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The Effect of the Model's Social Status on Placebo Analgesia Induced by Social Observational Learning

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Abstract

Background. Placebo analgesia can be induced by social observational learning. The aim of this study was to determine whether this effect can be influenced by the social status of a model. **Methods.** Healthy volunteers were randomly assigned to three groups: a group that observed a video featuring a high-status model (introduced as a professor), a group that observed a video featuring a low-status model (introduced as a janitor), and a control group. Participants observed videos showing a model (of high or low status) undergoing the experimental procedure, during which he received pain stimuli. In each group, half of participants watched a video in which the model rated blue stimuli as more painful (6–8 on the numeric rating scale) and orange stimuli as less painful (1–3 on the numeric rating scale), whereas the other half of participants watched a video in which the model rated orange stimuli as more painful and blue stimuli as less painful. Participants in the control group did not watch any video. Then, all participants received 16 electrocutaneous pain stimuli of the same intensity, preceded by either blue or orange colors. The perceived social status of the model and the trait empathy of participants were measured. **Results.** Placebo analgesia was induced in both experimental groups, yet no difference in the magnitude of the effect was found. However, we found that the participants' individual ratings of the model's social status predicted the magnitude of placebo analgesia. **Conclusion.** This is the first study to show that the perception of a model's social status is related to the magnitude of placebo analgesia induced by observational learning.

Key Words: Placebo Analgesia; Placebo Effect; Social Learning; Observational Learning; Model; Social Status

Introduction

The placebo effect is a learning phenomenon [1]. In addition to classical conditioning [2], verbal suggestions [3], and operant conditioning [4], there is a growing body of research showing that placebo effects on pain may be induced by observational learning; this was first suggested by Bootzin and Caspi [5], then supported by Colloca and Benedetti [6], and further replicated in several other studies [7–11]. Because people suffering from pain are often influenced by the behaviors of others, these studies' findings are important for clinical practice [12]. What is more, observation of others in pain may also affect the results obtained in clinical trials [13].

Our knowledge about the factors that influence the effectiveness of observational learning is still limited. A recently proposed model that aims to integrate the existing research findings on placebo effects induced by observational learning [12] emphasizes the importance of the observer's characteristics (including empathy) that may

influence the effects of observational learning. On the other hand, social learning theory [14] also highlights the role of the model's characteristics in the effectiveness of observational learning, including the model's sex, attractiveness, and social status. These characteristics may influence whether and how well the observer's attention is drawn to a model whose interpersonal attraction is greater. The attentional processes, in turn, determine and influence further components of observational learning: retention, motoric reproduction, and motivational subprocess [15].

The evidence that models' characteristics are relevant in placebo effects induced by observational learning is very limited, as only one study has been conducted that has examined their influence. Świder and Bąbel [9] showed that regardless of the sex of the observer, nocebo hyperalgesia was greater as a result of observing a male model, which contradicts Bandura's hypothesis [15] that similarity between a model and an observer enhances the effects of observational learning.

Also, in spite of the wide acceptance of Bandura's theory, only a few studies have attempted to verify the influence of a model's characteristics in general outside the domain of pain and placebo effects. One of the most studied characteristics that is presumed to influence observational learning is a model's social status [15]. Previous research has shown that the effects of observational learning were greater when models were of a higher social status [16–20]. Nevertheless, the authors of those studies defined the measured characteristics differently (e.g., as a social influence [19] or social power [16]), and they all may be considered to be slightly different constructs from social status. Furthermore, all these studies were conducted decades ago and have never been replicated. Moreover, to the best of our knowledge, no research has examined the influence of a model's social status on the magnitude of placebo analgesia induced by observational learning. As pain modulation is often influenced by its social context and a model's social status seems to be a potentially important factor that could affect observational learning, we hypothesized that the observation of a model of high status would induce stronger placebo analgesia than the observation of a model of low status.

Methods

Participants

The sample size was determined on the basis of data from a previous study [9]. In order to detect a significant difference in pain intensity between the experimental groups and the control group, it was estimated that a minimum sample of 16 participants was required per group ($\alpha = 0.05$, 80%, between-group comparison). However, to account for potential dropouts, 20 participants were examined in each group. The calculation was performed in *G**Power 3.1.9.2 (Heinrich Heine University Düsseldorf, Düsseldorf, Germany) [21].

A total of 60 volunteers participated in the study (32 females, mean age = 23.38 ± 2.55) (Table 1). They were randomly assigned to three groups: two experimental groups (high-status model [HSM] and low-status model [LSM]) and one control group. There were 20 participants in each group. All of them were healthy and free of neurological, psychiatric, and cardiovascular diseases and were not taking any medication. They were informed that they were participating in a study on pain perception and that they would receive a series of electrocutaneous pain stimuli. The participants gave their informed written consent to participate in the experiment. They were also informed that they could stop participating at any point during the study without giving any reason. At the end of the study, all of the participants were fully debriefed. For their participation in the study, they received a lottery ticket that could win them a store voucher. The study protocol was approved by the Research Ethics Committee at the Institute of Psychology of Jagiellonian University.

Stimuli
Pain Stimuli
The electrocutaneous pain stimuli were delivered by the Constant Current High Voltage Stimulator (Digitimer, Welwyn Garden City, England, model DS7AH) to the inner side of the nondominant forearm through two durable stainless-steel disk electrodes that were 8 mm in diameter with 30-mm spacing. During the calibration phase, participants received a varied number of stimuli (mean number = 14). In the testing phase, they received 16 pain stimuli preceded by color stimuli. Each stimulus lasted 200 μs. The intensity was calculated individually for each participant during the calibration procedure (see below).

Placebo Stimuli
The placebo effect is considered to be a context effect, as in fact a placebo intervention is not needed for the effect to occur [22], and for that reason, we chose to use color stimuli as a placebo. Blue and orange color stimuli were presented in full-screen mode on a computer screen (17 inches, resolution 1280×1024) facing the participant at a distance of approximately 50 cm.

Each color stimulus was displayed eight times for 8 seconds in a predetermined pseudorandom sequence. The stimuli were orange and blue, as these colors have been found to not have an impact on pain perception [23].

Measures
After each pain stimulus, participants rated pain intensity by means of an 11-point numeric rating scale (NRS) ranging from 0 = "no pain" to 10 = "maximum imaginable pain." At the end of the experiment, the participants from the experimental groups were asked to complete the Interpersonal Reactivity Index (IRI) [24], which is a 28-

Table 1. Characteristics of the participants in each of the groups and in total (means and standard deviations)

| Group | N | % of Females | Age | NRS | | IRI | | |
				Placebo	Control	PT	PD	EC
HSM	20	50%	22.85 ± 2.23	4.79 ± 1.45	5.33 ± 1.47	29.80 ± 4.02	24.00 ± 5.78	34.95 ± 3.78
LSM	20	50%	22.90 ± 1.92	5.03 ± 1.35	5.44 ± 1.23	30.15 ± 3.20	23.45 ± 4.94	35.15 ± 3.70
Control	20	60%	24.40 ± 3.14	5.60 ± 1.86	5.59 ± 1.76	–	–	–
All	60	53%	23.38 ± 2.55	5.14 ± 1.58	5.46 ± 1.48	29.98 ± 3.59	23.73 ± 5.31	35.05 ± 3.69

item measure of dispositional empathy that consists of three subscales: Perspective Taking (PT; score ranging from 9 to 45), Personal Distress (PD; range from 8 to 40), and Empathic Concern (EC; range from 11 to 55). Participants were asked to state to what extent they agreed with the items on a five-point scale ranging from "Does not describe me well" to "Describes me very well." The Polish adaptation of the scale was validated, and its reliability is similar to the original version of the IRI; Cronbach's alpha = 0.78 for the EC, 0.78 for the PD, and 0.74 for the PT [25].

Participants were also asked to rate the model presented in the video during the manipulation phase by means of 30 adjectives. Most of them were chosen from the Adjective Check List [26], including four adjectives concerning social status ("respectable," "wealthy," "educated," and "influential"), with the remainder not related to social status. On a five-point Likert scale ranging from 1 ("describes him very poorly") to 5 ("describes him very well"), participants were asked to rate how well these adjectives described the person that they had watched in the video. For the status subscale, the score was calculated by adding up the ratings for the four adjectives (with the final score ranging from 4 to 20 points). Participants were also asked to assess the model's social status by rating it on a five-point Likert scale ("How high is the social status of that person?") ranging from 1 ("very low") to 5 ("very high").

Design and Procedures

The experiment consisted of three phases: calibration, observation, and testing (Figure 1).

In the calibration phase, the nonpainful tactile sensation (t) and the pain threshold (T) were determined for each participant individually. Two series of stimuli of increasing intensity (steps of 1 mA, starting from 0 mA with 5-second intervals) were administered to each person. Participants were asked to inform the experimenter as soon as they started to feel any sensation (t). The stimuli of increasing intensity were applied until the participant signaled that he or she had started to feel pain (T). The mean intensity of the pain threshold was doubled (2T) and used in the testing phase.

The observation phase took place only in the experimental groups. During this phase, participants watched a video of a male model (57 years old). The model was presented either as a professor (HSM group) or a university

janitor (LSM group). In the video shown to the HSM group, the model was wearing an elegant shirt and glasses, and in the video shown to the LSM group, the model was dressed in a sweatshirt. To ensure that participants would pay attention to and notice the status of the model, they were asked to watch the video carefully and were informed that they would be asked questions about the video later. Participants were told that the video was instructional material showing a procedure that they would be asked to take part in later. The video consisted of two parts: 1) a short interview in which the model sat in front of the camera and responded to questions related to his work (while watching, participants had an opportunity to notice the social status of the model) and 2) a presentation of the model undergoing the same experimental procedure. During the first part of the video (the interview) shown to the HSM group, the model introduced himself as a professor of psychology working at the Jagiellonian University, talked about his professional interest and hobbies (which were reading books and traveling, among others). The model in the video shown to the LSM group introduced himself as a janitor working at the same university and then also talked about his job and mentioned watching sports and taking walks as his interests. In the latter part of the video, the model verbally rated eight electrocutaneous stimuli delivered to his forearm as more painful (ratings of 6–8 on the NRS) and eight electrocutaneous stimuli as less painful (1–3 on the NRS). In each of the experimental groups, half of the participants watched the video showing the model's higher ratings for stimuli preceded by blue (non-placebo stimuli) and lower ratings for stimuli preceded by orange (placebo stimuli); the other half watched the video showing the model's higher ratings for stimuli preceded by orange (non-placebo stimuli) and lower ratings for stimuli preceded by blue (placebo stimuli).

In the testing phase, 16 electrocutaneous stimuli of the same intensity (2T mA) preceded by eight orange stimuli and eight blue stimuli were applied to the participants in a pseudorandom sequence. The NRS for pain intensity rating was shown immediately after the electrocutaneous stimulus was applied.

After the experiment ended, participants were asked to fill in a questionnaire that consisted of manipulation check questions: 1) What was the aim of the experiment? 2) Did (and if yes—then how) the colors displayed on the computer monitor relate to the pain stimuli that followed
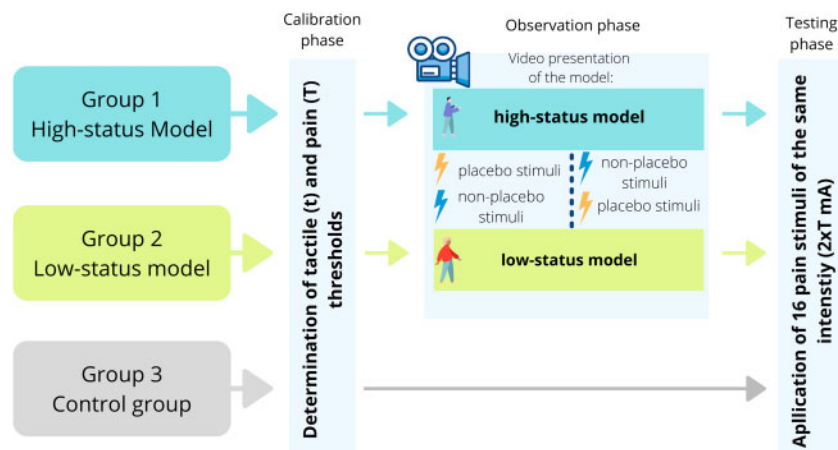
Figure 1. Study design. The study involved two experimental groups (HSM and LSM) and the control group. Participants in the experimental groups were shown different videos of different models (high status in Group 1 and low status in Group 2) experiencing placebo analgesia. Participants in the control group did not observe a model.

them? 3) What was the relationship between the colors and the observed person's ratings of pain stimuli? Subsequently, participants were asked to rate the model by means of 30 adjectives.

Participants in the control group underwent only phases 1 and 3 of the study, i.e., calibration and testing. They did not observe a video of a model before the testing phase started. They received 16 pain stimuli preceded by eight blue and eight orange stimuli in the same pseudorandom sequence that was applied in the experimental groups.

Statistical Analyses

Descriptive statistics were calculated for the following variables: age, tactile and pain thresholds, and empathy (measured by IRI). To verify that the participants differed in these characteristics between the groups, a one-way analysis of variance (ANOVA) was conducted with group as an independent variable.

Manipulation Check

To assess whether the manipulation used in the experiment was effective, the ratings of four model characteristics (*respectable, wealthy, educated,* and *influential*), combined into one score, as well as the explicit rating of the social status given by the participants, were compared between the experimental groups. The *t* test was performed with the rating of the model as a dependent variable and the experimental group as an independent variable. To verify whether those two measures of social status are correlated, the Pearson product–moment correlation coefficient (*r*) was calculated.

Social Status of the Model

Statistical comparisons were performed by means of the General Linear Model for repeated measures, including status of the model (high, low, or none) as a between-subject factor, and rating (placebo and non-placebo

stimuli) and trial (1–8) as a within-subject factors. *F* tests were followed by planned comparison tests. A planned comparison test on placebo- against control-associated NRS ratings in the model condition (HSM and LSM groups) as compared with the non-model condition (control group) was conducted to verify whether placebo analgesia had been induced. A planned comparison test on placebo- against control-associated NRS ratings in the HSM as compared with the LSM group was conducted to verify whether the social status of the model had an effect on the magnitude of placebo analgesia. To determine whether the participants' ratings of the model's social status characteristics accounted for placebo analgesia, multiple linear regression was performed with the ratings of the model's characteristics as independent variables and the difference between placebo- and control-associated NRS ratings as a dependent variable.

Empathy of the Observer

To investigate the effects of dispositional empathy on the magnitude of placebo analgesia induced by observational learning, a forward stepwise multiple regression analysis was performed in groups that had observed the model (1 and 2), with IRI subscale scores as independent variables and the difference between placebo- and control-associated NRS ratings as a dependent variable. The analyses were carried out in the STATISTICA data analysis software system, 64-bit version 13 (StatSoft Inc., Tulsa, OK, USA).

Results

The one-way ANOVA showed that there were no differences between the groups in age, tactile and pain threshold, and empathy. All the descriptive statistics are shown in Table 1.

Manipulation Check

The t test that was conducted to compare the participants' ratings of the model's social status in the two experimental groups revealed that social status was rated significantly higher in the HSM than in the LSM group. The effect was significant for both the social status score that was combined from the ratings of four adjectives ($F_{(1, 38)} = 47.53$, $P < 0.001$; $\eta^2 = 0.56$) and for the direct question about the model's status ($F_{(1, 38)} = 4.87$, $P = 0.03$; ; $\eta^2 = 0.11$). Correlation between both of those measures of social status was high ($r = 0.68$; $P < 0.05$).

Social Status of the Model

The repeated-measures General Linear Model on the NRS pain ratings revealed a statistically significant main effect for rating ($F_{(1, 57)} = 11.69$, $P < 0.002$; $\eta^2 = 0.17$) and for the following interactions: trial and model's status ($F_{(14, 399)} = 4.02$, $P < 0.001$; $\eta^2 = 0.12$), rating and model's status ($F_{(2, 57)} = 4.05$, $P < 0.03$; $\eta^2 = 0.13$), and trial and rating ($F_{(7, 399)} = 5.28$, $P < 0.001$; $\eta^2 = 0.09$), but not for model's status ($F_{(2, 57)} = 0.28$, $P < 0.76$; $\eta^2 = 0.01$), trial ($F_{(7, 399)} = 0.67$, $P < 0.7$; $\eta^2 = 0.01$), or the interaction between rating, model's status, and trial ($F_{(14, 399)} = 1.44$, $P < 0.14$; $\eta^2 = 0.05$).

A planned comparison test on placebo- against control-associated NRS ratings in the experimental groups (HSM and LSM) as compared with the control group showed that placebo analgesia was successfully induced in both the HSM ($F_{(1, 57)} = 7.56$, $P < 0.008$; $\eta^2 = 0.12$) and LSM ($F_{(1, 57)} = 4.06$, $P < 0.05$; $\eta^2 = 0.07$) groups. The participants in the experimental groups rated pain stimuli that were preceded by placebo stimuli as significantly less painful than pain stimuli that were preceded by non-placebo stimuli; however, the difference in the magnitude of induced placebo analgesia between the HSM and LSM groups was found to be nonsignificant ($F_{(1, 57)} = 0.54$, $P = 0.47$; $\eta^2 = 0.009$) (Figure 2).

Multiple linear regression was performed for both (indirect and direct) measures of social status of the model separately, as those two measures were found to be highly correlated and therefore should not be both included in one multiple regression analysis [27]. In the first analysis, participants' ratings of the model's social status characteristics combined into one scale (*respectable, wealthy, educated,* and *influential*) was an independent variable, and the difference between placebo- and control-associated NRS ratings was a dependent variable. It showed that the social status scale significantly accounted for the variance (corr. $R^2 = 0.08$; $P < 0.05$; β = 0.32). However, the multiple linear regression performed for the rating of the model by means of the direct status question (independent variable) and the difference between placebo- and control-associated NRS ratings (dependent variable) did not reach significant variance (corr. $R^2 = 0.05$; $P = 0.16$; β = 0.22).

Empathy of the Observer

The forward stepwise multiple regression analysis (performed in the model condition with IRI subscales scores as independent variables and the difference between placebo- and control-associated NRS ratings as a dependent variable) showed that two of the variables (EC and PT) significantly accounted for the variance (corr. $R^2 = 0.24$, $F_{(2, 37)} = 7.07$, $P = 0.003$). We found that EC was a significant predictor ($P < 0.003$, β = −0.4) and PT was a marginal predictor ($P < 0.06$; β = 0.28) of placebo analgesia.

Extinction of Placebo Analgesia

In Figure 3, which presents the mean pain ratings for placebo and non-placebo stimuli in all eight trials in the two experimental groups, it can be seen that over time, the difference between placebo- and control-associated NRS ratings seems to decline (which could mean that placebo analgesia diminishes) and also that in the control group the stimuli started to be rated as more painful over time.

To verify these observations, post hoc tests were conducted on placebo- against control-associated NRS ratings throughout all the trials (1–8) in all the groups. The analysis revealed statistically significant differences between placebo- against control-associated ratings in the HSM group for the first trial ($P < 0.001$), for the second trial ($P < 0.001$), and for the third trial ($P < 0.001$). In the LSM group, the difference was also significant for the first trial ($P < 0.001$) and for the second trial ($P < 0.001$). The differences in the rest of the trials in the experimental groups were nonsignificant. In the control group, the differences between the NRS ratings were nonsignificant in all the trials. Additionally, a post hoc test on the difference in NRS ratings between the first half (1–4) and the second half (5–8) of the trials in all the groups was conducted. This analysis revealed that the first half of the trials were rated significantly lower than the second half of the trials ($P < 0.02$) in the control group in contrast to the experimental groups, where the first four trials were rated higher than the last four trials ($P < 0.05$).

Discussion

The present study tested the effect of a model's social status on the magnitude of placebo analgesia induced by observational learning. Our first hypothesis, based on the results of previous studies [6, 8, 10], was that placebo analgesia would be successfully induced in both experimental groups in which participants observed a video recording of a model experiencing placebo analgesia. Indeed, the difference between pain ratings associated with placebo and non-placebo stimuli was observed in both experimental groups, whereas no such effect was found in the control group. Thus, our study replicated the findings of previous studies [6, 8, 10].
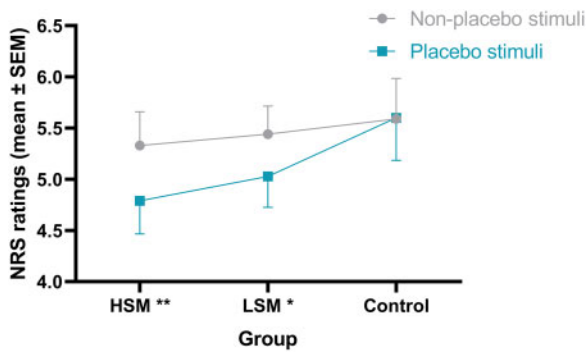
Figure 2. Mean pain intensity ratings on the NRS in each of the study groups. A statistically significant difference between placebo- and control-associated pain ratings (placebo analgesia) was observed in both experimental (HSM and LSM) groups. *$P < 0.05$, **$P < 0.01$.
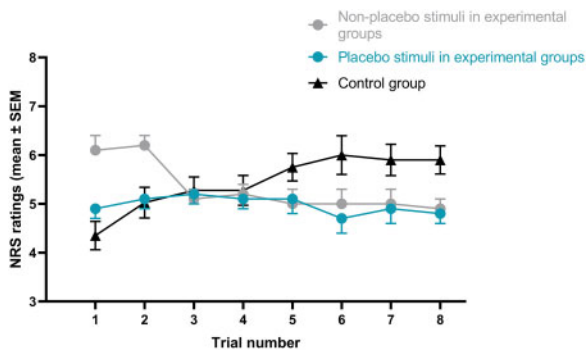
Figure 3. Mean pain ratings on the NRS for placebo and control stimuli in all trials and all groups.

Our second hypothesis, which was based on social learning theory [15] and the results of previous studies [16–20, 28], stated that placebo analgesia in the group in which participants observed the high-status model would be greater than that in the group in which participants observed the low-status model. Although our experimental manipulation was successful (the model was rated as having significantly higher status in the HSM group than in the LSM group), placebo analgesia was of similar magnitude in both these groups. However, we found that the social status of the model predicted the magnitude of placebo analgesia: Regardless of the experimental condition, observational learning produced greater placebo analgesia in participants who perceived the status of the model as higher. To the best of our knowledge, this is the first study to prove that perception of a model's social status can influence the magnitude of placebo analgesia induced by observational learning.

However, only indirect measurement of social status (the scale) was a significant predictor; the direct question about status was not. We speculate that participants felt it might have been tactless and socially unacceptable if they had directly rated one model's social status as very low. As they observed the janitor model during both the "interview" (in which he responded to some questions

about himself) and undergoing the experimental procedure, they might have felt ashamed to rate the social status of this model (with whom they were a bit familiar after the interview) as very low. However, this was not the case when they rated his status on the scale that consisted of many other buffer adjectives that were not related to status (for which the model could get higher ratings). This interpretation also complies with our results showing that the effect of the experimental manipulation (the difference in ratings of the status of the model between the HSM and LSM groups) was indeed stronger when social status was measured indirectly rather than directly.

Nonetheless, a question arises: Why was no difference in the magnitude of placebo analgesia found between the HSM and LSM groups, even though our experimental manipulation was successful? The first possible explanation is that social status is a complex concept that is difficult to measure on one simple scale, as this construct can be seen as consisting of different factors among different groups and communities [29]. This could be why the magnitude of placebo analgesia was found to be influenced only by the participants' individual perceptions of a model's status, and not by the experimental manipulation.

The second possible explanation is that research based on social perception theory shows that the two independent universal dimensions of social cognition, i.e., warmth and competence, provide fundamental social and structural answers about one's competition and status as they promote survival (by informing others in the environment whether somebody is a friend or an enemy) [30, 31]. It seems possible that even though the status of a model was perceived on the competence dimension as either high (professor) or low (janitor), their perception on the warmth dimension might have distorted and influenced the observational learning process. This also may have contributed to the fact that we found a significant influence of participants' individual model ratings on placebo analgesia, unlike the difference in the magnitude of the effect between the HSM and LSM groups.

Third, the fact that we did not find a difference between the HSM and LSM groups could also be explained by the nature of pain, which is a basic adaptive reaction that is common to animals and people and that informs them about potential dangers, thereby increasing the likelihood of survival [32]. Therefore, information about painful stimulation might be important enough to arouse vigilance and influence attentional and motivational processes, regardless of the social status of the person from whom it is coming. According to social learning theory , these processes influence the efficacy of learning, which could explain why the analgesic effect was similar in both groups.

Nevertheless, our study is the first to show that the perceived social status of a model can influence the magnitude of placebo analgesia induced by observational

learning. Therefore, we have confirmed and broadened the results of previous research [16–20, 28] based on social learning theory, as we have shown that the behaviors and reactions of people perceived as more powerful, influential, and wealthy are more likely to be followed by others and implemented in their behavioral repertoire; this also applies to behaviors and reactions related to pain. However, in our study, we used only a male model, as a previous study showed that observing a male model induced a greater placebo effect than observing a female model, regardless of the sex of the observer [9]. Thus, it should be taken into account that using a female model in this study might also result in a weaker placebo effect.

It is also interesting that our results show that empathy can play a role in placebo analgesia induced by observational learning, as we found that empathic concern and perspective taking were significant predictors of placebo analgesia, which had previously been proved only in studies with placebo effects induced by behavioral modeling (observing a live model) [6, 8, 9, 11]. In comparison with previous research that did not find empathy to be a predictor of placebo effects [7, 11], this difference could be due to the fact that we included the "interview phase" before the proper learning phase, which made it possible for the participants to get a little more acquainted with the model than in previous studies, and thus they could have empathized with him more.

Another interesting result that was found in our research is a possible extinction of placebo analgesia over time. As we observed in both experimental groups, placebo analgesia was found only in the first three trials in the HSM group and the first two trials in the LSM group out of the total of eight trials. This result stands in contradiction to previous studies that showed no extinction of the effect over time [6, 7]. On the other hand, we found that in the control group, pain was lower in the first four trials (1–4) than in the last four trials (5–8), which is a pattern contrary to the one observed in the experimental groups, where trials 1–4 were rated higher than trials 5–8. This may indicate that in the control group we observed naturally occurring sensitization, which was prevented in the experimental groups. A similar pattern was recently found in another study on placebo analgesia induced by observational learning [33]. This is an interesting result that could suggest that even though placebo analgesia may weaken over time, it can still diminish pain sensation in general, in comparison with a condition where people do not undergo observational learning. Hence, further research on both diminishing placebo analgesia over time and resistance to sensitization is needed, as it may bring useful conclusions for both placebo studies and clinical practice.

Some limitations of our study should be acknowledged. First, we studied acute experimental pain, which is of a different nature from clinical pain, and thus our results may not be entirely transferable to clinical settings. Second, we did not control for the social status of the participants, which could have influenced the effect; however, research has shown that a participant's similarity to a model does not always have an influence on the placebo effect [9].

The results of our study may have important clinical implications for pain management. As learning through observation influences pain experience and can induce placebo analgesia, it can be used in pain therapy. However, the status of a potential model, probably along with their other characteristics, can determine the efficacy of pain therapy. For this reason, research on models' characteristics seems to be crucial to improve treatment effectiveness.

The results of our study supplement the knowledge about the influence of models' characteristics on placebo effects induced by social observational learning. Previous research showed that the sex of a model [9], the self-confidence of a model [34], or the number of models observed [33], among other factors, may alter the magnitude of placebo effects. Therefore, it seems crucial to further investigate both the characteristics of a model that could influence placebo effects and the factors that could alter the functioning of an observer, e.g., evaluative conditioning [35] or susceptibility to hypnosis [36], as well as their neural mechanisms and psychophysical correlates.

Conclusion

Placebo analgesia was successfully induced in the experimental groups in which social observational learning was used. There was no difference in the magnitude of the effect between the group that observed a high-status model and the group that observed a low-status model. However, the perceived social status of the model was a significant predictor of the magnitude of placebo analgesia. The perception of the model's status as higher predicted greater effect, regardless of the experimental condition. More research is needed to test the effect of other characteristics of models on placebo effects induced by observational learning.

Acknowledgments

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