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Self-esteem and emotional reactivity of actors and magicians: a comparative study

Abstract: Self-esteem and emotional reactivity may be important personality determinants of human functioning in situations of social exposure. In this study, we compared the levels of these personality variables in a group of professional theater actors and a group of professional illusionists with a control group of participants who were neither actors nor illusionists and had no artistic education. We also examined the correlations between emotional reactivity and self-esteem in the three groups. For emotional reactivity, we found (1) very strong evidence that the level is less for magicians than for controls, (2) substantial evidence that the level is less for magicians than for actors, (3) anecdotal evidence that the level is less for actors than for controls, and (4) decisive evidence that the average score is less for males than for females. For self-esteem, we found (1) anecdotal evidence that the level is higher for magicians than for controls, (2) substantial evidence that there is no difference between actors and magicians, (3) anecdotal evidence against a difference between actors and controls, and (4) anecdotal evidence against a difference between males and females. Based on the entire sample we found a moderate correlation between self-esteem and emotional reactivity ($r = -.30$, $p < 0.001$). Our results are compatible with the notion that emotional reactivity – as part of the temperament concept – is a factor influencing the choice of an artistic profession.

Keywords: *theater actors, magicians, self-esteem, emotional reactivity*

INTRODUCTION

Performing arts like theater acting or stage magic requires having traits that make it possible to successfully conduct performances and convey emotions to the audience. The art of stage magic and the art of theater acting are visual arts in which the artists take on certain roles. The actor plays, as accurately as possible, a character according to a certain script. This involves conveying the emotions and the way of being of the character and becoming the character played, as it were (Konijn, 2000). As Goldstein and Winner (2012) put it, "acting is a peculiarly human activity in which we realistically pretend to be another person without any intent to deceive" (2017, p. 20). An illusionist is defined as an actor who, on stage, plays the role of a magician (Robert-Houdin, 1858). Nardi (2010), referring to this interpretation of the illusionist, indicates that to make the audience actually believe that the performer has supernatural abilities, the role played by the illusionist has to be very convincing. Magicians can achieve this goal by creating illusory experiences of impossibility induced "purely by psychology, handling and acting" (Swiss, 2012, p. 209). Apart from personality traits, emotional intelligence, cognitive functions, a sense of self-efficacy and social competences, temperament – including emotional reactivity- and self-esteem are particularly important in the context of public performance and visual arts. These variables may determine the success of stage performance and are associated with people's inclination to engage in stage activity as a performer - actor or as an illusionist (Dudek & Hauk, 2010).

The aim of the present article is to elucidate how emotional reactivity and self-esteem differ between artists (actors and magicians) and non-artists, as well as between actors and illusionists. Furthermore, we were interested in establishing the relationship between emotional reactivity and self-esteem, and whether this relationship is different for the above mentioned different groups. The obtained results may be of interest to people undertaking stage activity, by providing an understanding of the functioning of artists in the context of the social exposure situation and the role of self-esteem and emotional reactivity in performing on stage. There is still very little research on the personality traits of artists, especially those of illusionists, which are important for artistic functioning and related with stage performance.

Stage performance and emotional reactivity

Strelau's (1993) Regulative Theory of Temperament (RTT) assumes that "temperament refers to basic, relatively stable personality traits which apply mainly to the formal aspects of reactions and behaviour (energetic and temporal characteristics)" (Strelau, 1993, p. 117). According to the theory, these traits are present from early childhood, occur both in humans and animals (Strelau, 1993) and have the status of biologically determined and generalized tendencies to certain behaviors (Strelau, 2006). Emotional reactivity is one of the seven dimensions of RTT, as developed by Zawadzki and Strelau (1997) and revised by Cyniak-Cieciura, Zawadzki and Strelau (2016) and seems to be – among other temperament traits – mostly related to stage performing. It is defined as the "tendency to react intensively to emotion-generating stimuli, expressed in high emotional sensitivity and in low emotional endurance" (De Pascalis, Zawadzki & Strelau, 2000, p. 288). People with a high level of emotional reactivity are more easily affected by intense emotions, have a high level of excitability, and perform less well under stress – which is associated with low emotional resistance. High reactivity is manifested in emotional and sensual sensitivity and low-quality performance, while low levels of emotional reactivity is manifested in high quality performance and the capacity to endure strong and long-term emotional stimulation. Emotional reactivity is mainly associated with negative emotions such as anxiety.

In addition, people with high emotional reactivity tend to reduce the level of performance in stressful situations (Strelau, 2002). Emotional reactivity is associated with a greater tendency to respond to stress from environmental stimuli. Highly reactive people are also characterized by a stronger tendency to focus on negative emotions and anxiety (Strelau, 2002). Moreover, people with a high level of emotional reactivity, tend to declare to experience lower well-being, possibly because of a decreased effectiveness in functioning in stressful situations (Strelau, 2008). People with a low level of emotional reactivity tend to react with low emotional agitation even to strong stimuli and tend to be more resistant to stressful situations. Conversely, people with high levels of emotional reactivity tend to be less emotionally resilient and more prone to negative emotions (Strelau, 2006).

Low emotional reactivity is the dimension of temperament that is most conducive to making commitments and identifying with them (Lachowicz-Tabaczek & Śniecińska, 2008). Actors and illusionists have to make a host of commitments in order to advance their artistry, and since low emotional reactivity is most conducive to making commitments and identifying them (Lachowicz-Tabaczek & Śniecińska, 2008), high emotional reactivity could make this difficult. Moreover, emotional reactivity is a dimension that is characterized by a tendency to react emotionally, is a moderator in the assessment of stress, and is strongly related to the experience of emotional states – especially negative ones (Zawadzki & Strelau, 1997). Practicing as an actor involves taking care of many tasks related to the technical preparation of the role, such as remembering the text, designing the costume, mastering the stage space, working under time pressure, and agreeing with the director and other actors about the concept of individual characters (Hys & Nieznańska, 2007). Nurkiewicz (2002) showed that there is an inverse relationship between emotional reactivity and action orientation. Mądrzycki (1996) claims that high emotional reactivity promotes shyness, while Hammond and Edelmann (1991) showed that actors (compared to non-actors) are less shy, have lower social anxiety and are less susceptible to information related to social comparisons. High levels of emotional reactivity is a factor that makes functioning in a situation of social exposure very difficult. Both theater actors and illusionists are in this kind of situation during performances. Accordingly, we expect that actors and magicians tend to have lower level of emotional reactivity than non-performers.

Stage performance and self-esteem

Self-esteem is related to individuals' overall evaluations of their own worth (Rosenberg, 1965). This psychological construct may be defined as "way of being, thinking, feeling and acting that implies that one accepts, trusts and believes in oneself" (Gocmen, 2012, p. 2). Self-esteem is related to the degree to which a person is perceiving him - or herself as capable and effective. It is also related to the extent to which the individual feels valuable (Cast & Burke, 2002). Self-esteem plays an important role in the functioning of artists. It facilitates coping with stress and improves mental functioning, creative abilities as well artistic performance (Nordin & McGill, 2009). As Konijn (2000) points out, people in the acting profession are expected to have appropriate personality competences related to the management of emotions, appropriate self-presentation and social competences. This sense of competence affects well-being and has a positive effect on self-esteem. This may, in turn, contribute to the desire for further development. Positive reception of their acting performance may give actors positive feedback and can improve their self-esteem accordingly (Nicol & Macfarlane-Dick, 2006). Taylor (2016) points to the role of actor training in improving a self-esteem, and states that actor training "can have

enormous strength-building benefits for participants, including confidence and self-esteem, the ability to collaborate, communicate, empathies and appreciate other points of view, to name just a few" (p. 5).

People with high self-esteem consider themselves competent and want others to appreciate their competence. They are more persistent and take on numerous tasks (Łaguna, Lachowicz-Tabaczek & Dzwonkowska, 2007). People with high self-esteem strive for positive self-presentation (Łaguna, Lachowicz-Taczek & Dzwonkowska, 2007), set realistic goals that they successively pursue (Kulas, 1986), are characterized by self-respect, boldness, self-confidence and easy establishment of interpersonal contacts (Grabowiec, 2011). People with high self-esteem are able to refer to more positive experiences and show a higher level of life satisfaction (Diener & Diener, 1995). Wegscheider-Cruse (2007) reports that people who are characterized by low self-esteem are less likely to enter into close interpersonal relationships, while research conducted by Hys and Nieznańska (2007) showed that actors focus on looking for social contacts. High self-esteem may contribute more to success than low self-esteem (Bandura, 1982). High self-esteem prompts taking action and trying to cope with threats, while low self-esteem is associated with a tendency to avoid action and flee from danger (Bednar, Wells & Peterson, 1989).

Self-esteem is one of the most important personality determinants of human functioning in situations of social exposure. How an individual perceives the situation of social exposure as a favorable or difficult situation depends on the level of the individual's self-esteem. An important aspect of artistic professions is that they involve frequent exposure to the evaluation of others. Therefore, it appears advantageous for actors and magicians to have a level of self-esteem that allows him or her to read the situation of social exposure as favorable, despite the potential threats to his or her self-esteem (Hys & Nieznańska, 2001).

Performing as a magician may be argued to involve particular potential sources of threats to self-esteem. Failing to perform a magic trick successfully is obviously rather aversive and potentially humiliating, and particularly to the novice magician, the risk of failure is both real and difficult to assess. As Darwin Ortiz (2011) puts it, "for many magicians, doing a sleight-of-hand trick, in particular, is like running an obstacle course, from move to move to move … so for them, the trick is, going from move to move without dying". The risk of failure at performing sleight-of-hand tricks, can obviously be significantly reduced by serious amounts of practice in advance. But in addition to the challenge of practicing the technical aspects of a trick well enough to feel confident it can be performed flawlessly in a stressful situation, there is also another, perhaps more fundamental barrier that makes it difficult for magicians to feel confident that the tricks they perform will be successful. Since the magician's knowledge about the trick, as well as his or her conceptual (and visual) perspective on the trick, is very different from that of the spectators, it is far from trivial to assess how the trick (or the magician's particular handling of it) will be experienced from the spectators' point of view. Thus, magicians, particularly novice or hobby performers, often grapple with "magician's guilt". That is, they often needlessly worry that the secret method or handling is too obvious to fool the audience. One plausible reason why magicians often feel this way is that many magic tricks are much more robust and deceptive than one would naively expect based on a description of how it is performed[1] (Ekroll, Sayim & Wagemans, 2013; 2017; Ekroll, 2019; Pailhès, Kumari & Kuhn, 2020; Tompkins, Woods, & Aimola Davies, 2016; Svalebjørg, Øhrn & Ekroll, 2020). Thus, performing magic publicly is fraught with subjective doubts and uncertainties and can be a very nerve-wrecking experience which requires a considerable degree of confidence. The approach to the presentation of magic changes with the acquisition of experience — as Jay (2021) points out, professional magicians tend to convince themselves they can do something better than others. He emphasizes how believing in yourself and your own abilities is an important part of being a magician and a factor that enables one to develop as a performer. Thus, performing magic may require high level of self-confidence, self-efficacy, self-esteem and a low level of emotional reactivity. It is worth pointing out, that emotional reactivity is negatively correlated with extraversion (Cyniak-Cieciura, Zawadzki & Strelau, 2016) which seems to be helpful in social functioning – especially for stage performers. Being a magician and "reaching professional level requires years of professional training and acquisition of a multifaceted body of cognitive, motoric, social, and performance-related know-how. In this regard, magic shares important characteristics with other fields of creative professional expertise" (Rissanen, et al, 2017, p. 14). Years of gaining experience and becoming an expert in one field may has positive impact on self-esteem. Being an actor or a magican are both likely to be facilitated by appropriate personality predispositions, hence we expect both actors and magicians to have a higher level of self-esteem than the control group.

Self esteem and emotional reactivity

As the findings presented by Heimpel et al. (2002) suggest, avoidance is based on temperament and is related with emotional reactivity — individuals with high levels of emotional reactivity tend to have lower self-esteem, which in turn leads to a choice of unambitious goals. Therefore, it can be assumed that self-esteem is also associated with a temperamental tendency to take up challenges or avoid them. People who have low self-esteem, in addition to experiencing more negative emotions, show little tendency to take action, resist difficulties and take up challenges. Conversely, people with high self-esteem tend to be more active and ready to take risks to achieve a desired goals. As Lachowicz-Tabaczek and Śniecińska (2008) show, emotional reactivity is also negatively correlated with self-efficacy, positive affect and activity. Current research

[1] This is presumably a major reason why descriptions of how to perform a magic trick in instructional textbooks are typically preceded by a description of what the spectators actually experience.

shows that self-esteem is negatively linked with emotional reactivity (Lachowicz-Tabaczek, 2006). Moreover, self-esteem is more strongly correlated with negative emotions than with positive ones (Lachowicz-Tabaczek & Śniecińska, 2008). Emotional reactivity is negatively correlated with traits such as openness, extraversion, self-sentiment, and conscientiousness (Strelau & Zawadzki, 1995). Accordingly, we expect that there should be a negative correlation between self-esteem and emotional reactivity.

Magicians and actors may be expected to be similar to each other with respect to some issues but differ in others. Both groups need acting skills and the ability to influence the emotions of the audience. They also need self-presentation skills and confidence during the performance on the stage (Olf, 1974; Weber, 2019; Silva, Menezes & Coimbra, 2012). However, as pointed out by Rissanen et al. (2017, p. 14), "magic diverges from many other fields of creative work in that it entirely relies on informal cultivation of professional competence without formal education or legislated credentials". Unlike magicians, actors are typically educated in acting schools, where professional actors are teachers. They learn the game and stage movement, diction, voice modulation, and body control. They develop their knowledge and skills not only through practical classes, but also through the implementation of theoretical subjects that raise the general level of culture. They develop the skills of contact with the audience and other actors playing on stage, learn about the types of acting styles, develop situational and emotional memory, learn about the sociology of theater, knowledge about theater, and interpretation of the roles played. Artistic education has a great influence on the character of future actors (Mróz, 2008; Goldstein & Winner, 2017). Becoming a theater actor is a dream of many young people and their work is perceived as exceptional (Hebda & Madejski, 2004). Each year, in Poland, there are about 1200 people applying to 20-25 positions at each universities that educate future actors (Mróz, 2015). This mean that actors may have a higher level of self-esteem than magicians — actors perform a profession that is perceived by society as prestigious and have better educational background related to performing on stage. Thus, in summary, we formulated the following hypotheses:

1. Stage performers tend to have lower levels of emotional reactivity than people who are not stage artists.
2. Stage performers tend to have higher self-esteem than people who are not stage artists.
3. Actors tend to have higher levels of self-esteem than illusionists.
4. There is negative correlation between emotional reactivity and self-esteem

MATERIALS AND METHOD

Sample and procedure

The research was carried out in Poland. A total of 210 people took part in the study, including 53 professional illusionists (all male), 52 professional theater actors (24 females and 38 males) and a control group of 105 people (66 females and 39 males) who were not stage artists (see Table 1). The age ranged from 25 to 64 years (M = 39; SD = 11.8) in the group of actors, from 16 to 70 (M = 29.3; SD = 11.2) in the group of illusionists and from 21 to 67 (M = 35.9; SD = 11.9) in the control group. The theater actors were recruited from theaters that consented to participate in the research, namely: *Nowy Teatr im. Witkacego* in Słupsk, *Teatr Dramatyczny im. Aleksandra Węgierki* in Białystok, *Teatr im. Ludwika Solskiego* in Tarnów, *Bałtycki Teatr Dramatyczny im. Juliusza Słowackiego* in Koszalin, *Teatr im. Adama Mickiewicza* in Częstochowa, *Teatr im. Stefana Jaracza* in Łódź, *Teatr Rozrywki* in Chorzów, *Teatr Miejski* in Gliwice, *Teatr Witkacego* in Zakopane, *Teatr im. Juliusza Osterwy* in Lublin. The illusionists were recruited by informing about the study at meetings, conferences and workshops dedicated to illusionists, such as the *Warsaw Magic Conference*, the *Kraków Magic Session,* meetings at the *Magiczne Studio Arsene Lupin* and the *Częstochowskie Spotkania z Iluzją*. People from the control group were neither actors nor illusionists and had no artistic education. People interested in participating in the research received a set of questionnaires, then returned them by mail or personally at the next event of the Polish illusionists community. Magic is male-dominated art, and even some magical organizations did not admit women until certain time (Jay, 2021). Gygax, Thomas, Didierjean and Kuhn (2019) showed that if the woman magician showed a trick, her skills were rated worse than when it was a man (in fact, hands belonged to the same person).

Table 1. Number of participants for each combination of group and sex.

		Group			
		Magicians	**Actors**	**Controls**	**Sum**
Sex	Female	0	24	66	90
	Male	53	28	39	120
	Sum	53	52	105	210

The Participants in the control group (N = 105) were mainly recruited using the snowball method (Goodman, 1961). This means that each member in an initially recruited small group of respondents recommends other people who are also invited to participate in the research. That method was started after getting about 30 respondents in control group. In relation to their occupation, respondents from the control group can be divided into three groups – office workers (52,4 %), healthcare workers (17,1 %) and manual workers (28,6%). Two respondents were retired.

Instruments

Formal Characteristics of Behavior - Temperament Questionnaire Revised Version (FCB-TQ(R)) is a tool intending to measure the basic, originally biologically conditioned dimensions of temperament, constituting

a component of the personality according to the Regulatory Theory of Temperament. The inventory contains 100 statements, on which the respondent responds on a four-category scale, where 1 – strongly disagree, 2 – disagree, 3 – agree and 4 – strongly agree. Cronbach's alpha internal concordance coefficients obtained for each of the scales indicate a high reliability of the tool, ranging from α = .73 to α = .88 (Cyniak-Cieciura, Zawadzki & Strelau, 2016). In the current study, we found a value of α = .85 for the Emotional Reactivity scale (including 15 items). The minimum possible score to be obtained by the subjects for the Emotional Reactivity scale is 15, and maximum – 60.

The Self-Esteem Scale (SES) consists of 10 items and measures the level of global self-esteem in relation to the positive and negative feelings of an individual about him- or herself. The person who takes part in research procedure indicates to what extent he or she agrees with each of the items on a four-point scale. The scale has a high reliability coefficient of α = .82 (Łaguna et al., 2007). In the current study, we found a value of α = .81 for the Self-Esteem Scale. The minimum possible score to be obtained by the subjects is 10, and maximum – 40.

RESULTS

Emotional reactivity

Fig. 1A shows violin plots of the emotional reactivity for the three groups of participants, plotted separately for males and females. The dots connected by the lines are the means and the error bars show ± 1 SEM. At the descriptive level, we see that the average emotional reactivity is lower for males than for females. Both for males and females, the average emotional reactivity is less for the actors than for the control participants. Also, the average emotional reactivity for the magicians (who were all male) is smaller than for the males in the other two groups.

To evaluate the statistical evidence for the main effects of group and sex, as well as the possibility of an interaction, we performed Bayesian t-tests and ANOVAS using JASP (JASP Team, 2023). Since there were no female magicians in our sample, we restrict comparisons involving the magicians to the male participants in the other two groups (actors and controls). Fig. 2A, C shows the results of a Bayesian t-test comparing emotional reactivity for magicians and controls, while Fig. 2B, C shows the same for the comparison between magicians and actors. A Cauchy prior with a scale parameter of 0.701 was used for the effect size, which is the default setting in JASP (see Ly, Verhagen & Wagenmakers, 2016, for the rationale behind using this prior).

As can be seen in Fig. 2A, the compari on between magicians and controls yielded a Bayes factor BF_{01} = 82.5, which only constitutes “very strong” evidence in favor of a difference according to Jeffreys’ terminology (Jarosz & Wiley, 2014). Fig. 2C shows how the Bayes factor depends on the scale parameter used for the Cauchy prior. The Bayes factor varies in the range between 30 and 100, which is considered “very strong” evidence in favor of a difference.

As can be seen in Fig. 2 B the comparison between magicians and actors yielded a Bayes factor BF_{01} = 3.7, which constitutes “substantial” evidence in favor of a difference according to Jeffreys’ terminology. Fig. 2D shows that the Bayes factor obtained is fairly stable against changes in the scale parameter used for the Cauchy prior.

To analyze the difference between actors and controls, as well as that between men and women, we performed a 2-by-2 Bayesian ANOVA. The default priors of JASP were used (r scale 0.5). As can be seen in Table 2, the Bayes factor relative to the null model is largest for the model including both sex and group as factors, but no interaction. The Bayes factor of 5115 means that the data are 5115 times more likely given this model than given the null model. The Bayes factor for the winning model (sex + group) relative to the same model including an interaction (sex + group + sex * group) is 5031/1513 = 3.3. That is, the data are 3.2 times more likely given the model *without* the interaction than given the model *including* the interaction. Compared to the null model, the statistical evidence for the model including only an effect of sex

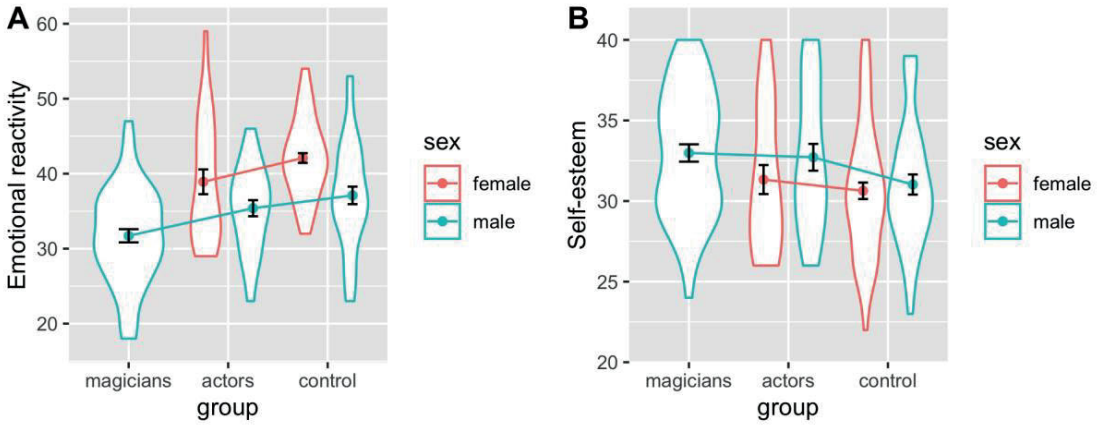

Figure 1. (A) Violin plots of the emotional reactivity scores for the three groups, plotted separately for males and females. The points connected by the lines are the sample means, and the error bars show ± 1 SEM. (B) Same as (A), but for the self-esteem scores. Note that there were no female magicians in our sample.

Fig. 1 and Figs. 6-8 were prepared with R (R Core Team, 2022), version 4.2.2 (2022-10-31) and ggplot2 (Wickham, 2016), version 3.4.2.

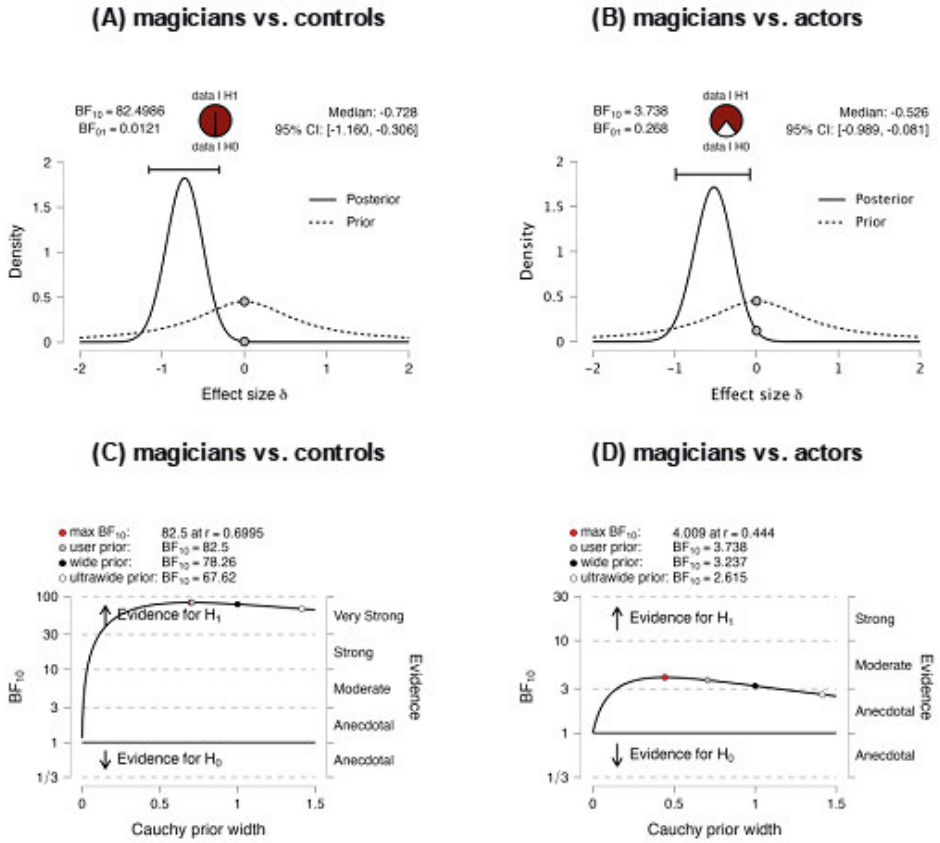

Figure 2. (A, C). Results from a Bayesian t-test comparing the emotional reactivity scores of magicians with those of controls. (B, D).Results from a Bayesian t-test comparing the emotional reactivity scores of magicians with those of actors.

Table 2. Results from a 2-by-2 Bayesian ANOVA analyzing the effect of the independent variables "sex" and "group" (actors vs. controls) on emotional reactivity.

Model Comparison		
Models	**BF_{10}**	**error %**
Null model	1.000	
group + sex	5031.521	2.843
sex	2544.932	5.158×10^{-10}
group + sex + group * sex	1513.464	2.566
group	6.688	0.004

(BF_{01} = 2544) is "decisive" according to Jeffreys' terminology (Jarosz & Wiley, 2014). Also compared to the null model, the statistical evidence for the model including only an effect of group (actors vs. controls, BF_{01} = 6.688) is "substantial". Yet, comparing the model with both sex and group as factor with the model including only sex yields a smaller Bayes factor (BF_{01} = 5131/2544 = 2.0), that would be classified as mere "anecdotal" evidence in Jeffreys' terminology. A plausible explanation for why the evidence for including the factor "group" is substantial when compared to the null model, yet only "anecdotal" when compared to the model including sex as a factor is that the two factors are correlated in the unbalanced design of our sample. As can be seen in Table 1, there is a much higher proportion of females in the group of controls (63%) than in the group of actors (46%). Thus, when the effect of sex is taken into account, there is weaker evidence for a pure effect of group (actors vs controls). The evidence for an effect of sex, on the other hand, is "decisive" both when compared to the null model (BF_{01} = 2545) and when compared to the model including only "group" as a factor (BF_{01} = 5031/6.688 = 752.2).

Fig. 3A shows the model averaged posteriors for the effects of belonging to either of the two groups and Fig. 3B shows the same for belonging to either of the sexes. Fig. 3C shows the model averaged posteriors for the interactions. Fig. 3D shows the posterior for R^2, which has a mean of 0.135 and a 95% credible interval ranging from 0.058 to 0.224. Table 3 provides a summary of the model averaged posteriors.

Taken together, the analysis of the data on emotional reactivity provides

1. very strong evidence that the average score is less for magicians than for controls,
2. substantial evidence that the average score is less for magicians than for actors,
3. anecdotal evidence that the average score is less for actors than for control and
4. decisive evidence that the average score is less for males than for females.

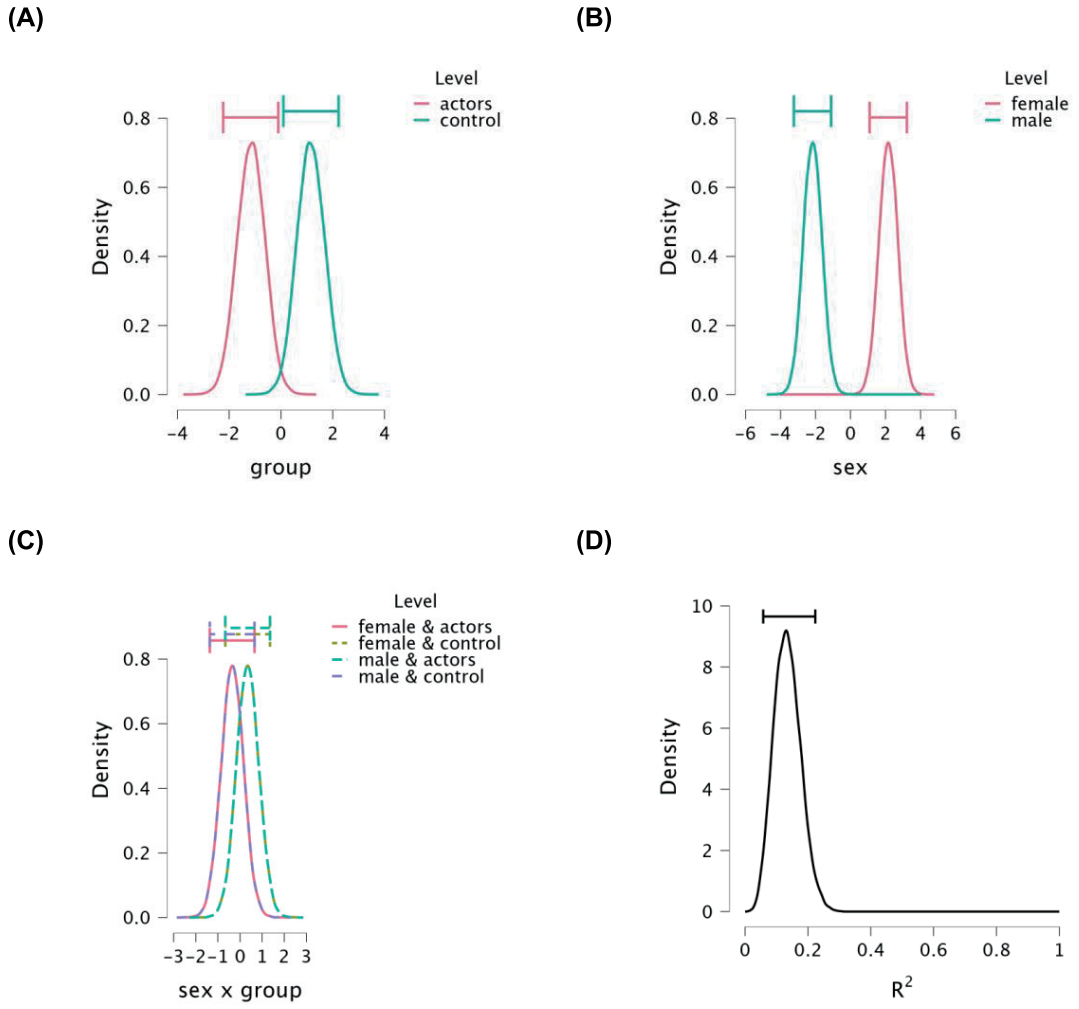

Figure 3. (A) Model averaged posteriors for the effects of belonging to either of the two groups (actors or controls) one motional reactivity. (B) Model averaged posterior for the effect of belonging to either of the sexes on emotional reactivity. (C) Model averaged posteriors for the interactions of these two factors. (D) Posterior for R^2, which has a mean of 0.135 and a 95% credible interval ranging from 0.058 to 0.224.

Table 3. Summary of the "model averaged" posteriors from the 2-by-2 ANOVA analyzing the effect of the independent variables "sex" and "group" (actors vs. controls) on emotional reactivity.

				95% Credible Interval	
Variable	**Level**	**Mean**	**SD**	**Lower**	**Upper**
Intercept		38.559	0.563	37.389	39.664
sex	female	2.169	0.533	1.103	3.227
	male	-2.169	0.533	-3.244	-1.120
group	actors	-1.162	0.534	-2.244	-0.108
	control	1.162	0.534	0.097	2.234
sex * group	female & actors	-0.352	0.502	-1.359	0.633
	female & control	0.352	0.502	-0.642	1.350
	male & actors	0.352	0.502	-0.642	1.350
	male & control	-0.352	0.502	-1.359	0.633

The estimate of the effect size (Cohen's d) for the difference between magicians and controls (Fig. 2A) is large (0.728), but the corresponding 95% credible interval is also large, ranging from -1.160 to -0.306, which indicates that there is a lot of uncertainty in the estimate. For the difference between magicians and actors (Fig. 2B), the estimated Cohen's d is of medium size (-0.526), and also here, there is a lot of uncertainty in the estimate (95% credible interval ranging from -0.989 to -0.081). Estimating corresponding effect sizes for each of the factors in the two-way ANOVA separately is potentially misleading, given that the factors are correlated in the sample. The estimated R^2 of both factors combined (0.135), however, suggest a medium-sized combined effect of the two factors, with a 95% credible interval ranging from 0.058 to 0.224 (see Fig. 3D).

Self-esteem

Fig. 1B shows violin plots of the self-esteem scores for the three groups of participants, plotted separately for males and females. The dots connected by the lines are the means and the error bars show ± 1 SEM. At the

descriptive level, the average scores are higher for the males than for the females, and higher for the actors than for the controls. The average score for the magicians (who were all males) is similar to the average score for the male actors.

Again, since there were no female magicians in our sample, we restrict comparisons involving the magicians to the male participants in the other two groups (actors and controls). Fig. 4A, C shows the results of a Bayesian t-test comparing self-esteem for magicians and controls, while Fig. 4B, C shows the same for the comparison between magicians and actors. Again, a Cauchy prior with a scale parameter of 0.701 was used for the effect size, which is the default setting in JASP.

As can be seen in Fig. 4A, the comparison between magicians and controls yielded a Bayes factor BF_{01} = 2.515, which only constitutes "anecdotal" evidence in favor of a difference according to Jeffreys' terminology (Jarosz & Wiley, 2014). Fig. 4C shows how the Bayes factor depends on the scale parameter used for the Cauchy prior. The Bayes factor varies in the range between 1 and 3, which is considered "anecdotal" evidence in favor of a difference. As can be seen in Fig. 4B, the comparison between magicians and actors yielded a Bayes factor BF_{01} = 0.25, which constitutes "substantial" evidence in favor of the null hypothesis. Fig. 4D shows that the Bayes factor decreases with prior width and lies in the range between 1/3 and 1/10, corresponding to "substantial" evidence for the null in Jeffreys' terminology, for the larger prior widths.

To analyze the difference between actors and controls, as well as that between men and women, we performed a 2-by-2 Bayesian ANOVA. The default priors of JASP were used (r scale 0.5). As can be seen in Table 4, the Bayes factor for each of the models relative to the null are less than unity, meaning that the data are more likely given the null model. The Bayes factor for the model including only "group" as a factor (BF_{01}= 0.839) constitutes mere "anecdotal" evidence in favor of the null hypothesis. The Bayes factor for the model including only "sex" as a factor (BF_{01}=0.399) also constitute mere

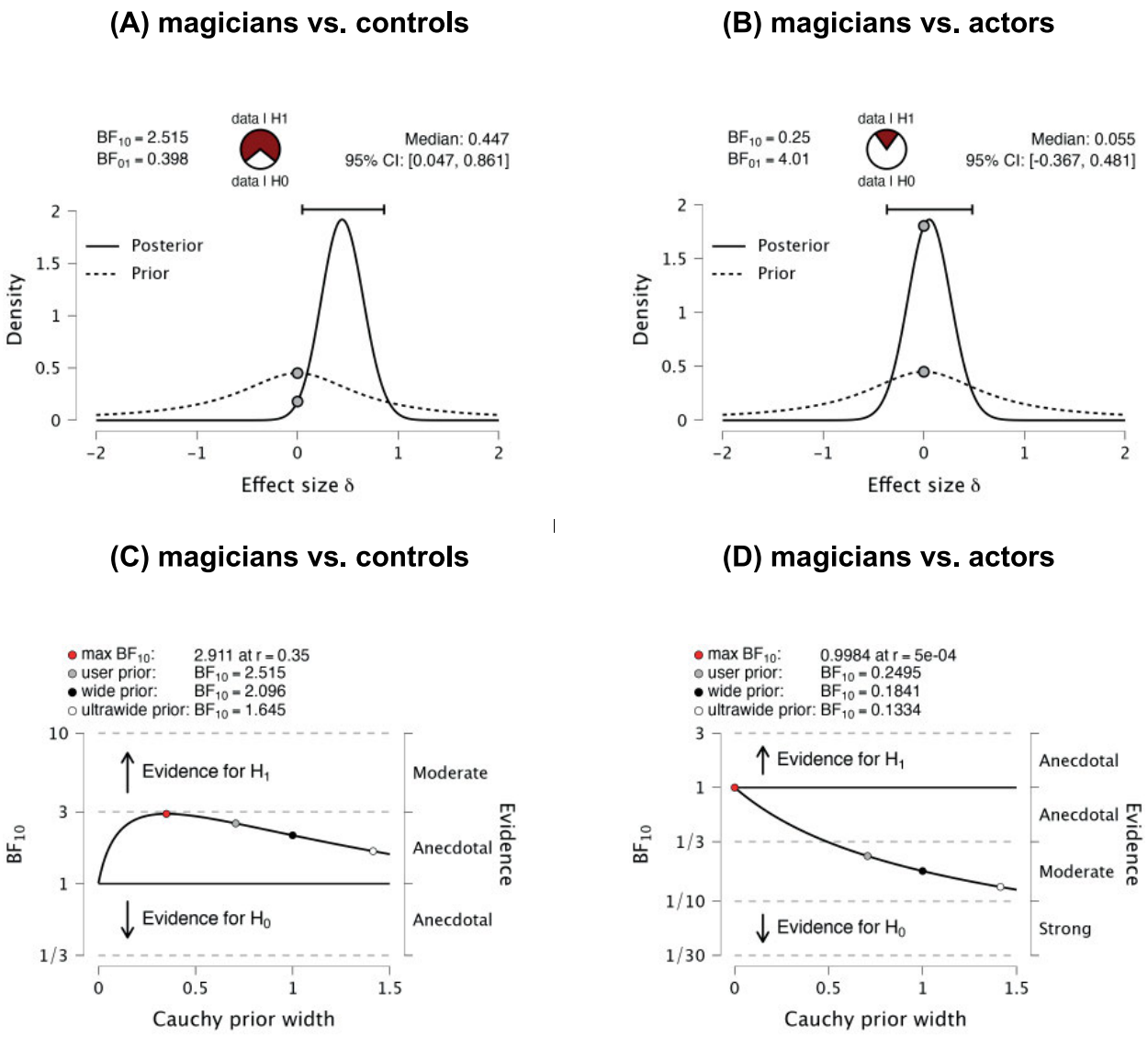

Figure 4. (A, C). Results from a Bayesian t-test comparing the self-esteem scores of magicians with those of controls. (B, D).Results from a Bayesian t-test comparing the self-esteem scores of magicians with those of actors.

Table 4. Results from a 2-by-2 Bayesian ANOVA analyzing the effect of the independent variables "sex" and "group" (actors vs. controls) on self-esteem.

Model Comparison		
Models	**BF_{10}**	**error %**
Null model	1.000	
group	0.839	0.017
sex	0.399	0.029
sex + group	0.257	3.157
sex + group + sex * group	0.076	3.570

"anecdotal" evidence in favor of the null. There is, however, "substantial" evidence (BF_{01} = 0.257) against the model including both factors. There is also "substantial" evidence (BF_{01} = 0.076) against the model including both factors and an interaction.

Fig. 5A shows the model averaged posteriors for the effects of belonging to either of the two groups and Fig. 5B shows the same for belonging to either of the sexes. Fig. 5C shows the model averaged posteriors for the interactions. Fig. 5D shows the posterior for R^2, which has a mean of 0.013 and a 95% credible interval ranging from 0 to 0.057. Table 5 provides a summary of the model-averaged posteriors.

Taken together, the analysis of the data on self-esteem scores provides

1. "anecdotal" evidence that the average score is higher for magicians than for (male) controls,
2. "substantial" evidence that there is no difference in the average score between magicians and actors,
3. "anecdotal" evidence against a difference between actors and controls,
4. "anecdotal" evidence against a difference between males and females and

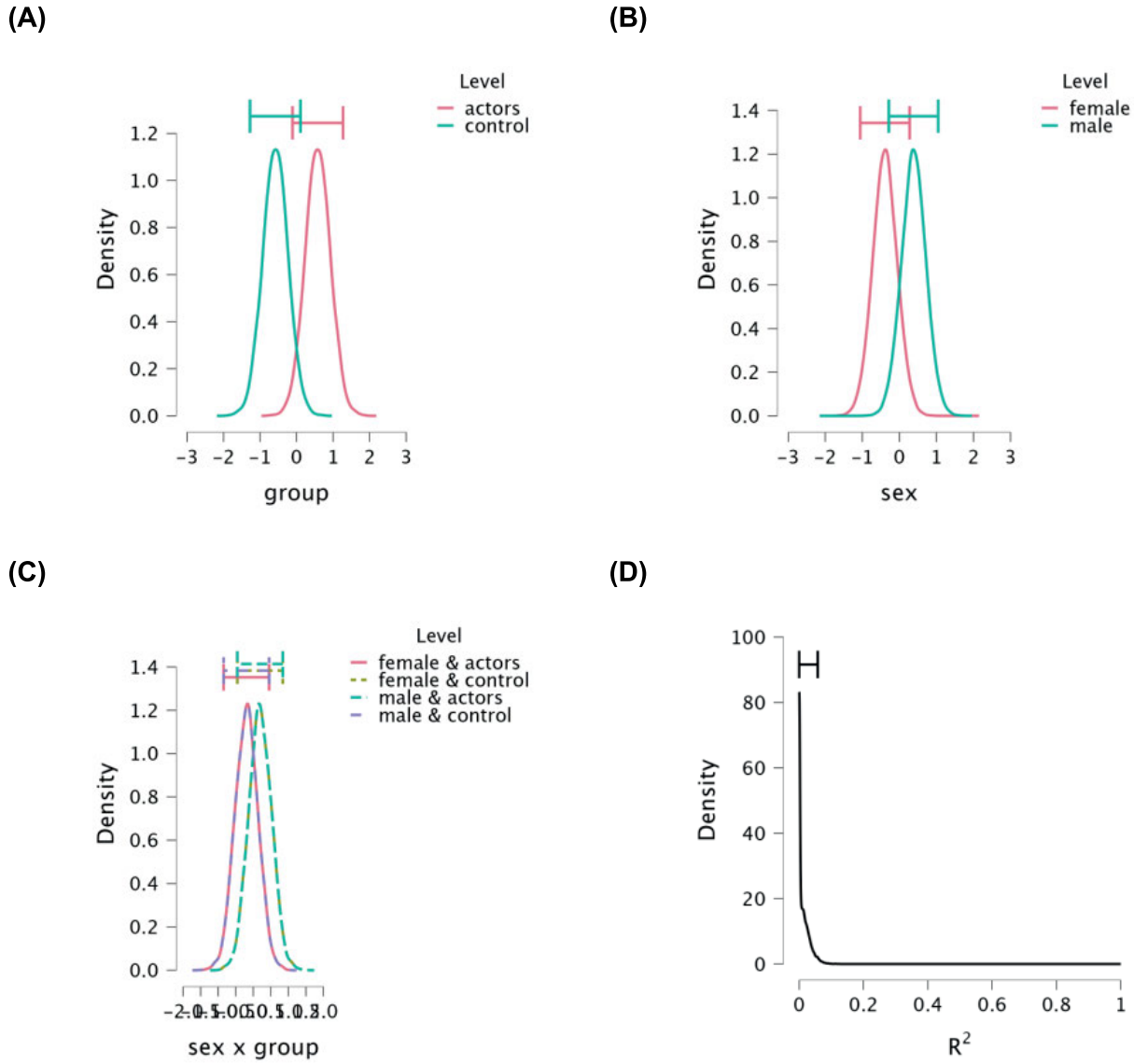

Figure 5. (A) Model averaged posteriors for the effects of belonging to either of the two groups (actors or controls) on self-esteem. (B) Model averaged posterior for the effect of belonging to either of the sexes on self-esteem. (C) Model averaged posteriors for the interactions of these two factors. (D) Posterior for R^2,0.013 and a 95% credible interval ranging from 0 to 0.057.

Table 5. Summary of the model averaged posteriors from the 2-by-2 ANOVA analyzing the effect of the independent variables "sex" and "group" (actors vs. controls) on self-esteem.

Variable	Level	Mean	SD	Lower	Upper
Intercept		31.313	0.300	30.692	31.992
sex	female	-0.388	0.331	-1.057	0.278
	male	0.388	0.331	-0.286	1.049
group	actors	0.581	0.346	-0.114	1.269
	control	-0.581	0.346	-1.276	0.107
sex * group	female & actors	-0.194	0.329	-0.847	0.450
	female & control	0.194	0.329	-0.456	0.841
	male & actors	0.194	0.329	-0.456	0.841
	male & control	-0.194	0.329	-0.847	0.450

5. "substantial" evidence against the model including both factors and the model including both factors and an interaction.

The estimate of the effect size (Cohen's d) for the difference between magicians and controls (Fig. 4A) is of medium size (0.447), but the corresponding 95% credible interval is quite large, ranging from 0.047 to 0.861, which indicates that there is a lot of uncertainty in the estimate. For the difference between magicians and actors (Fig. 4B), the estimated Cohen's d is small (0.055), and also here there is a lot of uncertainty in the estimate (credible interval ranging from -0.367 to 0.481). Estimating corresponding effect sizes for each of the factors in the two-way ANOVA separately is potentially misleading, given that the factors are correlated in the sample. The estimated R^2 of both factors combined (0.013), however, suggest a rather small combined effect of the two factors, with a 95% credible interval ranging from 0 to 0.057 (see Fig. 5D).

An important question to consider is what the minimal effect sizes the tests in the current study are able to detect. To answer this question, we performed a sensitivity power analysis (Lakens, 2022) estimating which effect sizes the Bayesian t-tests used can be expected to have sufficient power to detect given our sample size. Traditionally, 'power' refers to the probability of obtaining a statistically significant result at a given significance level (often $\alpha = 0.05$), given certain a non-zero true effect-size. Since we performed Bayesian t-tests rather than frequentist t-tests, 'power' instead refers to the probability of obtaining a Bayes factor larger than 3 (which is commonly regarded as "substantial" evidence for the alternative hypothesis). Fig. 6 shows estimates of this probability for a range of effect sizes from 0 to 2 for the two comparisons investigated using Bayesian t-tests. As can be seen, effect sizes of about 1 and larger can be expected to be detected with a probability close to unity based on this criterion, while the probability of detecting an effect size of 0.5 would be less than 0.5. Each point shown in Fig. 6 was obtained by drawing 3000 samples of random normally distributed data for the effect size in question, performing a Bayesian t-test for each random sample, and computing the proportion of cases where the Bayes factor was larger than 3. The number of participants for the each of the two groups in each comparison in the simulation was the same as in our study (see Tab. 1). The curve for the comparison between magicians (n = 53) and (male) controls is somewhat higher than the curve for the comparison between magicians and (male) actors, because there were more controls (n = 39) than actors (n = 28) in our sample. The Bayesian t-test in the simulation were performed using the Bayes Factor package (Morey et al., 2022), which is also used by JASP. The prior was the same as in the analyses we performed using JASP (Cauchy with scale parameter 0.707).

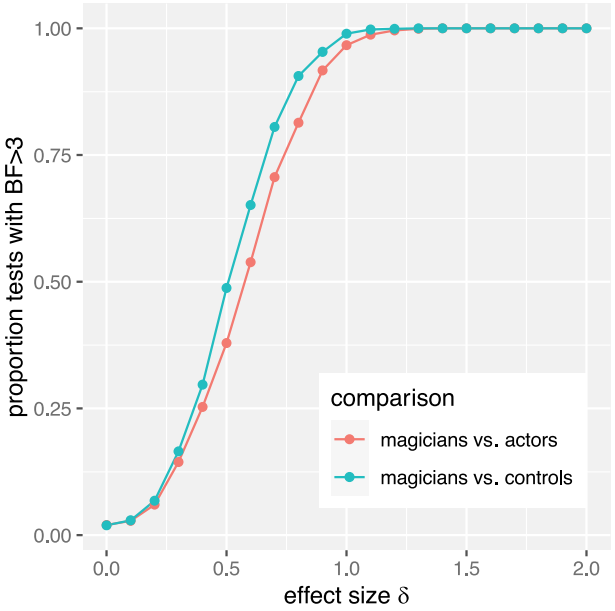

Figure 6. Estimates of the probability of obtaining a Bayes factor larger than 3 (which is commonly regarded as "substantial" evidence for the alternative hypothesis) for a range of effect sizes from 0 to 2 for the two comparisons investigated using Bayesian t-tests.

Relationship between emotional reactivity and self-esteem

In Fig. 7A, emotional reactivity is plotted against self-esteem for the entire sample. The correlation (r = -0.30) is negative, of moderate size, and statistically highly significant (p = 8.2e-06). Panels B-F in Fig. 7 show corresponding scatterplots for various subgroups. Fig. 8 shows the value of the correlation coefficient for each plot in Fig. 7 with 95% confidence intervals. As can be seen, the correlation is negative in all subgroups, but it is not significantly different from zero at the 5% level for the (male) magicians (panel D) and the male controls (panel F). The correlations for males (r = -0.27) and females (r = -0.24) are rather similar, and not significantly different according to a Fisher's z-test (z = -0.2452, p = 0.8063). The correlation is quite a bit lower for (male) magicians (r = -0.08), than for male actors (r = -0.49), but the difference is not statistically significant (z = 1.9030, p = 0.057). The

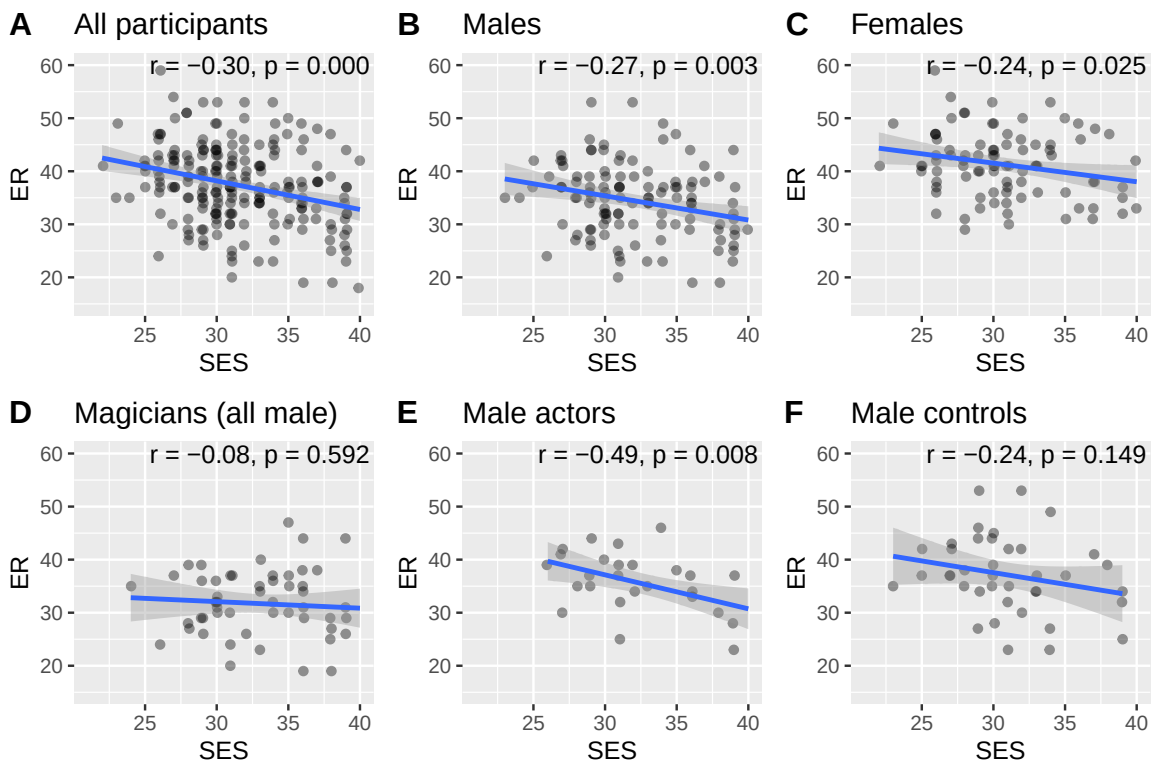

Figure 7. Emotional reactivity plotted against self-esteem for all participants (A) and for various subgroups (B-C). The gray areas show the 95% confidence intervals for the blue regression lines. Note that to reveal potential overplotting, a small amount of jitter (with a spread of 0.1 units to each side) has been added along the horizontal axis.

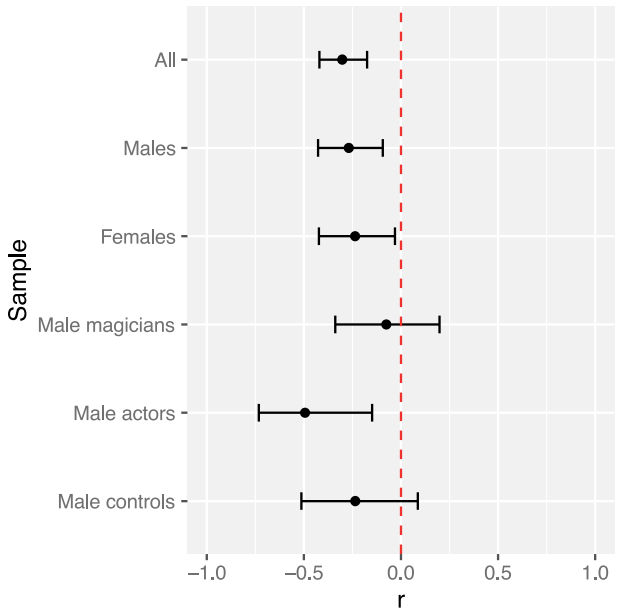

Figure 8. Correlation coefficients from Fig. 7 with 95% confidence intervals.

correlation for the male controls is intermediate between the two (r = -0.24) and not statistically different from either of them (z = -0.7524, p = 0.45 for the comparison with magicians and z = 1.1588, p = 0.2465 for the comparison with actors). Thus, our data do not support the hypothesis that the correlation between emotional reactivity and self-esteem depends on sex or the artistic background of participant (magicians, actors or controls).

DISCUSSION

The results of our study provide "very strong" evidence for the hypothesis that magicians tend to have a lower level of emotional reactivity than control participants who are not stage artists (BF = 82.5, see Fig. 2A). We also obtained "substantial" evidence for the hypothesis that magicians tend to have a lower level of emotional reactivity than actors (BF = 3.738, see Fig. 2B). These two results were obtained by analyzing male participants only, which was necessary because there were only male magicians in our sample. Thus, it is hard to tell whether these findings will generalize to females also. Analyzing the emotional reactivity scores of the groups of actors and controls, which included both female and male participants, we obtained decisive evidence that males tend to have a lower level of emotional reactivity than females and anecdotal evidence that the actors tend to have lower a lower level than controls.

Emotional reactivity is the tendency to experience frequent and intense emotional arousal. In a situation of social exposure, perhaps especially during public appearances, this temperamental trait may be expected to impede the effective performance of tasks. People with higher emotional reactivity tend to experience a higher level of situational anxiety compared to people with a lower level of this trait. As Terelak et al. (2002, p. 28) put it, emotional reactivity as "a temperamental trait is a factor that moderates the process of coping with stress or the level of stress itself".

This temperamental trait is responsible for the tendency to avoid highly stimulating situations and withdrawing from social interactions (Tomorowicz, 2011). As Dudek and Hauk (2010) point out, people with a lower level of emotional reactivity choose highly stimulating occupations (including professions related to performing in front of live audience). This may explain why magicians (and perhaps also actors) have a lower level of emotional reactivity than non-performers. Moreover, highly reactive individuals tend to have lower capacity and greater emotional sensitivity than low reactive individuals (Strelau, 2002). Being a stage artist requires a lot of effort in mastering technical issues pertaining to the role, preparing a performance or repertoire, cooperating with a team, and emphasis on social interactions seems to be related with lower level of emotional reactivity. It is worth pointing out that emotional reactivity is one of the factors which determines the degree of adaptation to particular professions (Nowak, 2021). People make choices – such as working life or leisure activities according to their own stimulation-processing abilities – which depend on the level of emotional reactivity (Cyniak-Cieciura, Zawadzki & Strelau, 2016). Research conducted by Oleszkiewicz-Zsurzs (1986) has shown that highly reactive people reject professions with high stimulating value (such can undoubtedly include the acting or illusionist profession). According to Strelau (2002), temperament traits are relatively stable and may have impact on profession choice.

Our results showed that illusionists tend to have a lower level of emotional reactivity than actors (Fig. 2B). The decision to choose a profession associated with social exposure may to be conditioned by a relatively low level of emotional reactivity. As Kasprzak and Brzuszkiewicz (2012, p. 29) argue, "low emotional reactivity will result in choosing various, rich in stimuli life and work environments". The professions of the magician and actor are both examples of this, and compared to controls we observed differences in the expected direction for both groups. But the statistical evidence for the difference between actors and controls was only “anecdotal”, whereas the statistical evidence for the difference between magicians and controls was very strong. Perhaps there are demands peculiar to the illusionist's profession which require a lower level of emotional reactivity than the profession of the theater actor. One skill which is arguably more important for performing magic than for theater acting, is the ability to perform tasks that require fine motor skills while simultaneously engaging in dialogue with the audience. If a magician experiences negative feelings (such as stage fright or stress) during the performance, it would be difficult to successfully perform many magic effects. Stage fright is obviously a factor that that may hamper the successful conduct of the performance, and in extreme cases it may even lead to a lack of behavior control (Stone, 2011).

With regards to self-esteem, the results of our study provide anecdotal evidence that magicians tend to have higher levels of self-esteem than people who are not stage artists, and substantial evidence against a difference in average score between magicians and controls. These two results were obtained by analyzing male participants only, which was necessary because there were only male magicians in our sample. Analyzing the self-esteem scores of the groups of actors and controls, which included both female and male participants, we obtained anecdotal evidence against a difference between actors and controls, and anecdotal evidence against a difference between males and females. Furthermore, we obtained substantial evidence against a model including both factors.

The anecdotal evidence against a difference between actors and control may appear to be in conflict with the results of Hys and Nieznańska (2001), who reported evidence that the actors tend to have a higher level of self-esteem than controls. It is worth noting, though, that the empirical difference found in the present study is in the same direction as the difference found in Hys and Nieznańska's (2001) study, with the average being higher for the actors (see Fig. 1B).

Proper functioning in a situation of social exposure depends, *inter alia*, on self-perception, including self-esteem. The latter is an important personality trait that determines the effectiveness of actions in this type of situation (Hys & Nieznańska, 2001), which in the case of high self-esteem is not perceived as difficult, although it may seem that self-esteem in such a situation may be endangered because the individual is exposed to constant evaluation by other people. According to Hys and Nieznańska (2001) the actors are therefore better adapted to the social situation of the public performance. Self-esteem has argued to be a factor, which is not only important with regard to stage professions, but also has a positive impact on professional effectiveness (Łaguna, 2010). It has been argued that achieving professional success increases the level of self-esteem – presenting magic have positive influence on the level of self-esteem (Prevos, 2013). Also in acting preparation related to theatrical plays, role preparation, remembering the text and performing increases the level of self-esteem (Kander, 2009).

The results of our study provided substantial evidence against the hypothesis that actors tend to have a higher level of self-esteem than illusionists. We expected that due to the fact that actors graduated from acting school, and thus have a strong sense of belonging to a unique social group, actors would tend to exhibit higher levels of the of self-esteem than illusionists. The failure to confirm this hypothesis may be related to experiences of actors from acting schools – maybe they are exposed to humiliating experiences and are required to be obedient towards authority – often, the teachers and lecturers are famous actors. According to Kwaśniewska (2015), full-time acting is the dream of many actors, and they experience financial instability and receive unsatisfactory earnings. In addition, the phenomenon of obedience to authorities (the director) and reluctance to presenting own opinions is noticeable. Godlewski (2020) points to the hierarchy prevailing in the

theatre, which may be conducive to this submissiveness. Orlak (2009) lists a number of threats that can have a negative impact on the actor, for example: lack of control over the script, low involvement in decision-making, possible conflict between private and professional life (mainly due to lack of work-life balance), the need to suppress one's own reactions and pretending to be someone else. Hys and Nieznańska (2007) pointed to the stress factors actors are exposed to – e.g. personality mismatch to the role, working under time pressure, being dependent on others – actors, director. Some studies indicate a higher level of neuroticism of actors (Nettle, 2006; Dumas, Doherty, & Organisciak, 2020), which may be one of the explanations for the results obtained in the self-esteem. Another factor potentially explaining the obtained results is fact that there are fewer professional magicians than actors in Poland, so it is also an elite professional group that, by presenting effects that are called impossible may be perceived as unique. It is worth to pointing out that actors and magicians have some similarities. A first one is that actors and illusionists must be aware that they introduce the audience to a certain "mistake" – the actor pretends to be someone else and plays this role in such a way as to show that he is this character as much as possible, and the illusionist gives the impression of doing things contrary to commonsense thinking. This type of behavior is socially acceptable and even desirable (Orzechowicz, 2008). A second similarity is that both professions are mostly performed on stage and are arts professions oriented to evoke emotions in the audience—theater actors achieve this through role plays (Konijn, 2000). ”For magic to be magic, it has to deceive. For magic to be art, a magician has to make (…) feel an intense emotion” (Jay, 2021, p. 158). In addition to deception, magic provides recipients with pleasant or even sublime experiences. Magical illusions allow the audience to experience the seemingly impossible (Leddington, 2020). Such experiences of the magic can be created if the program is embedded in an appropriate and dramatically summed-up plot and is well-acted (Ortiz, 1994). A third similarity is that actors and illusionists have the ability to shift from one emotion to another (Mróz, 2008; Weber, 2019). An actor performing on stage is realizing him- or herself by performing a task in accordance with his or her interests. Similarly, professional illusionists tend to exhibit – as all profession performed at high, professional level – a high degree of commitment to their art (motivation, endurance, persistence, faith in their abilities and work) (Siekańska, 2004; Jay, 2021). They must be able to express themselves and be aware of the viewer's expectations (Olf, 1974). Moreover, such a choice of profession means that the work performed complies with the interests and a high level of a generalized sense of control – the feeling of being an expert in a such a field (Siekańska, 2004). A fourth similarity between those two professions is captured by Robert-Houdin’s (1858) well-known definition, according to which a magician is an actor playing the part of a magician. In order to perform stage performances effectively, artists must have the necessary social competences, such as the ability to behave appropriately and to use appropriate resources in a given situation (Rosiński, 2007). Additionally, being a stage artist means that audience orientation is an indispensable part of public performance (Boerner & Jobst, 2013). It is worth pointing out that actors may have a strongly developed theory of mind – i.e. awareness of what the act looks like from the audience's perspective, while controlling and performing stage representations (Goldstein, 2009). A strongly developed theory of mind is also important for magicians. While designing and practicing magic effects, they have to imagine what the magic trick looks like from the viewer’s perspective (Brown, 2000). Another similarity between actors and magicians is that they both have the ability to control emotions (Goldstein, 2009; Ortiz, 1994). Each performance is preceded by meticulous preparation, role and repertoire practice. Illusionists create magical effects with extraordinary dexterity of hands and coordination of gaze and body movements. These skills, supported by acting skills, are of paramount importance for the value of the performance (Fitzkee, 1944). Achieving a professional level in performing magic requires considerable time, dedication and effort from an artist (Weber, 2019). A further similarity is the perception of the professions as unique and extraordinary. Actors have a strong sense of professional identity (Kociuba, 1996), and the acting profession is perceived as providing an interesting and unique life (Hebda & Madejski, 2004). Magicians also tend to emphasize their uniqueness – associate in groups, organize workshops only for magicians and they present art which is “unique artistic field that combines theater, acting and manipulation skills, psychological knowledge concerning, *inter alia* perception, attention and misdirection processes” (Napora, 2021, p. 204).

Our results confirmed the hypothesis that here is a negative correlation between emotional reactivity and self-esteem for the theater actors, but did not confirm the same hypothesis for the illusionists; there was no significant difference in the correlation between actors and illusionists. Emotional reactivity is related to experiencing negative emotions, reacting to highly stimulating situations with anxiety and uncertainty, is accompanied by a lower level of self-esteem in group of actors. Low self-esteem may be associated with perceiving oneself in a negative light, loss of confidence in abilities and a decrease in self-efficacy. It may be concluded that higher level of emotional reactivity is associated with experiencing a greater level of stage fright – in group of actors. As Goodman and Kaufman (2014) point out, actors “have a right to fear the evaluation of the crowd as much or more than any other performance domain” (p. 135). We did not notice significant correlation in the group of illusionist. This could mean that illusionists accept emotions (both positive and negative) to a greater extent than actors, however, research conducted by Napora and Sękowski (2020) showed there were no statistical differences in terms of acceptance of emotions and empathy, but they differ in terms of understanding emotions - actors

understand the emotions they experience better than the magicians.

It is worth pointing out that no female illusionists volunteered to participate in our study. This testifies to the strong and most unfortunate gender imbalance in the art of magic (Gygax, Thomas, Didierjean & Kuhn, 2019). Unfortunately, the role of women in the art of magic is often limited to assisting, serving props and being apparently cut in half and the like (Jay, 2021).

Although we found robust statistical evidence for several difference between theater actors, magicians and non-performers in the present study, all of these differences were rather small. Self-esteem and emotional reactivity are some of the factors that are important from the point of view of stage performance. Obviously, there are also other factors than the ones investigated here that are relevant for peoples' choice of profession.

CONCLUSIONS

We found very strong statistical evidence for an average differences in emotional reactivity between actors and illusionists, but substantial evidence against a corresponding difference in self-esteem. An appropriately high level of self-esteem and a relatively low level of emotional reactivity enable successive performance in front of an audience; what is more, a relationship between these variables was demonstrated, but only in the group of actors. The choice of an artistic profession may be a consequence of temperamental conditions (although emotional reactivity is not the only factor); in turn, self-esteem may be conditioned by performance, admiration from the audience, and a feeling of performing a unique profession.

Limitations of the study

The study was performed on relatively small sample size, and selection was not random. Another limitation is fact that all participants were of the same nationality. Further research could try to focus on the determinants of choosing artistic profession and include the remaining factors of the RTT. In the present study, to evaluate self-esteem, a global self-esteem measurement was used – maybe 2-factors solution (including self-acceptance and competency) could capture some differences between groups.

Compliance with Ethical Standards

Due to the nature of the research, in which humans participated, an application was made to the Research Ethics Committee of the Institute of Psychology of the John Paul II Catholic University of Lublin. The application was assessed positively.

Data availability

The data is available at the OSF service: https://osf.io/cm4pn/?view_only=d4d3f2f75d7947268b991627709d8740

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