that both self-enhancement and self-consistency can be used by individuals with different self-esteem levels.

As we have presented in our literature review, there are many different theories and hypotheses about the factors that influence individuals' cognitive and affective responses to different types of feedback as well as their perception of accuracy and acceptance of the feedback. The self-enhancement theory suggests that regardless of their self-esteem level, individuals will perceive positive feedback as more accurate (Jones, 1973; Shrauger, 1975). However, in their meta-analysis, Kwang and Swann (2010) refute the idea that self-enhancement strivings override self-verification strivings under almost every condition. Their results support the earlier evidence that affective responses are influenced by the desire for self-enhancement, but self-verification strivings shape cognitive reactions. Jussim, Yen, and Aiello

(1995)'s study argues that worries of self-consistency and perceived accuracy filters what one receives from a feedback and creates an interaction between self-esteem and feedback type. Based on their findings, we wanted to investigate how the acceptance of feedback is influenced by individual's self-esteem levels by looking at their initial judgement of feedback accuracy.

We based our research question on the findings from Jussim, Yen, and Aiello's (1995) study, as well as Swann, Pelham and Krull's (1989) arguments on the relationship between self-esteem level and feedback type. We hypothesized that there would be an interaction between feedback type and individuals' self-esteem on their acceptance of feedback. We argue that people with high self-esteem will find positive feedback more accurate than individuals with low self-esteem and individuals with low self-esteem will judge negative feedback as more accurate than individuals with high self-esteem.

Method

Participants

One-hundred students from Koç University participated in the study. There were forty-five females and fifty-five males, and they were all native Turkish speakers ($M_{age} = 21.04$, $SD_{age} = 1.39$). We selected the participants based on their willingness to participate in the study, there were no compensation given for their participation. The data collection took place in the Koç University Library. There were 25 participants in the low self-esteem, positive feedback condition; 25 in high self-esteem, positive feedback condition. Moreover, there were 27 participants in low self-esteem, negative feedback condition and 23 participants in high self-esteem, negative feedback condition. We created these groups using the median cut method, meaning that we separated the participants into two groups based on whether their scores were below or above the mean self-esteem score.

Measures & Materials

Anagram Test

We created an anagram test based on the article of Jussim, Yen and Aiello (1995) and we pretested the words to yield average results. There were five different tests with similar mean scores and each test consisted of one word to create anagrams. These words were: "Mercekli", "Tıklanma", "Mahirane", "Anaerkil", and "Kartalo". Each word contained eight letters. At the beginning of the anagram task, we gave the word "Bıçaklı" as an example and explained to the participant how to solve an anagram task. Five different words were used because we wanted to eliminate any affective or cognitive effect possibly elicited by a specific word, which would be a possible confounder. The participants were randomly assigned to one of the words.

Assessment of Global Self-Esteem

We gave the participants the Rosenberg's (1965) Self-Esteem Scale (RSES). The questions five, six, eight, ten and eleven were reverse-coded items. For the questionnaire, we used 7-point Likert scale ranging from "Strongly Disagree (1)" to "Strongly Agree (7)".

Perceived Feedback Accuracy

We used two questions to measure the participants' perceived feedback accuracy. These questions were "How accurate do you think was the student's evaluation of your performance?" and "How do you evaluate your own performance?" These variables were all assessed on 7-point Likert scales ranging from "Strongly Disagree (1)" to "Strongly Agree (7)".

Two female undergraduate students from the research team were trained to play the role of the student in the experiment, and they practiced conveying the feedback in a convincing manner. Whereas the male student played the role of the experimenter. We used both female students in the same role because we wanted to control for any effect which could come with the students' sex as a possible extraneous variable.

Procedure

All dialogues were scripted in Turkish to standardize the experimental process and were

practiced beforehand; and we received an IRB approval from Koç University for the whole procedure. We assessed each participant individually. When the participant arrived, the experimenter greeted them, and they were provided with a consent form. After they signed the form, the experimenter presented a cover story according to which she told that the participant was going to participate in a study about feedback effectiveness.

The experimenter then introduced the student (confederate) to the participant. The student first asked the participant to fill out the demographic questions form and then the Rosenberg's (1965) Self-Esteem Scale (RSES), which categorized the participant as high in self-esteem or low in self-esteem. The demographic questions and the self-esteem scales were answered on a laptop, using Qualtrics. After these steps, the student introduced the anagram test, to be completed in paper-and-pencil form. For the test, the participant was asked to generate 3, 4, 5, 6 or 7 letter words out of a 8-letter word.

Before the time started, the student also showed an anagram example to the participant. Then she gave the participant 120 seconds. At the end of the time limit, the student took the anagram test which is solved by the participant. Later, the student gave the participant a second anagram test as a filler task and left the room to evaluate the results. One minute later, the student came back to the room and conveyed a positive or negative feedback to the participant. The participants were randomly assigned to the feedback conditions. Positive feedback was: "Your score is above average. Your performance is successful." Negative feedback was: "Your score is below average. Your performance is not successful."

Then, the student told the participant to proceed to the final step of the experiment, where the participant was asked to answer the two questions on perceived feedback accuracy (see Appendix D). These questions were also answered on a laptop, using Qualtrics. After the completion of these questions, the experimenter told the participant that the experimenter was over and thanked them for their participation. The participant was then debriefed. Overall, the experiment took twenty minutes.

Results

The two-way analysis of variance was performed to assess the effects of self-esteem and the feedback type on perceived feedback accuracy. A 2 x 2 between subjects ANOVA revealed a significant main effect of the feedback type on perceived feedback accuracy ($F(1, 96) = 5.96, p = .016$), which implies that the perceived feedback accuracy scores significantly differ according to the feedback type regardless of the level of self-esteem. Individuals who received positive feedback on their performance in the anagram test ($M = 5.08, SD = .22$) perceived the feedback more accurate than individuals who received negative feedback on their performance ($M = 4.32, SD = .22$).

Self-Esteem	Positive Feedback			Negative Feedback		
	M	SD	N	M	SD	N
High	5.28	1.17	25	4.26	1.86	23
Low	4.88	1.09	25	4.37	1.93	27

Table 1: Descriptive Statistics for Perceived Feedback Accuracy and Type of Feedback.

A 2 x 2 between subjects ANOVA did not reveal a significant main effect of self-esteem on perceived feedback accuracy, ($F(1, 96) = .22, p > .05$), which implies that feedback accuracy scores did not significantly differentiate according to self-esteem level.

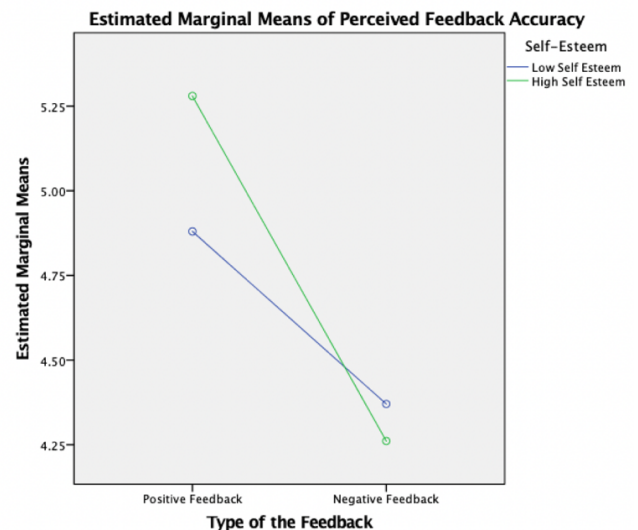


Figure 2: The Plot for the Relationship Between Self-Esteem and Feedback Type.

The 2 x 2 between subjects ANOVA did not reveal a significant interaction between self-esteem and the feedback type, ($F(1, 96) = .66, p > .05$), which implies that the differences among the feedback type do not depend on self-esteem levels in terms of perceived feedback accuracy.

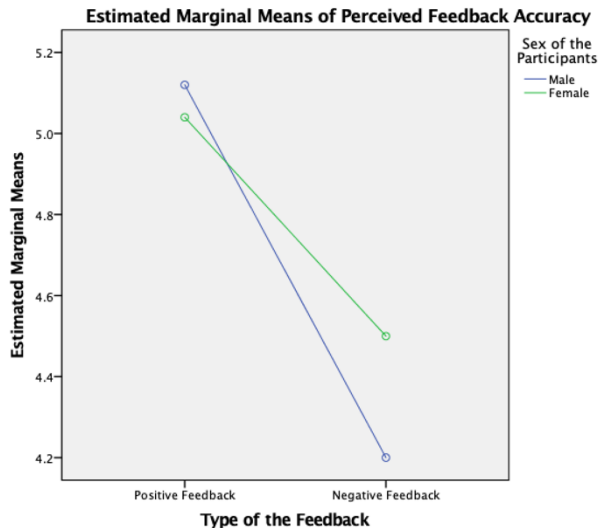


Figure 3: The Plot for the Relationship Between Sex and Feedback Type.

A 2 x 2 between subjects ANOVA revealed that the main effect of sex on perceived feedback accuracy is not significant, $F(1, 96) = .12, p = .73$, which implies that feedback accuracy scores did not significantly differ according to sex.

The 2 x 2 between subjects ANOVA revealed that there is no significant interaction between sex and the feedback type, $F(1, 96) = .88, p = .36$, which implies that the differences among the feedback type do not depend on participant sex in terms of perceived feedback accuracy.

Discussion

In our study, we investigated the interaction between self-esteem and feedback type, and how this interaction affects perceived feedback accuracy. The findings of our study showed that feedback type has a significant effect on perceived feedback accuracy. This means that participants perceived positive feedback as more accurate than negative feedback regardless of their self-esteem levels. However, we were not able to find a significant interaction between self-esteem and feedback type on participants' perceived feedback accuracy. Thus, our hypothesis

which stated that self-esteem moderates the relationship between feedback type and perceived feedback accuracy was not confirmed. These results confirmed the findings of (Jussim, Yen, & Aiello, 1995) that feedback type has a main effect on participants' response to the feedback, especially in affective responses. Because our experiment took a short time to complete, the participants did not have enough time to make a deeper processing and could not evaluate the feedback regarding their self-concepts. That is why it was probable that the affective responses, rather than cognitive responses, would dominate the perception of feedback accuracy. The previous research analyzed the cognitive and affective responses to feedback as separate processes (Jussim, Yen, & Aiello, 1995). However, we only focused on the cognitive responses in terms of perceived accuracy and acceptance of the feedback. We contributed to the literature by confirming the findings of the main effect of feedback type on perceived accuracy in a different setting. As our experiment took place in a different cultural setting than previous studies, it showed that the results can be generalized to different cultural environments.

One strength of our sample was that we did not offer any course credits for psychology courses which eliminated the possibility of a biased sample. Therefore, our sample represented a larger variety of students from different departments. Another strength of our study was that we conducted the study in a laboratory setting instead of using an online survey and we conveyed the feedback on a face to face manner. This increased the internal validity of our experiment because we controlled for possible extraneous variables by standardizing the setting in which the anagram tests were taken.

We also included both male and female participants in our study because in their article, Jussim, Yen, & Aiello (1995) stated that sex differences were not significant. In their study, they used only females because their sample came from an introductory psychology class which was mainly attended by female students. We have decided to include both sexes to ease the data collection procedure, and our findings showed that the sex of the participant had no significant interaction with feedback type.

Since our sample was a convenience sample, we only included Koç University students in our study. This may create a problem for generalizing the results to wider population. For example, our participants were aged between 18 and 25, and this may also be problematic because in the literature it was found that young individuals take feedback more seriously than older people (Meyer & Walker, 1961).

Another limitation was in our study design. Due to time constraints in data collection stage, one of our aims was to design an experiment which took a short time to complete. We collected the data in one session. However, if we were to conduct the study in two sessions where the participants solved an initial anagram test in the first session, they would have time to reflect on the task and their self-concepts on this particular task could be more accurately judged. They would have the feedback at the second session. This way, they would have more time to reflect on their performance, thus allowing them to have a more thought-out and accurate cognitive response.

Moreover, in our study both the role of experimenter and confederates were played by students. This was another weakness of our study because students may have appeared as less credible, the participants could have judged the feedback as not very serious. Therefore, this possibly affected their acceptance of the feedback, since literature shows that authority and credibility of the feedback source is a variable affecting the cognitive responses to the feedback (Ilgen, Fisher & Taylor, 1979).

Self-esteem scores in our sample ranged between 3.00 and 5.80, on a scale from one to seven. Because the scores were distributed narrowly, this created a problem while dividing the sample as low in self-esteem and high in self-esteem.

Like many other social psychology studies, replication is very important to confirm the previous knowledge gained from experiments. These results should be replicated in different populations, for example, seeing the effects of feedback in a sample composed of older people might be interesting. Further research might also focus on more clearly differentiating affective and cognitive responses to

feedback, as affective responses are only partially independent from cognitive responses (Zajonc, 1980). Since there are several limitations in our study, we believe that further research can be made on this subject.

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Development of a General Happiness Scale for Turkey

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Happiness is one of the universal emotions. However, its perception and expression differ across cultures, along with the variables that predict it. Therefore, it becomes clear that a happiness scale that would take into account the culture-related variables should be developed. The aim of this study is to develop a scale by investigating its reliability and validity. The General Happiness Scale (GHS) contains three subscales and 17 items. Its psychometric properties are checked on a sample of METU students (42 women, 38 men, 1 not sure). The results show that the scale has excellent psychometric properties with an internal consistency of $\alpha = 0.81$. The correlation between Subjective Happiness Scale (SHS), which was used to investigate convergent validity, and GHS is significant. GHS is also highly correlated with the Satisfaction with Life Scale (SWLS) which was used to measure the criterion validity. To examine its discriminant validity, we used the Perceived Stress Scale (PSS) and found a moderate negative correlation. Also, we discussed the limitations and possible future applications of the study.

Keywords: happiness, life satisfaction, stress, scale development, culture, Turkey

When people are asked about their goal in life, they will probably say that it is to be happy. Happiness seems to be one of the most important things in life. Oxford Dictionary (n.d.) defines happiness as “a feeling of pleasure or content” while the literature also possesses different definitions of it. Some researchers define happiness as being satisfied with one’s life, having more favorable emotions than unfavorable ones (Zou, Schimmack, & Gere, 2013). Therefore, some researchers claim that happiness can be investigated by the psychological states that a person has (Gruber, Mauss, & Tamir, 2011). On the other hand, Phillips, De Freitas, Mott, Gruber, and Knobe (2017) stated in their article that feeling happy or being satisfied is not enough only itself; people should also be living a good life under acceptable conditions and should have some decent life-standards. It is possible to include more variables in the definition of happiness, such as one’s health status, income, and even the consumption of fruits and vegetables. The abundance of the influential factors in happiness makes it a hard concept to define; however, especially due to its significance in people’s lives, it is an important topic to work on. It also explains the emergence of positive psychology, which scientifically studies positive sides of human psychology (Seligman, & Pawelski, 2003), and in

line with the rise of positive psychology, research on happiness also increased.

Happiness can be measured in many different ways, largely depending on the structure and the purpose of the study at hand. In terms of scales, it can be measured with the existing ones, some of which will be mentioned in this paper, or new scales can be developed in line with the aim of the particular study, as we do in this paper. Other than scales, biological measurements can be used, such as looking at specific neurotransmitters or hormones which might be related to happiness. For instance, serotonin is used in the studies of happiness and depression (Depue, 1995), since its amount is a good indicator of both (Matsunaga et.al., 2017). Behavioral measurements can also be used by observing the behaviors which are thought to be related to happiness, such as smiling. Although researchers have failed to reach a consensus over the effect of facial expressions on happiness, a recent meta-analysis conducted by Coles, Larsen, & Lench (2019) has shown that facial feedback has a small effect on the emotional experience. Although there are only a few examples in the literature, another option is to use implicit measurements, in which the participants are not aware that their happiness is being measured (Mochón, & Martínez, 2014). Brain imaging

techniques can also be used to measure happiness (Boissoneault, Robinson, Lai, & Staud, 2017; Matsunaga et.al, 2016; Ter Horst, Roosendaal, & Algra, 2012).

To illustrate how happiness can be related to many aspects of one's life, we can give the example of the correlation found between happiness and having an adequate amount of fruits and vegetables in one's diet and not missing breakfasts in the mornings (Lesani et.al., 2016). A similar example can be that one's perception of having a good income or good perceived health correlates with happiness (Weech-Maldonado, Miller, & Lord, 2017). Some variables like emotional intelligence (Iranfar, 2005), having a good relationship with one's parents (Cheng, & Furnham, 2003), having enthusiasm (Lauriola, & Iani, 2017), having self-esteem (Cheng, & Furnham, 2003), and being cheerful (Lauriola, & Iani, 2017) and extraverted (Cheng, & Furnham, 2003; Francis, Brown, Lester, & Philipchalk, 1998; Lauriola, & Iani, 2017; Tan, & Lee, 2017) seem to correlate with happiness. Happiness also demonstrates a "u" shape in relation to age (Beja, 2017). Religiousness, together with having a high number of children, also has a significant correlation with happiness (Cranney, 2017; Gundlach, & Opfinger, 2013; Rizvi, & Hossain, 2017), when people perceive parenthood to be a good thing (Vanassche, Swicegood, & Matthijs, 2013).

In this study, after developing the General Happiness Scale, life satisfaction is used to measure the criterion-related validity as they have a positive correlation (Tomlinson, Keyfitz, Rawana, & Lumley, 2017). Perceived stress is used to demonstrate the discriminant validity since the literature shows that there is an inverse relationship between stress and happiness (Schiffrin, & Nelson, 2010). In our study, we also expected to see a strong positive correlation between life satisfaction and happiness, and a moderate negative correlation between perceived stress and happiness.

Perception of constructs may differ in different cultures, so additional attention might be necessary while conducting cross-cultural research or using a scale that was developed for one culture. One

of these concepts that can have different meanings and antecedents across cultures is happiness, which is the main concern of our research. Cultures differ from each other in a lot of aspects, including their cultural orientation (individualism/collectivism), emotion-related processes, and even in their cognitive styles (Matsumoto, & Juang, 2013). For instance, Eastern people are seen to be holistic thinkers (inclusion of context in the thinking process), whereas Westerners are seen to be analytic in thinking (Oliveira, & Nisbett, 2017) a difference that might influence their evaluation of things and therefore, leads to different emotions. To further illustrate, Asians seem to differ drastically from Europeans regarding their emotion related processes (Shao et al., 2015). Shao and his colleagues discussed in their article that some aspects of emotional intelligence are universal, such as emotion perception; and some others are heavily influenced by culture, such as emotion understanding and emotion regulation (2015). Since emotion regulation is largely affected by what is appropriate to be shown in a culture (Cooper, Doucet, & Pratt, 2007), emotion regulation dramatically differs among cultures (Shao et al., 2015). Moreover, happiness, life satisfaction, and well-being seem to be very much influenced by the individualist and collectivist orientation of the related cultures (Rego, & Cunha, 2009). This difference must be pronounced, especially regarding the antecedents of happiness, in other words, what makes people happy. In collectivist cultures in which relational identity is pronounced (Hamamura, 2017), happiness might be more influenced by interpersonal relationships when compared to individualist cultures.

All of these differences across cultures emphasize the need to pay additional attention while conducting studies, especially during the method and scale selection, about concepts that can have different meanings in different cultures. Because, there is a chance that a scale developed in an individualist culture will not fit a collectivist culture, or will not thoroughly cover the necessary elements of it. Along with that, Turkey has a unique characteristic regarding its cultural orientation. It shows the elements from both individualism and collectivism,

with relationality being emphasized under collectivism (Satici, & Tekin, 2017). Furthermore, being with significant others and feeling loved (collectivism/relationality), and having a lot of money and achievements (individualism) are the most important sources of happiness in Turkey (Satici, & Tekin, 2017). These multiple and combined cultural orientations show that it is necessary to have a tailor-made scale for Turkey's culture.

The need for a new scale was even more pronounced while searching for a happiness scale in the literature. In this study, the Subjective Happiness Scale (Lyubomirsky, & Lepper, 1999) is used, to measure the convergent validity. Still, the items were too broad and did not include the possible effects of culture on happiness, which can make the scale not applicable to measure happiness in every culture. Even if it could measure happiness, it would not give us its correlation with culture-related experiences, since it basically asked if the participant perceived him/herself happy (Lyubomirsky, & Lepper, 1999). Another questionnaire that we have considered was the Oxford Happiness Questionnaire (Hills, & Argyle, 2002). However, it did not cover the culture-related elements that we needed, and it also lacked construct validity (Kashdan, 2003). On the Affect Balance Scale developed by Bradburn (1969), the problem was that the subjective meaning of the construct seemed to differ in other cultures; therefore, it might have been inappropriate to be used with a sample from Turkey (Schiaffino, 2003).

When it comes to literature, an even bigger gap can be seen in Turkey. There are not many happiness scales that are adapted to or developed in the literature, and the number even decreases when the inclusion of cultural elements is taken into account. One of the contributing scales that was adapted is the Turkish version of the Harmony in Life Scale (Satici, & Tekin, 2017). This scale measured a construct called harmony in life, which is quite related to cultural experiences (Satici, & Tekin, 2017). Therefore, it can be said that it is a valuable contribution, as it brings culture in the literature on this topic. Still, we wanted to cover more elements in

our scale, like relationality, perceived social/emotional support, and achievement. With the other scales we have also viewed, it was salient that our scale needed to be developed to measure the influence of culture in the context of Turkey, considering what would be relevant to predicting happiness in Turkey.

To conclude, our motivation to develop this new scale is to measure happiness in Turkey's cultural context. Mainly, by including general items like health condition, emotional stability, and getting pleasure out of life which are common in most of the happiness scales (unrelated to specific influences of the culture in Turkey), and some items measuring the elements that are identified as the sources of happiness particularly in the cultural context of Turkey such as relationship with significant others, perceived social support, and being appreciated for one's achievements.

In the current study, we hypothesized that General Happiness Scale would have a significant positive correlation with Subjective Happiness Scale and Satisfaction with Life Scale; and it would have a moderate negative correlation with Perceived Stress Scale. Moreover, it was expected that the inter-item correlation of this scale would be high.

Method

Participants

We recruited 81 participants from undergraduate METU students between the ages of 18-24. 42 of them were women, 38 of them were men, and 1 preferred not to say. We used the convenience sampling method, and participation was voluntary and anonymous. Also, before they agreed to participate, we gave informed consent to the participants. There were no incentives for participation.

Measures & Materials

Demographic Information Form

Participants first received a demographic information form which includes questions about

their personal and daily life. Some short questions, testing the validity of the factors claimed to be related to happiness in the literature, were also asked. This demographic form was composed of 13 questions, which included perceived income, perceived health (Weech-Maldonado, Miller, & Lord, 2017), living conditions (where and with whom the person lives), sleep cycle, eating vegetables, fruits and having breakfast regularly (Lesani et.al., 2016), religion (Cranney, 2017; Gundlach, & Opfinger, 2013), GPA (Quinn, & Duckworth, 2007), gender, age (Beja, 2017), and satisfaction with one's department. All these were related to happiness according to the literature.

Subjective Happiness Scale

Subjective Happiness Scale (Lepper & Lyubomirsky, 1997) is a questionnaire with 4 items aiming to measure the subjective level of happiness. It was adapted to Turkish by Doğan and Totan (2013). While adapting this scale to Turkish, researchers collected data from two groups of participants which were from a community sample and a university sample. The sample items included: "*Genelde kendimi şu şekilde değerlendiririm: "* and "*Bazı insanlar genellikle çok mutludurlar, ne olup bittiğine aldırmaksızın her şeyden keyif alırlar. Böyle bir ifade sizi ne ölçüde tanımlamaktadır?*". The first item was rated on a 7-point Likert scale (1=not a very happy person, 7= a very happy person), the second item was rated again on a 7-point Likert scale (1=less happy, 7=happier), and the last two items were weighted on a 7-point Likert scale as 1 indicating not at all and 7 indicating a great deal. The Cronbach's alpha reliability coefficients for internal consistency are .65 for the university sample and .70 for the community sample, construct validities are .30 and -.78 for the university sample and .33 and -.91 for the community sample and lastly its convergent validity was measured to be .71.

Satisfaction with Life Scale

Satisfaction with Life Scale consisted of 5 items which were designed to measure one's judgments of his/her life satisfaction as a whole (Diener, Emmons,

Larsen & Griffin, 1985). Then it is translated into Turkish, and some changes are made based on the suggestions from the experts (Dağlı, & Baysal, 2016). Sample items in this scale include: "*İdeallerime yakın bir yaşantım vardır*" and "*Şimdiye kadar yaşamdan istediğim önemli şeylere sahip oldum*" (Dağlı, & Baysal, 2016). The items were assessed on a 7-point Likert scale (1=Strongly disagree, 7=Strongly agree). The Pearson product-moment correlation coefficient was found as 0.92. Cronbach Alpha coefficient of measurement, in general is 0.88 and 0.97 for test-retest reliability.

General Happiness Scale

This scale was developed by researchers of this article in order to assess people's general happiness levels. Scale contains 17 items and is composed of 3 subscales which are physical predictors of happiness, subjective experiences and social aspects related to it. Sample items in this scale can be given as: "*Düzenli egzersiz yaptığımı söyleyebilirim*"(physical predictors), "*Günlük yaşamımda yaptığım şeylerden zevk alırım*"(subjective experiences) and "*Ailemle iyi bir ilişkim vardır*" (social aspects). The scale was appraised on a 5-point Likert scale (1=strongly disagree, 5=strongly agree).

Perceived Stress Scale

Perceived Stress Scale (Cohen, S., Kamarck, T., and Mermelstein, R.,1983) is a 10 item scale that measures "the degree to which situations in one's life are appraised as stressful" (Cohen, Kamarck, & Mermelstein,1994). The scale then, is adapted to Turkish and named as 'Algılanan Stres Ölçeği' (Eskin, Harlak, Demirkıran, & Dereboy,2013). The scale consists of 2 subscales: perception of stress/distress and insufficient self-efficacy. Sample items in this scale include: "*Geçen ay, beklenmedik bir şeylerin olması nedeniyle ne sıklıkta rahatsızlık duydunuz?*" (perception of stress/distress) and "*Geçen ay, kişisel sorunlarınızı ele alma yeteneğinize ne sıklıkta güven duydunuz?*" (insufficient self-efficacy). Items were weighted on a 7-point Likert scale, 1 referring to not at all and 7 referring to very frequent. The internal consistency reliability coefficient was found as .82

and the test-retest reliability coefficient was found as .88.

Procedure

The scale was distributed by sending a link to the participants with the assistance of an online form website. The link was sent either to the big social media groups or to the individuals directly. Participants first read the informed consent and agreed to participate in the study, and only after then, they could pass to the scale and answer the questions.

Results

After the study was conducted, the first thing to do was to conduct the reliability analysis for each scale in order to see their Cronbach alpha values. The reliability analysis of the Subjective Happiness Scale (SHS) revealed that it had high overall reliability (4 items, $\alpha = .83$). This finding was consistent with the literature. Then, a reliability analysis was conducted for the Satisfaction with Life Scale (SWLS). The results showed that SWLS had a Cronbach's alpha of .85 with 5 items. Another scale used in the study was the Perceived Stress Scale (PSS) which seemed highly reliable (10 items, $\alpha = .925$) in the analysis conducted. Finally, the Cronbach's alpha for the developed General Happiness Scale (GHS) was calculated as .81 with 17 items. Further analysis was conducted for GHS in order to see the Cronbach's alpha values if any of the items were removed from the scale. The results showed that removal of any of the items was not necessary (see Table 1).

Convergent Validity Evidence

Subjective Happiness Scale has been accepted as a good measure of general happiness in the literature and has good psychometric properties. In the search of convergent validity evidence, participant's scores from SHS and General Happiness Scale were analysed with correlation analysis. The results showed that, SHS and GHS were significantly correlated, $r = .675$, $p < .01$. This means that the General Happiness Scale measured the same

construct with the Subjective Happiness Scale which is general happiness.

Criterion Related Validity Evidence

Literature suggests that life satisfaction is a construct that is correlated with happiness. Life satisfaction was measured with the Satisfaction with Life Scale (SWLS) and the Pearson correlation coefficient was calculated by using the overall scores from SWLS and GHS. The results showed that there was a significant correlation between the two scales, $r = .699$, $p < .01$. These findings supported what the literature suggested, and it can be said that with GHS, life satisfaction acted as a criterion variable.

Discriminant Validity Evidence

In the literature, stress and happiness were found to be moderately and negatively correlated. In this study, similar results were expected. Perceived Stress Scale is accepted to be valid by the literature and it was used in order to measure perceived stress. The results of the correlation analysis between participants' overall scores from PSS and GHS showed that there was a significant negative correlation between the two scales, $r = -.625$, $p < .01$. This suggested that as the general happiness of a person increases, the perceived stress will decrease, and vice versa. The findings supported the moderate correlation hypothesis and, showed that PSS and GHS measure different constructs.

With the purpose of further investigating, some variables from the literature that seem to be correlated with happiness were measured in our demographic form. These were perceived income, perceived health, living conditions, having an irregular sleep cycle, eating vegetables, fruits and having breakfast regularly, religion, GPA, gender, age, and satisfaction with one's department. Correlation analysis was conducted for each of them in order to see their relation to general happiness. According to the analysis, correlations of some of those constructs to the general happiness scores of our participants were significant and reported in the following sentences. It was found that there was a significant positive correlation between the perceived

income and general happiness of the participants, $r = .39, p < .01$. This finding suggested that an increase in one's general happiness can be seen when one's perceived income increases. Also, the results showed that there was a significant positive correlation between satisfaction with one's department and general happiness, $r = .533, p < .01$ and this indicated that people who have higher satisfaction with their department might have higher scores on the general happiness scale. There was also a significant positive correlation between perceived health and general happiness, $r = .496, p < .01$. This relation supported that, as people perceive themselves to be healthier, their score on the General Happiness Scale might increase. Furthermore, a significant positive correlation was found between having regular breakfasts and general happiness, $r = .347, p < .01$ which suggests that people who have breakfast regularly would score higher on GHS. Regularly eating fruits and vegetables also had a significant positive correlation with general happiness, $r = .325, p < .01$. Finally, a significant negative correlation was found between having irregularity in one's sleep cycle and general happiness, $r = -.439, p < .01$. This suggests that, if people have disturbances regarding their sleep, this can contribute them score lower on GHS whereas people who do not have any irregularities will have higher scores. Overall, these correlations supported the findings that are already in the literature.

Discussion

This study was conducted to develop and validate a scale with the purpose of measuring the level of general happiness. This new scale which we called "General Happiness Scale" showed excellent psychometric properties in our study. It had a high internal consistency, with Cronbach's alpha of 0.81.

To examine the construct validity of our scale, we chose to check the convergent validity by correlating it with the Satisfaction with Life Scale, which measures life satisfaction. We thought that life satisfaction was a construct which is related to happiness. Indeed, our analysis resulted in a

significant positive correlation between the two scales. To further investigate our construct validity, we obtained evidence of discriminant validity by correlating our scale with the Perceived Stress Scale, and statistical analysis showed that PSS and GHS had a significant negative correlation. These results were in line with our expectations. On the other hand, we found an unexpected result when we checked the religion and happiness relation. Even though the literature suggests that there is a relation between the two constructs, in our study we did not find such a correlation. We think that this is because of the fact that our sample was not heterogeneous enough to show the correlation. Since our sample was only undergrad METU students, it was not fully representative.

Our new scale can be used in research studying predictors or outcomes of happiness. Another application of this scale could be using it to measure levels of happiness before and after psychological interventions that aim to increase happiness and life satisfaction. Because of the fact that this scale is a valid measure of happiness, it is important for every type of study which will focus on studying happiness. By developing this scale, we propose a new questionnaire for happiness studies whether it is about increasing happiness or solely focusing on its relation to different constructs. Also, it is important that our scale covers cultural aspects of happiness that have not been included in the past scales. This creates another use of our scale while studying culture and happiness relation. Overall, we think that happiness is an important construct and it is important for it to be measured precisely and our work contributes to this endeavour. However, our study had its limitations as well as its strong sides.

This scale was developed in Turkey, and the psychometric properties were tested exclusively on a sample of the Middle East Technical University students, which might have limited the generalizability of this scale's features. Future studies can be conducted to investigate the psychometric properties of this scale in various types of samples and different cultures. We think that a comparative study can be conducted in order to see the difference

if the scale is tested within a different culture. Moreover, additional studies using distinct methods such as cognitive processes or evaluating physiological responses can be run to further validate the General Happiness Scale.

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General Trust in Science Inventory: Scale Development and Validation

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We aimed to develop a scale, measuring people’s trust in science in a general context in this study. 257 participants from Middle East Technical University, Turkey were included in the study. Exploratory Factor Analysis (EFA) was conducted on the items before validation analyses. General Trust in Science Inventory (GTSI, developed by the authors) was comprised of 5 factors explaining the 61,71% of the variance in the ‘trust in science’ construct with an overall .80 Cronbach’s alpha reliability. Construct validity of GTSI was assessed with Turkish version of Scientific Attitudes Inventory-II (Demirbaş & Yağbasan, 2006) for convergent validation, and Revised Paranormal Beliefs Scale (Lindeman, Svedholm-Hakkinen & Riekk, 2016) for discriminant validation. Criterion-related validity of GTSI was assessed with Oxford Scale of Knowledge (Durant, Evans, & Thomas, 1989) for concurrent validation. Only discriminant validity was established by the results, with other associations distributed to the overall scale and sub-factors with a mixed pattern.

Keywords: trust, science, attitudes, paranormal beliefs, knowledge

Controversies between the scientific community and general public have a long history, which may be traced back to Galileo in 1610 (Burrage, 2015), or afore. Occurrence of each specific controversy or conspiracy theory, and the factors they depend on can be scrutinized by various approaches – such as by studying public attitudes towards science (Sturgis, & Allum 2004), evaluating the effectiveness of science communication (Longnecker, 2016; Weart, 2011), or keeping track of general public’s trust in scientists and in scientific method and scientifically acquired knowledge (Camporesi, Vaccarella, & Davis, 2017; Hmielowski, Feldman, Myers, Leiserowitz, & Maibach, 2013). Likewise, there is an interdisciplinary field of study, known as ‘public understanding of science’, which concerns itself with the aforementioned issues (Sturgis & Allum, 2004). Most of the research in the field so far focused on the specific controversial issues, such as belief in evolution (Elsdon & Baker, 2015), global warming (Hmielowski et al., 2013; Weart, 2011), homeopathy (Gray,2017), effectiveness of psychiatric drugs (Ashby,2017; Lim, 2017), safety of GMO’s (Christiansen, Jonch-Clausen, & Kappel, 2017) and even flat earth beliefs (Boudry, Blancke, & Pigliucci,2015). These studies

generally focused on the observed changes in the trends related to public opinion over time.

Despite the exponentially accelerating advancements in each scientific field, the scientific community is losing its credibility (Weart, 2011). The outcomes of gradual erosion of public’s positive attitudes toward science may have certain impacts on both community and the public itself, such as general funding cuts (Burrage, 2015), and political disagreements regarding the intervention necessities (i.e. Global warming prevention measures; Rose, Stevens, Edmonds, & Wise, 1998). These concerns about losing credibility of and even attacks on science have also been raised by many researchers and journal editors in the recent past (e.g. Ashby, 2017; Chadwick, & Schülenk, 2006; Hmielowski et. al., 2013; Leopold, 2014), These and the other possibly unlisted problems due to public’s negative attitudes toward science should be addressed both in the short and the long run with precise psychological measures.

In the literature, there are some instruments that aim to measure the attitudes towards science. Scientific Attitude Inventory (SAI), a comprehensive 60-item Likert-type scale developed by Munby (1983), is one of them. The scale was extensively used in the literature to examine factors affecting the

attitudes of students toward science and scientists. Additionally, SAI captures the factors that motivate students to become a scientist. Later, a shorter – with 40 items – revised form called The Scientific Attitude Inventory II (SAI-II) was also constructed and validated by Moore and Foy (1997). Its Turkish form, called ‘Bilimsel Tutum Ölçeği’, with the same 40 items has been adapted to Turkish and validated by Demirbaş & Yağbasan (2006). A considerable amount of research, aimed to measure teachers’ and students’ attitudes towards science was conducted using this measure (see Blalock et al., 2008). However, in our perspective, SAI and SAI-II’s content represents more of a career interest survey and falls short of a general and comprehensive assessment of general attitudes towards science, scientific methods, and scientists.

There are other studies in which attitudes towards science are measured without validated scales with minimal, on-spot developed items to fill in the side interests of the studies. For example, Sturgis and Allum (2004) conducted a study to examine the effects of personal scientific knowledge on the attitudes towards science with a 4-item Likert-type scale, directly assessing the degree and direction of the attitudes towards scientists and scientific methods with an unacceptably low inter-item reliability level ($\alpha = .53$, see Sturgis & Allum, 2004). In another study by Clobert and Saraglou (2015), the relationship between religiosity and distrust in science was measured with 1 item, directly asking the degree of distrust. Other researchers have also used 1-item Likert-type scales to examine the public’s trust in science, especially by focusing on the currently debated topics like global warming (e.g. Bolsen, Druckman, & Cook, 2017; Hmielowski et al., 2014). Reliability concerns become problematic with these kinds of measures since traditional parameters such as Cronbach’s alpha appears either low or cannot be calculated due to using only 1 item.

On this basis, we aimed to fill the aforementioned gap in literature with developing a comprehensive, reliable and valid inventory that measures public’s general trust in science as a psychological construct.

The Oxford Dictionary (n.d.) defines trust as “the firm belief in the reliability, truth, or ability of someone or something”. Likewise, the definition of ‘science’ is as follows, “the intellectual and practical activity encompassing the systematic study of the structure and behavior of the physical and natural world through observation and experiment” (Oxford Dictionary, n.d.). Hence, we have directly followed these definitions to further develop the construct ‘Trust in Science’.

We constructed our own definition of ‘General Trust in Science’ as follows, “a cognitively unconditional reliance on the concept of science, scientists, and scientifically acquired knowledge”. In order to compose an item pool, each researcher of the present study has reviewed the related literature and deductively produced items tapping to the contents related to trust in science as an individual concept, trust in scientist, and trust in scientifically acquired knowledge. We ended up with 74 items, and excluded the items with the same content, or with a double-barreled structure. After these processes, 35 items retained for initial testing. We named the final form as ‘General Trust in Science Inventory (GTSI)’.

To assess the convergent validity of GTSI, we used the adapted version of ‘The Scientific Attitude Inventory-II (Moore & Foy, 1997) called ‘Bilimsel Tutum Ölçeği’ by Demirbaş & Yağbasan (2006) – since we expect trust and positive attitudes to appear as overlapping concepts, and ideally related. In addition, SAI-II is a suitable measure for student sample (Blalock et al., 2008), and our sample will also be consisting of university students.

To assess the discriminant validity of GTSI, we used the Revised Paranormal Belief Scale (R-PBS) developed by Lindeman, Svedholm-Hakkinen & Riekkı (2016). Since the scale had no Turkish form, we translated it with the permission of our instructor –and called “Paranormal İnanç Ölçeği”. The translation of the scale was conducted by a bilingual member of our research team. Items were directly translated and reviewed by the rest of the researchers for their validity. Previous literature indicates that religiosity/paranormal beliefs have a negative effect on attitudes towards scientific

practices and scientists (Granger & Price, 2007; Harris, 2005). The opposite of this pattern also holds for non-religious samples (Hilgard & Jamieson, 2017). However, these findings appear to be a western phenomenon (Clobert & Saroglou, 2015). Religiosity and scientific attitudes were found to bear no relationship in Middle-eastern countries where majority of the population consists of Muslims (Gentzkow & Shapiro, 2004). Prooijen (2017) found that Muslims in the U.S. had more negative attitudes towards science than their Christian and non-religious counterparts. However, Prooijen (2017) discusses that Muslims in Western societies can be sociologically counted as marginalized groups, and this marginalization process would favor more negative tendencies towards the normative context of that society. In addition, in Eastern countries, particularly the ones with Buddhist teachings as dominant norms, paranormal beliefs were found to be not related to negative attitudes against scientific information (Silver, 2006; Wallace, 2003). We reasoned that the case would not be the same here in Turkey as it is in the Western societies, since Hofstede (1980) and İmamoğlu, Kuller, İmamoğlu, & Kuller (1993) defined the population of Turkey as a relatively collectivist society, similar to Middle-eastern and Eastern societies, relative to the U.S. and European countries.

To assess concurrent validity of GTSI, we used the Oxford Scale of Knowledge (OSK), developed by Durant, Evans and Thomas (1989). It is a knowledge test with multiple choice and fill-in-the-blanks type of questions that taps into mainstream scientific topics for the general public. The test content includes understanding probability, nature of scientific enquiry, experimental design and control groups. Cognitive deficit model depicts the construct of 'trust' in any concept, person, or institution as parallel to the degree of knowledge regarding that concept, person, or institution (Wynne, 1991). According to this model, the more public knows and understands the scientific findings, the more trust it will lend towards them (Ahteensuu, 2012). Contextualist perspective, on the other hand, states that attitudes depend on multiple, non-contiguous

factors such as political views, socio-economic status, religiosity and other social attitudes (Sturgis & Allum, 2004). Accordingly, positive attitudes towards any concept would increase the likelihood of a person's engagement with that concept. Thus, it can be assumed that people with positive attitudes towards science/ scientists will know more about them due to simple engagement in those areas. Whereas, people with negative attitudes towards science/ scientists will have less knowledge about them due to multiple factors. Following the Contextualist perspective, we reasoned that higher trust in science would increase the likelihood of the individual's engagement with science-related topics. We also expect that there will be a moderately positive correlation between OSK and GTSI scores.

Method

Participants

A sample of 257 native Turkish speaking university students volunteered to participate in the study. 91 participants who dropped out before completing the survey (whose completion ratio was under 75% of the items) were removed from the data pool; ending up with remaining 166 participants ($M_{\text{age}} = 23,17$, $SD_{\text{age}} = 7,75$; age range 18-27; 108 females, 58 males, 3 preferred not to say; 32 Psychology students, 129 from other departments, 8 graduate students).

Measures & Materials & Procedure

After receiving ethical approval from Departmental Human Subjects Ethic Committee in Middle East Technical University Psychology Department, all researchers distributed to the survey via social media platforms using Qualtrics Survey Software. After informed consents were signed, participants completed the scales in the following order; GTSI, SAI-II, Paranormal Belief Scale, Oxford Scale of Knowledge, demographics form with age, gender, department, educational status, and CGPA. Full participation took approximately 15 minutes to complete. At the end of the survey, participants were debriefed about the contents of the study.

First scale used to measure participants' trust in science was our own General Trust in Science Inventory (GTSI); 35 items with 6-point Likert-type scale (1 = completely disagree, 2 = disagree, 3 = somewhat disagree, 4 = somewhat agree, 5 = agree, 6 = completely agree). By using a 6-point Likert-type scale, we aimed to reduce neutral or undecided answers for increasing our data quality. Also, in Chomeya's (2010) study, 6-point Likert-type scales shown higher trend of discrimination and reliability compared to 5-point Likert-type scales. 2 example items in English are 'Scientific studies change our lives positively' and 'My beliefs cannot be refuted by scientific methods'. The full scale and the final form are available with request from any of the authors.

Second scale used to measure participants' attitudes towards science was Turkish adapted version of Scientific Attitudes Inventory-II (Demirbaş & Yağbasan, 2006); 10 items with 5-point Likert-type scale (1 = completely disagree, 2 = disagree, 3 = not certain, 4 = agree, 5 = completely agree). Original scale consists of 40 items with a .76 Cronbach's alpha. We, with the permission of our course instructor, selected 10 items with highest factor loadings (greater than .40) to prevent exhaustion for the participants. 2 example items in English are 'Scientists discover laws that tell us exactly what is happening in nature' and 'People have to understand science because science affects their lives.'

Third scale used to measure participants' religiosity/paranormal beliefs was Turkish-translated form of Revised Paranormal Beliefs Scale (Lindeman et. al., 2016); 13 items with 5-point Likert-type scale (1 = completely disagree, 2 = disagree, 3 = not certain, 4 = agree, 5 = completely agree) and a .92 Cronbach's alpha. 2 example items in English are 'Even if the body is dead, the soul continues its existence' and 'Astrology is an accurate method of seeing the future.'

The final scale used to measure participants' scientific knowledge was a form of Oxford Scale of Knowledge (Durans et. al., 1989); with a .68 Cronbach's alpha, consisting of 10 items with 2 multiple choice questions and 8 true/false questions.

The translation of the scale to the Turkish language was conducted by a bilingual member of our research team. Items were directly translated and reviewed by the rest of the researchers for their validity. 2 example items in English are 'Sex of the child is determined by genes passed from the mother; False' and 'Suppose a medicine used to treat high blood pressure is suspected of not working. The following options have three different methods that scientists can use to solve this problem. Which method they should use; C) Create two groups from people with illness, give medicine to one and not the other, and make comparisons between groups. Correct answers were coded as '1' and incorrect ones as '0'.

Before the initial analyses, we aimed to reduce the item pool to represent a parsimonious measure. For this purpose, we first checked the data for its suitability in terms of factor analytic procedures. Kaiser-Meyer-Olkin (KMO) value was .79, representing a good data fit for factor analysis (Tabachnick & Fidell, 2013). Bartlett's test of sphericity was also significant, $\chi^2(120) = 718.762, p < .001$, indicating that data matrix was suitable for factor analysis. Since we did not have any a priori expectations on the construct, an exploratory factor analysis (EFA) with varimax rotation was conducted to see the construct underlying the participants' responses upon GTSI items. We based our criteria to retain or delete items in the pool as with following principles; Eigen values of greater or equal to 1.0 (Kaiser, 1961) and factor loading of minimum .40 (Brown, 2006). In addition, items with factor loadings greater than .40 on multiple factors were deleted.

Results

After initial reduction of items based on EFA results, 19 items which could not meet the analysis criteria were deleted. 16 items retained in the scale and both Scree plot figure and Rotated Factor Matrix table indicated 5 factors explaining 61.71% of the total variance in the data. All correlations between the factors were lower than .30, a cut-off criterion suggested by Tabachnick and Fidell (2001).

Table 1: Descriptive Statistics and reliabilities for GTSI, GTSI sub-factors and validity scales

	N	M	SD	Cronbach's α
Trust in Science	169	4,29	,83	.83
Fear of Science	169	4,19	1,21	.70
Belief Compromise	169	4,64	,88	.63
Trust in Scientists	169	3,64	,83	.62
Personalization	169	4,08	1,60	na
Overall GTSI	169	4,17	,60	.80
SAI-II	169	3,92	,77	.76
RPBS	169	2,24	,70	.92
OSK	169	8,39	1,28	.68

Scientific Attitudes (SAI-II) and Overall GTSI scores were positively correlated, $r(169) = .245, p < .01$. This result provides a small support for convergent validation for GTSI (Hypothesis 1). 'Trust in Science' and 'Fear of Science' factors also provided significant correlations, $r(169) = .321, p < .01$; $r(169) = -.174, p < .05$. However for 'Belief Compromise', 'Trust in Scientists', and 'Personalization' factors; correlations were low and non-significant (in the same order; $r(169) = .088, p = .25$; $r(169) = .035, p = .65$; $r(169) = -.094, p = .22$). These results indicate that our scale's multi-dimensional nature did not follow our first hypothesis for the convergent validation.

Paranormal Beliefs (PBS) and Overall GTSI scores were negatively correlated, $r(169) = -.206, p < .01$. Although significant, this correlation is small by Cohen's (1988) effect size standards. Thus, this result provides a corroborating evidence for discriminant validation of GTSI (Hypothesis 2). While the correlational pattern was approximately the same for the 'Trust in Science', 'Fear of Science', and 'Belief

Compromise' factors ($r(169) = -.297, p < .01$; $r(169) = .163, p < .05$; $r(169) = -.460, p < .01$), 'Trust in Scientists' factor showed no correlation with paranormal beliefs, $r(169) = -.019, p = .80$. 'Personalization' factor, on the contrary, positively and significantly correlated with paranormal beliefs, $r(169) = .157, p < .05$. These results indicate that although discriminant validation of our scale was partially established, a parsimonious support for the Hypothesis 2 was not found.

Oxford Scale of Knowledge scores and Overall GTSI scores did not correlated significantly, $r(169) = .094, p = .22$. Hypothesis 3. for concurrent validation of GTSI was not supported by this result. Only Belief Compromise factor followed our hypothesis with a small positive correlation, $r(169) = .222, p < .01$. No significant correlations between other factors and scientific knowledge accordingly to our hypothesis were observed (all $ps > .05$). Full correlations between each scale and factor were presented in the Table 2.

Table 2: Correlation Coefficients for validity scales and GTSI measures * $p < .05$. ** $p < .01$.

	Trust in Science	Fear of Science	Belief Compromise	Trust in Scientists
Scientific Attitudes	.321**	-.174*	.088	.035
Paranormal Beliefs	-.297**	.163*	-.460**	-.019
Scientific Knowledge	.126	-.055	.222**	.339

Discussion

Public Understanding of Science is a multidisciplinary field in which there are separate but collaborating areas such as science communication, science education, public attitudes towards science, and so on (Sturgis & Allum, 2004). Each of these approaches to the subject matter is necessary to bring the science and community together, which requires precise tools to scope the issues that may have risen by the lack of that togetherness (Barrage, 2015). Our

literature review had ended up finding no thorough measurement tool to measure individual's trust in scientific issues in a general sense. Thus, we have aimed to study these issues with a psychological approach; and placed 'trust' to the center of our newly developed measure, focusing on the public's attitudes towards science. In this study, we aimed to develop a scale that taps into the 'Trust in Science' construct in a general context, with possessing necessary psychometric properties. Overall results indicated that we have failed to do so when the inventory is treated as a single factor. More complex results have appeared when the multi-dimensional nature of the scale was considered. Nevertheless, a fully successful validation of the General Trust in Science Inventory was not met in this study.

After the factor and reliability analyses, and item reductions according to their results, GTSI turned out to be an internally consistent measure. Factor analysis results indicated that GTSI does not possess a unitary construct, with a five-factor solution explaining an acceptable range of variance in the data. Factors' internal consistencies as Cronbach's alpha coefficients were ranging between .62 to .83 – in which the lower coefficients of 'Belief Compromise' and 'Trust in Scientist' factors were most probably due to their lower number of items. Each factor's descriptive properties resembled normal distribution.

We named our factors 'Trust in Science', 'Fear of Science', 'Belief Compromise', 'Trust in Scientists', 'Personalization', accordingly to their content (see Table 1. for the items and their factor loadings). Higher scores in 'Trust in Science' factor for a person indicates an overall value given to science and scientific methodologies in general. An example item for it is 'Developments that will change the world arise only from scientific understanding'. Higher scores in 'Fear of Science' factor for a person indicates a degree of mistrust to the scientific developments. An example item for it is 'I think that the speed of scientific advances in today is turning humanity into a disaster'. Higher scores in 'Belief Compromise' factor for a person indicates that the personal beliefs/ideologies are put before the

scientific findings. An example item for it is 'I don't easily believe in research results that contradict my own truths'. Higher scores in 'Mistrust in Scientist' factor for a person indicates an overall devalue and mistrust given to the members of scientific community. An example item for it is 'I don't trust scientists can work without aiming for profit in their work'. 'Personalization' factor, which is a 1-item factor, indicates that the person does not approach to the scientists accordingly to the scientists' political view. The English version of the item is 'I don't care about the political attitudes of scientists'. Overall GTSI scores can be calculated with averaging all the factors into a single variable after reversing the scores from 'Fear of Science' and 'Mistrust in Scientists' factors, in which higher scores indicates a general trust in science.

Convergent validity of the GTSI was barely established in our study. Small positive associations were observed between the overall GTSI scores and the scientific attitudes of the participants. We had hypothesized to observe at least a moderate positive correlation, accordingly to the nature of both scales. Sub-factor associations were mixed and none of the factor associations were in the expected magnitude and direction. Only Trust in Science factor moderately and positively correlated with the scientific attitudes (see Table 3.). It was expected since the content of both measures similar in nature. Other factors' contents appear to deviate from mere scientific attitudes greater than what we expected.

Discriminant validity of the GTSI was almost fully established through small associations observed with the participants' paranormal beliefs, as it was hypothesized. It appeared that participants' general trust in science follow their paranormal beliefs – contrary to the negative associations observed in the Western societies (see Granger & Price, 2007; Harris, 2005; Hilgard & Jamieson, 2017). Our findings were in line with the similar studies conducted with non-western samples –especially the ones with the Turkish samples (see Gentzkow & Shapiro, 2004; İmamoğlu et al., 1993; Prooijen, 2017; Silver, 2006; Wallace, 2003). Results based on sub-factors of the scale followed a similar pattern, with the exception of

Belief Compromise factor. Moderately negative associations were observed between participants' de-emphasis in terms of their personal belief's ideologies when it comes to considering their scientific attitudes were negatively related to their paranormal beliefs. Although the magnitude of this relationship was higher than the other factors, its direction followed a rationally similar pattern to the other factors. This could be due to the sample characteristics, in which most data were obtained from university students rather than general public.

Concurrent validity of the GTSI was not met in this study. Following the Contextualist Perspective, we expected people high in trust in science to be more knowledgeable in science-related topics. The results propose no such pattern, with only Belief Compromise factor having positive and significant, but small, correlations with scientific knowledge of the participants. Other factors and overall GTSI scores and their correlations with scientific knowledge of participants did not support our hypothesis for the GTSI's concurrent validity. These results propose 2 possibilities. The first one is that the hypothesized relation and the theory it was derived from is faulty and needs revisions. The second one is that it is due to measurement insensitivity. Scores in Oxford Scientific Knowledge was at ceiling in our sample. This might have resulted in lower reliabilities and accordingly low correlations (see Table 2. for the descriptive values and reliability results).

First limitation of our study was that the data were collected via convenience sampling method and most of the participants were university students from METU, hence the sample in our study was relatively homogeneous and fell short in population representativeness. Further studies seeking to validate the scale should take using a more representative sample into consideration for generalization purposes.

Second limitation of our study was regarding the validation scales we used. We directly translated the Revised Paranormal Belief Scale (Lindeman et. al., 2016), and Oxford Knowledge Scale (Durant et al., 1989) to Turkish with the permission of our

instructor, since these had no available Turkish forms. Though the scales were turned out to be acceptably reliable in our study, scales rather with peer-reviewed and validated psychometric properties should have been used. In addition, Oxford Scientific Knowledge (Durant et. al., 1989) was a rather old scale for our measurement purposes –might have been not feasible to be used in a university sample in 2018. Future studies seeking to further validate the scale should rationally link the contents of the GTSI to other psychological constructs and use valid, up-to-date measurements.

In general, GTSI in this state is not ready to be used in further studies for correlational and/or predictive purposes. Factors underlying the overall inventory should be confirmed with confirmatory factor analyses in the possible further validation studies.

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