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(Pre)occupations: A data-driven model of jobs and its consequences for categorization and evaluation

Roland Imhoff[a,b,*], Alex Koch[b], Felicitas Flade[a]

[a] Social and Legal Psychology, Johannes Gutenberg University, Mainz, Germany
[b] Social Cognition Center Cologne, University of Cologne, Germany

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ABSTRACT

We present a data-driven model of stereotypes about occupations (total $N = 3919$). Across two classification systems and national contexts (U.S.; Germany), we show remarkable convergence in the stereotype dimensions spontaneously employed to make sense of occupational groups (agency; progressiveness). Further studies show that these dimensions reflect presumed characteristics of job holders and not just describe their occupational role (Study 2), and that proximity of occupations on the emerging stereotype model increased superordinate categorization (Study 3) and contagious transfer of (positive and negative) valence from one occupation to another (Study 4). Together these studies do not only provide important insights into the perception of one of the most ubiquitous social taxonomies but also provide a rich, open access dataset for researchers seeking to employ occupational groups as a tool to better understand stereotypes and intergroup relations in general.

To simplify orienting and navigating in today's complex social world, people infer others' informative but not immediately observable characteristics from the groups they evidently belong to, also known as stereotyping. Besides gender, age, race and other stereotypes, people also form, use, and share occupational stereotypes. For example, people believe they know that librarians are shy, models are flamboyant, construction workers are tough-minded, and bankers are greedy. In the present paper we seek to provide an integrative model of dimensions on which people typically compare and position occupational groups to make sense of their social surrounding.

There are numerous examples in the social psychological literature of specific stereotypes people hold about occupational group. Knowing that someone is a scientist will likely evoke an image of this person as being maybe likeable but also robot-like and somewhat obsessed, and capable of immoral conduct (Rutjens & Heine, 2016). Politicians and lobbyists are seen as powerful and as relatively threatening (Imhoff & Bruder, 2014). Male nurses are more helpful than stockbrokers (Abele & Petzold, 1998), and physicians are seen as truthful, competent and altruistic, whereas used car salesmen are not (Rotter & Stein, 1971). Such stereotypes may be derived from the occupational activity. Originally proposed to explain gender stereotypes, social role theory (Eagly, Wood, & Diekman, 2000) posits that observed social roles held by men and women are used to infer presumed characteristics of men and women (i.e., gender stereotypes). The same principle might apply to other activities and roles people hold in society, most prominently, their occupation. If so, occupational stereotypes should closely align with what people believe to be central activities in a job.

Although it is of course relevant to describe the specific stereotype people hold of specific groups, our goal in the current research was to systematize these stereotypes. Specifically, we were interested whether occupations are more likely categorized on some dimensions than others. Existing taxonomies placed occupations on continua from hierarchy-enhancing to hierarchy-attenuating (e.g., Pratto, Stallworth, Sidanius, & Siers, 1997; Sidanius, Liu, Pratto, & Shaw, 1994), but these were typically theory-driven researcher-based sorting schema, not data-driven insights into how people spontaneously mentally arrange the occupational field.

On the lookout for dimensions of spontaneous occupational stereotypes, one both relevant and established finding is that people readily categorized some occupations as stereotypically (fe)male (Wilbourn & Kee, 2010). Particularly occupations with leadership responsibilities were construed as masculine (Koenig, Eagly, Mitchell, & Ristikari, 2011) and women's likelihood of being offered a leadership position was higher if they have stereotypically masculine attributes (Glick, Zion, & Nelson, 1988). Given the wealth of findings relating occupations to gender, it seems plausible that occupations are spontaneously compared and categorized along a stereotype dimension ranging from female/feminine to male/masculine.

Other research has simply posited that occupational stereotypes follow the same dimensionality as other stereotypes and thus suggested

* Corresponding author at: Social and Legal Psychology, Binger Str. 14-16, 55122 Mainz, Germany.
E-mail address: roland.imhoff@uni-mainz.de (R. Imhoff).

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the influential stereotype content model (SCM; Fiske, Cuddy, Glick, & Xu, 2002) and its two dimensions of warmth and competence as an applicable model also for occupational stereotypes (Fiske & Dupree, 2014; Imhoff, Woelki, Hanke, & Dotsch, 2013; Koenig & Eagly, 2014). One critical aspect of getting at spontaneous stereotypes, however, is to make no a priori decision in the research design that only allows specific dimensions to be applied (e.g., by asking only about warmth and competence; Fiske & Dupree, 2014). Revealing the stereotype dimensions that people spontaneously use to make sense of others based on their occupation requires ecologically valid studies (Brunswik, 1955) in which people are free to choose any desired stereotype dimension(s) to a representative sample of stimuli (for a recent approach to stereotypes about social groups see Koch, Imhoff, Dotsch, Unkelbach, & Alves, 2016).

1. The present research

We took a data-driven approach to spontaneous occupational. In two studies, people rated the similarity of two different exhaustive samples of occupations. Importantly, similarity allowed people to compare the occupations on any desired stereotype dimension(s) that spontaneously came to their mind. If that was morality, they would rate nurses and surgeons as more similar than surgeons and lawyers. If it was intelligence, they would rate nurses and surgeons as less similar than surgeons and lawyers. Importantly, if most people would consensually rate the similarity of most occupations on the same dimensions, these spontaneous occupational stereotypes could be identified by computing and interpreting a cognitive model that would visualize the pattern of the consensual similarity ratings. In Studies 1a and 1b, we computed cognitive models of 150 U.S. occupations, respectively 88 German occupations and interpreted the dimensions that spanned this "map". This also allowed an exploration whether such stereotype dimensions align with dimensions developed to characterize occupational roles. In Study 2 we sought to differentiate people's impression of a job from their impression of people who have this job as only the latter constitutes a stereotype (inferring people's characteristics from their group memberships) in the strict sense. Based on these findings, we examined automatic social categorization (Studies 3a–c) and lateral attitude change (Studies 4a–b; Glaser et al., 2015) as downstream consequences. We report all studies, as well as therein all measures, manipulations, and exclusions (if any) conducted in this research line. In lack of informed estimates of effect sizes, sample size for each study was determined by rule of thumb: 25 raters per rating and 100 participants per cell in between-subject designs. No intermediate analyses were conducted and there was no continued data collection after data analysis. All materials, data and supplemental figures and tables are available on our OSF project site (link).

2. Study 1

To identify the dimensions people spontaneously use to stereotype others based on their occupation we followed a sequence of three steps in two national contexts: USA and Germany. For both contexts, we generated an exhaustive list of occupations. We started from two different classification systems that seek to include all occupations: the U.S. Department of Labor's Occupational Employment Survey in Study 1a and the International Standard Classification of Occupations in Study 1b and adapted these lists to increase comprehension. We then collected estimates of similarity between typical holders of all occupations and subjected these similarity estimates to multidimensional scaling (MDS; for an introduction, see Hout, Papesh, & Goldinger, 2013; for an example, see Lammers, Koch, Conway, & Brandt, 2017). For both contexts, this resulted in three-dimensional spaces in which typical occupation holders stereotyped as more similar were positioned closer to one another. To understand the dimensions that spanned this space we aligned the typical occupation holders' coordinates on the three space dimensions with independent ratings of potential stereotype dimensions (property fitting analyses). As an important difference, the researchers selected potential candidate dimensions that spanned the space in Study 1a, which could introduce biases and limit generalizability of results. In Study 1b, therefore, participants themselves generated labels for the dimensions, which were then synthesized and later rated for each occupation by another group of participants.

2.1. Method and results

2.1.1. Study 1a

2.1.1.1. A complete list of U.S. occupations

We approximated a complete list of occupations based on the U.S. Department of Labor's Occupational Employment Survey (OES) of 2012 (http://www.bls.gov/oes/special.requests/oesm12all.zip). According to this survey, the highest order of the North American Industry Classification System lists 457 "broad" occupations. The list contains 16, 24, and 25 kinds of teachers, engineers, and managers, respectively, and numerous other highly similar occupations. As we were not interested in such detail, we cut down the list based on first two authors' consensual decision. We merged highly similar occupations and shortened long occupation titles to everyday equivalents (e.g., "Agents and Business Managers of Artists, Performers, and Athletes" became "Agents of Artists"). In some cases, ambiguous occupations titles were split into their components (e.g., "Physicians and Surgeons" became "Physicians" and "Surgeons"). Table osm.1 (see online supplementary materials) shows the final list of 150 occupations.

2.1.1.2. Computing the cognitive model of U.S. occupations

To explore the stereotype dimensions that people spontaneously use to make sense of others based on their occupation, 213 U.S. Americans recruited from Amazon's Mechanical Turk (M_{age} = 34.05, SD = 10.54; 101 women, 111 men) were instructed to "position 50 occupational groups [randomly drawn from the list of 150 occupations] on the computer screen according to how similar or dissimilar you perceive typical members of these groups to be." (Figs. osm.1–osm.2). This spatial arrangement method (SpAM; Alves, Koch, & Unkelbach, 2016; Hout, Goldinger, & Ferguson, 2013; Hout & Goldinger, 2016; Koch, Alves, Krüger, & Unkelbach, 2016) measures similarity in terms of proximity. This is a particularly efficient approach as repositioning a stimulus simultaneously adjusts the proximities/similarities between that stimulus and all other stimuli on the screen. We recorded the distance between two occupations in relation to the greatest possible distance (the screen diagonal).

For each of the 11,175 pairs that could be formed with the 150 occupations, we averaged dissimilarity across all participants who repositioned the two occupations. We subjected the 11,175 mean dissimilarity indices to MDS with an ALSCAL procedure (Young, Takane, & Lewyckyj, 1978); assuming an interval scale, we estimated coordinates for the 150 occupations in a 1D-6D model. Scaling fit was indicated by a (preferably low) scaling stress (S; 0.16, 0.14, 0.12, 0.11, 0.10, and 0.10 for the 1D, 2D, 3D, 4D, 5D, and 6D model, respectively). Balancing fit and parsimony of the scaling solution (Jaworska & Chupetlovska-Anastasova, 2009), we proceeded with interpreting the 3D cognitive model of U.S. occupations.

2.1.1.3. Interpreting the model of U.S. occupations

Rotating the "map", we searched for and selected a number of stereotype dimensions that possibly spanned the "map" (i.e., spontaneous stereotypes that people could have used to rate the occupations' similarity). These candidate dimensions inspired by the data were augmented with candidates derived from main theories of stereotype content (e.g., Fiske et al., 2002), resulting in the 41 candidates shown in Table osm.2. 1245 MTurkers (M_{age} = 34.04, SD = 11.77; 517 women,