The Relationship Between Recruitment Strategy, Gender, and Person-Environment Fit in STEM Jobs

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Executive Summary

E-recruitment has become one of the most widely used practices by organizations for recruiting qualified candidates to gain a competitive advantage. One indicator of the success of e-recruitment is to look at the person-environment (P-E) fit of the recruited candidates. It consists of subtypes such as person-organization (P-O) and person-job (P-J) fit. The problem is that there is currently an underrepresentation of women in science, technology, engineering, and mathematics (STEM) jobs, and diversity in the workplace is being pressingly called for due to its benefits (e.g., better problem solving, more perspective-taking, fewer assumptions). Despite the rapid increase of e-recruitment, there has only been scarce research done on it. As the posting of job vacancies online and active sourcing via the internet are the first points of contact recruited candidates have with a company, evaluating the effectiveness of those two recruitment strategies was urgently needed.

That is why for Study 1, I sought to investigate how recruitment strategy (job posting, active sourcing) is related to candidates' subjective P-O and P-J fit. In Study 2, I examined how different job advertisement wordings (feminine, masculine, gender-fair) relate to the subjective P-O and P-J fit of sourced female and male candidates.

The findings of Study 1 showed that the posting of job vacancies online is more efficient in attracting candidates with a high P-O and P-J fit than active sourcing over the internet. Results from Study 2 indicated that women potentially benefit the most from the feminine job advertisement wording regarding their P-O and P-J fit. Men also scored differently on P-O and P-J fit depending on the job advertisement wording that they received, benefiting from the masculine job advertisement wording the most.

These results should not go unnoticed by human resource management. As the sourced candidates may not be as fitting to the company and job as the applicants, I recommend that the recruiter team use artificial intelligence (AI) software to help them gain a more suitable candidate pool. This will ultimately leave less room for poor sourcing decisions. As can be inferred from the results from Study 2, female- and male-sourced candidates' P-O and P-J fit are affected differently by the job advertisement wording. To obtain a diverse workforce, a dynamic approach of using differently phrased job advertisements is advocated. When women are underrepresented, companies should source candidates with a feminine-worded job advertisement as it could attract more females. Masculine-phrased job advertisements should be used when there is a low percentage of men

at the company. In the long term, it would be ideal if the company could also hire female recruiters as that could be another signal in the recruitment process, in addition to the job advertisement wording, that communicates to women that they are wanted in STEM jobs.

Abstract

Due to the rapid acceleration of e-recruitment changing how companies attract desired talent, research was desperately needed to inspect the effectiveness of e-recruitment strategies. The current paper consisted of two online studies with English-speaking senior software engineers as participants. Study 1 examined the relationship between recruitment strategy (job posting, active sourcing), person-organization (P-O), and person-job (P-J) fit in science, technology, engineering, and mathematics (STEM) jobs. Study 2 investigated the relationship between job advertisement wording (feminine, masculine, gender-fair), sourced candidates' gender (female, male), and sourced candidates' P-O and P-J fit in STEM jobs. The one-way multivariate analysis of variance (MANOVA) from Study 1 showed that applicants (N = 76) scored higher on P-O and P-J fit compared to the sourced candidates (N = 76). This was in complete agreement with the literature on P-O and P-J fit suggesting that people are attracted to environments congruent to them. In Study 2, 300 sourced candidates were contacted with one of the three job advertisements, with 50 women and 50 men per condition. The two-way MANOVA of Study 2 revealed that females' P-O and P-J fit was highest in the feminine job advertisement wording condition compared to the masculine and gender-fair ones. This further supported the idea that the job advertisement wording could maintain gender inequality in STEM jobs. In contradiction with earlier findings, this study suggested that job advertisement wording also relates to the P-O and P-J fit of men.

Keywords: e-recruitment, person-environment fit, job advertisement wording, gender, STEM

Ever since the coronavirus disease 2019 (COVID-19) pandemic started (Ciotti et al., 2020), businesses had to quickly find alternative ways of recruiting people since human capital plays arguably the greatest role in achieving competitive advantage (Chopra, 2017). Fast forward to 2022, where rapid digitalization led to web-based recruitment booming more than ever (Suarez-Santos & Morales-Velez, 2022). The goal of e-recruitment is to hire the most qualified and suitable people (Muscalu, 2015). It allows companies to attract individuals without geographical borders and consists of different strategies, one being the posting of job vacancies on the internet. Another strategy is active sourcing, which is to actively reach out to potential candidates via job portals such as LinkedIn, where recruiters can apply filters to source desired people (Holm, 2012).

Despite the possibilities e-recruitment provides, hiring candidates can still be quite challenging for companies. First, organizations need to attract qualified candidates using only limited communication channels (Okolie & Irabor, 2017). Secondly, sourcing has been inferred to be a difficult task for recruiters as hundreds of profiles have to be scanned every day (Rani & Venkatraman, 2020). Even though active sourcing over the internet offers the ability to select candidates from a diverse candidate pool (Prakash, 2018) in science, technology, engineering, and mathematics (STEM) jobs, an underrepresentation of women still exists (Botella, Rueda, López-Iñesta, & Marzal, 2019). Given that many companies have started to use online recruitment, there is a current and urgent need to determine its potential flaws and ways to overcome them (Suarez-Santos & Morales-Velez, 2022). Thus, the present research aims to help STEM companies improve their recruiting strategies.

One indicator of knowing how successful recruitment strategies are is to focus on the person-environment (P-E) fit. The P entails everything about the person, such as their personality, skills, and needs. The E refers to, e.g., the working culture and the company's mission (Andela & van der Doef, 2019). The P-E fit theory reflects the degree of compatibility of a person with their work environment and assumes that individuals are attracted to environments similar to their traits (Bowe, 2020). A plethora of research consists of both objective and subjective P-E fit, with the latter being proven to have a higher predictive value of willingness to join a company and organizational commitment (Edwards & Shipp, 2007; Kristof-Brown, Zimmerman, & Johnson, 2005). Therefore, this thesis will focus on subjective P-E fit.

Research stretching from as early as the 1970s up until the present suggest that P-E fit is significantly related to employees' work commitment, performance, and turnover. As the meta-analysis by Van Vianen (2018) has illustrated, a high P-E fit correlates positively with the positive aspects, and a low fit is seen as maladaptive. Moreover, the P-E fit theory distinguishes between various subcomponents, two of them being the person-organization (P-O) fit and the person-job (P-J) fit. The P-O fit is the match between the individual and organizational values and characteristics. As implied by Saether (2019), a high P-O fit is crucial for having motivated and satisfied employees. The P-J fit is the compatibility between the job requirements and a person's knowledge, skills, abilities, and other characteristics. A high P-J fit is related to higher task involvement and well-being (Huang, Yuan, & Li, 2019; Zhu et al., 2018).

A key problem with much of the literature on recruitment strategies was that usually an online one was compared to a traditional one (Fernandes & Machado, 2022). This comparison suffers from several pitfalls as offline and online recruitment strategies have fundamental differences (e.g., candidates' demographic diversity and the speed of reaching out to candidates; Dworkin, Hessel, Gliske, & Rudi, 2016). By comparing two e-recruitment strategies, it could provide a clearer image of the effectiveness of those strategies. The information gathered can help STEM companies make critical decisions about which web-based recruitment strategies to implement. Therefore, Study 1's research question is, "What is the relationship between recruitment strategy (job posting, active sourcing), and the candidates' P-O and P-J fit in STEM jobs?"

Another important factor in gaining the best human capital is by having a diverse workforce. Gender diversity can be a huge competitive advantage, according to Gomez and Bernet (2019), because it could increase, e.g., creativity and problem-solving. However, women make up less than one-third of the total STEM workforce (Botella et al., 2019; Wang & Degol, 2017). In this field, it is crucial to facilitate diversity since STEM professions are responsible for the digitalization of our world, which has been expanding rapidly (Lambrecht & Tucker, 2019).

One reason for the gender gap, proposed by Blickenstaff (2005), may be that in male-dominant occupations, male stereotypical traits such as "leader" and "independent" are used more often in job advertisements than female ones (e.g., communicative, cooperative). Gaucher, Friesen, and Kay (2011) have inferred that when a job vacancy had more stereotypical masculine words, women felt underrepresented to a greater extent and found the job less appealing. When a feminine-phrased job vacancy was used, females perceived a better fit, alleviating their attraction towards the organization. Furthermore, wording effects have not been observed for men as existing societal beliefs communicate to them that they belong in these jobs, diminishing the wording effect (Gaucher et al., 2011; Krome, 2016). Studies have acknowledged that when the P-O and P-J fit are low, candidates are less likely to pursue the job since they believe they are not competent enough to fulfill its demands (Ballout, 2007). Therefore, increasing women's P-O and P-J fit can potentially tackle their underrepresentation in STEM jobs.

The research problem is that most studies on occupational gender inequality and fit have only been done in the form of hiring simulations and with students as participants (Babarović, Dević, & Burušić, 2019; Wille & Derous, 2018). Field studies are needed to see

how generalizable previous findings are (Harrison & List, 2004). Furthermore, people at a later stage in their career might be more selective when choosing a job and thus more attentive to word cues in a job advertisement (Hentschel, Braun, Peus, & Frey, 2021). By tackling these problems, it could provide vital knowledge to STEM companies' human resources departments to improve their sourcing strategies. Hence, Study 2 focuses on the relationship between job advertisement wording (feminine, masculine, gender-fair), sourced candidates' gender (female, male), and the sourced candidates' P-O and P-J fit in STEM jobs.

The first hypothesis, researched in Study 1, is that there is a relationship between recruitment strategy (job posting, active sourcing) and candidates' P-O and P-J fit. Applicants are hypothesized to report a higher P-O and P-J fit compared to sourced candidates. This is a well-grounded hypothesis, as several studies suggest that applicants are drawn to organizations with similar values and jobs with appropriate demands (Carless, 2005). Contrary to that, recruiters may not have the time to assess the P-O and P-J fit of each sourced candidate accurately (Prakash, 2018; Rani & Venkatraman, 2020).

The second hypothesis, tested in Study 2, is that there is an interaction effect of job advertisement wording (feminine, masculine, gender-fair) and sourced candidates' gender (female, male) on sourced candidates' P-O and P-J fit, such that job advertisement wording only affects the P-O and P-J fit of female candidates, not of male candidates. Specifically, female candidates in the feminine job advertisement wording condition are hypothesized to report a higher P-O and P-J fit compared to the gender-fair and masculine job advertisement wording conditions (H2a). Because, as Krome (2016) argued, the feminine job advertisement wording will increase their belongingness to the company and their confidence in being able to meet the job demands. Females in the gender-fair job advertisement wording condition are hypothesized to report a higher P-O and P-J fit compared to the masculine one since the latter will signal values and job tasks that they will not perceive as fitting (H2b; Hentschel et al., 2021). For males, no effect of job advertisement wording on P-O and P-J fit is hypothesized (H2c; Gaucher et al., 2011).

Present Research

In the present research, I sought to evaluate the effectiveness of different e-recruitment strategies in two separate field studies, to help STEM companies gain a competitive advantage. The formulated hypotheses were tested using collected data from senior software engineering applicants (Study 1) and sourced candidates (Studies 1 and 2).

Study 1

Study 1 investigated whether recruitment strategies (job posting, active souring) result in different candidate P-O and P-J fit.

Method

Design and Participants

The research was carried out using recruitment strategy (job posting, active sourcing) as a categorical predictor variable, and P-O and P-J fit as distinct continuous criterion variables. 152 responses were collected (76 applicants, 76 sourced candidates). Since preliminary research has not provided sufficient information to derive effect sizes from it, a sensitivity power analysis for a multivariate analysis of variance (MANOVA) was executed via G*Power. The goal of the analysis was to gain information on what the smallest detectable effect size could be given different sample sizes (e.g., $N = 152$, $N = 100$, $N = 52$). When using an alpha error probability of .05, a power of .80, two groups, and two response variables (Cohen, 1988), 152 participants were needed to reliably detect a minimum f^2 of .07, which can be considered medium (small = .01, medium = .06, large = .16; Cohen, 1988). Other scenarios ($N = 100$, $N = 50$) would only have allowed for the reliable detecting of a large f^2. Consequently, there would have been a higher chance for the study to be underpowered, making it more difficult to draw conclusions (Lakens, 2022). That is why I chose to go for the larger sample size.

As a selection criterion, participants had to be senior software engineers as it is part of the overarching STEM jobs and they are not at the beginning stage of their career anymore. Additionally, individuals had to be older than 16 for legal reasons. A question to assess the English level was also included. It had to be either intermediate, advanced, or native to ensure that respondents understood all materials. Moreover, subjects who indicated to be female or male were included. If participants did not give their consent, or “younger than 16” was selected for their age, or “beginner” was selected for their English skills, or people responded with “other” as their gender, the survey automatically ended, and they were excluded from the data analysis. Demographic information is summarized in Table 1.

Table 1

Summary of Participants’ Demographic Information

Recruitment strategy	Gender		English level		
	Female	Male	Native	Advanced	Intermediate
Job posting	38	38	27	49	0
Active sourcing	38	38	29	33	14
Total	76	76	56	82	14

Materials

Person-Organization fit. The P-O fit was measured using the four-item P-O fit scale developed by Cable and Judge (1996; see Appendix A). An example item was "To what extent are the values of the organization similar to your own values?" The answer choices were distributed on a 5-point Likert scale ranging from "to a very little extent" to "to a very large extent." Final P-O fit scores were calculated for each participant by creating a mean score of their responses. To verify the usage of this scale, it was demonstrated to have high internal consistency (α = .90; Tugal & Kilic, 2015) and high construct validity (Cable & DeRue, 2002). This study also found a high level of internal consistency (α = .89).

Person-Job fit. The P-J fit was measured using the four-item P-J fit scale developed by Saks and Ashforth (2002; see Appendix B). An example item was "My abilities, skills, and talents are the right type for this job." The answer choices were distributed on a 5-point Likert scale ranging from "strongly disagree" to "strongly agree." Final P-J fit scores were calculated for each participant by creating a mean score of their responses. To verify the usage of this scale, it was demonstrated to have high internal consistency (α = .93) and high discriminant validity (Brkich, Jeffs, & Carless, 2002). This study also found a high level of internal consistency (α = .86).

Procedure

The research was conducted from February 1st until July 3rd, 2022. First, to guarantee that the pool of applicants conformed to the inclusion requirements, the senior software engineer job vacancy stated "good English skills" and "three or more years of experience" as job requirements. Then, applicants were contacted via the web application Lever, which is an applicant tracking system. The senior software engineer applicants received an automatic response that their application was being reviewed with the survey link attached.

Next, the two-person recruiter team applied filters (“senior software engineer,” “three or more years of experience,” and “professional or native English skills”) on LinkedIn Recruiter, which is a hiring platform, to actively source potential candidates. “Potential candidates” referred to senior software engineers that the recruiters thought would match the organization’s culture and job. Finally, the sourced people were contacted with the regular company job advertisement and the survey link attached and were asked to fill out the survey based on the job advertisement that they received.

All the messages that were used to contact the participants explained briefly what the purpose of the study was and that participating would not increase their chances of being hired whatsoever. Another important aspect is that gender was controlled for by having an equal number of female and male participants in each condition.

The approximately 10-minute-long Qualtrics online survey first started with an information letter (see Appendix C) and a consent form (see Appendix D). Next, personal questions were asked, which included gender and whether the subject was older than 16. After that, the English level was assessed. If respondents selected an answer choice that made them ineligible to participate, they were immediately shown an ending screen. Whatsoever, if they fulfilled all the inclusion criteria, participants answered the corresponding questions to the P-J and then the P-O fit scale. Finally, an ending screen with a thank you message was visible. To accelerate the timely recruitment, a reimbursement of €10 was given to one random participant, which they could win by sending the code that was visible on the final ending screen to my email. On June 18th, 2022, the money was sent via PayPal to the email that the participant contacted me with. It should also be noted that this study adhered to the light track of the Ethics Committee (see Appendix E).

Analysis

The statistical software Statistical Package for the Social Sciences (SPSS) 28 was used to analyze all data. Before conducting the main analysis, a couple of assumptions had to be tested. Groupwise normality was assessed through the visual evaluation of boxplots and Q-Q plots. Homogeneity of error variances was assessed by conducting Leven’s test of homogeneity. Interval data was assessed by looking at the distance between the response choices of the survey. Independence was assessed using the Durbin-Watson test. Homogeneity of variance-covariance was assumed since the sample sizes were equal (Warner, 2012). Groupwise linearity was assessed using a visual examination of the

scatterplots. No multicollinearity was assessed by looking at the correlation between the P-O and P-J fit. Absence of multivariate outliers was assessed using the Mahalanobis distance (Leys, Ley, Klein, Bernard, & Licata, 2013). Then, descriptive statistics were calculated for every variable. The data was inspected for outliers by calculating groupwise z-scores and adhering to an interval of plus to minus 3.29 for the z-scores of each dependent variable throughout the conditions (Tabachnick & Fidell, 2013).

Finally, the research question was analyzed using a one-way MANOVA with recruitment strategy (job posting, active sourcing) as a categorical predictor variable, and P-O and P-J fit as distinct continuous criterion variables. An alpha value of .05 as a cutoff for significant results was used. When the multivariate effects turned out to be significant, a follow-up one-way analysis of variance (ANOVA) was executed to compare group means.

Results

Preliminary Analysis

After checking with SPSS 28, no responses had to be removed because all participants fulfilled the inclusion criteria, and no missing values were present.

Next, assumptions were tested. Normality was violated (for P-O fit see Appendix F, Figure F1-4; for P-J fit see Appendix F, Figure F5-8). Homogeneity of error variance was violated based on Levene's test for the P-O ($F(1, 150) = 35.13$, $p < .001$) and P-J fit ($F(1, 150) = 50.82$, $p < .001$). Interval data was met because the questionnaire used to measure P-O and P-J fit had equal intervals between the response choices. Independence was met based on the Durbin-Watson test, with a value of 1.84 for the P-O fit and 1.96 for the P-J fit, indicating that the data were not autocorrelated. Linearity was met based on observations from the scatterplots, indicating a linear relationship between P-O and P-J fit in the job posting and active sourcing conditions (see Appendix F, Figure F9 and F10). Absence of multicollinearity was met since the P-O and P-J fit were not highly correlated with each other ($r(150) = .71$, $p < .001$) using a cutoff of .80 (Shrestha, 2020). Absence of multivariate outliers was met since no outliers were present based on the Mahalanobis distance (Leys et al., 2013).

Although the normality and homogeneity of error variance assumptions were violated, because the data consists of a large sample with equal groups, the one-way MANOVA was expected to be robust against those violations (Yatim & Ismail, 2014).

Descriptive Analysis

Considering the scale range (1-5), applicants P-O (M = 4.21, SD = 0.55) and P-J fit (M = 4.29, SD = 0.45) were in general high.

Considering the scale range, sourced candidates P-O (M = 2.83, SD = 1.16) and P-J fit (M = 3.38, SD = 1.03) were in general average.

Main Analysis

The results of the one-way MANOVA indicated a statistically significant difference between the recruitment strategies on the combined P-O and P-J fit, $F(2, 149) = 45.93$, $p < .001$, Pillai's Trace = .38, with a large effect size ($\eta_p^2 = .38$; small = .01, medium = .06, large = .14; Cohen, 1988).

Follow-up one-way ANOVA results indicated that recruitment strategy had a statistically significant effect on both P-O ($F(1, 150) = 88.87$, $p < .001$) and P-J fit ($F(1, 150) = 50.52$, $p < .001$). A large effect size was detected for P-O ($\eta_p^2 = .37$) and P-J fit ($\eta_p^2 = .25$).

Based on the group means, applicants had a higher P-O (M = 4.21, SD = 0.55) and P-J fit (M = 4.29, SD = 0.45) compared to the sourced candidates' P-O (M = 2.83, SD = 1.16) and P-J fit (M = 3.38, SD = 1.03), which was in line with hypothesis one.

Discussion

Consistent with hypothesis one, applicants scored higher on P-O and P-J fit compared to sourced candidates. Thus, Study 1 substantiates previous findings in the literature on P-O and P-J fit, advocating that people are attracted to environments that are congruent with their own traits (Bowe, 2020).

Study 2

Study 2 investigated whether the P-O and P-J fit of female and male sourced candidates differed, depending on the job advertisement wording received (H2a-H2c).

Method

Design and Participants

The research was carried out using a 3 X 2 between-subject design, with job advertisement wording (feminine, masculine, gender-fair) and gender (female, male) as categorical predictor variables, and P-O and P-J fit as distinct continuous criterion variables. A total of 300 responses were collected, and the demographic information of the participants is summarized in Table 2.

Table 2

Summary of Participants' Demographic Information

Job advertisement wording	Gender		English level		
	Female	Male	Native	Advanced	Intermediate
Feminine wording	50	50	42	43	15
Masculine wording	50	50	26	59	15
Gender-fair wording	50	50	41	46	13
Total	150	150	109	148	43

The time in which Study 2 was done, the inclusion criteria for the sourced participants, the way it was handled when respondents did not fulfill the inclusion criteria, the alpha error probability, and the power for the sensitivity power analysis were all the same as in Study 1. The differences were that only sourced candidates took part in this study, and for the sensitivity power analysis, six groups, two predictors, and two response variables were used, striving for a sample size of 300 participants (100 per job advertisement wording condition). The final sample of 300 subjects allowed for the detection of a minimal f^2 of .02, which can be considered small to medium (Cohen, 1988).

Materials

The materials were the same as in Study 1, except that the feminine-, masculine-, and gender-fair job advertisements were used. Final P-O and P-J fit scores were calculated the same way as for the sourced candidates in Study 1. The scales used to measure P-O (α = .94) and P-J fit (α = .93) had a high level of internal consistency.

Job advertisement templates. The feminine- and masculine-worded job advertisements were both based on the company's job vacancy by replacing the qualifications with terms from the list given by Gaucher et al. (2011). To establish similarity between them, they all included a company, job, and qualification section. The feminine version had eight feminine stereotypical qualifications (see Appendix G), and the masculine version had eight masculine stereotypical qualifications (see Appendix H). An example sentence from the feminine version was "*Cooperates* well in a team environment," whereas the masculine one

was phrased as "Ability to perform in a *competitive* environment." The gender-fair worded job advertisement consisted of an equal mix of the other two conditions, four feminine- and four masculine-related words (see Appendix I). Several studies have pointed out that the words used for the feminine job advertisement were indeed perceived as feminine, and vice versa for the masculine job advertisement (Askehave & Zethsen, 2014; Gaucher et al., 2011).

Procedure

Procedures were the same as for the participants in the sourced condition from Study 1, except that the sourced candidates were randomized to receive one of the differently phrased job advertisements (feminine, masculine, gender-fair). Also in Study 2, candidates answered the survey based on the job advertisement that they received.

Analysis

The testing of assumptions, checking for outliers, the descriptive analysis, and the alpha value used as a cutoff for significant results were the same as for the sourced candidates from Study 1. The differences compared to Study 1 were that the research question was analyzed using a two-way MANOVA, with job advertisement wording (feminine, masculine, gender-fair) and gender (female, male) as categorical predictor variables, and P-O and P-J fit as distinct continuous criterion variables. When the multivariate effects turned out to be significant, follow-up one-way ANOVAs and a simple effects test were executed.

Results

Preliminary Analysis

Also, for Study 2, no participants had to be removed based on the inclusion criteria or missing values, and no outliers were present.

Next, assumptions were tested. Normality was violated (for P-O fit see Appendix J, Figure J1-J12; for P-J fit see Appendix J, Figure J13-J24). Homogeneity of error variance was violated based on Levene's test for the P-O ($F(5, 294) = 4.02$, $p = .002$) and the P-J fit ($F(5, 294) = 3.59$, $p = .004$). Interval data was met based on the same reason as for Study 1. Independence was met based on the Durbin-Watson test, with a value of 1.73 for the P-O fit and 1.50 for the P-J fit, indicating that the data was not autocorrelated. Linearity was violated based on observations from the scatterplots, indicating a non-linear relationship between P-O and P-J fit across the different Job Advertisement Wording X Gender conditions (see Appendix J, Figure J25-J27). Absence of multicollinearity was met since P-O and P-J fit were

not highly correlated with each other ($r(298) = .40$, $p < .001$), using the same cutoff as in Study 1. Absence of multivariate outliers was met since no outliers were present based on the Mahalanobis distance (Leys et al., 2013).

Although the normality, homogeneity of error variance, and linearity assumptions were violated, for the same reason as in Study 1, the two-way MANOVA was expected to be robust against those violations (Yatim & Ismail, 2014).

Descriptive Analysis

No matter the job advertisement wording condition, females' and males' mean P-O and P-J fit scores were always between two and four (see Table 3). This is, considering the scale range (1-5), low to high.

Table 3

Descriptive Statistics for Female and Male Participants' P-O and P-J Fit Across the Job Advertisement Wording Conditions

		Gender			
		Female		Male	
Fit	Job advertisement wording	*M*	*SD*	*M*	*SD*
P-O fit	Feminine wording	3.93	1.00	3.09	1.43
	Masculine wording	2.76	1.34	3.23	1.35
	Gender-fair wording	2.53	1.09	2.71	1.09
P-J fit	Feminine wording	3.59	1.27	3.04	1.21
	Masculine wording	2.72	1.16	3.66	1.04
	Gender-fair wording	2.83	1.20	3.99	0.76

Main Analysis

The results of the two-way MANOVA indicated that there was a statistically significant main effect of job advertisement wording on the combined P-O and P-J fit, $F(4,$

588) = 8.53, $p < .001$, Pillai's Trace = .11, with a medium effect size ($\eta_p^2 = .06$). Moreover, there was a statistically significant main effect of gender on the combined P-O and P-J fit, $F(2, 293) = 10.39$, $p < .001$, Pillai's Trace = .07, with a medium effect size ($\eta_p^2 = .07$).

However, these main effects were qualified by a significant interaction effect between job advertisement wording and gender on the combined P-O and P-J fit, $F(4, 588) = 9.22$, $p < .001$, Pillai's Trace = .12, with a medium effect size ($\eta_p^2 = .06$). Follow-up one-way ANOVAs indicated that the interaction of job advertisement wording and gender had a statistically significant effect on both P-O fit, $F(2, 294) = 7.75$, $p < .001$, and P-J fit, $F(2, 294) = 17.37$, $p < .001$. A small to medium effect size was detected for the P-O fit ($\eta_p^2 = .05$), and a medium effect size for the P-J fit ($\eta_p^2 = .11$).

A follow-up simple effects test was performed to examine the effect of job advertisement wording on females' and males' P-O and P-J fit separately.

Females' P-O Fit

Results showed that there was a statistically significant difference in females' P-O fit between the feminine compared to the masculine ($p < .001$) and gender-fair ($p < .001$) job advertisement wording conditions. Females scored higher in the feminine compared to the masculine and gender-fair job advertisement wording conditions (see Figure 1), which conformed to hypothesis 2a. The other comparison did not differ significantly ($p = .351$), contradicting hypothesis 2b.

Males' P-O Fit

Results showed that there was a statistically significant difference in males' P-O fit between the masculine and gender-fair ($p = .035$) job advertisement wording conditions, with males scoring higher in the masculine one (see Figure 1). This finding contradicted hypothesis 2c. The other comparisons did not differ significantly (ps > .124), which conformed to hypothesis 2c.

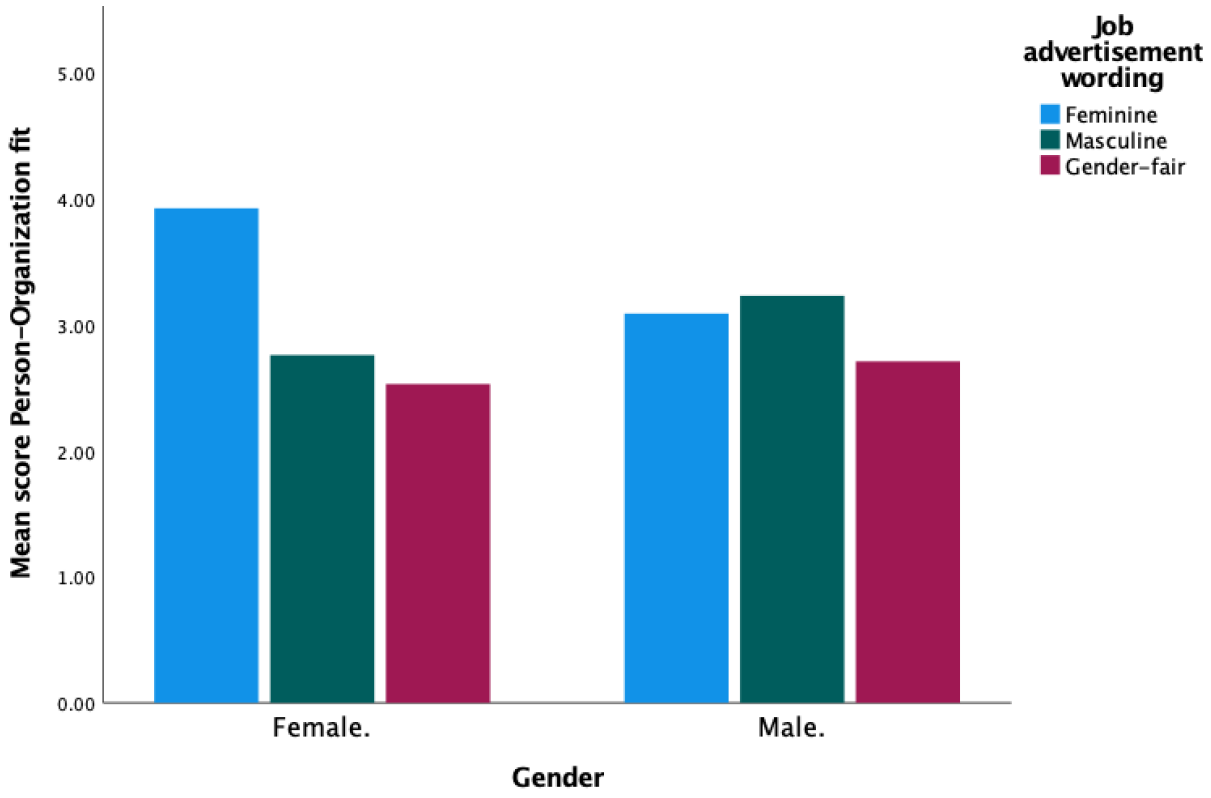

Figure 1. Mean values of females' and males' person-organization fit across the job advertisement wording conditions.

Females' P-J Fit

Results showed that there was a statistically significant difference in females' P-J fit between the feminine compared to the masculine ($p < .001$) and gender-fair ($p < .001$) job advertisement wording conditions. Females scored higher in the feminine compared to the masculine and gender-fair job advertisement wording conditions (see Figure 2), which conformed to hypothesis 2a. The other comparison did not differ significantly ($p = .639$), contradicting hypothesis 2b.

Males' P-J Fit

Results showed that there was a statistically significant difference in males' P-J fit between the feminine compared to the masculine ($p = .006$) and gender-fair ($p < .001$) job advertisement wording conditions. Males scored higher in the masculine and gender-fair job advertisement wording conditions compared to the feminine one (see Figure 2). This finding contradicted hypothesis 2c. The other comparison did not differ significantly ($p = .148$), which conformed to hypothesis 2c.

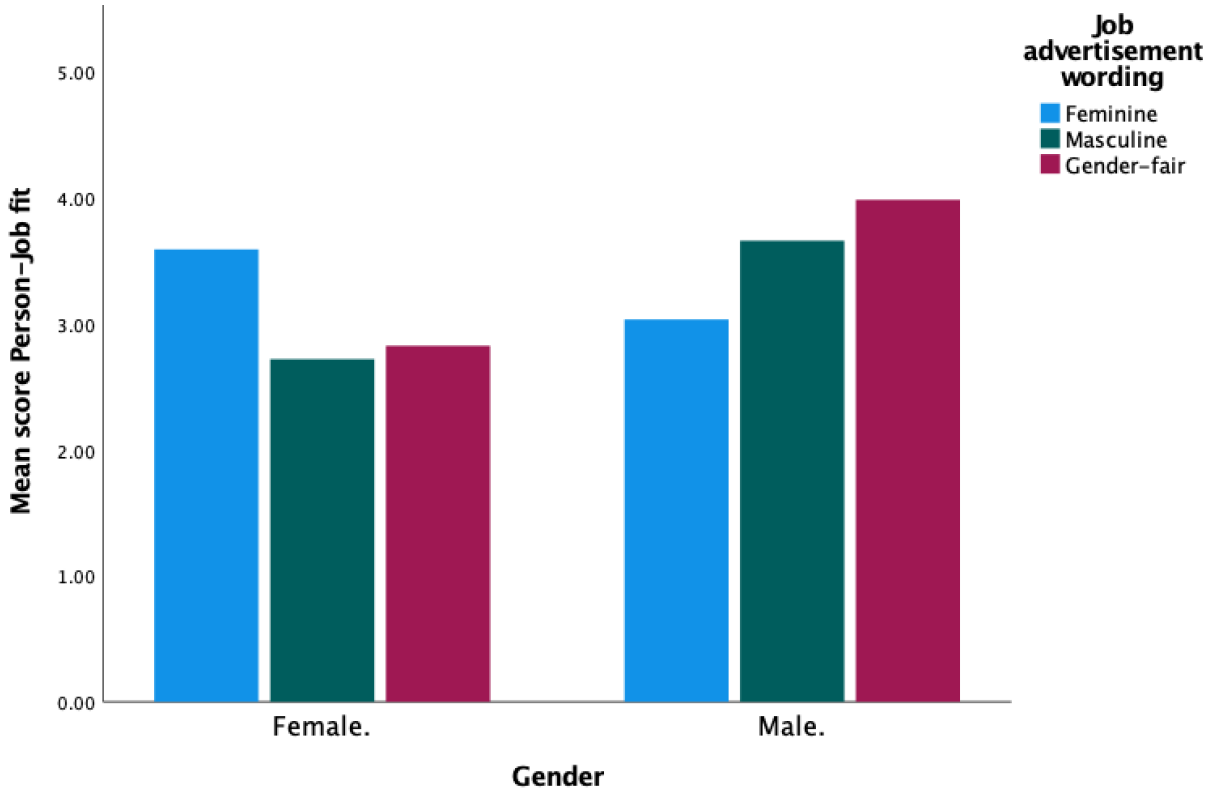

Figure 2. Mean values of females' and males' person-job fit across the job advertisement wording conditions.

Discussion

Consistent with hypotheses 2a and 2b, females scored highest on P-O and P-J fit when contacted with a feminine-phrased job advertisement compared to a masculine and gender-fair one. This finding is supported by prior research and suggests that the feminine stereotypical job characteristics signal values and job demands to females that they perceive as fitting, increasing their P-O and P-J fit (Krome, 2016). Nevertheless, I was surprised to find that, contrary to hypothesis 2c, males' P-O and P-J fit also differed depending on the job advertisement wording, as substantial disagreement is evident (Gaucher et al., 2011; Hentschel et al., 2021). Therefore, it can be argued that the P-O and P-J fit of males at a later stage in their career is affected by the job advertisement wording.

General Discussion

The current study was designed to gain insight into whether e-recruitment strategies (job posting, active sourcing), whose usage has largely increased, could explain the gender

gap in STEM jobs (Botella et al., 2019). According to Yu (2014) and Stich (2020), one important indicator of why people are attracted to companies is their perceived fit with the organization (P-O fit) and job (P-J fit). Therefore, the current study scrutinized two research questions. First, what is the relationship between recruitment strategy (job posting, active sourcing) and candidates' P-O and P-J fit in STEM jobs? Secondly, when recruiters use active sourcing as a strategy, what is the relationship between job advertisement wording (feminine, masculine, gender-fair), sourced candidates' gender (females, males), and their P-O and P-J fit in STEM jobs?

The findings from Study 1 revealed that applicants scored higher on P-O and P-J fit compared to the sourced candidates. In Study 2, it was shown that females' and males' P-O and P-J fit differed across the job advertisement wording conditions.

To answer the research questions, there is a relationship between recruitment strategy and candidates' P-O and P-J fit, as well as a relationship between job advertisement wording, gender, and sourced candidates' P-O and P-J fit.

In line with hypothesis one, applicants had a higher P-O and P-J fit than sourced candidates. This reciprocates a plethora of research on P-E fit theory, strengthening the idea that people are attracted to environments similar to their own traits (Oh et al., 2014; Van Vianen, 2018).

In support of hypothesis 2a, females benefited more from the feminine-phrased job advertisement as it increased their P-O and P-J fit compared to the masculine- and gender-fair worded job advertisements, which correlates favorably with findings from Gaucher et al. (2011) and Hentschel et al. (2021). This study broadens the scope of previous findings by replicating them with people at a later stage in their careers. Additionally, it sheds light on the role wording plays in increasing females' P-O and P-J fit for STEM jobs, possibly tackling the gender gap.

In contrast to hypothesis 2b, females' P-O and P-J fit did not differ between the gender-fair and masculine-worded job advertisements. This could be explained by the idea that multiple fit signals are sent to candidates during the recruitment process, as proposed by Chapman, Uggerslev, Carroll, Piasentin, and Jones (2005). They observed that female recruiters increased women's perceived fit towards an organization, and the opposite was true when the recruiter was male. Since the current study only used male recruiters, it may have diminished the wording effect.

Inconsistent with hypothesis 2c and what was previously thought by Gaucher et al. (2011) and Hentschel et al. (2021), this paper is the first to suggest that job advertisement wording matters for men too. For the P-O fit, it seems as if they prefer a job advertisement that communicates males being the majority. The obtained results are consistent with the similarity-attraction theory, which holds that people are attracted to environments like themselves, as this reduces uncertainty and increases predictability of the environment (Montoya & Horton, 2013).

For the P-J fit, men seem to prefer a masculine or gender-fair worded job advertisement over the feminine one. Since, according to Cennamo and Gardner (2008), work values are not stable but change with age due to e.g., work experience, male senior software engineers may have started to become more open towards feminine stereotypical job characteristics.

Limitations and Future Research

Despite the important contributions that this research provides, limitations should not be overlooked. First, P-E fit has many different subtypes, with some being specific to the relationship with the working group or supervisor (Kristof-Brown et al., 2005). Thus, they could not be assessed in the sourcing stage. In addition, P-E fit is a continuous process of the interaction between the person and environment, susceptible to change (Su, Murdock, & Rounds, 2015). Therefore**,** to get a complete picture of whether the recruitment was successful, future research should conduct longitudinal studies in which participants' P-E fit subtypes are measured at least twice in different periods, before and after joining.

Moreover, the sample only consisted of English-speaking participants. English is a primarily gender-neutral language, where most of the nouns (e.g., job titles) are gender-neutral. It would be interesting for future research to replicate this study with job advertisements in grammatical gender languages (e.g., German or Spanish; Stahlberg, Braun, Irmen, & Sczesny, 2007). Since in grammatical gender languages, the different genders are much more detectable, job advertisement wording effects may differ (Bußmann & Hellinger, 2003).

Practical Implications for the Organization

Based on the results of Study 1, sourced candidates may experience a lower fit with the organization and job compared to applicants. To achieve better sourcing decisions, I suggest that the company implements artificial intelligence (AI) software. The AI can be

calibrated to select profiles that adhere to the company's ideal candidate without getting tired or unconsciously discriminating (Albert, 2019).

Based on the findings from Study 2, the company should use a dynamic sourcing approach where they switch between the feminine- and masculine-phrased job advertisements to overcome the gender gap. When women are underrepresented, sourced candidates should be contacted with the feminine-worded job advertisement. However, once men start to become underrepresented, the company should switch to a masculine-phrased job advertisement to attract more men. Overall, this will help gain a balanced workforce as both genders may be less attracted to the company if they receive a job advertisement that is phrased oppositely to their gender. Ideally, in the long term, the company could hire female recruiters to send more signals throughout the recruitment process that women belong to the organization (Hentschel et al., 2021). This could attract more female candidates and play a great part in reducing the gender gap.

Conclusions

To conclude, this study extends previous literature by being the first field study, to my knowledge, to examine the relationship between recruitment strategy and P-O and P-J fit and the relationship between job advertisement wording, sourced candidates' gender, and their P-O and P-J fit in STEM jobs with senior career candidates. As e-recruitment is gaining increasing attention from companies all around the world, there was a current and urgent need to determine ways to improve it (Suarez-Santos & Morales-Velez, 2022).

The findings of the study have contributed to solving this problem by illustrating that the candidates who were sourced over the internet may not fit as well to the organization and job as applicants. Furthermore, this research has also provided practical implications for the company's HR management by showing that feminine-phrased job advertisements seem to benefit the P-O and P-J fit of sourced female candidates, and masculine-phrased job advertisements benefit the P-O and P-J fit of sourced male candidates.

Future studies should continue to fight the underrepresentation of women in STEM jobs by discovering what causes, reinforces, and maintains the gender gap.

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Appendix A

Person-Organization fit scale

For each of the following statements, please indicate how applicable it is to you.

		To a very little extent.	To a little extent.	To some extent.	To a large extent.	To a very large extent.
1.	To what extent are the values of the organization similar to your own values?	1	2	3	4	5
2.	To what extent does your personality match the personality or image of the organization?	1	2	3	4	5
3.	To what extent does the organization fulfill your needs?	1	2	3	4	5
4.	To what extent is the organization a good match for you?	1	2	3	4	5

Appendix B

Person-Job fit scale

For each of the following statements, please indicate how applicable it is to you.

		To a very little extent.	To a little extent.	To some extent.	To a large extent.	To a very large extent.
1.	To what extent does your knowledge, skills, and abilities match the requirements of the job?	1	2	3	4	5
2.	To what extent does the job fulfil your needs?	1	2	3	4	5
3.	To what extent is the job a good match for you?	1	2	3	4	5
4.	To what extent does the job enable you to do the kind of work you want to do?	1	2	3	4	5

Appendix C

Information letter

Information letter

for participation in scientific research: **Attracting and Sourcing Fitting Talent in STEM Jobs. A Person-Environment fit Perspective**

This study is conducted within the Master Thesis and Internship course of the Work, Organization, and Health study track of the Radboud University. In this course, students conduct a study on a psychological topic under supervision of a teacher of the Master of Science program.

Goal of the Research

I want to examine whether and how different ways of recruiting people and different recruitment texts attract a diverse group of people with a high fit to the organization.

To do so, the study consists of an online questionnaire with questions about the perceived fit between you, the organization and job, and takes less than 10 minutes to complete. Furthermore, I ask for your gender, as I am interested in the number of women and men that are attracted by the recruitment system. Moreover, I need to ask whether you are older than 16 since people under the age of 16 are not allowed to participate. No other personal data is asked from you.

In the consent form you are asked to give permission for the collection, use and storage of the above-mentioned personal data (i.e., gender, and whether your age is above 16).

Anonymity

Filling out the survey will be completely voluntarily and anonymous: We cannot link your responses to the survey to you or to your job application. Hence, your decision to take or not take part in this study and your answers to the questions will in no way affect (i.e., increase or decrease) your chances of being hired.

Voluntary participation

During the study you can indicate at any moment in time that you want to quit participating, without you having to explain why you want to quit. Quitting during the study has no consequences whatsoever.
You have the right to withdraw your consent at any time whilst filling out the survey. However, once your response choices have been submitted, I cannot trace back the answers to you and thus consent cannot be withdrawn anymore.

Who has access to the data?

The information you provide for the current research purposes is treated with the utmost care and is accessible to authorized staff only. Some persons and organizations must have access to your anonymous personal and research data to test whether the research has been carried out properly and reliably; these include: authorized persons within the Behavioral Science Institute or Radboud University (for example a dean, director or data officer) and (inter) national supervisory authorities (for example the Dutch Data Protection Authority and the Netherlands Board on Research Integrity). You will be asked to grant permission for this access. If you refuse to do so, you cannot participate in the study.

Radboud University is responsible for compliance with the General Data Protection Regulation (GDPR) when processing your personal data. I will ensure that your privacy and the conditions attached to it are safeguarded and I will adhere to the Dutch code of conduct for scientific integrity and university policy regarding the storage and management of personal and research data when conducting this research. You can find the Radboud University Privacy Statement at: https://www.ru.nl/english/vaste-onderdelen/privacy-statement-radboud-university/. If you have any questions about your privacy, please contact the Privacy Officer Faculty of Social Sciences (P.Janssen@socsci.ru.nl). For general questions, please contact the office of the Data Protection Officer of Radboud University via privacy@ru.nl. More information about your rights in the processing of your personal data can be found at https://www.ru.nl/privacy/english/protection-personal-data/data-subjects-rights/ and on the website of the Dutch Data Protection Authority (https://autoriteitpersoonsgegevens.nl/en).

Ethical approval

The study has been reviewed independently by the Ethics Committee Social Sciences (ECSS) of the Radboud University and there is no formal objection to this study.

Contact

If, after the study, you have remarks or complaints about it, you can contact me under marco.valdes@ru.nl or the general coordinator of the course Master thesis and Internship, Brigitte Claessens (brigitte.claessens@ru.nl).

Compensation

There will also be a compensation given of 10€ to one random participant. At the ending screen of the questionnaire, more information on the procedure will be given.

If you indicate that you want to participate in this study, I will ask you to sign an informed consent form. By signing this form, you indicate that you are sufficiently informed about the study and that you want to participate in the study and that you voluntarily do so.

Kind regards,

Marco Valdes
Master Thesis and Internship
Masters specialization in Work, Organization, and Health
Radboud University

Appendix D

Consent form

Consent Form

for participation in scientific research: **Attracting and Sourcing Fitting Talent in STEM Jobs. A Person-Environment fit Perspective**

I hereby confirm that

- I allow the researcher to use my gender to answer his research question for the duration of this project.
- I was satisfactorily informed about the study and I have read and understood the written information on the study.
- I was informed that the current study is conducted by a psychology student as part of his master thesis of the Work, Organization, and Health study program.
- I have had the opportunity to ask questions regarding the study and my questions have been answered satisfactorily.
- I was allowed sufficient time to consider whether to give my consent.
- I participate on my own free will.
- I have received the contact information of the student.

I understand that

- I have the right to withdraw my consent at any time whilst filling out the survey without having to give a reason and withdrawing my participation has no further consequences. However, once my response choices have been submitted, consent cannot be withdrawn anymore because the researcher will not be able to trace back my answers to me.
- My information will be collected and processed anonymously and only used by the student to research the effectiveness of the recruitment system.
- Only the researcher, and supervisory authorities may inspect my anonymous personal and research data for the purpose of auditing the research.

- The anonymized research data will be stored until the project has been evaluated and graded and will be kept until October 1st at the latest.
- The research data obtained will not be viewed from a medical and/or clinical perspective. Therefore, my participation in the study cannot be considered a medical/clinical test. Since the current study is completely anonymous, any scores that are worrying and/or that may be of personal clinical significance cannot be related back to you.
- Once I have submitted my responses, I cannot withdraw my consent since the answers are completely anonymous cannot be traced back to me.
  my personal data are processed in accordance with the privacy statement of Radboud University (https://www.ru.nl/english/vaste-onderdelen/privacy-statement-radboud-university/).
- I will not be informed about my individual results.

I hereby consent to participate in the study referred to above.

Appendix E

Ethical checklist

		YES	NO[1]	N/A
Location and setting of the study				
1	The research takes place physically within the Netherlands or is arranged online (nationally/internationally).		X	
2	If the study is done at an external organisation (e.g., a school, institution or organisation), I will only start collecting data if a consent form/agreement has been signed by the management/board of the institution/organisation.	X		
3	If online data collection is used, this has been carefully considered and I will follow the guidelines.		X	
Participants and dealing with participants				
4	The participants in the study are 16 years of age or older.	X		
5	The participants in the study are mentally/legally competent.	X		
6	The participants in the study are healthy and do not belong to a vulnerable and/or a patient group.	X		
7	Participation is voluntary; there is no social pressure, dependent relationship with the researcher or any other situation that undermines the ability of participants to feel free in their decision to participate.	X		
8	Participants can quit the study at any time, without any consequences for them and without having to give a reason. Participants are explicitly informed of this.	X		
9	Careful consideration has been given to the number of participants to include (minimum and maximum).	X		
10	The reimbursement for participating in the study is in line with the ECSW guidelines.	X		

Appendix F

Assumptions Study 1

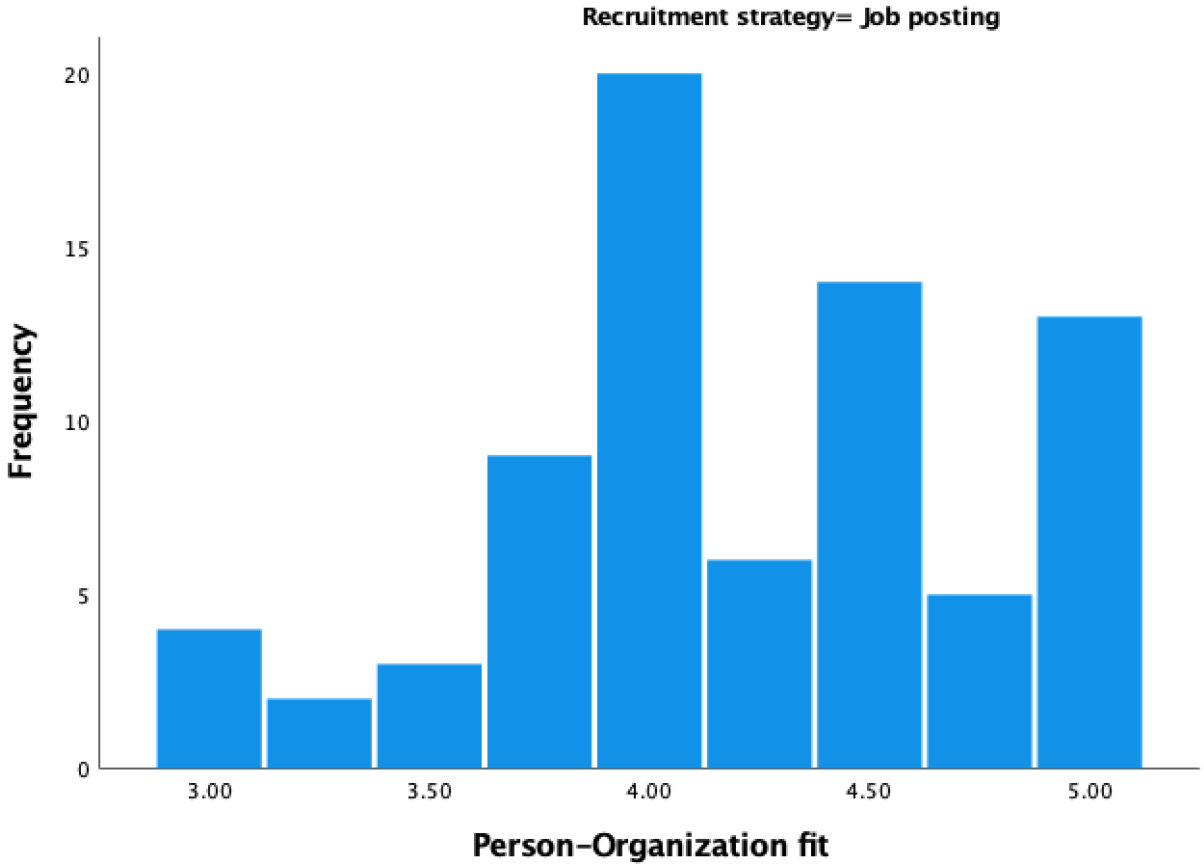

Figure F1. Histogram for applicants' person-organization fit.

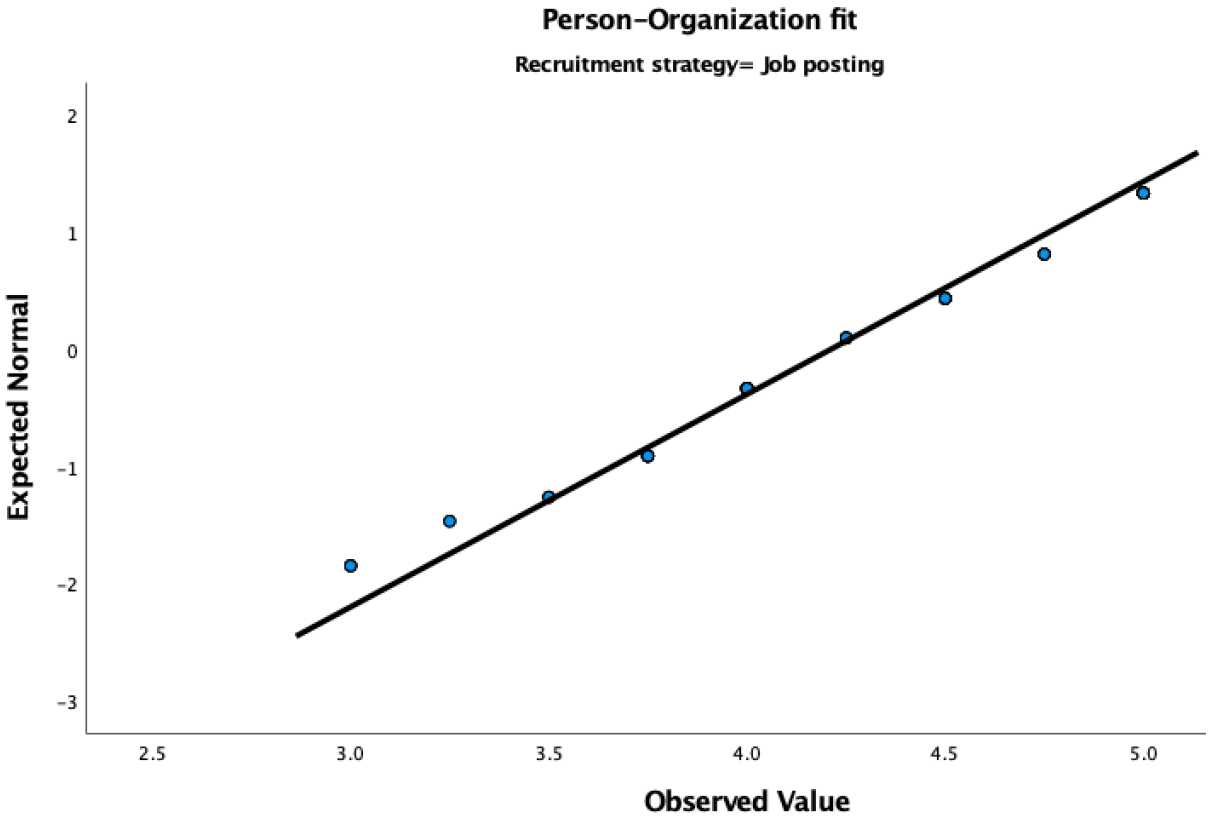

Figure F2. Normal Q-Q plot for applicants' person-organization fit.

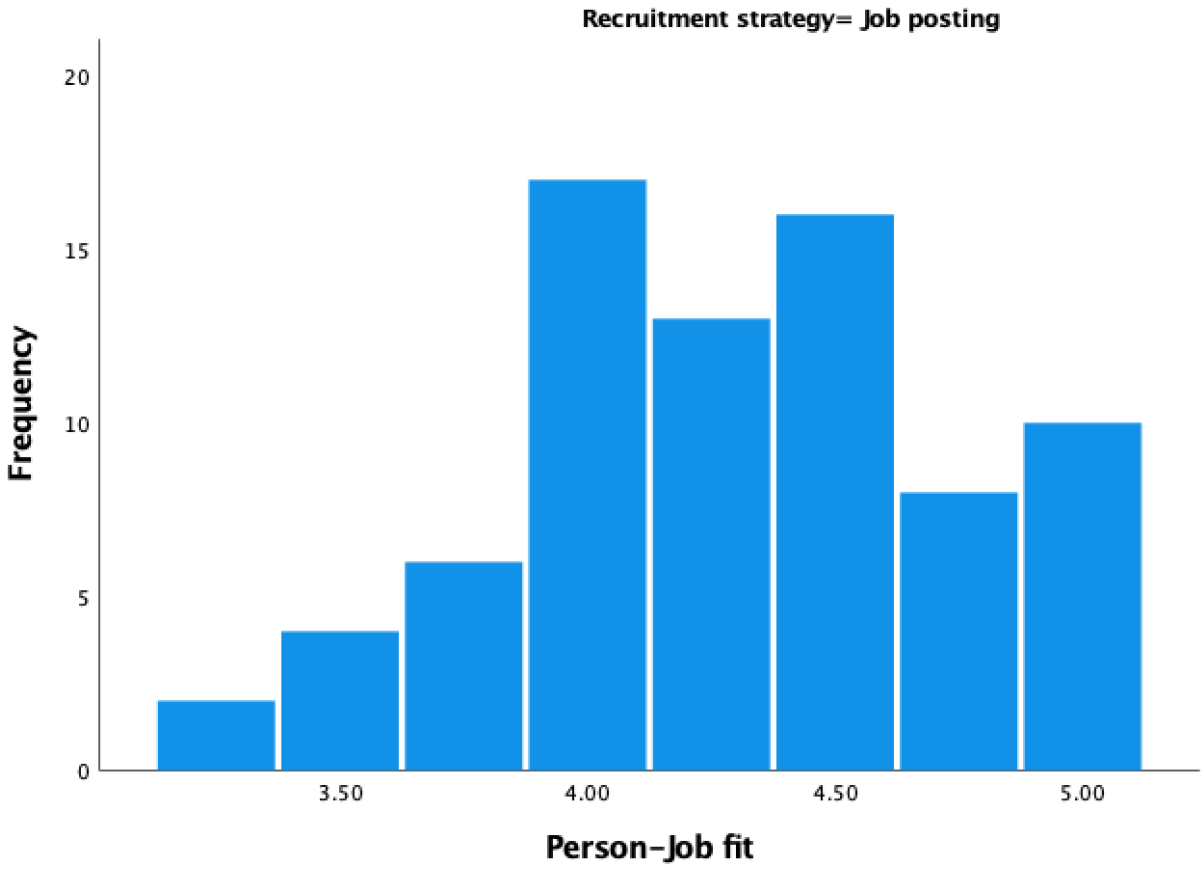

Figure F3. Histogram for applicants' person-job fit.

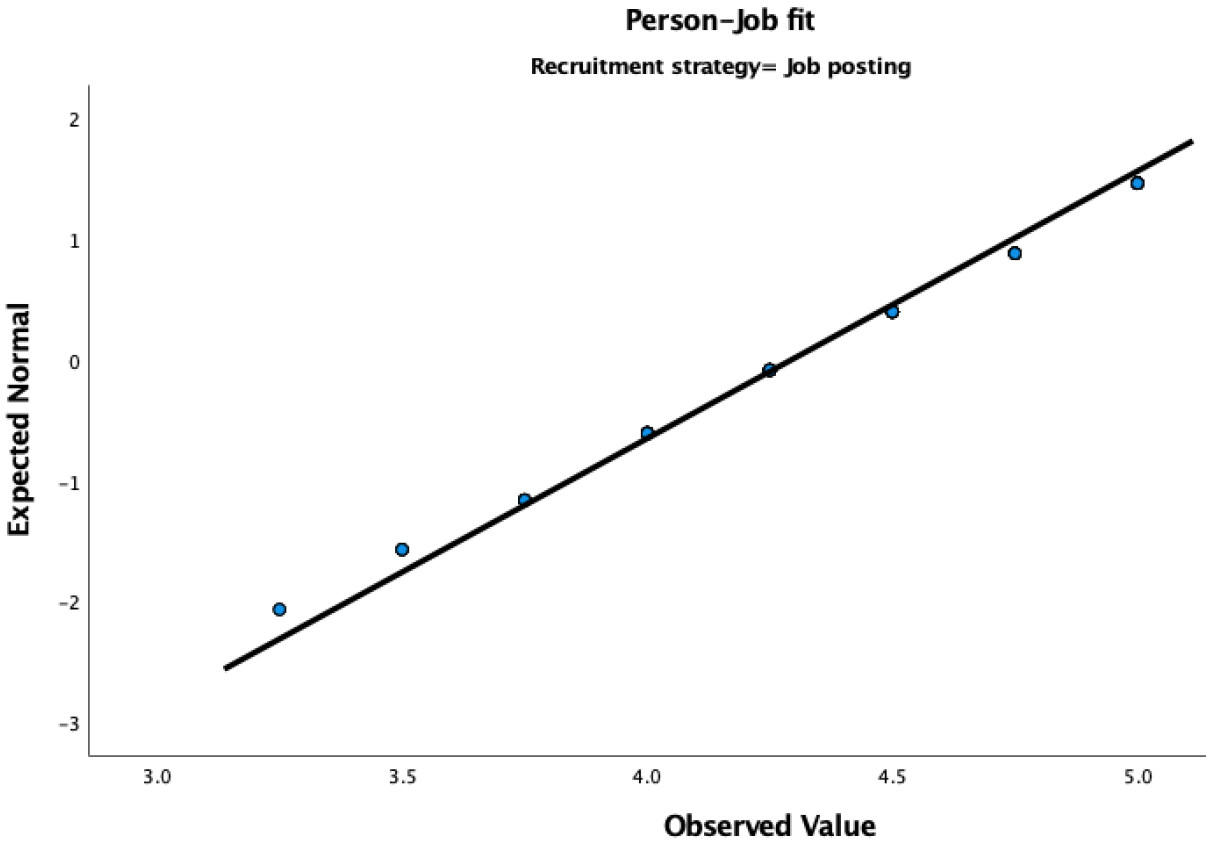

Figure F4. Normal Q-Q plot for applicants' person-job fit.

Figure F5. Histogram for sourced candidates' person-organization fit.

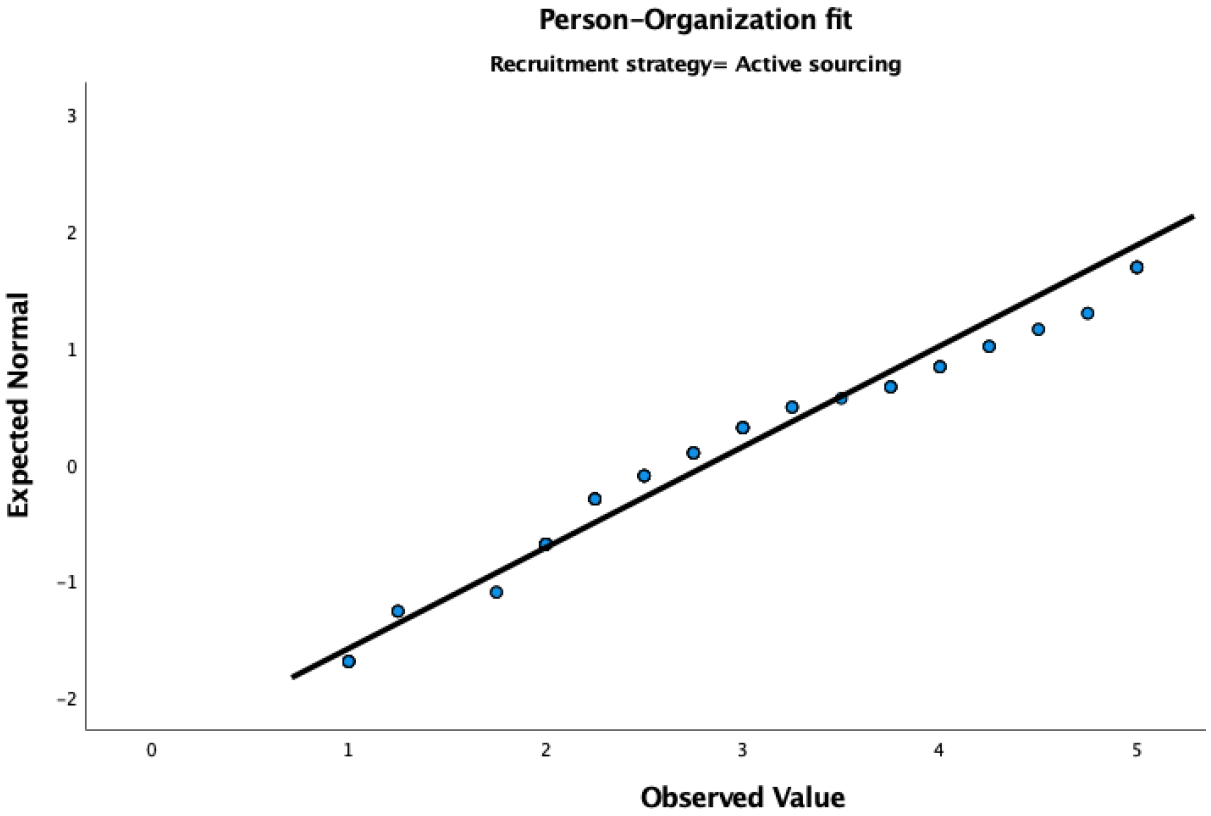

Figure F6. Normal Q-Q plot for sourced candidates' person-organization fit.

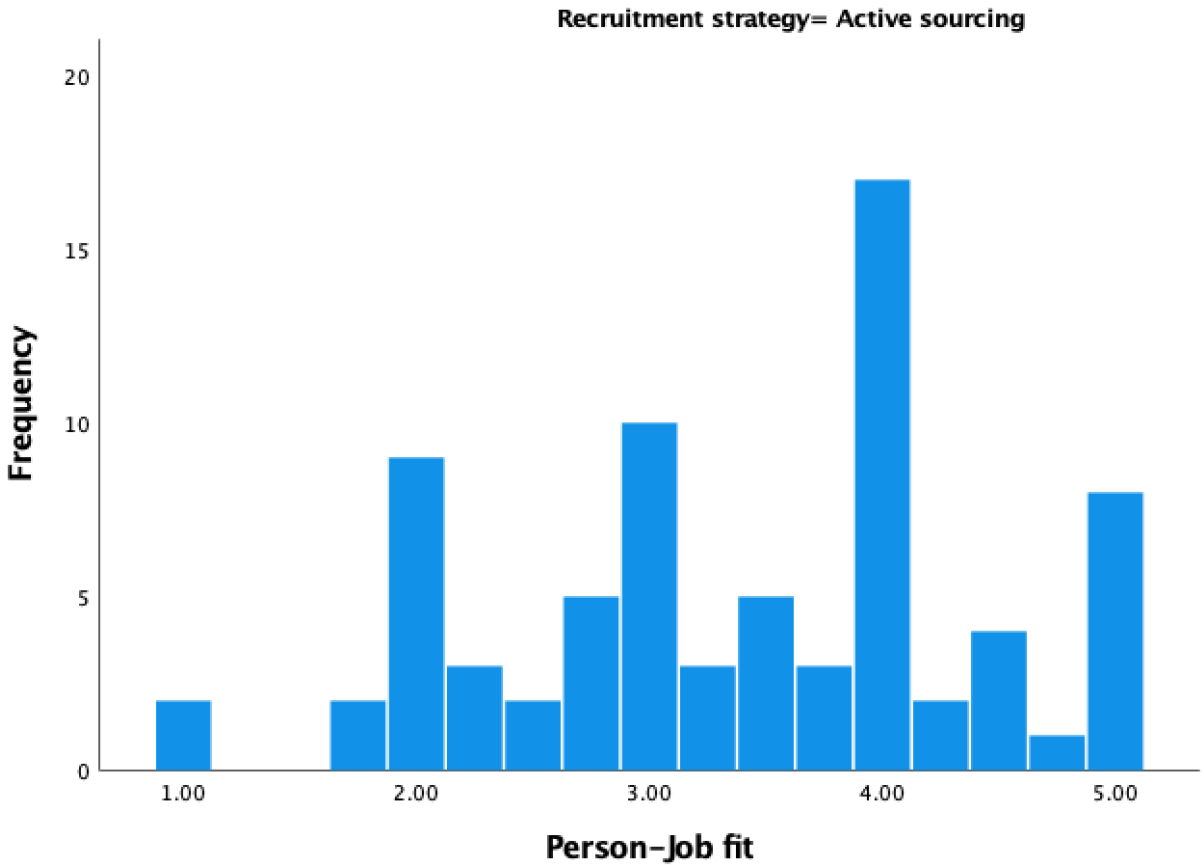

Figure F7: Histogram for sourced candidates' person-job fit.

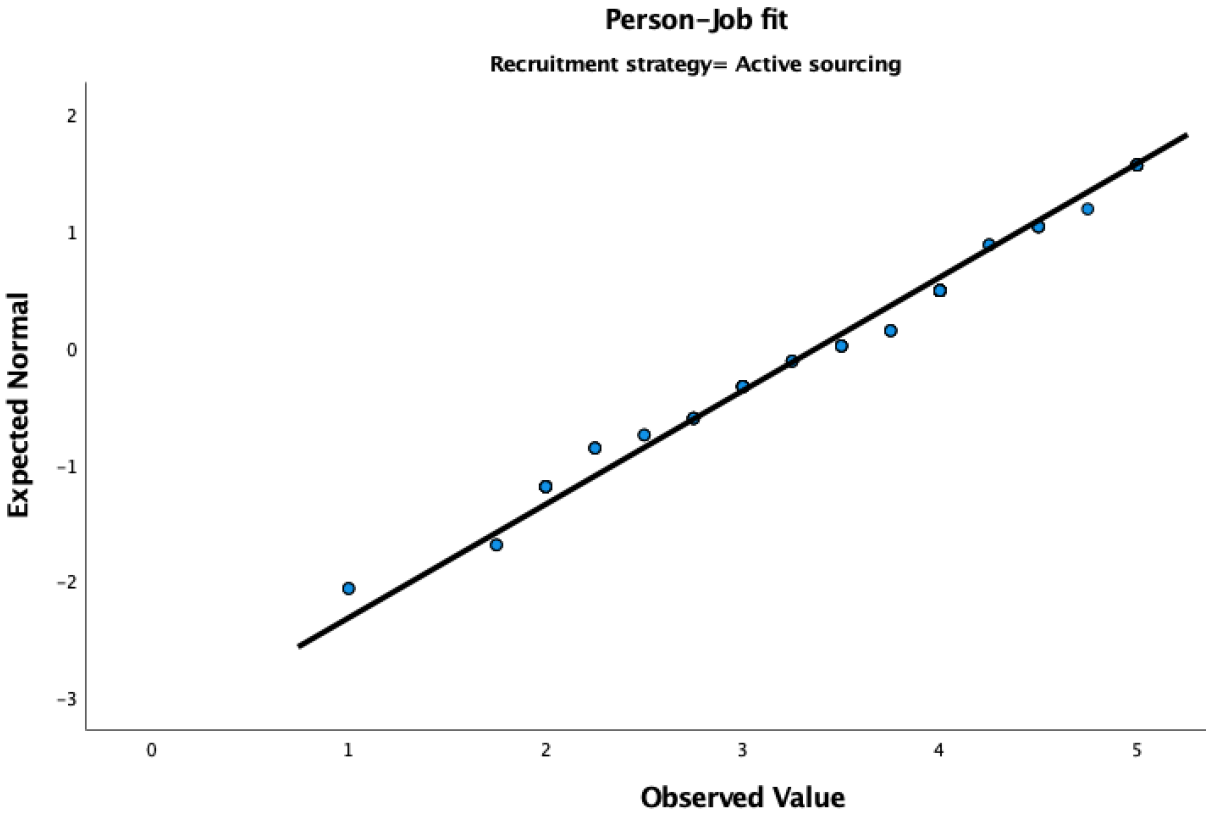

Figure F8. Normal Q-Q plot for sourced candidates' person-job fit.

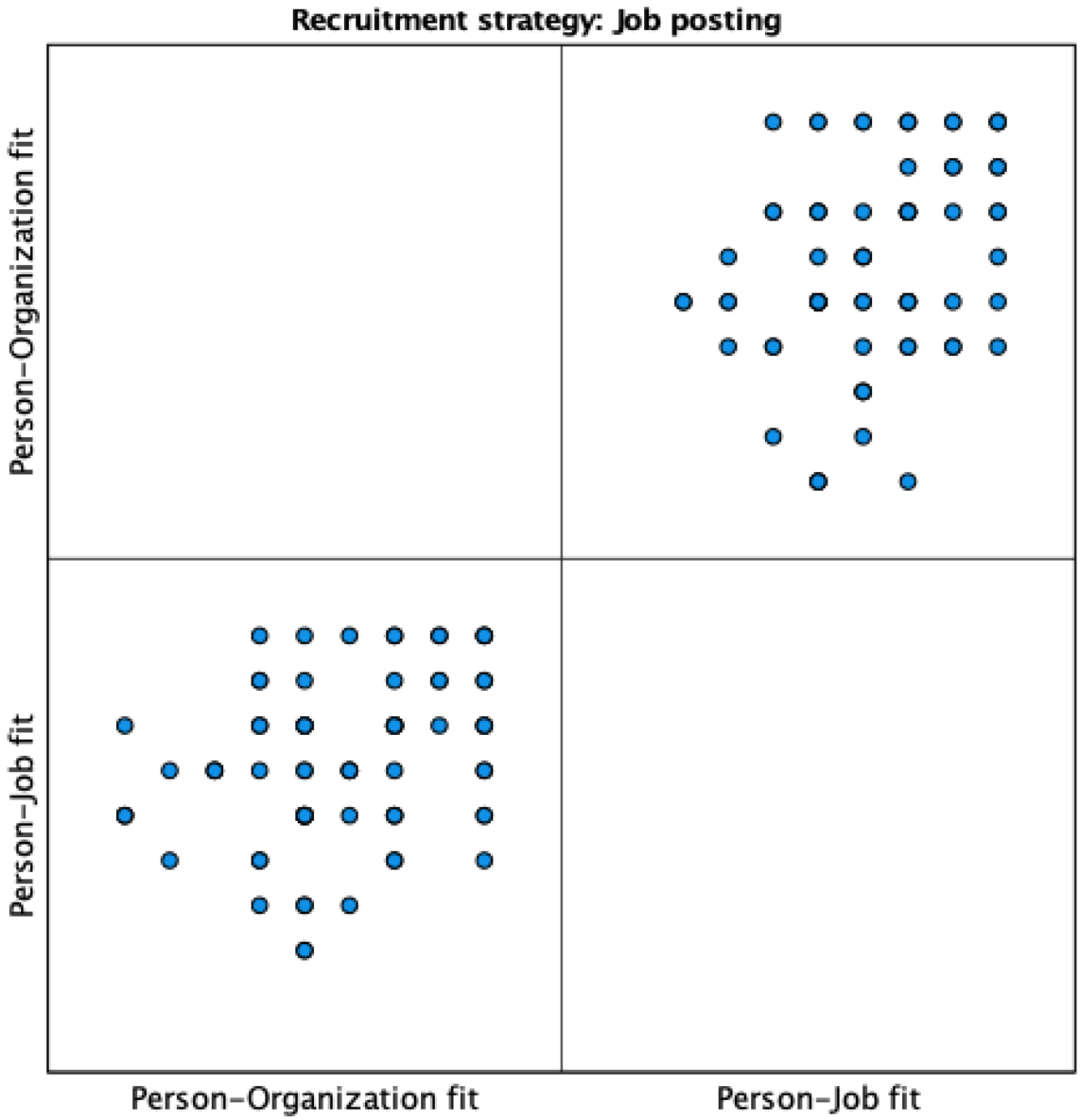

Figure F9. Scatterplot for applicants' person-organization and person-job fit.

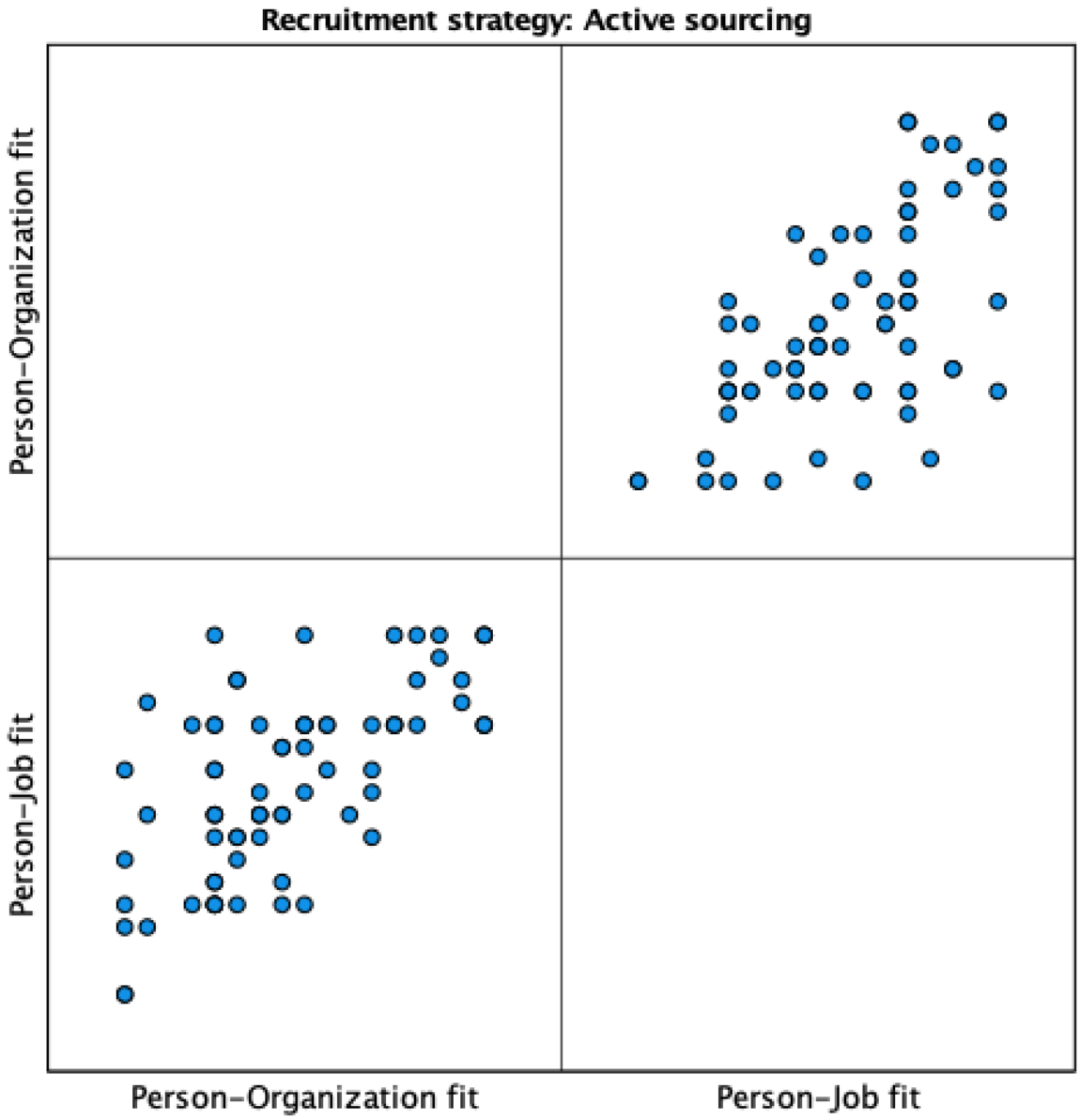

Figure F10. Scatterplot for sourced candidates' person-organization and person-job fit.

Appendix G

Feminine job advertisement wording

The orange words indicate the feminine stereotypical characteristics.

Company description
Daedalus is a different kind of startup. We are a community of world-class engineers on a mission to build the world's first autonomous factory that can build anything. We have effective **relationships** with many satisfied clients and are **committed** to **understanding** the engineering sector intimately.

Qualifications
• Proficient oral and written communication skills.
• **Cooperates** well in a team environment.
• **Sensitive** to clients' needs, can develop **warm** client relationships.
• Bachelor of Engineering degree or higher from a recognized university.

Responsibilities
• Provide general **support** to project teams in a manner complimentary to the company.
• **Together** with the team, create the architecture of the systems that power the next generation of intelligent machines.
• Design and build mission-critical software: from distributed systems and network infrastructure, to real-time robot perception and control, to computational geometry and machine learning, with attention to performance, reliability, flexibility, and code quality.

Appendix H

Masculine job advertisement wording

The blue words indicate the masculine stereotypical characteristics.

Company description
Daedalus is a different kind of startup. We are a **dominant** team of world-class engineers on a mission to build the world's first autonomous factory that can build anything. We are also **determined** to stand apart from the **competition.**

Qualifications
• Strong communication and influencing skills.
• Ability to perform in a **competitive** environment.
• **Lead** a team of software engineers.
• Bachelor of Engineering degree or higher from a recognized university.

Responsibilities
• **Lead** project groups to manage project progress and ensure accurate task control.
• **Determine** compliance with client's objectives.
• Deliver **superior** mission-critical software: from distributed systems and network infrastructure, to real-time robot perception and control, to computational geometry and machine learning, with attention to performance, reliability, flexibility, and code quality.

Appendix I

Gender-fair job advertisement wording

The orange words indicate the feminine stereotypical characteristics, and the blue words the masculine stereotypical characteristics.

Company Description
Daedalus is a different kind of startup. We are a community of world-class engineers on a mission to build the world's first autonomous factory that can build anything. We are also **determined** to stand apart from the competition.

Qualifications
• Strong communication and influencing skills.
• **Cooperates** well in a team environment and is able to **independently** write mission-critical software: from distributed systems and network infrastructure, to real-time robot perception and control, to computational geometry and machine learning, with attention to performance, reliability, flexibility, and code quality.
• Bachelor of Engineering degree or higher from a recognized university.

Responsibilities
• **Together** with the team, create the architecture of the systems that power the next generation of intelligent machines.
• Deliver **superior** mission-critical software: from distributed systems and network infrastructure, to real-time robot perception and control, to computational geometry and machine learning, with attention to performance, reliability, flexibility, and code quality.
• Provide general **support** to project teams in a manner complimentary to the company.
• **Determine** compliance with client's objectives, and be **sensitive** to their needs.

Appendix J

Assumptions Study 2

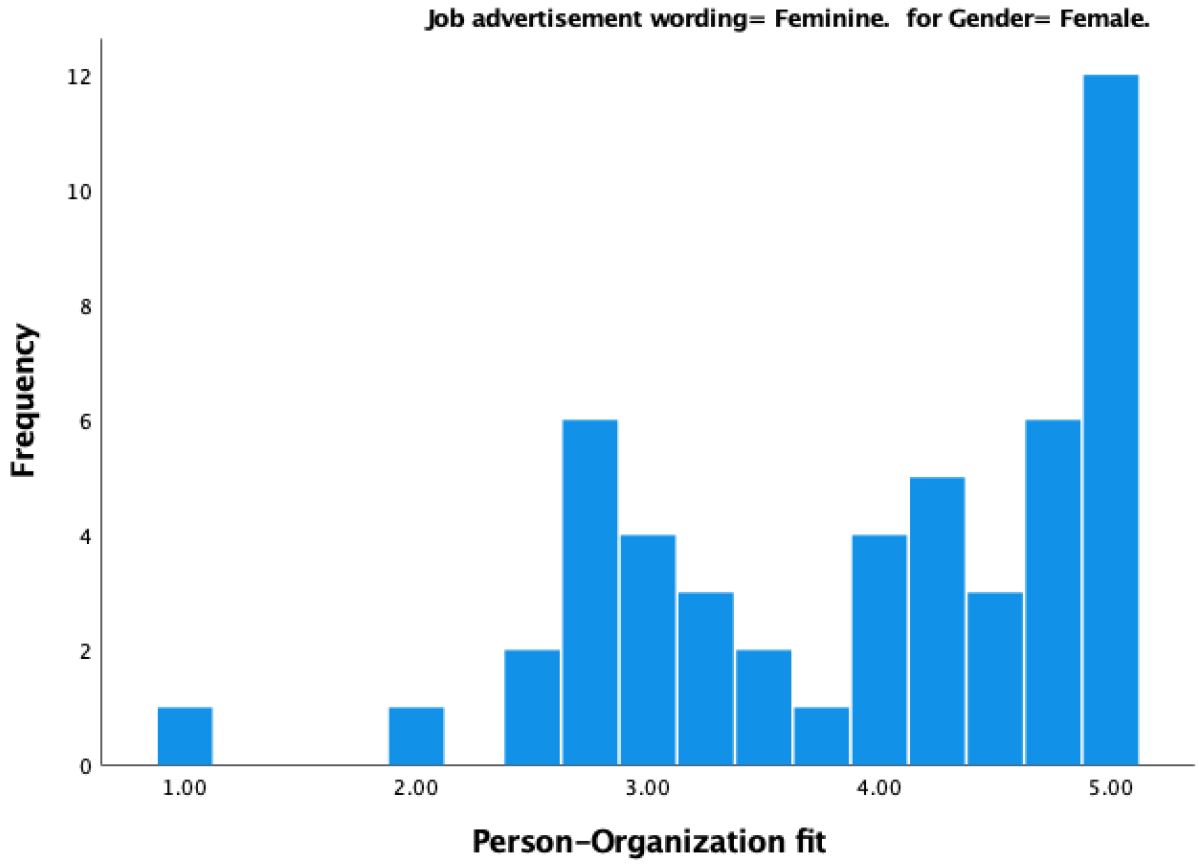

Figure J1. Histogram for females' person-organization fit in the feminine job advertisement wording condition.

Figure J2. Normal Q-Q plot for females' person-organization fit in the feminine job advertisement wording condition.

Figure J3. Histogram for males' person-organization fit in the feminine job advertisement wording condition.

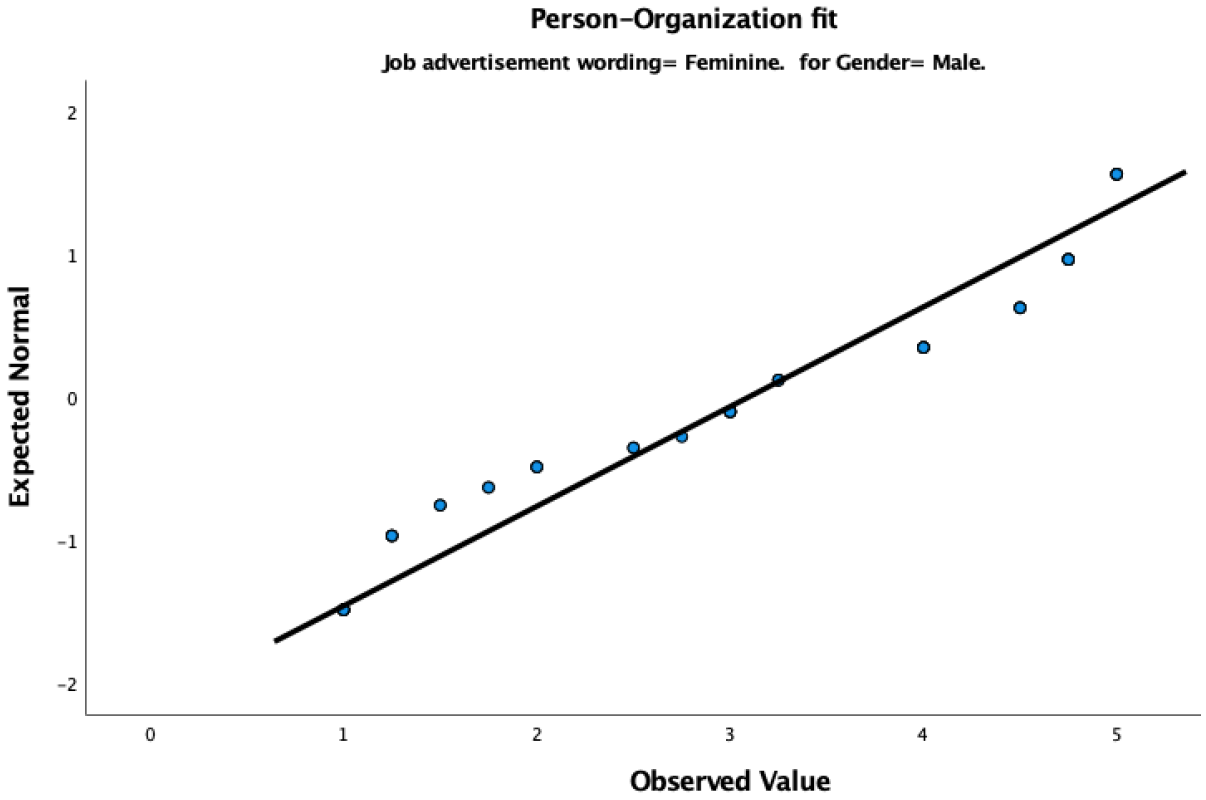

Figure J4. Normal Q-Q plot for males' person-organization fit in the feminine job advertisement wording condition.

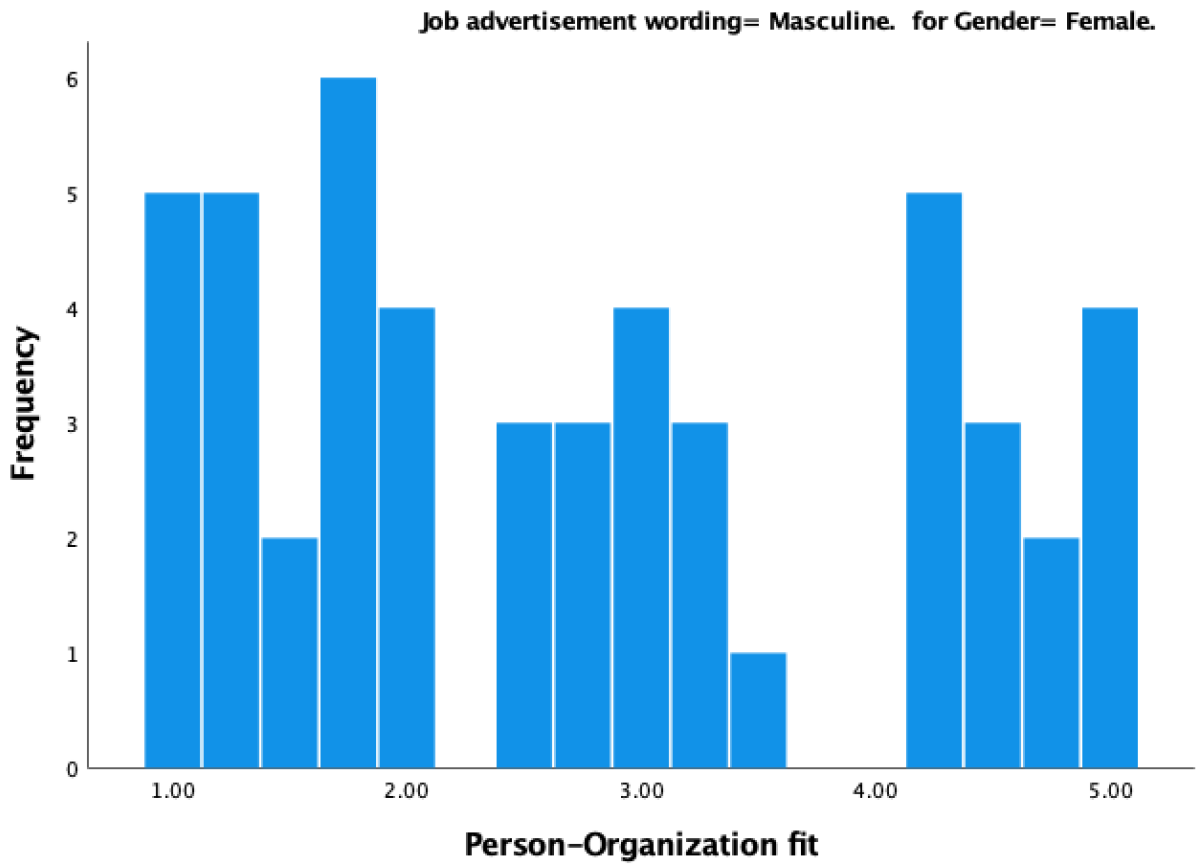

Figure J5. Histogram for females' person-organization fit in the masculine job advertisement wording condition.

Figure J6. Normal Q-Q plot for females' person-organization fit in the masculine job advertisement wording condition.

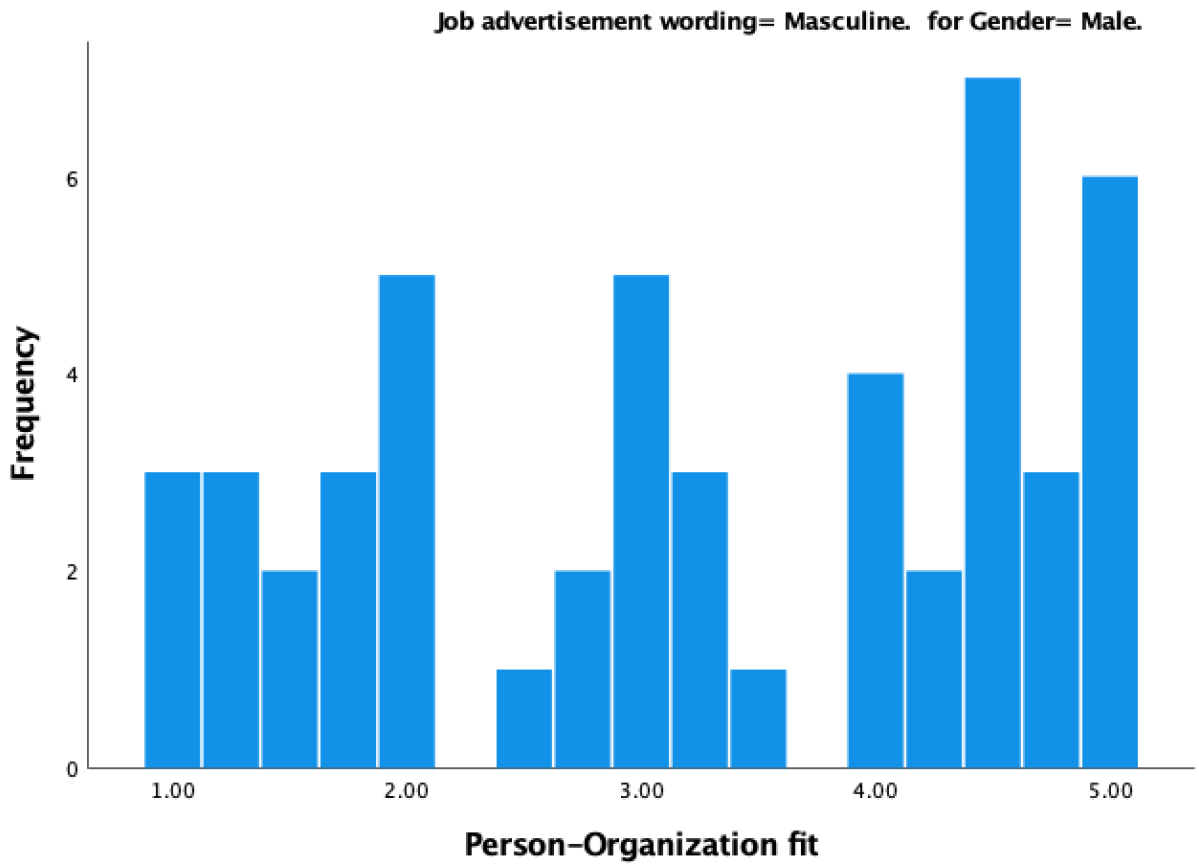

Figure J7. Histogram for males' person-organization fit in the masculine job advertisement wording condition.

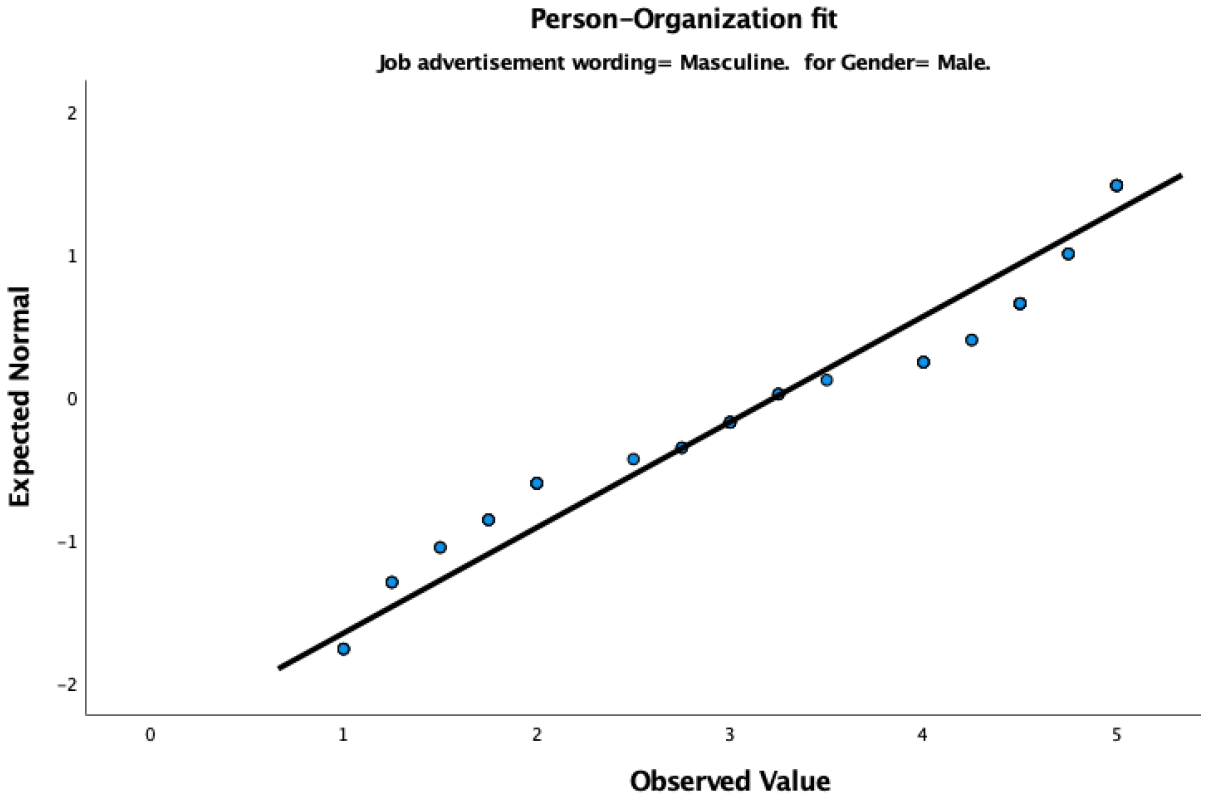

Figure J8. Normal Q-Q plot for males' person-organization fit in the masculine job advertisement wording condition.

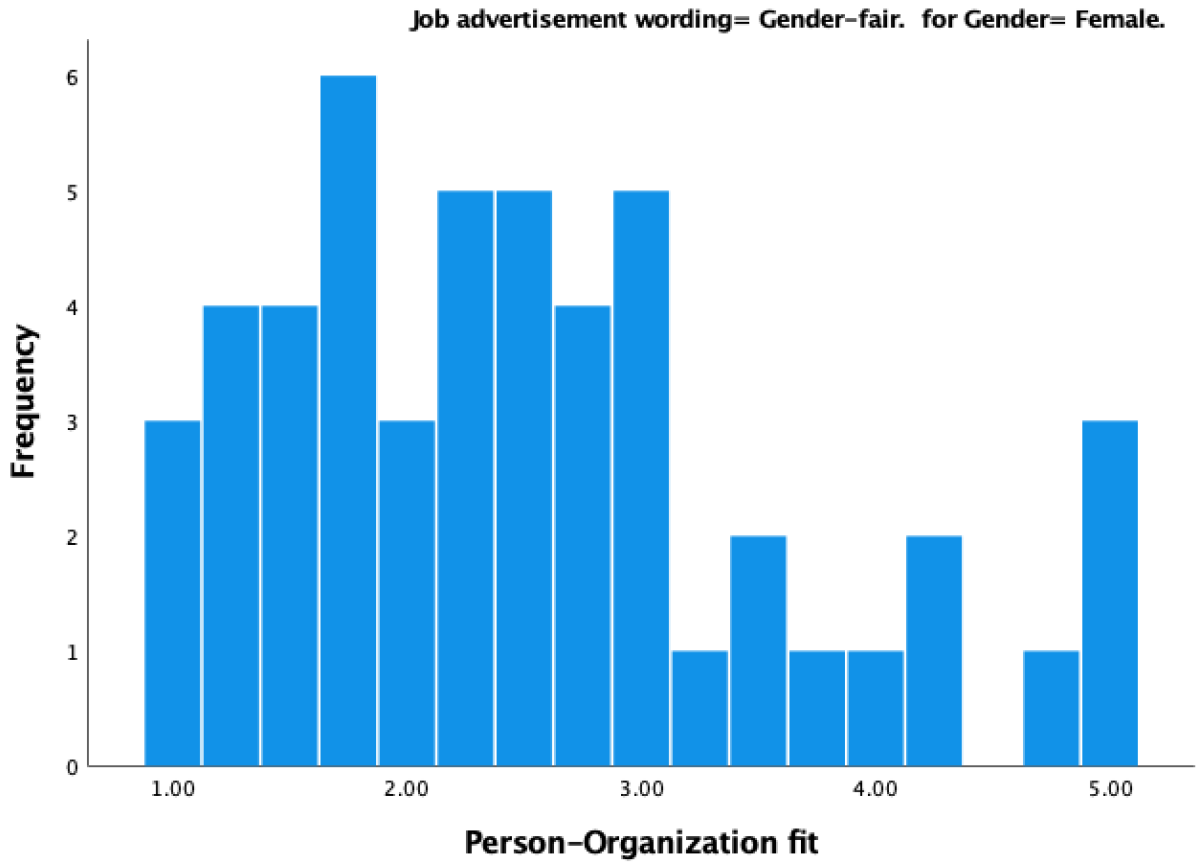

Figure J9. Histogram for females' person-organization fit in the gender-fair job advertisement wording condition.

Figure J10. Normal Q-Q plot for females' person-organization fit in the gender-fair job advertisement wording condition.

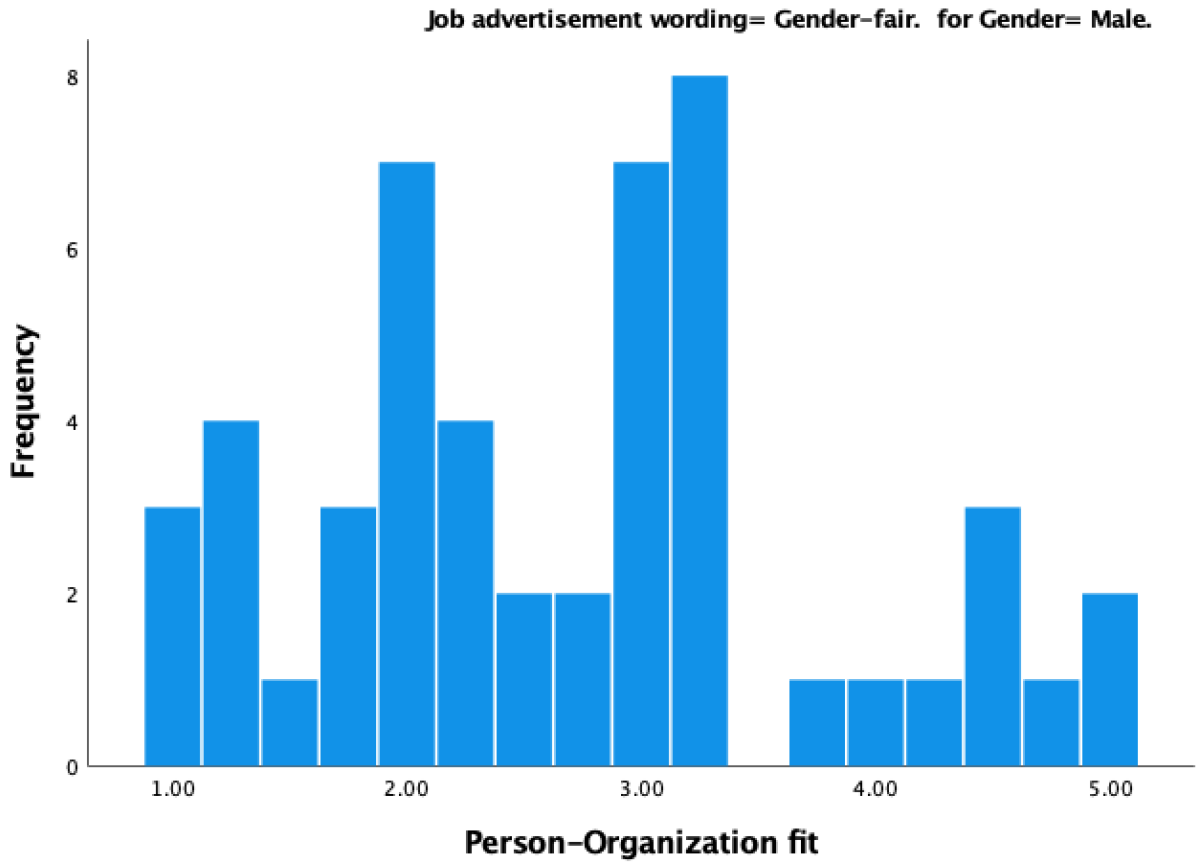

Figure J11. Histogram for males' person-organization fit in the gender-fair job advertisement wording condition.

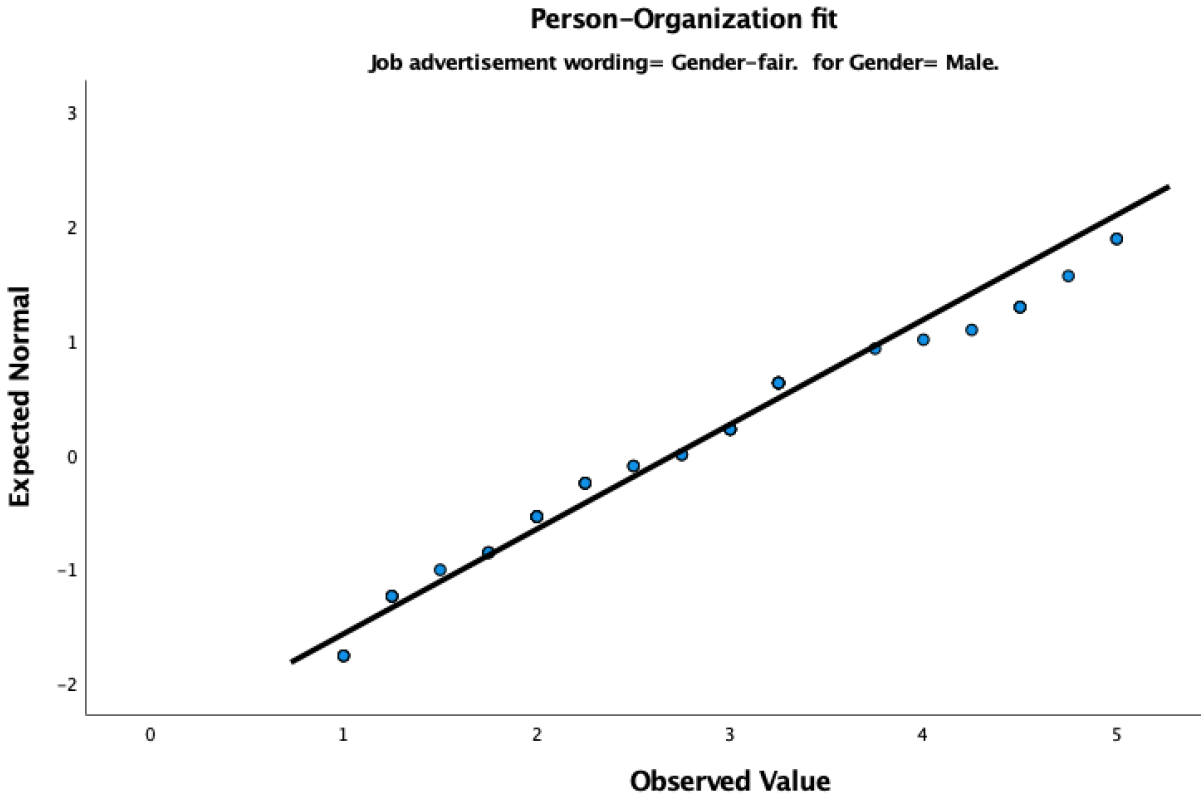

Figure J12. Normal Q-Q plot for males' person-organization fit in the gender-fair job advertisement wording condition.

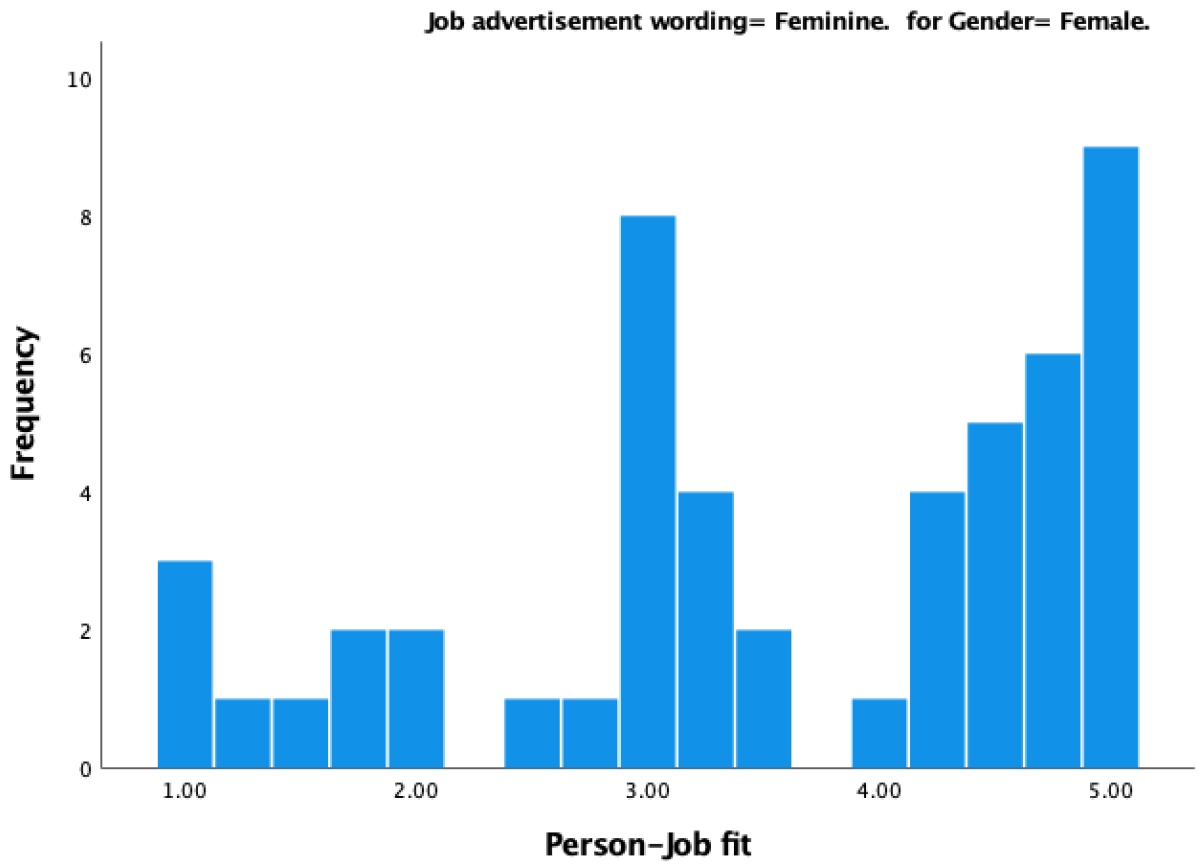

Figure J13. Histogram for females' person-job fit in the feminine job advertisement wording condition.

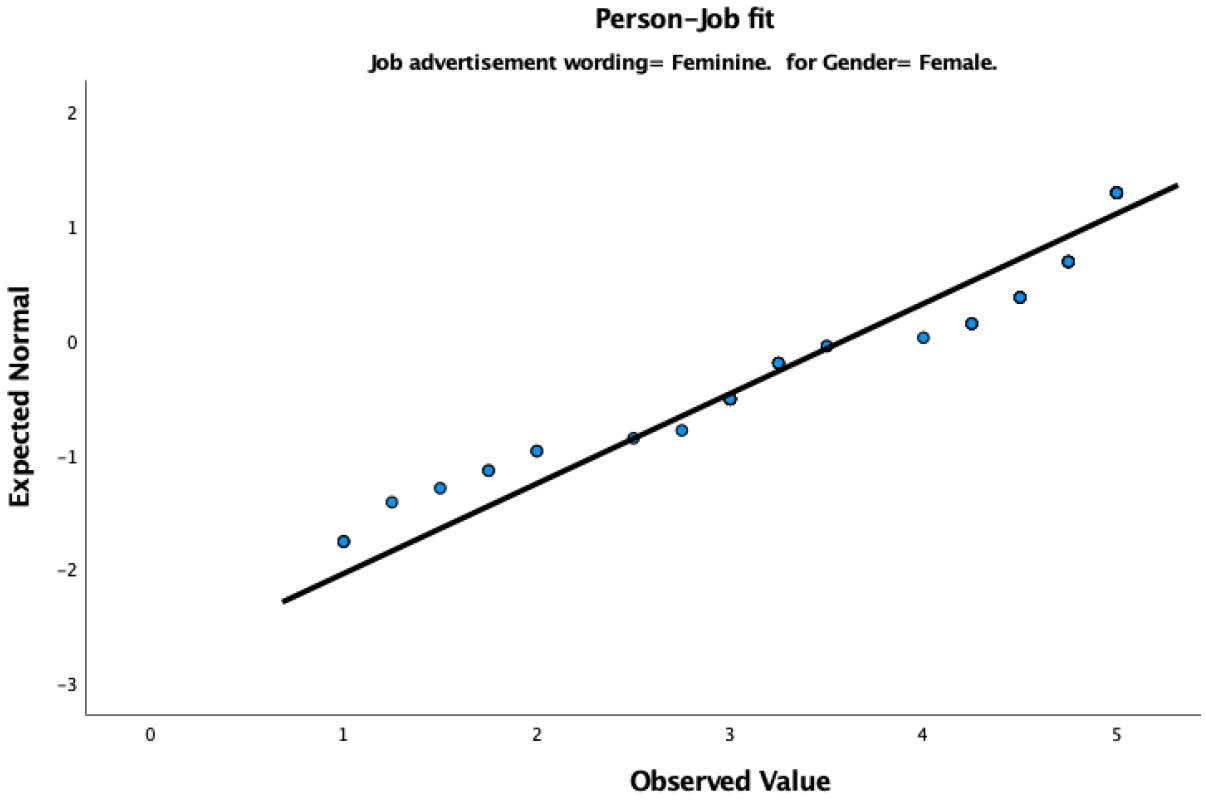

Figure J14. Normal Q-Q plot for females' person-job fit in the feminine job advertisement wording condition.

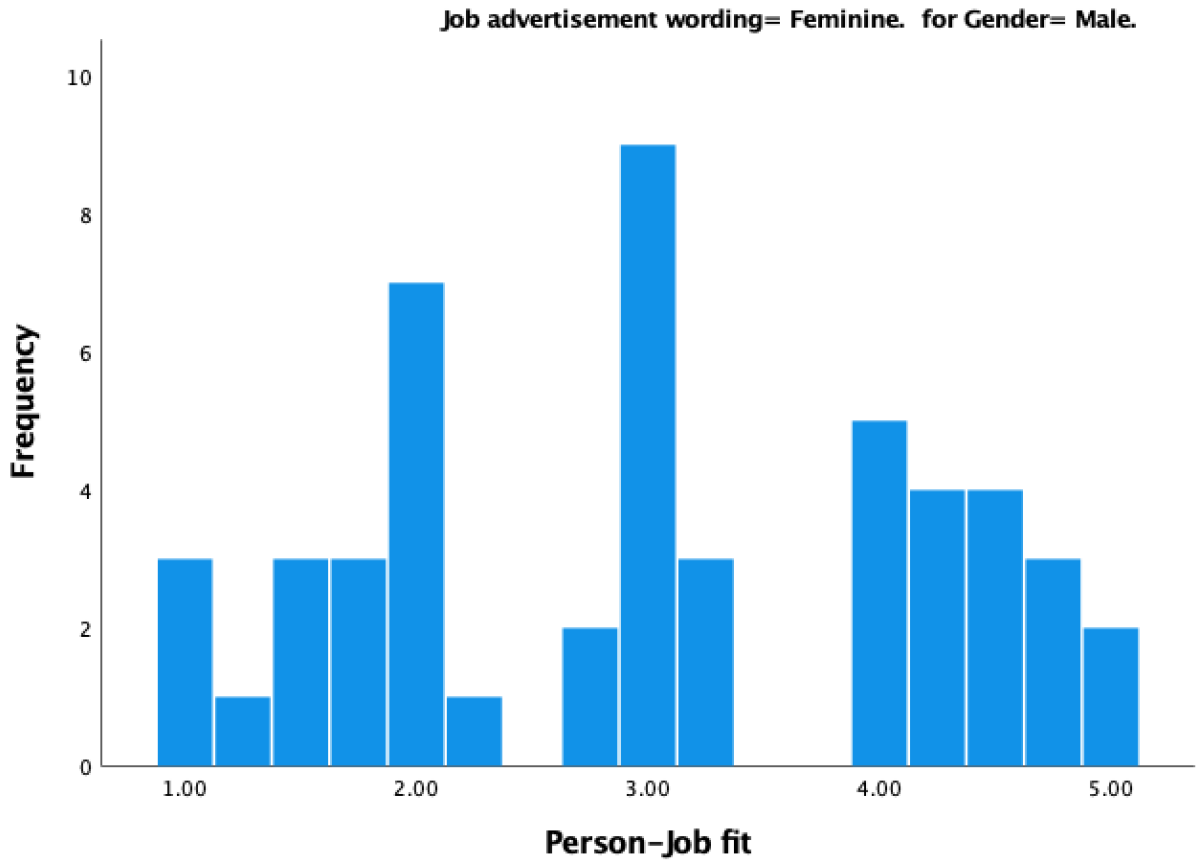

Figure J15. Histogram for males' person-job fit in the feminine job advertisement wording condition.

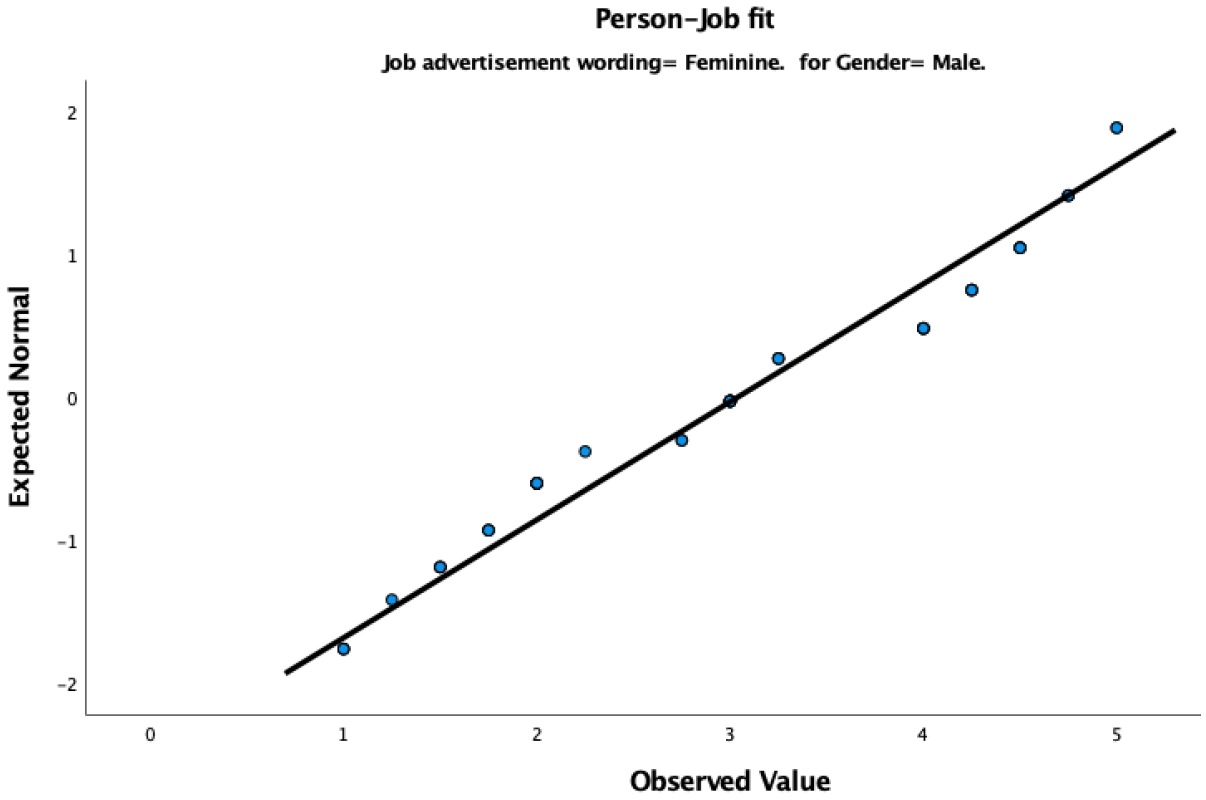

Figure J16. Normal Q-Q plot for males' person-job fit in the feminine job advertisement wording condition.

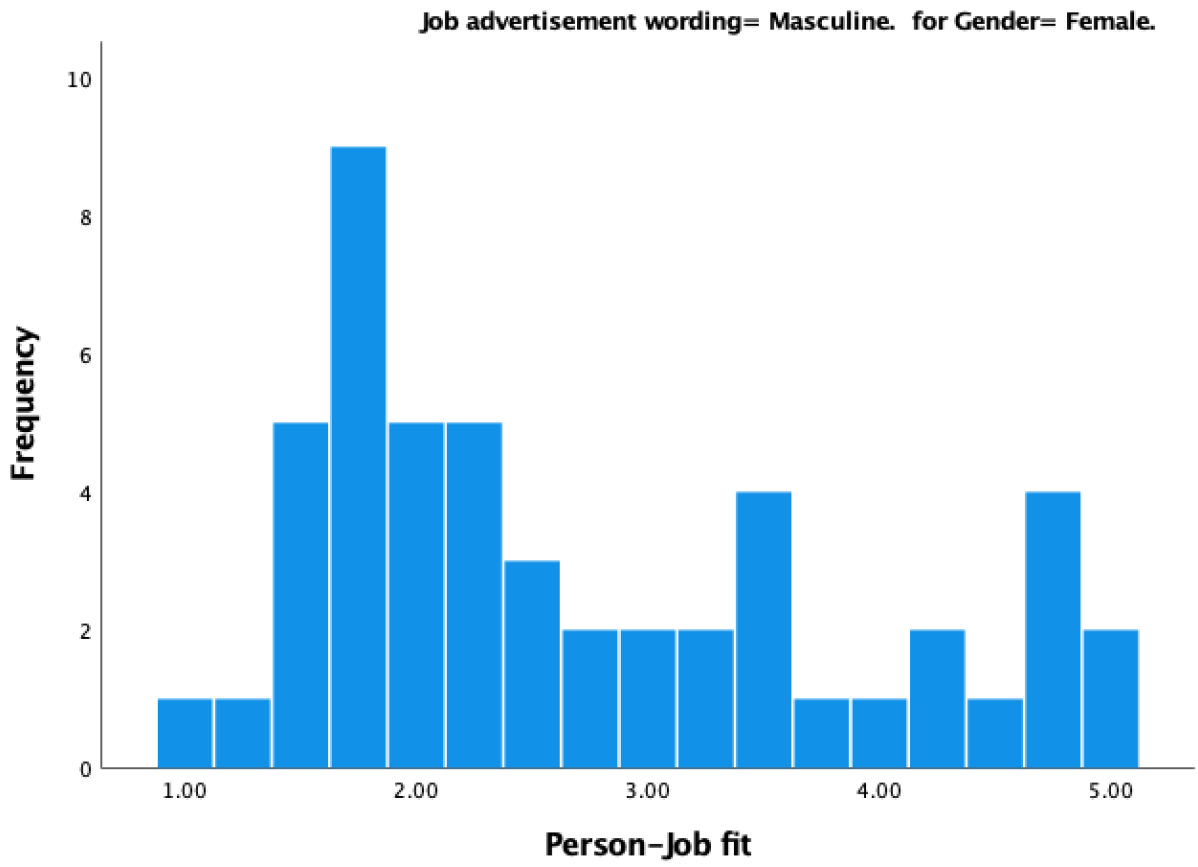

Figure J17. Histogram for females' person-job fit in the masculine job advertisement wording condition.

Figure J18. Normal Q-Q plot for females' person-job fit in the masculine job advertisement wording condition.

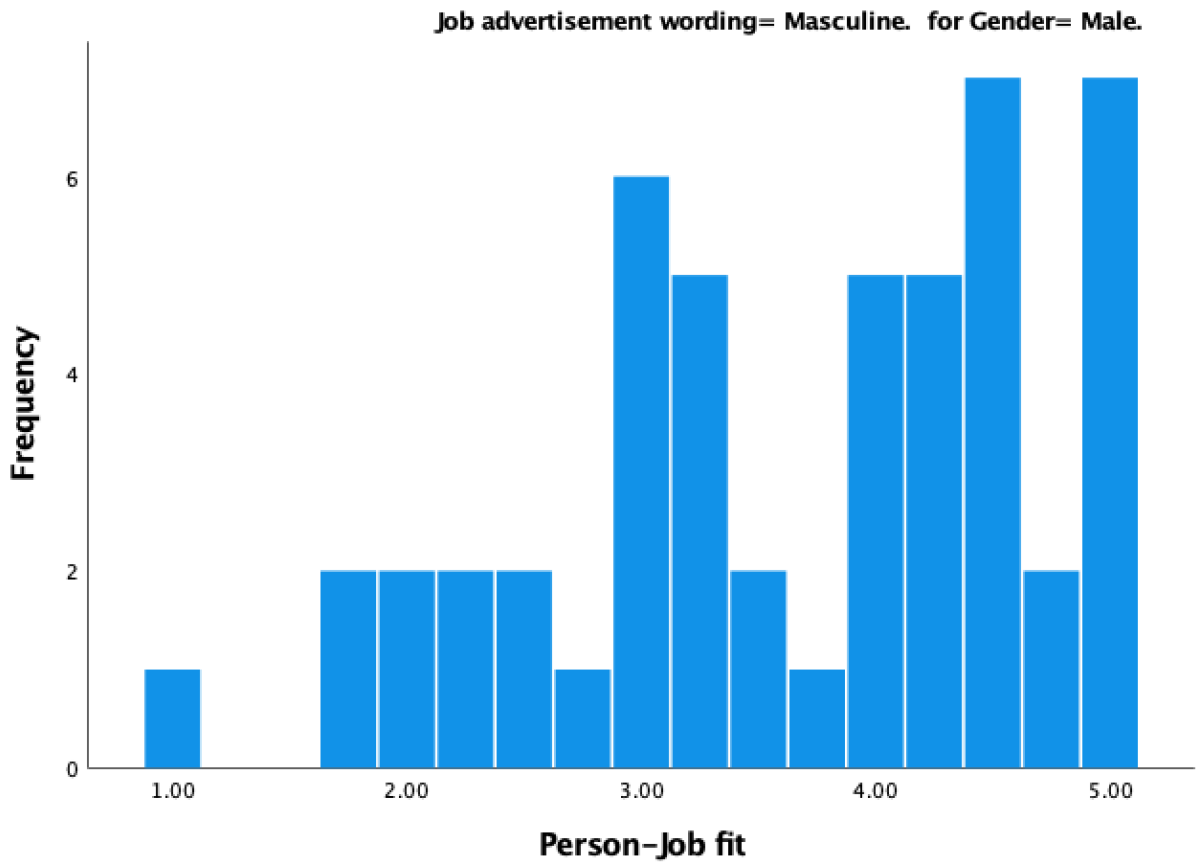

Figure J19. Histogram for males' person-job fit in the masculine job advertisement wording condition.

Figure J20. Normal Q-Q plot for males' person-job fit in the masculine job advertisement wording condition.

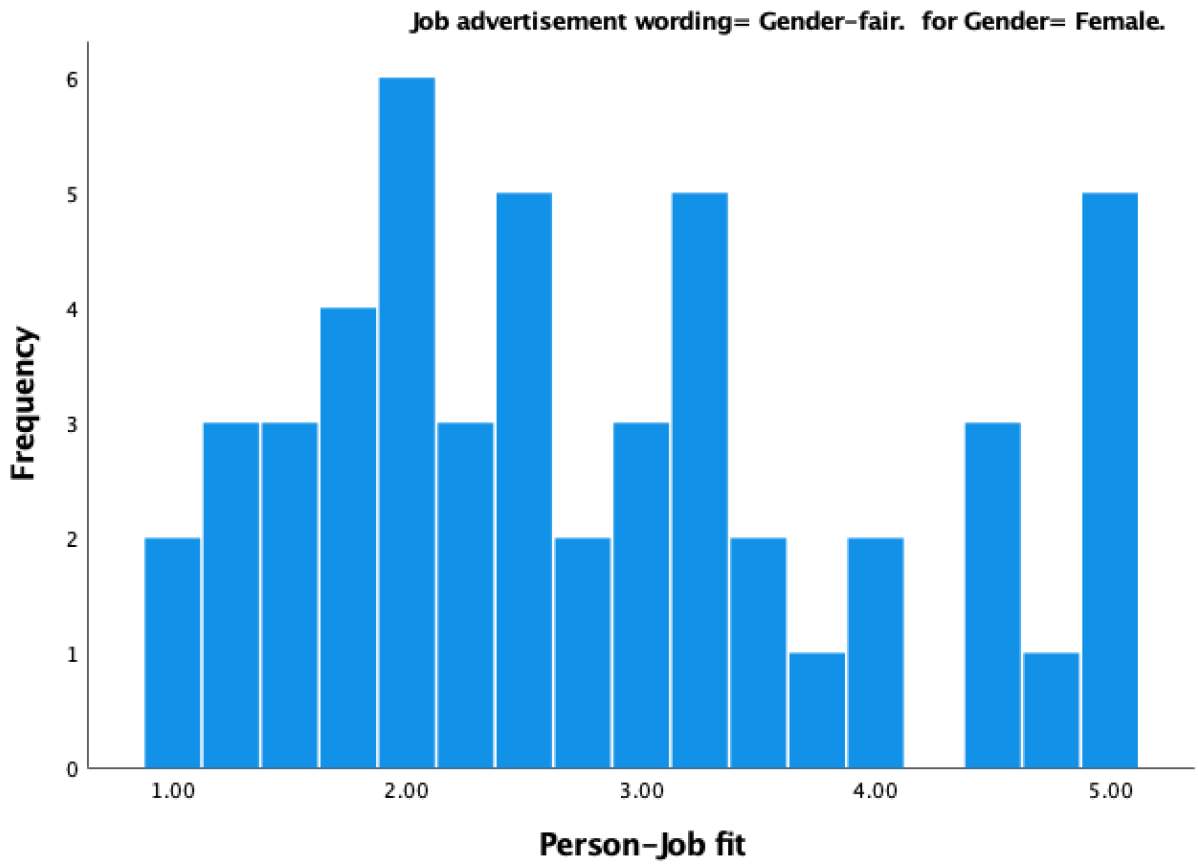

Figure J21. Histogram for females' person-job fit in the gender-fair job advertisement wording condition.

Figure J22. Normal Q-Q plot for females' person-job fit in the gender-fair job advertisement wording condition.

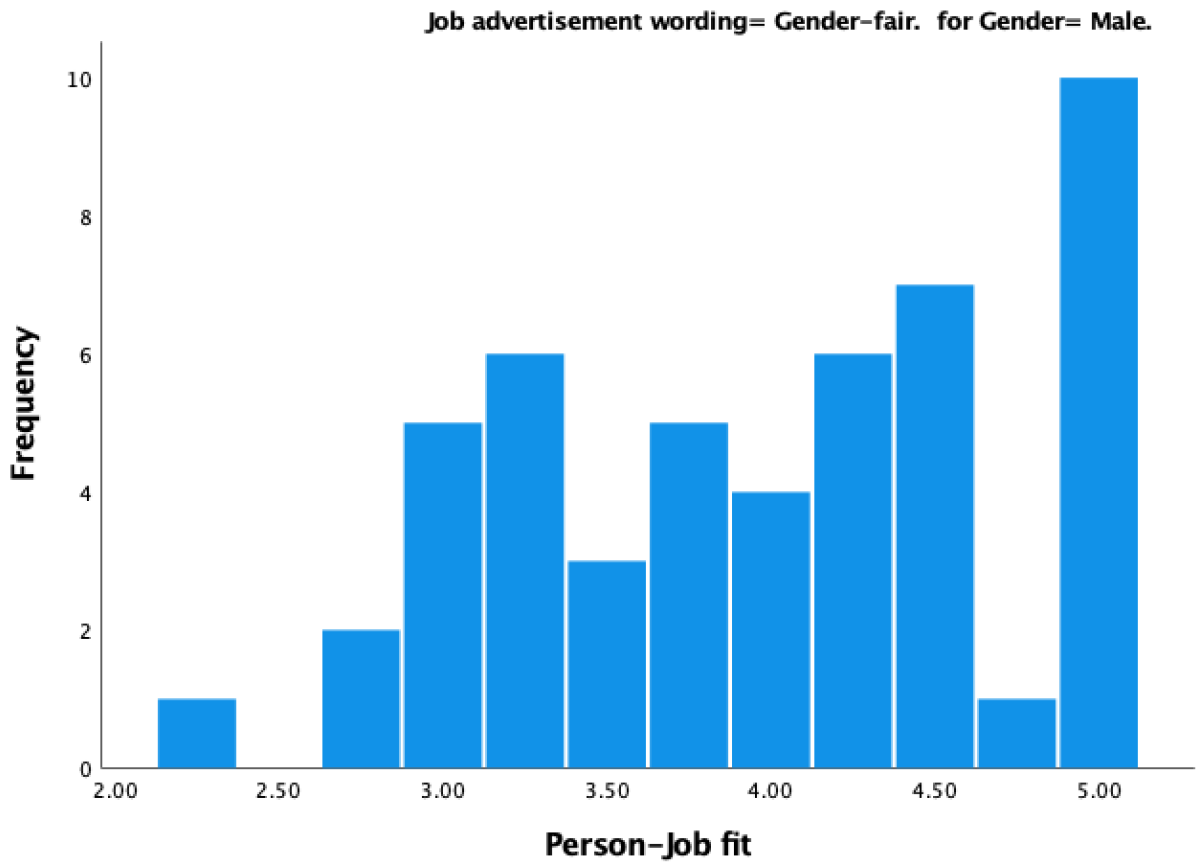

Figure J23. Histogram for males' person-job fit in the gender-fair job advertisement wording condition.

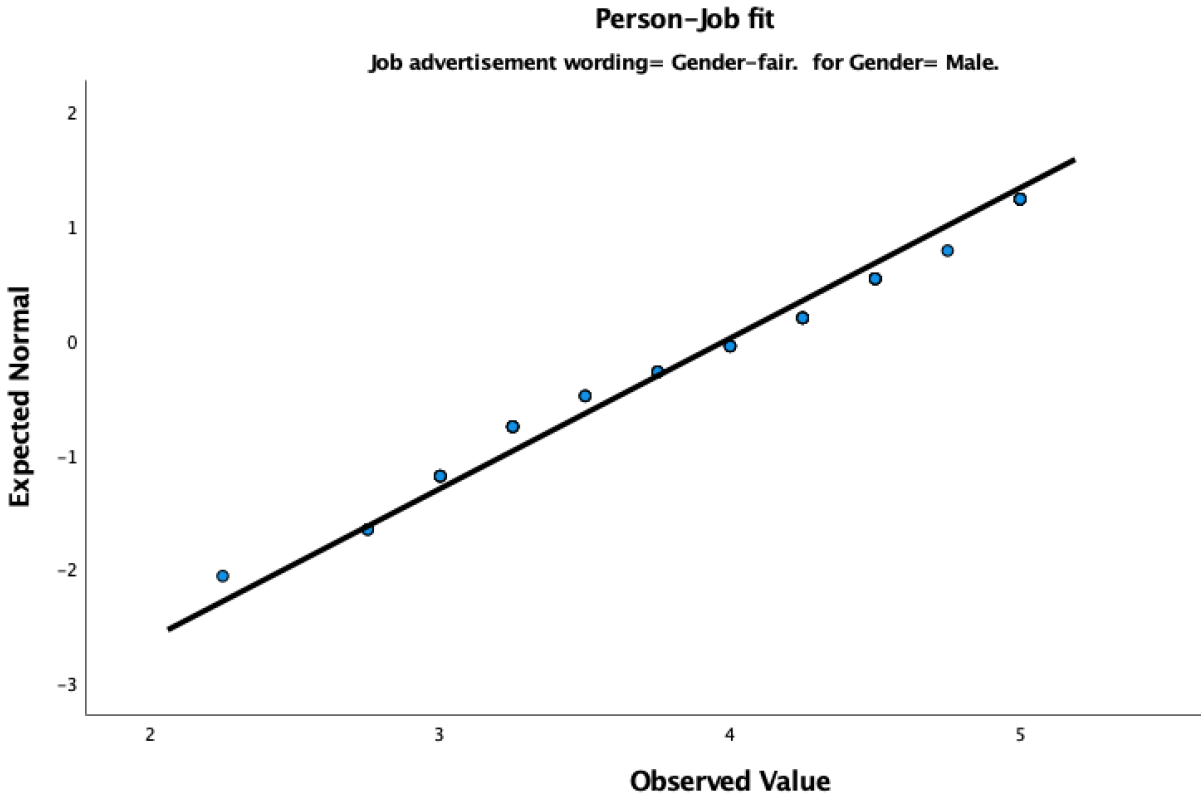

Figure J24. Normal Q-Q plot for males' person-job fit in the gender-fair job advertisement wording condition.

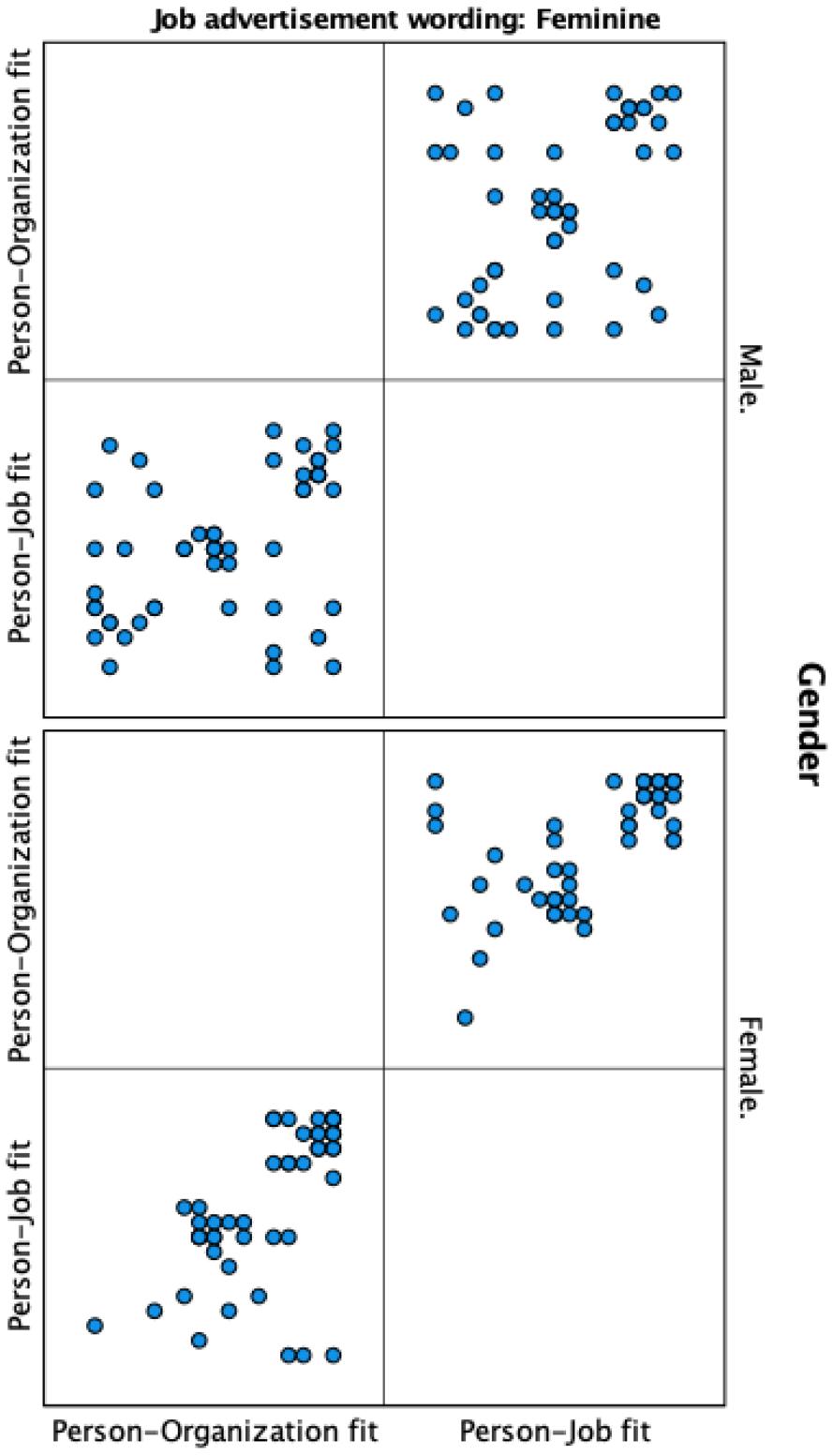

Figure J25. Scatterplots for females' and males' person-organization and person-job fit in the feminine job advertisement wording condition.

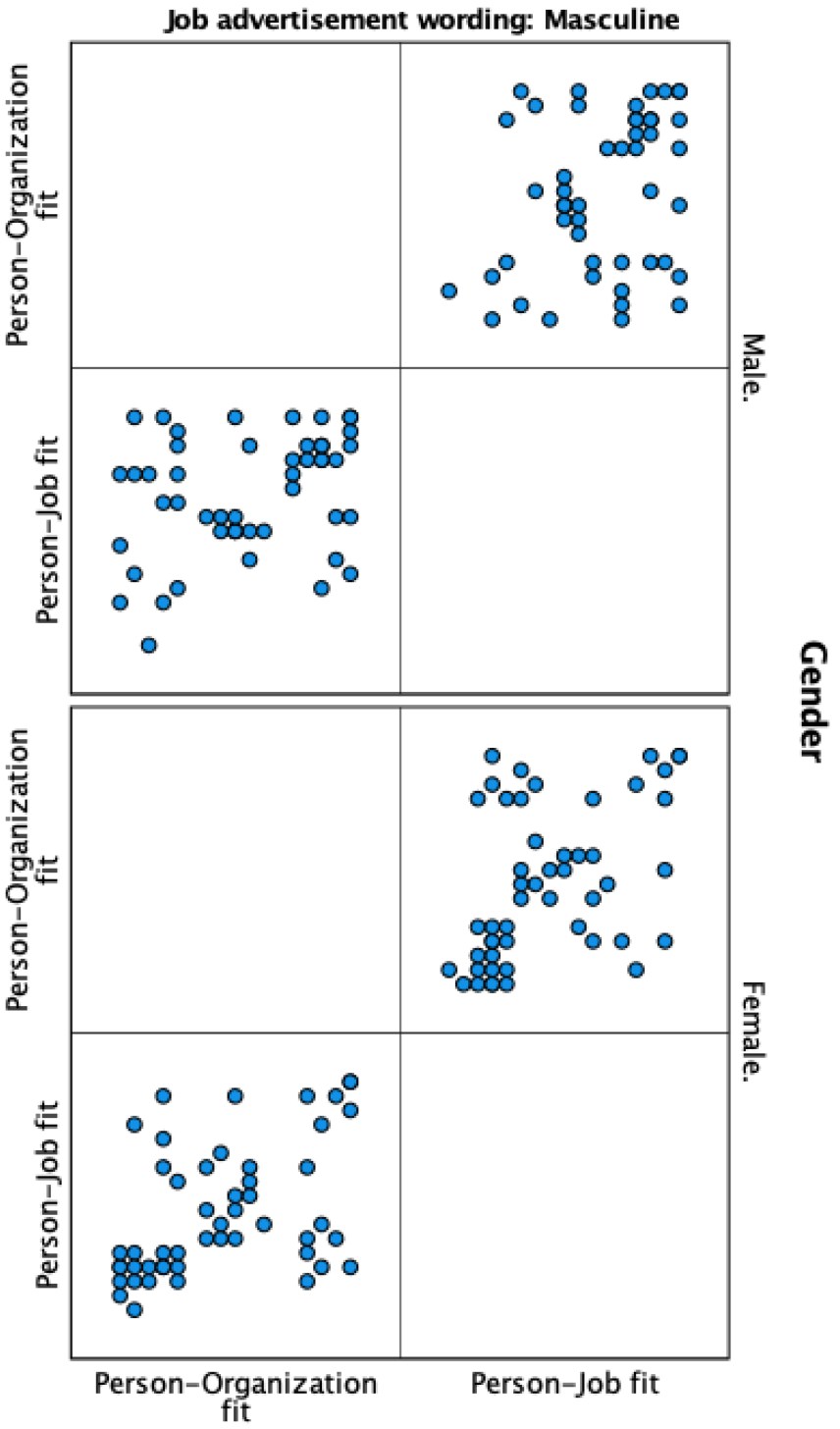

Figure J26. Scatterplots for females' and males' person-organization and person-job fit in the masculine job advertisement wording condition.

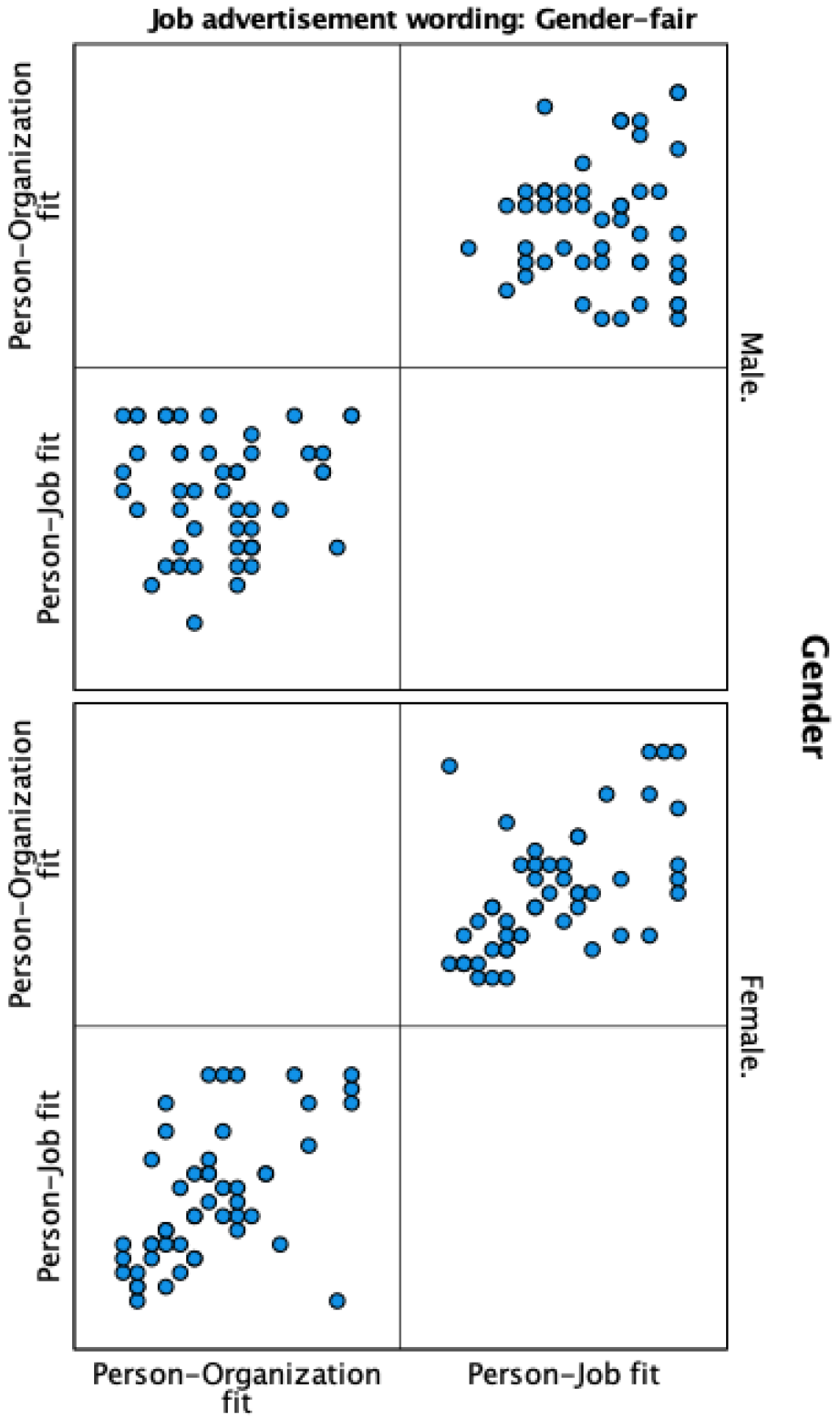

Figure J27. Scatterplots for females' and males' person-organization and person-job fit in the gender-fair job advertisement wording condition.