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INFLUENCE OF MOTIVATION ON STRENGTH OF RUBBER HAND ILLUSION EXPERIENCE

A recent plethora of evidence suggests the direct influence of motivation on perception. Surprisingly, there has not been any scientific reports concerning whether the intrinsic motivation to experience a particular phenomenon can influence the character of that experience. To examine such possibility, an experimental study employing Rubber Hand Illusion (RHI) paradigm was conducted. The strength of the illusion has been assessed using first- (questionnaire) and third-person (skin conductance response – SCR – in a situation threatening rubber hand) measurement methods.

Correlation between self-reported motivation and self-reported strength of the illusion did not reach statistical significance. However, highly motivated participants displayed pattern of skin conductance response characteristic for strong illusion. We conclude that the motivated participants actually experienced the illusion stronger, but simultaneously their expectations concerning the illusion escalated so their subjective reports of the strength of the illusion did not reflect results obtained by SCR. The obtained results support the hypothesis that cognition influences perception.

Keywords: Cognitive influences on perception, motivation, rubber hand illusion, skin conductance response, El Greco fallacy

INTRODUCTION

One of the most fundamental problems in contemporary cognitive science pertains to how extraperceptual factors may shape perceptual experience. According to the orthodox standpoint, higher-order cognitive factors do not have access to the earliest stages of perceptual processing – in other words, output of an encapsulated initial part of perceptual processing is determined by the properties of incoming sensory signals – e.g. wavelength of light in the case of vision (Pylyshyn, 1999). Accordingly, influence of higher-order factors (Firestone and Scholl, 2014) occurs before (e.g. directing attention) or after (e.g. comparisons with stored representations of objects held in memory) perception. On the other hand, some researchers claim that higher-order factors may organize and render perceptual processing more efficient and, as a consequence, effectively guide behavior (Lupyan, 2015; Clark, 2013). This approach is rooted in the "New Look" movement (Bruner, 1957) in which there is no such thing as "raw perception" and values, needs or beliefs determine the perceptual processing even at the lowest levels. After decades of stagnation, the movement is undergoing a revival; in the recent years, the amount of scientific reports concerning higher-order influences (such as conceptual knowledge, values, needs, possibilities to act or emotion) on perception has been significantly rising (for a review see Vetter and Newen, 2014; Zadra and Clore, 2011). The influence of motivation has also become a subject of study[1] – for example, some have argued that craving influences distance estimations – desired objects seem to lie closer than undesirable or disgusting (Balcetis and Dunning, 2010; Cole, Balcetis and Dunning, 2013). Same relationship has been observed for locations (Alter and Balcetis, 2011). In the experiment employing binocular rivalry paradigm it has been demonstrated that dominance times are significantly longer for a percept associated with reward than with punishment and that this effect cannot be explained by attentional mechanisms (Marx and Einhäuser, 2015). In the case of ambiguous stimuli, participants much more often declare that they see favorable interpretation (related to assignment to a pleasant task – juice drinking) compared to unfavorable (related to assignment to an unpleasant task – gelatinous goo drinking). These results have also been supported by non-declarative measurements (Balcetis and Dunning, 2006).

It seems though that cognitive penetrability problem has not yet been solved. Studies which claim to prove that perception may be distorted in accordance with present goals and abilities of an agent have been convincingly criticized (Firestone and Scholl, in press). Most frequently repeated objections pertain to problems with replication in the case of slightly modified instructions (Durgin et al., 2009) and to vast possibilities of simpler explanations, e.g. in reference to semantic priming (Firestone and Scholl, 2015a) or response bias. For example, Firestone and Scholl (2014) showed the apparent character of an effect of remembering moral or immoral deeds from the past on the lightness judgments. Participants who summoned up a situation in which they acted immorally judged their perceptual environment as darker on the numerical scale. Interestingly, analogous effect was observed when the judgments were made on a scale in which numerical values were replaced by several gray patches (varying in lightness) that had to be matched with perceived brightness of a perceptual scene. Such effect is impossible to obtain – if bringing back memories about immoral deeds had influenced perception itself, the patches would have seem darker as well. Therefore, exactly the same patches would have been picked as reflecting the perceived brightness and results obtained in the experimental group would not differ from the control group. It seems justified to say that it was the experimental manipulation itself that induced particular pattern of answers – design of the study made it possible to disentangle (not necessarily consciously) experimenter intentions and to give answers compliant with her purposes. One must not claim on the basis of the results obtained with the patch scale, that activation of the concept of morality influences perceived brightness – it would be a reasoning fallacy (Firestone and Scholl coined a term “el Greco fallacy”[2])

Some of the researchers claim that frequently reported between–group differences in perception may be explained in reference to metacognitive treatment of the perceptual data on the further stages of the process – e.g. mechanisms of interpretation, judgment or memory (Firestone and Scholl, in press). Therefore, the authors propose a list of good methodological practices in research on higher-order influences of perception and claim that following such methodological rules is necessary if one wants to convincingly prove occurrence of such influences. They strongly advice adopting of the following

[1] For the sake of brevity, we omitted motivational influences that are based on values or needs (for a review see Firestone and Scholl, in press), focusing on those based on desires.

[2] The name of the fallacy comes from a theory that was popular at the beginning of the twentieth century. According to it, elongated silhouettes depicted on El Greco’s paintings were caused by his putative astigmatism. However, this theory did not consider the fact that in this case he would have perceived the canvass on which he painted as elongated as well. As a result, effects would cancel each other out and depicted silhouettes would have normal proportions for an outside observer.

research strategies: (1) joint employment of first- and third-person (e.g. behavioral, psychophysiological, neuronal activity) measurement methods – research based solely on declarative measures does not exclude the explanations referring to response bias. Moreover, additional informational value may emerge from juxtaposition of results obtained with different measures (e.g. zero-correlation criterion; Dienes et al., 1995); (2) experimenter expectancy effect minimization – with the use of double-blind designs or post-hoc questionnaires concerning the alleged purpose of the experiment; (3) avoidance of presentation of different stimuli – even careful standardization may not protect against differences on the level of basic perceptual features (e.g. white and black faces may be distinct even when they lightness is equaled; Firestone and Scholl, 2015b). All abovementioned methodological recommendations have been considered in the presented study.

RUBBER HAND ILLUSION

Rubber hand illusion (RHI) is a visuo-kinesthetic illusion that results in embodiment of a dummy hand stimulated simultaneously with a participant's hand which is placed outside the field of view. The exact character of experience is hard to define – when asked whether they feel that rubber hands belong to them, participants seem to provide inconsistent answers. Feelings may be idiosyncratic and encompass a wide variety of sensations, including feelings of ownership or control over the rubber hand and haptic sensations originating from it (Longo et al., 2008). Rubber hand illusion may also entail disruptions of sensations flowing from one's own hand – e.g. feelings of its loss or numbing. During the illusion the temperature of the hand drops down (Moseley et al., 2008) and resistance to pain caused by a very cold compress increases (Siedlecka, Klimza, Łukowska and Wierzchoń, 2014). People differ in their amenability to illusion (Botvinick and Cohen, 1998); for example, increased interoceptive sensitivity (capability to sensate and monitor one's own internal states) is linked to the lower strength of the illusion (Tsakiris et al., 2011).

Self-assessment measures of the strength of the illusion comprise simple questionnaires based either on one (Moseley et al., 2008) or few positions (Ijsselsteijn, de Kort i Haans, 2006) and developed questionnaires constructed with the use of psychometric methods (Longo et al., 2008). For the same purpose, behavioral methods have been devised (e.g. estimation of the location of one's own hand which is hidden from view; Tsakiris and Haggard, 2005). Physiological markers of the strength of the illusion include increased skin conductance response (Atmel and Ramachandran, 2003) and increased electric activity in adductor muscles of a corresponding hand (Slater, Perez-Marcos and Ehrsson, 2009) in a situation threatening a dummy hand.

THE STUDY

The purpose of the study presented in the article was to examine whether intrinsic motivation to experience a particular phenomenon ("I want to experience such experience" – e.g. because it is interesting) can influence or strengthen that experience. Surprisingly, a thorough literature search did not bring any research reports concerning this issue. The studies carried out until now indicate mostly how extrinsic motivation (desires, values or needs associated with a perceived object) may shape perceptual experience. Therefore, most of the studies focus on visual perception of the distance and on effects of perceptual "pulling in" or "pushing out" (e.g. shortening or extension of the distance between an agent and an object in dependence of experimental condition). Filling this gap seems to be of particular importance – demonstration of influence of intrinsic motivation on perceptual experience could carry important implications for work in related psychology subdisciplines, such as social psychology (individual and group religious experiences) or psychology of aesthetic experience.

In the present study, we employed rubber hand illusion because of its specificity – it is virtually impossible to elicit the illusion outside laboratory conditions. Since participants do not know what they ought to expect, it is possible to manipulate their motivation to experience RHI. Moreover, application of the rubber hand illusion breaks a certain "visuocentrism" in the contemporary work on higher-order influences on perception (most of the experiments from this field focus on visual perception; see e.g. Vetter and Newen, 2014) and may allow generalization of the obtained results on different sensory modalities and multisensory experiences.

Hypotheses

The main purpose of the study was to answer the question: is it possible that people additionally motivated to experience the illusion could experience it more strongly?

The participants were divided into two groups (experimental and control). To assess the strength of the illusion, we applied a questionnaire (which included positions pertaining to various sensations associated with rubber hand illusion) and a psychophysiological measure (amplitude of electrodermal response to a threat to the rubber hand) measures. We hypothesized that additionally motivated people would judge the illusion to be stronger on a self-assessment survey. Research questions concerning (1) dependence between motivation and strength of skin conductance response and (2) relationship between questionnaire and psychophysiological measures were open. We considered these relations to be helpful in adjudicating whether our results reflect real effects on perception or are simply caused by induction of a tendency to give certain answers.

Participants

Thirty persons took part in the experiment – 17 women and 13 men, aged 19–26 (M = 21.3). Most of them studied at the University of Warsaw. Three participants were left-handed. All the participants granted informed consent to participate in the study and received 10 zł in compensation. They were recruited via announcements posted on Facebook and posters hanged at the Faculty of Psychology of the University of Warsaw. None of the participants studied psychology. Short post-hoc survey carried out after the experiment showed that none of the participants guessed the purpose of the experiment.

Materials

In the first part of the experiment, a prepared video material was used (see below: procedure). Strength of the illusion was assessed in a twofold way. We employed a questionnaire containing 18 items derived from the work by Longo and colleagues (2008), which referred to two basic dimensions of rubber hand illusion experience: embodiment of a dummy hand and loss of one's own hand. The assessments were made on 11-point numerical Likert type scale (from 0 – "I completely disagree" to 10 – "I completely agree"). The second method we used was measurement of a physiological reaction – amplitude of skin conductance response to an "attack" on rubber hand with the use of a sharp tool. Electrodermal response was assessed with the use of PowerLab 16/35 device and LabChart 7 program made available by Laboratorium Neuroscience operating at the Faculty of Psychology of the University of Warsaw. To induce the illusion, we utilized a very realistic, life-size rubber hand (right) bought in the online shop for professional tattooists[3] and a self-made shelf of 25 cm (width) x 20 cm (length) x 7 cm (height) (fig. 1). The distance between a fake and a real hand was equal to the height of the shelf (7 cm).

[3] http://www.apoundofflesh.bigcartel.com/product/apof-hand

Fig. 1. Devices used in the experiment

Procedure

Participants were randomly assigned to one of the two groups (15 persons in each) and were presented a short video material. Groups differed in what they watched – in the experimental group, we placed an additional excerpt in a movie, in which an actor playing a professor enthusiastically presented the illusion, describing it as one of the most interesting experiences in his life. In the control group, a different excerpt was placed in the same part of the movie, where the professor delivered a rather neutral opinion on why examination of out-of-body-experiences is important.

After watching a movie, participants proceeded to the main part of the experiment. The fake hand was placed on the upper surface of the shelf and participants were asked to place their own hand on the lower surface (fig. 1; see Pavani, Spence and Driver, 2000) and space between the dummy and the participant's arm was covered with a textile. Both hands were equally distanced from the participant's body and orientation of both hands was coherent. Electrodes for skin conductance response measurement were put on the index and ring fingers of the participant's left hand. Subsequently, we waited until the signal reached the resting state characteristic for a given subject. Participants were then given instructions underlining the need to keep their hand still during the experiment. The experimenter eliciting the illusion did not know to which group a given participant is assigned.

Both real and fake hands were simultaneously stroked with two paintbrushes in order to produce rubber hand illusion. Stimulation was harmonized in space and time, but it was not unvarying – its dynamics and sequence of stroked fingers was changing during the experiment. During the stimulation (which lasted 4 minutes), the fake hand was being attacked every 40 seconds with a sharp pencil – such an attack would have possibly resulted in a sharp pain if a real hand had been the target. We registered moments when pencil was being raised above the dummy (suggesting the incoming attack) and moments of the spikes themselves. We analyzed electrodermal response in three following time brackets encompassing:

- time bracket 1: a period between the moment when the pencil was raised and the moment of attack (since electrical activity of the skin may change in response to a potential threat)
- time bracket 2: a period spanning 6 seconds after the attack (since latency period and post-threat arousal may last up to 3 seconds; Figner and Murphy, 2011)
- time bracket 3: a period spanning both brackets combined.

Subsequently, participants assessed the subjective strength of the illusion using a questionnaire and filled a short post-hoc survey concerning their interest in illusion, motivation to experience it elicited by the video presentation, and the putative aim of the experiment.

RESULTS

Due to inefficiency of experimental manipulation, we did not analyze between-group differences in the strength of the illusion[4]. Since self-reported motivation (M = 6.17; SD = 2.93) as well as subjective strength of the illusion[5] (illusion strength: M = 4.03; SD = 2.29; embodiment: M = 4.29; SD = 2.72; loss of one's own hand: M = 3.33; SD = 2.46) varied among the participants, we inferred that – even though our manipulation was not effective – the participants differed in their motivation to experience the illusion and degree to which they experienced it. Therefore, we could examine our main hypothesis concerning the influence of motivation on self-reported illusion strength as well as research questions concerning whether variance of electrodermal response may be explained in reference to questionnaire measures.

We did not find any significant relationships between self-reported motivation and self-assessed strength of the illusion – both for all items averaged: r = .26, p = .17, and embodiment factor: r = .23, p = .22. Similarly, there was no relationship between motivation and subjectively evaluated interest in the illusion: r = -.01, p > 0.05. Participants who experienced the illusion stronger judged it as more interesting: r = .65, p < 0.001.

The relation between subjective strength of the illusion and its psychophysical marker varied depending on whether the attack order was considered[6,7]. When we introduced average score in the questionnaire (general indicator of the strength of the illusion – independent variable) to the regression model we found that it could not explain variance of averaged electrodermal response (dependent variable): B s= 0.02, SD = 0.06, t(136) = 0.40, p > 0.05. However, when we took the order of the attacks into consideration, we found significant interaction between attack number and self-reported strength of the illusion: B = -0.04, SD = 0.01, t(136) = -3.14, p < 0.01. The model explained 21.1% of variability of the electrodermal activity: R^2_{corr} = 0.21, F(3, 136) = 13.4, p < 0.001. The fit was better after introducing interaction: ΔR^2 = 0.051, F(1, 136) = 9.8, p < 0.01.

Self-reported motivation also turned out to be a predictor of electrodermal activity but, again, only when the order of the attacks was considered – we observed analogous interaction: B = -0.03, SD = 0.01, t(136) = -3.18, p < 0.01. The model explained 21.2% of the signal's variance: R^2_{corr} = 0.21, F(3, 136) = 13.5, p < 0.001 and was bet-

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[4] We carried out U Mann-Whitney test and found no significant differences in subjectively assessed illusion strength between experimental (E) and control (C) groups, both for 1) average score in the questionnaire (E: Me = 4.72; C: Me = 3.83 – U = 111, p > 0.05) and all main factors: 2) embodiment (E: Me = 4.67; C: = 4.67 – U = 105, p > 0.05) and 3) loss of one's own hand (E: Me = 2.60; C: Me = 2.40 – U = 111.5, p > 0.05) . We did not observe differences in the averaged amplitude of electrodermal response to a situation threatening the rubber hand in the analyzed time brackets (1: W(23) = 0.93, p > 0.05; 2: W(22) = 1.63, p > 0.05; 3: W(23) = 1.22, p > 0.05). Experimental manipulation was not effective – experimental group (M = 6.53; SD = 2.92) did not differ from the control group (M = 5.80; SD = 2.98) in terms of motivation to experience the illusion: t(28) = 0.68; p > 0.05.

[5] Results obtained on the scales were averaged due to satisfactory reliability – α = .93 for the entire questionnaire, α = .93 for embodiment and α = .85 for loss of one's own hand.

[6] The presented results concerning electrodermal response refer to the second time bracket – that is, the bracket encompassing 6 seconds after the pencil attack on the rubber hand. In most of the analyses carried out, the results were analogous for the third bracket, but these results were less pronounced and were probably a consequence of the post-attack effects, since in the first bracket we did not observe any significant results.

[7] One could perhaps raise objections against treating the "attack number" variable as if it was interval. However, it seems to be justified since in analyses of variance, regression and correlations treating ordinal scales as if they were interval is permissible, even if they adopt only 5 values, with no risk of information loss or misinterpretation of the results (Norman, 2010). High variance of the variable (we collected the same number of measurements for each item) and comparatively equal differences between items (measurements were almost equally distributed in time, the variable was not recoded) additionally validate our methodological choice.

ter fit after interaction was introduced: $\Delta R^2 = 0.052$, $F(1, 136) = 10.1$, $p < 0.01$. In all abovementioned analyses simple contrasts were applied. Results shown in figures 2., 3. and 4. indicate that distribution of electrodermal activity amplitudes is analogous both for subjectively assessed strength of the illusion and self-reported motivation (dependent variable was centered). For lower scores on questionnaire measures (two lower quartiles), the amplitude of skin conductance response to a threatening event was similar throughout the experiment. For higher scores (fourth quartile, for motivation third quartile as well), we can observe *habituation effect* – gradual decline of electrodermal response strength following consecutive attacks.

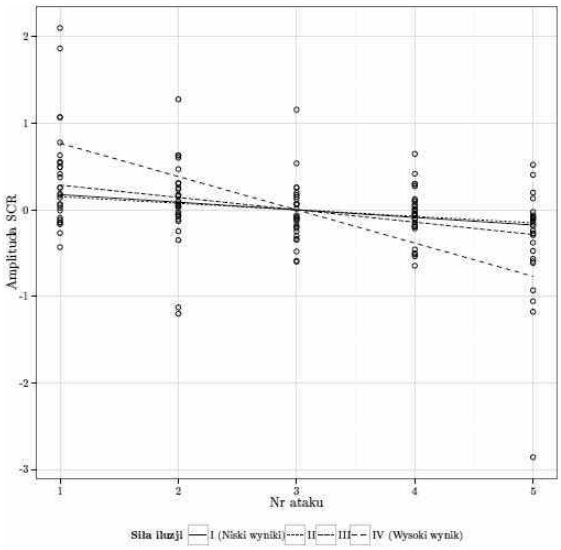

Fig. 2. "Habituation effect" – a gradual decline of electrodermal response amplitude for high scores on questionnaire pertaining to subjective strength of the illusion

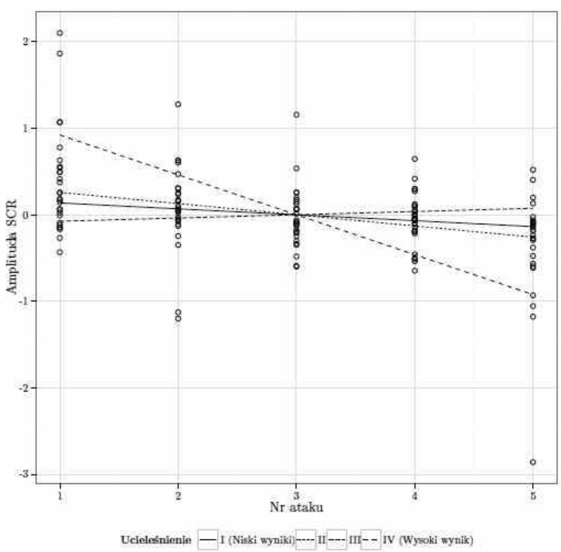

Fig. 3. "Habituation effect" – a gradual decline of electrodermal response amplitude for high scores on one of the questionnaire's main factors – embodiment

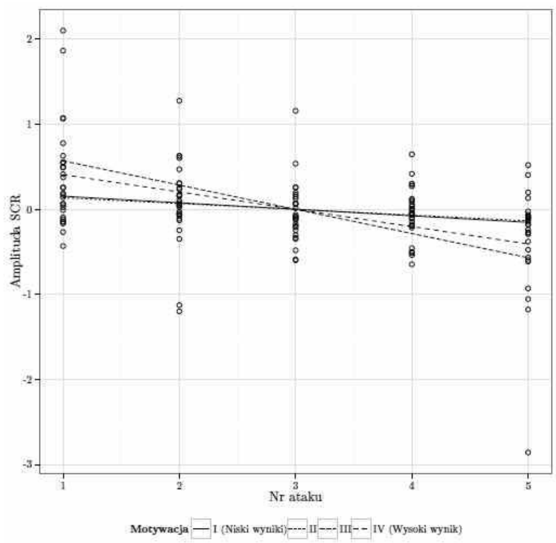

Fig. 4. "Habituation effect" – a gradual decline of electrodermal response amplitude for participants declaring a high level of motivation

DISCUSSION

Since our experimental manipulation was inefficient, we did not obtain significant between-group differences. Manipulation was possibly too weak and could not elicit proper motivation – the excerpt inserted in 90-seconds video lasted about 10 seconds. Therefore, it was possibly too short to significantly influence the participants' attitudes.

Relationships shown in the study are based on exploratory analyses. We did not find dependencies between motivation and the strength of the illusion on the declarative level – weak correlations did not reach statistical significance. However, when attack order was considered, we observed relations between those measures and skin conductance response amplitude. Subjectively strong illusion is associated with a characteristic pattern of electrodermal activity – a gradual decline in strength of electrodermal response. This habituation effect may be explained as follows: participants who experienced the illusion were more afraid at the beginning of the experiment since the feeling of embodiment of the rubber hand was very convincing. Therefore, they expected a sharp pain to follow the pencil attack on the dummy. Since the expected pain did not occur, they felt relief and habituated the following threatening events. On the other hand, electrodermal response of participants who did not experience the illusion may be explained by nonspecific factors (such as a sharp tool moving in their peripersonal space). These participants did not feel relieved and so electrodermal response remained unchanged throughout the experiment. Since those who strongly experienced the illusion were more aroused at the beginning of the experiment and less aroused after last attacks, the effect was not revealed when we analyzed average skin conductance response. The fact that the dependency between the strength of the illusion and electrodermal activity was observed only when the attack order was taken into consideration suggests that the method employed in our experiment (based on multiple measurements) may be superior to single skin conductance response measurements (e.g. see Armel and Ramachandran, 2003). Single measurements may be biased by external factors, such as e.g. the extent to which attention is focused on the threatening event.

Analogous habituation effect was found for intrinsic motivation – same relationship emerges only when attack order is considered. Self-reported motivation explains similar amount of electrodermal response variance (21.2% for motivation, compared to 21.1% for a general score in the questionnaire and 23.7% for embodiment factor). If we acknowledge habituation effect to be a psychophysical marker of the strength of the illusion – and that is justified by significant interactions – then we can conclude that motivated participants actually experienced the illusion stronger. If this is the case, why this effect was not revealed on the declarative level? Intrinsic motivation to experience something is linked to certain expectations concerning the character of that experience. Additionally motivated participants possibly experienced the illusion to a higher degree, but simultaneously their expectations concerning the illusion rose. Since motivated persons were more strict in their subjective assessments pertaining to sensations associated with the illusion, their declarations did not reflect electrodermal response measurements. It could possibly be described as "reversed el Greco effect" (see Firestone and Scholl, 2014) – induction of response bias rendered real effect unexposed. Reliance on declarative measures could lead to the error of the second kind.

There is a possibility though that the lack of significant correlations is caused by a limited sample or by differences in variables – while we can assume that motivation is stable (or rather it is understood as a single point in time, as a "motivation to experience the illusion right before it was elicited"), the strength of the illusion may dynamically change throughout the experiment. Perhaps it would be beneficial to implement simple repeated measurements of the illusion strength (e.g. "how strong the illusion is right now, from 0 to 10?"), so one could control relationship between motivation and variability of illusion strength in time.

The study has also its limitations. Essentially, the experimental manipulation failed and, therefore, analyses concerning motivation were conducted on the basis of a single questionnaire item. Moreover, participants assessed their motivation after they experienced the illusion. This may raise doubts about the validity of this assessment. Nevertheless, such procedure seems to be justified since 1) participants could have guessed the purpose of the experiment if they had been asked about motivation before illusion induction 2) it is improbable that retrospective judgments could be contaminated by a degree to which the illusion was experienced – we could perhaps consider subjective interest in the illusion (which strongly correlated with a questionnaire scores) as "one-item" indicator of the illusion strength 3) we did not observe relationship between self-reported motivation and interest in the illusion. A natural continuation of this study would entail experimental manipulation improvement, employment of another behavioral measure, such as estimation of the location of one's unseen hand (proprioceptive drift) and an implementation of simple repeated measurements of the illusion strength during an experiment.

CONCLUSIONS

To sum up, the original hypothesis concerning the relationship between self-reported motivation and self-assessed illusion strength was not confirmed. However, psychophysiological data suggest that motivation influences rubber hand illusion strength since we observed a characteristic physiological marker of the illusion in motivated participants ("habituation effect"). Such data indicate that those who declared high motivation experienced the illusion to a higher degree. These results are consistent with theories predicting that higher-order influences modulate perceptual processing (see e.g. Clark, 2013; Vetter i Newen, 2014; Lupyan, 2015) and with contemporary work in binocular rivalry paradigm which shows increased perceptual availability of stimuli associated with reward (Marx and Einhäuser, 2015).

To the authors' best knowledge, the present study is the first experimental attempt to show influence of intrinsic motivation (e.g. flowing from curiosity – "I want to experience that experience") on perceptual experience. Moreover, the described experiment was carried out according to the strict methodological guidelines for work in this area (Firestone and Scholl, in press). The study fills also a significant gap, extending the scope of interpretation of the results (supporting hypothesis that higher-order cognitive factors influence perception) from vision to proprioception.

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WPŁYW MOTYWACJI NA SIŁĘ DOŚWIADCZENIA ILUZJI GUMOWEJ RĘKI

ABSTRAKT

Współczesne doniesienia naukowe wskazują na bezpośredni wpływ motywacji na percepcję, jednak problematyka wpływu wewnętrznej motywacji („chcę przeżyć to doświadczenie") była dotychczas pomijana. W związku z tym przeprowadzono badanie eksperymentalne dotyczące wpływu wewnętrznej motywacji na siłę doświadczenia iluzji gumowej ręki. Pomiaru siły iluzji dokonano za pomocą metod pierwszoosobowych (dane kwestionariuszowe) i trzecioosobowych (reakcja elektryczna skóry w sytuacji zagrożenia gumowej ręki).

Korelacja pomiędzy motywacją a deklarowaną siłą iluzji okazała się nieistotna statystycznie. Jednak u osób zmotywowanych zaobserwowano marker psychofizjologiczny charakterystyczny dla silnego odczuwania iluzji – stopniowe osłabienie reakcji elektrodermalnej na kolejne sytuacje zagrażające gumowej ręce. Wyniki te sugerują, że osoby zmotywowane doświadczyły iluzji w większym stopniu, jednak równocześnie wzrosły ich oczekiwania dotyczące charakteru zjawiska, przez co pomiary uzyskane za pomocą reakcji elektrodermalnej nie znalazły odzwierciedlenia w deklaracjach osób badanych. Uzyskane wyniki są zgodne z hipotezą dotyczącą wpływu czynników wyższego rzędu na percepcję.

Słowa kluczowe: wpływ czynników wyższego rzędu na percepcję, motywacja wewnętrzna, iluzja gumowej ręki, reakcja elektrodermalna, „błąd El Greco"