SIMPOZIJ 3 / SYMPOSIUM 3

SCIENCE DENIAL, ATTITUDES TOWARDS SCIENTISTS AND PSYCHOLOGY OF FREEDOM

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Science denial is a common phenomenon occurring in various areas such as climate change, vaccine safety, tobacco and violent media effects. It is often accompanied by anger and personal attacks on individual researchers (Lewandowski et al., 2013) as well as development of global negative attitudes towards science and scientists (Prot et al. 2017). This symposium brings together researchers examining science denial, attitudes towards scientists and psychology of freedom. The first talk reports four correlational and experimental studies examining causal factors leading to science denial and attacks on scientists. Next, three talks examine global negative attitudes towards science and scientists. The second talk discusses metric properties of a global measure of attitudes towards scientists (the Attitudes towards Science scale, ATS), demonstrating reliability and validity across two parallel forms of thescale. The third talk examines the factor structure of the Attitudes towards Science scale in a 5-wave longitudinal study and shows evidence of a stable factor structure across time. The fourth talk examines the factor structure of Scale Of Attitudes Towards Scientific Fields (Prot and Anderson, 2015), revealing both global and specific attitudes towards different scientific disciplines (including physics, chemistry, biology, medicine, astronomy, climate science, psychology, sociology, archeology, anthropology and kinesiology). The final talk discusses the current state of the research literature on the psychology of freedom and proposes a new psychometric measure of Personal Perceptions of Freedom. This symposium integrates studies using multiple methodologies (cross-sectional, experimental, longitudinal) and aims to integrate diverse perspectives on science denial, attitudes towards scientists and the psychology of freedom.

METRIC PROPERTIES OF TWO FORMS OF THE ATTITUDES TOWARDS SCIENTISTS SCALE

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Past studies suggest links between science denial in specific areas of research (such as climate change and media violence effects) with negative global attitudes towards science (Lewandowsky et al., 2013; Nauroth et al., 2014). However, no well-validated measures have been developed measuring attitudes towards scientists. To address this gap in the literature, a 78-item scale of Attitudes towards Scientists (ATS) was constructed. Metric properties of the initial version of the scale suggested that the scale should be shortened (Prot, 2015). Two 28-item alternate forms of scale were formed using clustering algorithms (Prot & Prot, 2017a, 2017b). The two forms (ATS-A and ATS-B), were measured in a sample of 217 freshmen students from the Faculty of Kinesiology in Zagreb. Participants were measured four times over the course of the semester in four- to five-week intervals. In the fourth time point, attitudes towards specific scientific fields were also measured, including physics, chemistry, biology, medicine, astronomy, climate science, psychology, sociology, archeology, anthropology and kinesiology. Metric properties of ATS-A and ATS-B were determined for items and total results in four time points. The reliability of two scale forms was established by Cronbach's coefficient of internal consistency; all values are high, ranging from 0,88 to 0.95. The validity of the ATS scales was examined by correlations with eleven total results in the Scale of Attitudes towards Scientific Fields and correlations with the first principal component of eleven fields assessment. Correlations with the separate total result of each field are low to medium, highest value is 0,41; correlations with the first principal component are higher, ranging from 0,30 to 0,47. It can be concluded that both forms of the Attitudes towards Scientists scale are instruments with good metric characteristics.

PRELIMINARY VALIDATION OF REPEATEDLY MEASURED ALTERNATE FORMS OF THE ATTITUDES TOWARD SCIENTISTS SCALE

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Two alternate forms of 29 iteams each have been derived from pool of 78 items items of attitudes toward science (Prot, Prot & Anderson, 2017). Eliminating one pair of equivalently formulated items 28 items in each of the forms remained. In new research, on five occasions, repeated measurement of attitudes toward science with two alternate forms, i.e. A and B were applied on the sample of students of kinesiology at University of Zagreb. For the moment 94 students completed all of five measurements. Means and standard deviations showed that pairwise difference between forms are existing, and that differences are present in between measurements points in forms internally. Preliminary validity of measurements is presented in two steps. For the first step composite score for each of forms and measurement points was derived as unweighted sum of items and their correlations were analyzed. Pairwise validity for each of five measurement of the forms A and B is defined as correlation matrix of order ten. Submatrices of correlations inside repeated measurement of each of forms are symmetric with positive and high values suggesting internal validity and offering possibility for simplex structure testing. Submatrix of correlations between repeated measurements of one of the forms against the other is asymmetric with high positive values having their pairwise validities in main diagonal ($r1ab = 0.813$; $r2\ ab = 0.866$; $r3ab = 0.897$; $r4ab = 0.901$; $r5ab = 0.887$) and are highest values in respective rows and columns. There is one distinctively big eigenvalue 7.507of correlation matrix explaining 75.08% of overall variability by the first principal component. In the second step, synthetic measure of validity between sets of repeated measurement is demonstrated by correlation between the first principal components $r12k = 0.954$; the first pair of canonical correlation components $r12c = 0.963$; and the first pair of quasicanonical correlation components $r12q = 0.955$.

SCIENCE DENIAL, ANGER AND AGGRESSION TOWARDS SCIENTISTS: SHORT-TERM AND LONG-TERM CAUSES

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Denial of scientific evidence is a fairly common phenomenon which has been documented in various areas such as climate change, evolution, effects of vaccinations, tobacco and violent video game effects. Science denial is often accompanied by anger and aggressive actions towards scientists, leading some authors to label it "war on science" (Lewandowsky, Oberauer & Gignac, 2013). Science denial can be explained, in part, by well-established processes affecting individuals such as belief perseverance, confirmation bias and cognitive dissonance. However, recent research suggests that group processes may also play a key role in denial (Lewandowsky et al., 2013; Nauroth et al., 2014). The current research takes this reasoning a step further and frames science denial in terms of individual processes, group processes and intergroup conflict. Four studies explored predictors of science denial, anger and aggressive actions towards scientists, focusing on individual differences, group processes and intergroup dynamics between scientists and denialists. Study 1 provides initial correlational evidence that threatened social identities can trigger science denial in areas of climate change, vaccine safety and violent video game effects. Study 2 experimentally demonstrates causal short-term effects of intergroup threat from scientists on science denial anger and aggression towards scientists (measured in terms of self-reports and observed behavior). Finally, longitudinal Study 3 reveals long-term negative effects of system justification and paranoid ideation on anti-science attitudes over time. These findings suggest that science denial is a complex phenomenon influenced by a number of individual-level and group-level processes. When research findings threaten a valued social identity and when scientists are perceived as a highly threatening group, people are more likely to derogate the research and express anger and aggression towards researchers.

LATENT STRUCTURE OF THE SCALE OF ATTITUDES TOWARDS SCIENTIFIC FIELDS

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Past research indicates that people's attitudes towards science vary significantly across different scientific areas (Lewandowsky, Oberauer & Gignac, 2013; Diethelm & McKee, 2009). The Scale of Attitudes towards Scientific Fields (Prot & Anderson, 2015) measures attitudes towards ten specific fields: physics, chemistry, biology, medicine, astronomy, climate science, psychology, sociology, archeology and anthropology. Participants are asked to rate each field in terms of four characteristics: "How important (1), useful (2), scientific (3), ethical (4) is this discipline?". Attitudes towards each of the ten disciplines are computed as a sum of the four item ratings. In the current study, the scale was used in a sample of 125 freshmen from the Faculty of Kinesiology in Zagreb. A modified version of the scale was used in which "kinesiology" was added to the list of scientific fields. The component analysis with promax rotation was applied on the eleven summative results. The number of significant components was determined by Guttman-Kaiser criterion; three eigenvalues exceeded 1. The first eigenvalue is 4,928 and explains 44,8% of variance. The second and third eigenvalues are considerably lower, 1,463 and 1,054, respectively. Together, three eigenvalues explain 67,68% of total variance. The solution obtained by promax rotation can be easily interpreted. The correlations of three factors are moderate, ranged from 0,39 to 0,44. The first factor is mainly defined by physics, chemistry, biology and astronomy, and can be recognized as factor of natural sciences. The second factor is defined by psychology, sociology and anthropology and represents social sciences. The third factor is defined by kinesiology and medicine and represents health sciences. The higher order analysis gave one eigenvalue greater than one, explaining 60,2% of variance. Undoubtedly, extracted factor represents general factor of attitude toward sciences.