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ORIGINAL RESEARCH

Effects of Gender-Fair Language on the Cognitive Representation of Women in Stereotypically Masculine Occupations and Occupational Self-Efficacy Among Primary School Girls and Boys

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Abstract

Based on the assumption that language influences thinking, the present study investigated the effect of gender-fair language in German, a grammatically gendered language among primary school children. Specifically, in a single-study experiment, we compared 218 German third and fourth graders on the effects of the generic masculine (e.g., *der Polizist*; English: *the policeman*) and gender-fair language in terms of the feminine and masculine form (e.g., *die Polizistin/der Polizist*; English: *the policewoman/the policeman*) on the cognitive representation of women in stereotypically masculine occupations and occupational self-efficacy. General self-efficacy was examined as a moderator variable, assumed to influence the effect of gender-fair language on occupational self-efficacy. The results indicate that the gender-fair form led to a higher cognitive representation of women in stereotypically masculine occupations for girls and increased girls' occupational self-efficacy for stereotypically masculine occupations. In contrast, the use of gender-fair language did not significantly influence boys' cognitive representation of women and their occupational self-efficacy. General self-efficacy did not affect the effect of gender-fair language on occupational self-efficacy. Thus, even as early as in primary school, gender-fair language could help attracting girls to stereotypically masculine occupations.

Keywords Gender-fair language · Gender stereotypes · Cognitive representation of women · Occupational self-efficacy · Primary school students

Equal rights for women and men are fundamental in many societies. In Germany, many milestones have been achieved for women during the 20th century, such as the right to vote or the right to go to work without the husband's consent. Nevertheless, there is still systematic discrimination against women in certain areas today. Women typically earn less money than men (i.e., the gender pay gap) and are underrepresented in leadership positions (World Economic Forum, 2021) as well as in certain vocational fields such as craftsmanship or STEM (science, technology, engineering, and math), which are in high demand and well-paid in modern societies (Bundesagentur für Arbeit, 2019). Gender stereotypes in terms of associations of certain professions, activities, and attributes with femininity and masculinity might contribute to that situation, with leadership positions, craftsmanship, and STEM professions being typically associated with masculinity (e.g., Gadassi & Gati, 2009; Makarova et al., 2019). These gendered perceptions are associated with undesirable consequences such as lower interest in certain jobs, exclusion of career options, poorer performance, and lower task persistence (Lent et al., 1994; Lent & Brown, 2013; Rottinghaus et al., 2003).

Besides directly challenging gender stereotypes through real or fictional role models (e.g., Dasgupta & Asgari, 2004; Nhundu, 2007; see Olsson & Martiny, 2018, for a recent review), gender-fair language might be an avenue to increase girls' interest and their belief to succeed in STEM professions (i.e., their occupational self-efficacy; Betz & Hackett, 1981). Language reflects our actual socio-cultural state and is used to express and maintain existing gender

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stereotypes (Garnham et al., 2016). Theoretically, this argument is related to the Sapir-Whorf hypothesis, which states that the structure of language influences how people perceive their environment and think about the world (Hoijer, 1954). In grammatical gender languages (such as German), the gender of a person is typically explicitly given by the form of the determiner and by the morphological form of the noun, and the masculine form can be used for both men and women (i.e., generic use of the masculine) (Gygax et al., 2008). However, the generic use of the masculine (e.g., *Ingenieur*, which is the masculine form of *engineer*) might promote the perception that certain jobs are only (or at least predominantly) suitable for men. In contrast, by using gender-fair language, such as the feminine and masculine form (e.g., *Ingenieurin/Ingenieur*), language might promote the perception that certain jobs are suitable for both men and women.

The present study examines whether a gender-fair language using both the feminine and masculine form (e.g., *Ingenieurin/Ingenieur*) opposed to the generic masculine (e.g., *Ingenieur*) influences primary school children's perception of stereotypically masculine and feminine occupations and their occupational self-efficacy concerning these occupations. In addition, we examine whether general self-efficacy moderates the effect of language on occupational self-efficacy. In the following section, we briefly summarize the research on language and gender representation in grammatical gender languages. Then we turn to effects of gender-fair language on the perception of occupations and occupational self-efficacy. We finish by discussing general self-efficacy as a moderator that might affect the effect of the gender-fair language intervention.

The Generic Masculine and Cognitive Representation of Gender

As already mentioned, in grammatical gender languages (such as German), the masculine form of a word can be used for referring to men only but also to both men and women (i.e., generic use of the masculine) (Gygax et al., 2008). To examine whether the generic use of the masculine is genderless as intended, a vast number of studies have been conducted (e.g., Gabriel et al., 2018; Gygax et al., 2008, 2009; Stahlberg & Sczesny, 2001). Taken together, these studies show that across different languages (e.g., German, French, Italian, and Spanish) the generic masculine is despite its generic intent typically associated with a masculine cognitive representation and thus induces a male bias (for summaries, see Gygax & Gabriel, 2011; Stahlberg et al., 2007). In German, for example, the use of the generic masculine for occupational titles (e.g., *Apotheker*, which is the masculine form of *pharmacist*) and social roles (e.g., *Schüler*, which is the masculine form of *student*) leads to a cognitive association of these jobs and roles with masculinity (Heise, 2000, 2003; Stahlberg & Sczesny, 2001; Stahlberg et al., 2001). This effect of the generic masculine has been consistently shown for stereotypically masculine occupations and roles, but not for stereotypically feminine occupations and roles. Stereotypically feminine occupations and roles are often strongly associated with femininity and do typically not suffer from a male bias – despite the use of the generic masculine (Braun et al., 1998; Vervecken et al., 2013).

Importantly, these studies also show that the use of gender-fair language, such as using both the masculine and the feminine form (e.g., *Ingenieur/Ingeneurin* or *Ingenieurin/Ingenieur*), significantly reduces the male bias and accordingly increases the cognitive representation of women (Heise, 2003; Irmen & Roßberg, 2004; Klein, 1988; Körner et al., 2022; Stahlberg & Sczesny, 2001; see Gygax & Gabriel, 2011, and Stahlberg et al., 2007, for summaries).

Effects of Language on Occupational Self-Efficacy

A number of studies have examined how language influences participants' perception of occupations, such as difficulty, attractiveness, or status, and their occupational self-efficacy (e.g., Bem & Bem, 1973; Gaucher et al., 2011; Vervecken et al., 2013, 2015). Occupational self-efficacy is the belief that one can succeed in a specific profession (Betz & Hackett, 1981) and low occupational self-efficacy for stereotypically masculine jobs might explain why girls are underrepresented in these jobs (Bandura et al., 2001; Yu & Jen, 2021) – despite similarly strong competences (OECD, 2019).

Relying on Bandura's (1977, 1986) social-cognitive theory, Chatard et al. (2005), for instance, argue that gender-fair language in terms of using the feminine and masculine form for stereotypically masculine occupations provides female role models and can directly be a source of self-efficacy for girls. Girls might learn through the feminine and masculine form that women can equally successfully pursue stereotypically masculine occupations. Chatard et al. argue that the use of the feminine and masculine form should not or only to a little degree influence girls' self-efficacy towards stereotypically feminine occupations because girls already have sufficient female role models in the real world and thus high occupational self-efficacy anyway. Boys, in contrast, should also profit from the use of the feminine and masculine form because it introduces a social comparison with the lower status group of females and should therefore increase

occupational self-efficacy for stereotypically masculine and feminine occupations.

Similar to Chatard et al.'s (2005) social comparison hypothesis, Vervecken and Hannover (2015) argue that gender-fair job titles increase girls' and boys' occupational self-efficacy because gendered language activates the social category "gender" and thus gender stereotypes. Since femininity tends to be associated with lower status and lower difficulty (e.g., Merkel et al., 2012), the use of the feminine and masculine form should result in stereotypically masculine occupations being perceived as less difficult, which in turn should increase boys' and girls' occupational self-efficacy. Although Vervecken and Hannover did not formulate hypotheses for stereotypically feminine jobs, following this "difficulty" rationale, there are two possibilities. Girls' and boys' occupational self-efficacy for stereotypically feminine jobs should not be affected by the use of the feminine and masculine form because they are already strongly associated with femininity. Alternatively, it is possible that the use of the feminine and masculine form (compared to the generic masculine) further increases the perception of low difficulty, which should lead to an increase in occupational self-efficacy for both boys and girls.

We propose an additional explanation for effects of the feminine and masculine form of gender-fair language on participants' occupational self-efficacy that – similar to Vervecken and Hannover (2015) – assumes that gendered language activates the social category "gender" and thus gender stereotypes. We argue that the congruence between participants' gender and available gender information of an occupation matters. Using the feminine and masculine form provides gender information associated with the "female" and "male" category. Therefore, it should increase the association with the social category "female" compared to the generic masculine for both stereotypically masculine and feminine jobs. Activating an association with gender (by explicit labeling or by providing gender-associated information) has also been shown to influence performance, behavioral intentions, own and predicted interest of others, and liking of already gender-associated as well as of novel and therefore "ungendered" objects and activities (e.g., Martin et al., 1995; Montemayor, 1974; Seitz et al., 2020; Weisgram et al., 2014). For example, Seitz et al. (2020) introduced novel activities in children's stories in their experiments. In Experiment 1, a male or female character embedded in a non-gendered context or a non-gendered character in a gendered context engaged in these activities. In Experiment 2, a male or female character embedded in a gender-congruent or gender-incongruent context did so. The results of both studies indicated that both sources of gender-associated information influenced the perception of the novel activities as suitable for boys or for girls. In addition, children were more willing to engage in an activity and reported higher interest in the activity if the gender information provided in the story matched their own gender, with gender incongruent information reducing gender association, behavioral intention, and interest ratings.

Showing a similar effect, Rosenthal and Crisp (2006) asked female students to list characteristics shared by men and women. Compared to a baseline condition, the female participants in this "shared" condition indicated higher preferences for stereotypically masculine jobs and lower preferences for stereotypically feminine jobs, resulting in a smaller relative preference for stereotypically feminine jobs. Similarly, we hypothesized that gender congruence might also affect gender-associated self-efficacy ratings. An increased association with femininity should lead to higher occupational self-efficacy for both stereotypically masculine and feminine occupations in girls and a decrease for both types of occupations in boys. However, as stereotypically feminine occupations tend to be associated with femininity despite the use of the generic masculine (e.g., Braun et al., 1998), the effect of the feminine and masculine form could be less pronounced for stereotypically feminine jobs.

Turning to empirical evidence, Chatard et al. (2005; $N=250$) found that French girls aged 14 to 15 showed higher occupational self-efficacy when stereotypically masculine occupations were presented either in feminine and masculine form or with a feminine ending in parentheses (e.g., *mathématicien(ne)* which means *mathematician*) compared to the occupation presented in generic masculine. Vervecken and Hannover (2015; Experiment 2, $N=154$) confirmed this finding in German, as they found increased occupational self-efficacy for girls from Grade 3 to 6 when stereotypically masculine occupations were presented in the feminine and masculine form. However, there was a major difference between the two studies with regard to the effects of gender-fair language on their male peers. In Chatard et al.'s study, the linguistic manipulation had no significant effect on boys' occupational self-efficacy concerning stereotypically masculine occupations, whereas boys' respective occupational self-efficacy increased in Vervecken and Hannover's study on stereotypically masculine occupations. Moreover, with regard to stereotypically feminine occupations, Vervecken and Hannover found no effect of gender-fair language on occupational self-efficacy, whereas Chatard et al. reported no effect on girls but an increase for boys. In sum, the findings of these studies show that gender-fair language (in terms of using both the feminine and masculine form) increases girls' occupational self-efficacy for stereotypically masculine jobs. However, the results are not completely consistent, concerning the effects on boys and on stereotypically feminine occupations.

General Self-Efficacy as a Moderator of the Effects of Gender-Fair Language

Self-efficacy represents an individual's judgement of his/her capability to organize and execute actions required to attain designated types of performances and thus to exert control over events affecting his/her life (Bandura, 1986). Self-efficacy is, for example, a positive predictor of job performance (Stajkovic & Luthans, 1998), teaching effectiveness (Klassen & Tze, 2014), and a negative predictor of burnout (Shoji et al., 2016). It exists at different levels, with situation-specific self-efficacy representing the lowest, most concrete level and general self-efficacy the highest, most abstract level, namely a relatively stable, trait-like, generalized competence belief (Chen et al., 2001). General self-efficacy has been proposed to act as a moderator variable on the association between external influences, such as interventions and trainings, and their consequences, such as performance and motivation. The behavioral plasticity hypothesis (Brockner, 1988) assumes that individuals with low general self-efficacy are more susceptible to external cues such as social influences and, therefore, are more malleable than individuals with high general self-efficacy.

Following this hypothesis, the effect of a gender-fair language intervention might be more pronounced in students with low self-efficacy compared to students with high self-efficacy. Research has found empirical evidence supporting this effect in a number of domains such as job-search activity and reemployment in unemployed persons (Eden & Aviram, 1993), seasickness in cadets (Eden & Zuk, 1995), or cognitive effort in college students (Pillai et al., 2011). However, to our knowledge, the behavioral plasticity hypothesis has not been tested for gender-fair language interventions yet.

The Current Study

Building on previous research (e.g., Chatard et al., 2005; Vervecken & Hannover, 2015), the current study examined whether gender-fair language had an impact on primary school children's perception of stereotypically masculine and feminine occupations and their occupational self-efficacy regarding those occupations. For effects of gender-fair language in terms of the feminine and masculine form, different mechanisms have been proposed (role modeling, social comparison, and perceived difficulty) and empirical evidence has been inconsistent regarding effects on boys' occupational self-efficacy as well as effects on occupational self-efficacy for stereotypically feminine jobs (e.g., Chatard et al., 2005; Vervecken & Hannover, 2015). In addition to the existing assumed mechanisms, we propose gender congruence of the occupation and one's own gender as an additional mechanism that might help explaining the effect of gender-fair language on occupational self-efficacy. Moreover, it is unclear if effects of gender-fair language are the same for all boys and girls or if they depend on individual characteristics such as general self-efficacy. To address these issues, a questionnaire assessing children's cognitive gender representation of stereotypically masculine and feminine occupations, their occupational self-efficacy concerning those occupations as well as their general self-efficacy, was presented in two parallelized versions. One version included occupational titles in the generic masculine, while the other version presented the same occupations in the masculine and the feminine form.

Cognitive gender representation is a main mechanism through which the effects of language unfold. Accordingly, the present study examined whether the consistently reported finding that gender-fair language reduces male bias and increases cognitive representation of women in stereotypically masculine domains can be replicated in the present sample.

Hypothesis 1 The representation of stereotypically masculine occupations in both feminine and masculine form leads (compared to generic masculine) to a stronger mental representation of women in those occupations for both boys and girls.

With regard to the research question on effects of gender-fair language on occupational self-efficacy, the theoretical explanations (Chatard et al., 2005 propose role modeling for girls and social comparison for boys; Vervecken & Hannover, 2015 propose perceived difficulty; we propose perceived gender congruence as an additional explanation) assume that gender-fair language will increase girls' occupational self-efficacy for stereotypically masculine occupations. However, the theoretical accounts as well as the empirical evidence (Chatard et al., 2005; Vervecken & Hannover, 2015) differ on their predictions for effects of gender-fair language on boys' occupational self-efficacy for stereotypically masculine occupations. The social comparison hypothesis (Chatard et al., 2005) and the difficulty hypothesis (Vervecken & Hannover, 2015; Vervecken et al., 2013) predict an increase of boys' occupational self-efficacy. The congruence hypothesis, in contrast, would be consistent with a decrease of boys' occupational self-efficacy.

Hypothesis 2 Using both the feminine and masculine form (compared to generic masculine) increases girls' occupational self-efficacy for stereotypically masculine occupations.

Hypothesis 3a (Based on the social comparison hypothesis and the difficulty hypothesis): Using both the feminine and masculine form (compared to generic masculine) increases boys' occupational self-efficacy for stereotypically masculine occupations.

Hypothesis 3b (Based on the congruence hypothesis): Using both the feminine and masculine form (compared to generic masculine) decreases boys' occupational self- efficacy for stereotypically masculine occupations.

Concerning effects of gender-fair language (in terms of the feminine and masculine form) on stereotypically feminine occupations, the theoretical accounts provide less clear predictions for boys' and girl's occupational self-efficacy. The role modeling and the social comparison hypotheses (Chatard et al., 2005) predict an increase for boys due to the social comparison and either an increase or no effect on girls due to sufficient female role models in the real world. The difficulty hypothesis (Vervecken & Hannover, 2015; Vervecken et al., 2013) would be consistent with either a general increase or no effect for both boys and girls due to the already existing association with femininity and therefore lower difficulty. The congruence hypothesis would be consistent with an increase for girls and a decrease for boys or no effect on both boys and girls due to the already existing association with femininity. Considering this low precision and partial overlap between the theoretical accounts, we formulated no specific hypotheses and conducted the analyses on effects of gender-fair language on stereotypically feminine occupations as exploratory.

Finally, we examined whether general self-efficacy might moderate the effect of gender-fair language on children's occupational self-efficacy. In line with the behavioral plasticity hypothesis (Brockner, 1988; Eden & Aviram, 1993; Eden & Zuk, 1995; Pillai et al., 2011), we assumed that children might be more susceptible to effects of linguistic form, when their general self-efficacy is low. Importantly, this moderator effect is assumed to affect both positive (H2, H3a) and negative effects (H3b) of presenting both the feminine and masculine form.

Hypothesis 4 General self-efficacy moderates the relationship between linguistic form and occupational self-efficacy, such that when general self-efficacy is low, using the feminine and masculine form (compared to generic masculine) has a stronger effect on boys' and girls' occupational self-efficacy.

Method

Sample and Power Analysis

This study was approved by the Ethics Committee of the University of Bamberg, Germany (dossier number: 2023-06/27). Participants and their parents were provided with an informed consent informing them about the purpose of the research, voluntary participation and data usage. Only children whose parents had provided written consent were allowed to participate.

In total, 219 children from seven third grade classes and four fourth grade classes of two Bavarian elementary schools participated in the study. Third and fourth graders were selected for the study because they have already acquired sufficient reading competencies to allow for a whole class intervention and, in Germany, children typically choose a school branch after the fourth grade. One child had to be excluded because information on his/her gender was missing. Among the remaining 218 children were 105 girls and 113 boys, aged between 8 and 11 years ($M = 114.23$ months, $SD = 8.10$ months), with 55 boys and 49 girls in the generic masculine condition and 58 boys and 56 in the gender-fair condition. All children participated voluntarily, and written consent was obtained from their legal guardians.

Previous research found large effects of gender-fair language on cognitive representation of women and small to medium-sized effects of gender-fair language on occupational self-efficacy in schoolchildren (Chatard et al., 2005; Vervecken & Hannover, 2015; Vervecken et al., 2013). Accordingly, we set a small to medium-sized effect ($d = 0.40$), which represents a desirable effect for educational interventions according to Hattie (2009), as smallest effect size of interest. Sample size calculations with G*Power (Faul et al., 2009) yielded a required sample of 199 students for Hypotheses 1 and 2 (ANOVA; main and interaction effects; $1\text{-}\beta = 0.80$, $\alpha = 0.05$; $f = 0.20$), and of 81 students for Hypothesis 3 (linear multiple regression; fixed model, single coefficient with seven predictors; two-tailed; $1\text{-}\beta = 0.80$, $\alpha = 0.05$; $f^2 = 0.10$).

Instruments and Procedure

The study had a duration of approximately 40 min and was completed in classes in the participating schools. Children within the classes were assigned randomly to one of the two experimental conditions (generic masculine vs. gender fair),

and direct seatmates were assigned to the same condition. In the first part of the study, the children completed the General Self-Efficacy Expectancy Scale (Schwarzer & Jerusalem, 2003), which consists of 10 items that are answered on a 4-point Likert scale (1 = *totally disagree* to 4 = *totally agree*). The sum score of the items was calculated, ranging from 10 to 40. Higher scores represented higher general self-efficacy. We simplified some of the items linguistically to make them better suitable for primary school children. This first part was identical in both experimental groups.

In the second part, the children had to provide a first name for different occupations. The task was used to assess cognitive associations of occupations with gender and was oriented at a task used in previous studies, which required children to provide first names for a selection of movie roles (Vervecken et al., 2013). Children were asked: "Suppose you are a film producer. Which first names would you give to the following movie characters? Please write down a first name for each character." These movie roles consisted of nine stereotypically feminine (*flower seller*, *nurse*, *secretary*, *veterinarian*, *dental nurse*, *educator*, *hairdresser*, *tailor*, *teacher*; German: *Blumenverkäufer*, *Krankenpfleger*, *Sekretär*, *Tierarzt*, *Zahnartzhelfer*, *Erzieher*, *Friseur*, *Schneider*, *Lehrer*) and nine stereotypically masculine occupations (*firefighter*, *football coach*, *craftsman*, *trucker*, *astronaut*, *car mechanic*, *mayor*, *mathematician*, *policeman*; German: *Feuerwehrmann*, *Fußballtrainer*, *Handwerker*, *Lastwagenfahrer*, *Astronaut*, *Automechaniker*, *Bürgermeister*, *Mathematiker*, *Polizist*). The occupations were selected from Gabriel et al. (2008), who had 126 roles assessed for their gender stereotypicality in three different languages. For the present study, occupations were selected for the stereotypically masculine category if, in the German language, the participating subjects estimated that they consisted of at least 70% men, and for the stereotypically feminine category, if the estimation rose to a maximum of 30% men. Further occupations were selected from Vervecken and Hannover's (2015) study. Attention was paid to the children's daily lives, so that they would be familiar with the occupations and not require additional explanations. This naming task was presented under the pretext that names for roles in a film were sought. The order of the stereotypically masculine and feminine occupations was determined randomly and presented to all children in the same order. In the generic masculine group, the occupations were presented in generic masculine (e.g., *policemen*). In the gender-fair group, the feminine and masculine form was provided (e.g., *policewomen and policemen*). The number of female first names provided by the children were summed for stereotypically masculine and feminine occupations, ranging from 0 to 9 per scale. Higher scores represented a stronger cognitive representation of women.

In the third part of the study, children's occupational self-efficacy for the occupations was assessed. The children were given the written instruction "The last thing I'm interested in is whether you think you'll be able to do certain jobs when you grow up. Imagine you want to be …. Do you think you can do it?" (original in German: "Als letztes interessiert mich, ob du glaubst, dass du bestimmte Berufe schaffen kannst, wenn du erwachsen bist. Stell dir vor, du willst … werden. Denkst du, du kannst das schaffen?"). The answer was given on a 4-point Likert scale (1 = *definitely not* to 4 = *definitely yes*). Again, the order of the occupations was randomized and did not vary between children and, depending on the experimental group, the occupations were presented in generic masculine (e.g., *policeman*) or in the feminine and masculine form (e.g., *policewoman* or *policeman*). In the latter case, the female form was always listed first, followed by the male form, since it is a convention to mention women first. Finally, at the end of the study, the children were informed of the true purpose of the study and were given the opportunity to ask questions. The items were summed for stereotypically masculine and feminine occupations, ranging from 9 to 36 per scale. Higher scores represented stronger occupational self-efficacy for stereotypically masculine and feminine jobs.

Results

Data Preparation and Statistical Analysis

Sum scores were calculated for all tasks. All analyses were performed with JASP (JASP Team, 2023, version 0.17.1.0). The threshold for statistical significance was set at $p < .05$, with all tests being conducted as two-tailed.

One child had to be excluded from the study due to missing information on his/her gender. For general self-efficacy, there were seven missing values for individual items, which could be classified as missing completely at random. Accordingly, we replaced the missing values by the arithmetic mean of the respective child's general self-efficacy items. In the occupational self-efficacy task, eight values for individual items were missing, which could be classified as missing completely at random. Accordingly, missing values on stereotypically masculine items were replaced by the arithmetic mean of the respective child's self-efficacy for stereotypically masculine occupations. Missing values on stereotypically feminine items were replaced by the arithmetic mean of the respective child's self-efficacy for stereotypically feminine occupations. In the naming task, some children occasionally noted nicknames (e.g., *Toni* or *Luca*) that could not be classified clearly as male or female. These names were coded as 0.5, representing a neutral

value between 1 (*female*) and 0 (*male*). An inspection for outlier values (> 3 *SD*) showed that one girl and one boy reported very low values on the general self-efficacy scale. In the naming task, two girls produced very high numbers of female names. Finally, two boys reported very high values in the occupational self-efficacy task. Because the results were comparable with and without the outlier values, and because all the outlier values represented plausible values, no outlier values were excluded from the analysis.

Preliminary Analyses

Table 1 provides an overview on the descriptive values of the whole sample as well as split by gender and experimental condition. There were no bottom or ceiling effects in the sample or any of the subsamples. Internal consistencies (McDonald's omega) of the scales were acceptable to good in the whole sample In the subsamples of boys and girls, internal consistencies were good for the self-efficacy measures, but low for the gender associations, indicating considerable heterogeneity in the gendered perception of the occupations. As expected, the children named more female first names for stereotypically feminine occupations than for stereotypically masculine occupations, $t(217) = 24.49$, $p < .001$, $d = 1.66$ with 95% CI [1.45, 1.86]. Boys and girls, $t(216) = -0.11$, $p = .911$, $d = -0.02$ with 95% CI [-0.28, 0.25], as well as the experimental groups, $t(216) = 0.14$, $p = .887$, $d = 0.02$ with 95% CI [-0.25, 0.29], did not differ statistically significantly on general self-efficacy. There was also no statistically significant difference in age between boys and girls, $t(216) = 0.74$, $p = .462$, $d = 0.10$ with 95% CI [-0.17, 0.37], and between the experimental groups, $t(216) = -0.77$, $p = .444$, $d = -0.10$ with 95% CI [-0.37, 0.16].

Effects of Gender-Fair Language on Mental Gender Associations

We tested whether gender-fair language, in terms of the use of both the feminine and masculine form, compared to the generic masculine, resulted in higher numbers of reported female first names for stereotypically masculine occupations (Hypothesis 1). A 2 (generic masculine vs. feminine and masculine form) x 2 (gender: boys vs. girls) ANOVA indicated significant main effects for gender, $F(1,214) = 62.26$, $p < .001$, $\omega^2 = 0.189$, and experimental condition, $F(1,214) = 31.65$, $p < .001$, $\omega^2 = 0.095$. Girls provided more female names than boys and participants reported more female names in the gender-fair condition than in the generic masculine condition. However, these main effects were modified by a significant interaction between gender and experimental condition, $F(1,214) = 14.492$, $p < .001$, $\omega^2 = 0.042$. Follow-up contrasts indicated that girls provided

Table 1 Descriptive values

Scale (number of items; scale range)	Full sample ($N = 218$)			Boys ($n = 113$)			Girls ($n = 105$)			Generic masculine ($n = 104$)		F & M form ($n = 114$)	
	M	*SD*	ω	*M*	*SD*	ω	*M*	*SD*	ω	*M*	*SD*	*M*	*SD*
Age (months)	114.23	8.10	NA	114.62	8.16	NA	113.81	8.05	NA	113.79	8.43	114.63	7.81
General self-efficacy (10; 10 to 40)	31.02	4.98	0.84	30.98	5.07	0.83	31.06	4.90	0.85	31.07	4.60	30.97	5.32
Gender association masculine occupations (9; 0 to 9)	2.09	1.81	0.65	1.30	1.13	0.36	2.94	2.01	0.64	1.50	1.21	2.63	2.09
Gender association feminine occupations (9; 0 to 9)	5.90	2.21	0.69	4.65	2.02	0.57	7.24	1.50	0.47	5.66	2.04	6.11	2.34
Occupational self-efficacy masculine occupations (9; 9 to 36)	20.27	5.82	0.81	20.94	5.50	0.75	19.55	6.08	0.86	19.90	6.27	20.61	5.37
Occupational self-efficacy feminine occupations (9; 9 to 36)	21.27	7.05	0.90	18.07	6.47	0.88	24.71	5.97	0.85	20.84	6.89	21.66	7.20

Note. F & M form = gender-fair language including both the feminine and masculine form. ω = McDonald's omega

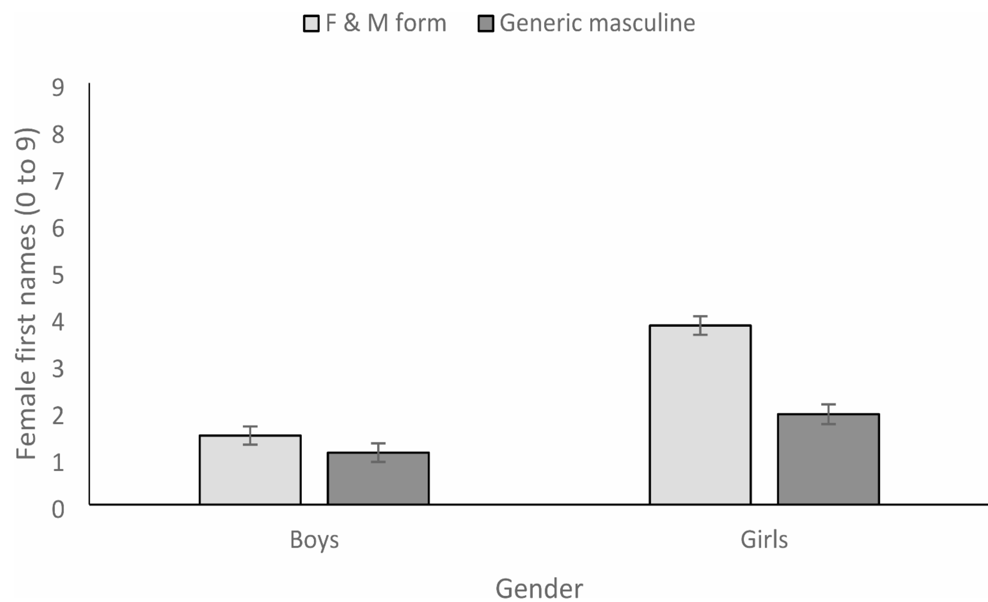

Fig. 1 Number of female first names provided for stereotypically masculine occupations *Note*. F & M form = gender-fair language including both the feminine and masculine form. Estimated marginal means from the statistical model are depicted. Bars represent standard errors

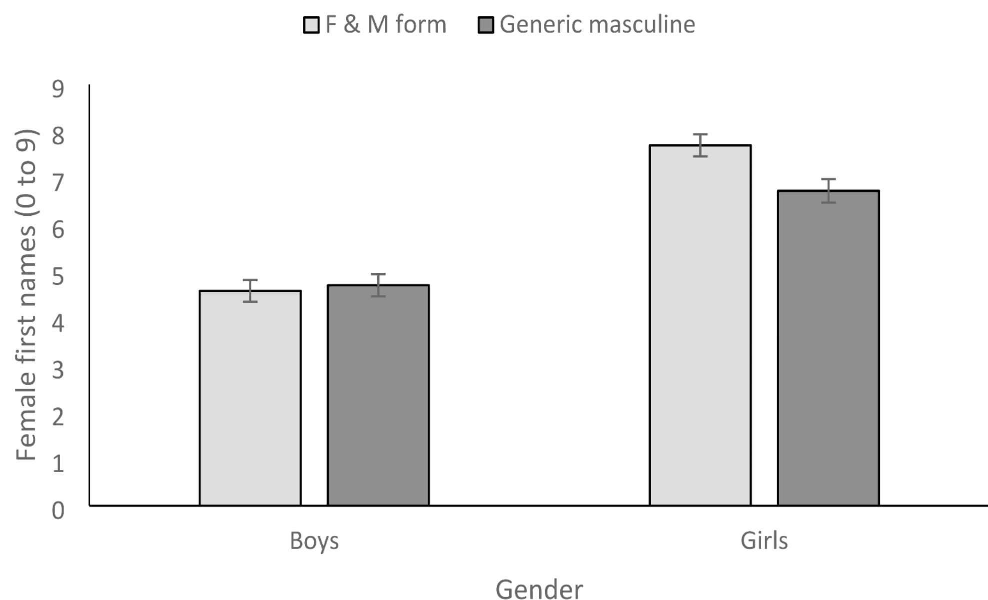

Fig. 2 Number of female first names provided for stereotypically feminine occupations *Note*. F & M form = gender-fair language including both the feminine and masculine form. Estimated marginal means from the statistical model are depicted. Bars represent standard errors

significantly more female names in the gender-fair condition ($M = 3.82$, $SD = 2.08$) than in the generic masculine condition ($M = 1.93$, $SD = 1.38$), $t(214) = 6.55$, $p < .001$, $d = 1.28$, whereas for boys there was only a non-significant tendency in this direction ($M = 1.47$, $SD = 1.31$ vs. $M = 1.11$, $SD = 0.88$), $t(214) = 1.31$, $p = .19$, $d = 0.25$ (see Fig. 1). Thus, the data support the hypothesis that the use of the feminine and masculine form increases the cognitive representation of women.

Concerning the effects of gender-fair language on the naming of female first names for stereotypically feminine professions, we had no specific hypotheses and conducted the analyses as exploratory. We found a significant main effect for gender, $F(1,214) = 114.60$, $p < .001$, $\omega^2 = 0.336$, with girls providing more female names, and a significant interaction between gender and experimental condition, $F(1,214) = 5.23$, $p = .023$, $\omega^2 = 0.013$. This time there was no significant main effect for experimental condition, $F(1,214) = 3.15$, $p = .078$, $\omega^2 = 0.006$. Follow-up contrasts indicated that girls provided significantly more female first names in the gender-fair condition ($M = 7.70$, $SD = 1.16$) than in the generic masculine condition ($M = 6.72$, $SD = 1.67$), $t(214) = 2.82$, $p = .005$, $d = 0.55$, whereas for boys there was no statistically significant difference between the conditions ($M = 4.59$, $SD = 2.17$ vs. $M = 4.71$, $SD = 1.87$), $t(214) = -0.37$, $p = .712$, $d = -0.07$ (see Fig. 2).

Effects of Gender-Fair Language on Occupational Self-Efficacy

We tested whether gender-fair language, in terms of the use of both the feminine and masculine form, compared to the generic masculine, resulted in higher occupational self-efficacy for stereotypically masculine occupations for girls (Hypothesis 2). In addition, we tested the competing hypotheses that predicted either an increase (Hypothesis 3a) or a decrease for boys (Hypothesis 3b).

A 2 (generic masculine vs. feminine and masculine form) x 2 (gender: boys vs. girls) ANOVA indicated no significant main effects for gender, $F(1,214) = 3.58$, $p = .060$, $\omega^2 = 0.012$, or experimental condition, $F(1,214) = 1.069$, $p = .302$, $\omega^2 < 0.001$. However, there was a significant interaction effect between experimental condition and gender, $F(1,214) = 4.29$, $p = .039$, $\omega^2 = 0.015$. Follow-up contrasts showed that gender-fair language increased girls' occupational self-efficacy ($M = 20.68$, $SD = 5.92$ vs. $M = 18.26$, $SD = 6.07$), $t(214) = 2.16$, $p = .032$, $d = 0.42$, whereas for boys there was no significant effect on occupational self-efficacy, $t(214) = -0.75$, $p = .455$, $d = -0.14$. For boys there was even a small descriptive tendency of a reduced occupational self-efficacy ($M = 20.54$, $SD = 4.84$ vs. $M = 21.35$, $SD = 6.14$) (see Fig. 3). Thus, the present results support Hypothesis 2. However, they do support neither Hypothesis 3a nor Hypothesis 3b.

Concerning the effects of gender-fair language on occupational self-efficacy for stereotypically feminine occupations, we had no specific hypotheses and conducted the analyses as exploratory. We found a significant main effect of gender, $F(1,214) = 60.48$, $p < .001$, $\omega^2 = 0.215$, with girls exhibiting higher occupational self-efficacy for stereotypically feminine occupations than boys (see Fig. 4). However, there was no significant main effect of experimental condition, $F(1,214) = 0.73$, $p = .393$, $\omega^2 < 0.001$, and no significant interaction effect between gender and condition, $F(1,214) = 1.06$, $p = .305$, $\omega^2 < 0.001$, with girls showing descriptively a small increase ($M = 25.45$, $SD = 6.07$ vs. $M = 23.86$, $SD = 5.80$) and boys showing descriptively a very small decrease following the use of the gender-fair form ($M = 18.00$, $SD = 6.28$ vs. $M = 18.15$, $SD = 6.71$).

Examining General Self-Efficacy as a Moderator Variable

Finally, we examined whether general self-efficacy moderated the effect of gender-fair language on girls' and boys' occupational self-efficacy for stereotypically masculine occupations (Hypothesis 4). To do so, we ran a linear regression model with experimental condition and gender as factors, general self-efficacy (centered) as covariate, and the two-way and three-way interactions between experimental condition, gender, and general self-efficacy (centered). While general self-efficacy ($B = 0.37$, $SE = 0.16$, $t = 2.72$, $p = .024$) was a significant positive predictor of occupational self-efficacy for stereotypically masculine occupations, the interaction between general self-efficacy and experimental condition ($B = -0.13$, $SE = 0.21$, $t = -0.59$, $p = .557$) and the three-way interaction with gender were not significant ($B = 0.127$, $SE = 0.32$, $t = 0.86$, $p = .392$). Thus, contrary to Hypothesis 4, general self-efficacy did not moderate the effect of the gender-fair language intervention.

We also explored whether there was a moderator effect of general self-efficacy on the effect of gender-fair language on girls' and boys' occupational self-efficacy for stereotypically feminine occupations. Again, general self-efficacy was a positive predictor ($B = 0.37$, $SE = 0.17$, $t = 2.14$, $p = .034$),

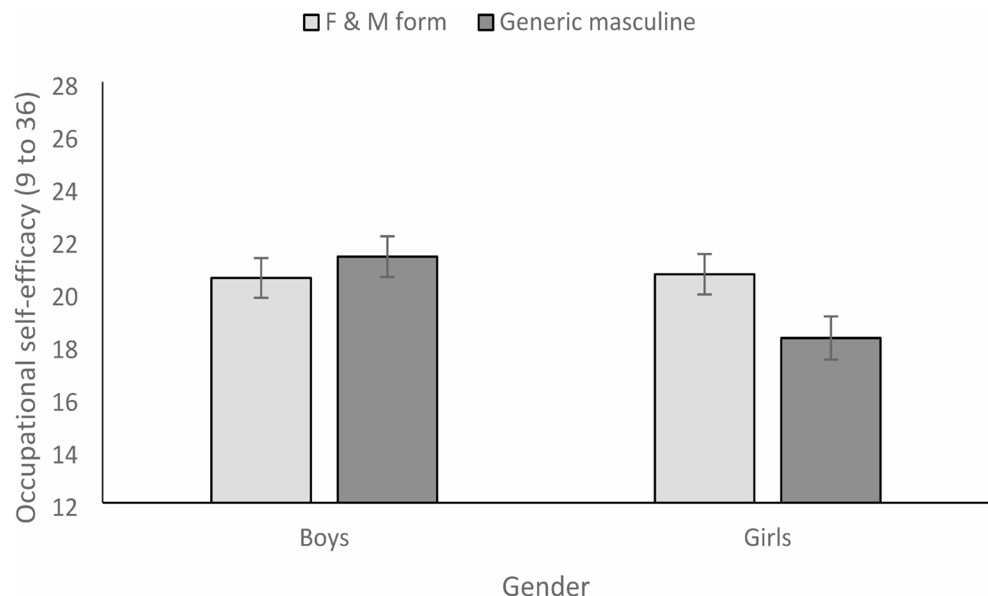

Fig. 3 Occupational self-efficacy for stereotypically masculine occupations
Note. F & M form = gender-fair language including both the feminine and masculine form. Estimated marginal means from the statistical model are depicted. Bars represent standard errors

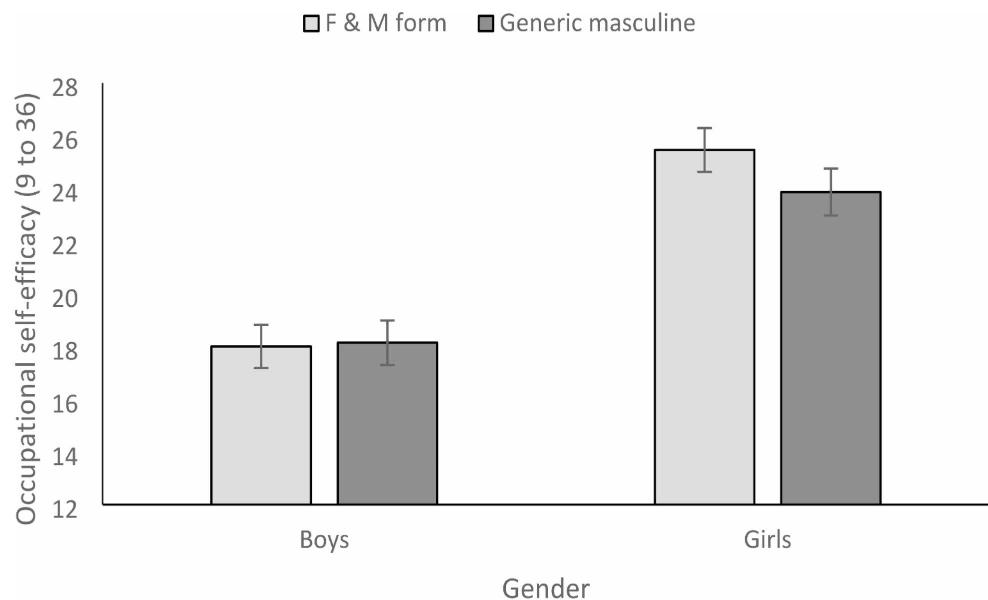

Fig. 4 Occupational self-efficacy for stereotypically feminine occupations
Note. F & M form = gender-fair language including both the feminine and masculine form. Estimated marginal means from the statistical model are depicted. Bars represent standard errors

but the interaction between general self-efficacy and experimental condition ($B = 0.01$, $SE = 0.23$, $t = 0.06$, $p = .955$) and the three-way interaction with gender were not significant ($B = 0.15$, $SE = 0.34$, $t = 0.43$, $p = .665$).

Additional Exploratory Analyses

To address the concern that the naming task, which consisted of providing suitable first names for film roles and which was used as an indicator of cognitive association with gender, might have affected occupational self-efficacy ratings, we checked the correlations between the two measures for girls and boys. Results of the naming task and occupational self-efficacy showed only small, non-significant correlations (stereotypically masculine occupations: girls: $r = .15$, $p = .140$, boys: $r = -.09$, $p = .357$; stereotypically feminine occupations: girls: $r = .12$, $p = .220$, boys: $r = -.07$ $p = .492$). In addition, we ran mediation models for stereotypically masculine and feminine occupations for girls and boys. We found that scores in the naming task did not statistically significantly mediate the effect of the experimental manipulation (i.e., gender-fair language vs. generic masculine) on occupational self-efficacy ratings as indicated by statistically non-significant indirect effects (stereotypically masculine occupations: girls: $p = .547$, boys: $p = .459$; stereotypically feminine occupations: girls: $p = .411$, boys: $p = .768$).

Discussion

The aim of the present study was to examine whether the use of gender-fair language (feminine and masculine form) compared to generic masculine leads to more cognitive representation of women and higher occupational self-efficacy in primary school children, in particular for stereotypically masculine professions in girls. In addition, we examined whether general self-efficacy moderated the effect of gender-fair language on girls' and boys' occupational self-efficacy. For this purpose, 218 third and fourth graders completed a questionnaire with stereotypically masculine and stereotypically feminine occupations in one of two versions, the generic masculine or a gender-fair form (i.e., feminine and masculine form).

We found that the use of gender-fair language enhanced girls' cognitive representation of women for stereotypically masculine occupations and their self-efficacy concerning these occupations. However, gender-fair language had no significant effect on boys' cognitive representation of women for stereotypically masculine occupations or their self-efficacy concerning these occupations. Concerning stereotypically feminine occupations, gender-fair language increased the association with femininity in girls but had no effects on boys' gender-associations and girls' or boys' occupational self-efficacy. Finally, general self-efficacy did not moderate the effect of the gender-fair language intervention on occupational self-efficacy.

The first hypothesis tested whether the use of gender-faire language is an effective way to create a more balanced mental gender representation in stereotypically masculine professions. As expected, we found that the children provided more male names for stereotypically masculine

occupations and more female names for stereotypically feminine occupations. Girls and boys also provided more names of their own gender, which is in line with previous findings and represents a form of in-group favoritism (Tajfel, 1982; Vervecken et al., 2013). Girls were sensitive to linguistic form, reporting significantly more female first names for stereotypically masculine professions in the gender-fair condition than in the generic masculine condition. The effect of gender-fair language on boys' mental gender associations showed a similar tendency but was considerably smaller and not statistically significant in the present study. The results are in line with previous research (Backer & Cuypere, 2012; Körner et al., 2022; Stahlberg & Sczesny, 2001; Stahlberg et al., 2001; Vervecken et al., 2013) and they agree with Green et al.'s (2004) finding that it is typically more challenging to influence boys' than girls' gender-stereotypic behavior.

A similar pattern of results emerged for stereotypically feminine professions. Similar to Verecken et al.'s (2013) study, this time boys were clearly not affected by gender-fair language. However, it is important to note that boys in both experimental conditions reported similar numbers of female and male first names, indicating a balanced cognitive representation of men and women for stereotypically feminine occupations. Girls in contrast, displayed a clear female bias, i.e., they reported more female than male names, and this female bias even increased when the feminine and masculine form was used. Interestingly, the opposite was found in Vervecken et al.'s (2013) study, in which the feminine and masculine form increased for girls the number of male first names for stereotypically feminine occupations. This difference might have occurred because some of the occupations presented in the Vervecken et al. (2013) study were different from those presented in the present study. In addition, the instructions differed concerning one important aspect. In Vervecken et al. (2013), children were asked to provide two first names per profession, whereas in the present study, a single name had to be written down. It is likely that effects of gender-fair language might be better observable in version with two first names, as this allows providing a gender-balanced approach per occupation and is thus more easily reconcilable with existing gender stereotypes. However, the version with one first name per occupation had the advantage that children were required to select and could not just provide a male name for the masculine form and a female name for the feminine form. Accordingly, the one-name version provided a stricter test of the intervention effect. Ideally, however, future studies should use an even more fine-grained assessment approach to capture changes in gender associations of specific occupations. For example, Seitz et al. (2020) used a child-friendly 5-point rating scale, ranging from *only for females* to *only for men*.

Hypothesis 2, 3a and 3b related to the effect of the feminine and masculine form compared to the generic masculine on occupational self-efficacy for stereotypically masculine occupations. While the three presented theoretical accounts (Chatard et al., 2005 propose role modeling for girls and social comparison for boys; Vervecken & Hannover, 2015 propose perceived difficulty; we propose perceived gender congruence as an additional explanation) assumed an increase for girls, they differed on their predictions for boys. As hypothesized, gender-fair language (i.e., the feminine and masculine form) increased girls' occupational self-efficacy – even to the level of boys' self-efficacy. Boys, in contrast, did not statistically significantly react to the linguistic variation, but showed a slight descriptive decrease. This finding does not agree with Vervecken and Hannover's (2015) difficulty hypothesis or Chatard et al.'s (2005) social comparison hypothesis because both expect an increase. The non-significant, descriptive decrease of boys' occupational self-efficacy concerning stereotypically masculine occupations does best but not perfectly agree with the congruence hypothesis, which assumes that the feminine and masculine form compared to the generic masculine decreases the association of the stereotypically masculine occupation with the social category "male" and therefore the perceived congruence between boys' gender and the occupation. Importantly, the statistically non-significant effect on boys could not be explained by a ceiling effect as their occupational self-efficacy was well below the maximum of the occupational self-efficacy scale. Turning to previous research, Chatard et al. found similar to our results that gender-fair language did not statistically significantly affect boys' occupational self-efficacy for stereotypically masculine occupations, whereas Vervecken and Hannover reported an increase supporting their difficulty hypothesis. Considering the results of the three studies, a combination of the difficulty or social comparison hypothesis and the congruence hypothesis might explain best the mixed findings as they predict opposed effects for boys that agree with zero effects or in weak effects in either direction. Of course, a simpler explanation might be that boys are simply not susceptible to interventions addressing gender-associated behavior which has been found in some studies (e.g., Green et al., 2004).

Concerning occupational self-efficacy for stereotypically feminine occupations, girls reported higher values, but we found no statistically significant effect of the gender-fair language intervention on girls' or boys' occupational self-efficacy. This finding agrees with Vervecken and Hannover's (2015) results and is compatible with both the perceived difficulty hypothesis and the perceived gender congruence hypothesis, but incongruent with Chatard et al.'s (2005) social comparison hypothesis for boys. As argued in the introduction section, effects of the feminine and masculine

form are generally expected to have little or no effect on stereotypically feminine occupations because those jobs are already associated with femininity.

Finally, our last hypothesis concerned the role of general self-efficacy as a moderator variable on the effect of gender-fair language on occupational self-efficacy. Following the behavioral plasticity hypothesis (Brockner, 1988; Pillai et al., 2011), we had assumed that general self-efficacy moderated the effect of the gender-fair language manipulation, with effects being stronger for girls and boys with low general-self efficacy. Contrary to the hypothesis, there was no significant moderator effect of general self-efficacy. This was unexpected given the findings for interventions in other domains (Eden & Aviram, 1993; Eden & Zuk, 1995). However, to our knowledge, the behavioral plasticity hypothesis had not been tested for gender interventions before and additional studies are needed before reliable conclusions can be drawn for its effect on this type of interventions.

Limitations and Future Research Directions

Although this study represents a well-controlled field experiment, it is subject to certain limitations. First, the results are based on seven third and four fourth grade classes at two Bavarian elementary schools. Since no demographic data on the migration background or educational level of the parents could be collected, it is not possible to gauge to what extent the sample was representative of the general population of third and fourth graders. Second, due to time constraints, we used only a limited set of stereotypically masculine and feminine occupations. Although we expect the findings to generalize to other stereotypically masculine and feminine occupations, further studies using larger sets of occupations would be desirable. Third, our measures of cognitive gender association (the naming task) and occupational self-efficacy were oriented at but were no exact reproduction of instruments used in previous research (e.g., Chatard et al., 2005; Vervecken et al., 2013). As we did not pre-test our instruments, it is possible that they might not reflect the constructs as intended, which might have had an influence on the results of the present study.

Fourth, our conclusions are limited to a specific form of gender-fair language, namely the use of the feminine and masculine form. We chose this form of gender-fair language because it is intuitively understandable for young children and, according to current research, most likely to produce balanced mental gender representations (for a summary, see Stahlberg et al., 2007). Since the use of the gender star (or gender asterisk) has constantly increased in recent years (Duden, 2021) and is a linguistic way for overcoming the dichotomous conceptualization of gender, studies with the gender star or other more inclusive forms of gender-fair language would be desirable. An interesting observation in the present study was that when the children were informed about the goals of the research afterwards, some of them even mentioned that the gender star could have been used instead of the feminine and masculine form.

Fifth, we did not vary the order of the two dependent variables (i.e., the naming task and the occupational self-efficacy questionnaire). Therefore, children's behavior in the naming task might have affected their occupational self-efficacy ratings. Although both tasks correlated only weakly and the naming task did not statistically significantly mediate the effect of the experimental manipulation on occupational self-efficacy, it is still possible that the effects of the experimental manipulation on girls' occupational self-efficacy might be partly a consequence of conducting the naming task prior to the questions on occupational self-efficacy. Related to that it is unclear if using the same manipulation for both dependent variables (i.e., generic masculine vs. gender-fair language) might have increased the differences in the second dependent variable (i.e., the occupational self-efficacy). For example, if participants were asked about being a policeman after being exposed to the gender-fair language earlier in the naming task, would there still be an effect occupational self-efficacy or would it look similar to the masculine generic level?

Finally, the findings of the present study are limited to a short and tender intervention and a direct posttest. However, since even this limited linguistic variation resulted in significant differences in mental gender representations and occupational self-efficacy for girls, language seems to be a powerful tool to change the way we think about gender. Nevertheless, studies are needed that capture the effects of regularly used gender-fair language forms in everyday life. In school contexts, for example, it would be interesting to conduct observational studies of teachers' daily use of gender-fair language or to design extensive experimental intervention studies, in which some of the teachers receive training so that they use more gender-fair language in classroom. These studies should also include follow-up measurements to assess long-term effects of gender-fair language.

Practice Implications

The results of the present and previous studies (Chatard et al., 2005; Vervecken & Hannover, 2015; Vervecken et al., 2013) indicate that the use of gender-fair language, here the feminine and masculine form, increases the cognitive representation of women for stereotypically masculine occupations and strengthens girls' occupational self-efficacy concerning these occupations. This is a desirable effect because women are underrepresented in leadership positions (World Economic Forum, 2021) and in STEM professions, which are in

high demand and well-paid in modern societies (Bundesagentur für Arbeit, 2019) and which are typically associated with masculinity (Gadassi & Gati, 2009; Makarova et al., 2019). Importantly, as boys' occupational self-efficacy is not significantly negatively affected, there seems to be little downside of this type of easy-to-do language intervention. Therefore, we recommend using the feminine and masculine form instead of the generic masculine.

Conclusion

The use of gender-fair language in terms of the feminine and masculine form makes women more visible in male domains and increases girls' occupational self-efficacy for stereotypically masculine professions. Given these effects, the small effort of extending the generic masculine by adding the feminine form could be worthwhile for many situations (e.g., written texts, language in classroom). In particular, since linguistic formulations become habits through regular and frequent use, they will not require more cognitive resources than the generic masculine in the long run. However, the results of the present study also show very clearly that language is just one of several tools for addressing issues of gender equality. In particular, the feminine and masculine form of gender-fair language seems not suitable for increasing boys' occupational self-efficacy for stereotypically feminine occupations, which would be necessary to meet the challenge of skilled worker shortages and the general issue of gender equality in modern societies. To do so, other approaches such as changing gender stereotypes through real or fictional role models might be more suitable (e.g., Trepanier-Street & Romatowski, 1999).

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Author Contributions Jan Lenhart: conceptualization, methodology, statistical analysis, writing, and supervision. Franziska Heckel: conceptualization, methodology, statistical analysis, writing, and data collection.

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Data Availability Data and materials are available from the authors on request.

Declarations

Ethics Approval and Consent to Participate This study was approved by the Ethics Committee of the University of Bamberg, Germany (dossier number: 2023-06/27). Participants and their parents were provided with an informed consent informing them about the purpose of the research, voluntary participation and data usage. Only children whose parents had provided written consent were allowed to participate.

Consent for Publication All authors agree with the publication. The participants provided written consent for the use of the anonymized data for scientific purposes.

Competing Interests We have no known conflict of interest to disclose.

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