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READY OR NOT? EXAMINING ACCEPTANCE AND FEARS OF ROBOTS IN THE LABOR MARKET: A SURVEY OF A POLISH SAMPLE

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The purpose of the study is to assess attitudes toward robots among a Polish sample (*N* = 1044) using a series of questions focused on their perceptions within the labor market. Based on previous research, higher concerns toward and lower acceptance of robots were predicted for women, people performing manual and manual work, and people who are not familiar with robotics. The hypotheses were only partially confirmed. Orientation in the field of robotics is conducive to greater acceptance of the presence of robots in trust works professions. Unexpectedly, it turned out that people who declared performing physical work, compared to people performing other types of tasks, have a more affirmative attitude to the participation of robots in customer service occupations and to accept the autonomy of the robot to a higher degree. The results also showed that women are more concerned about the increased presence of robots in the labour market and less accepting of the replacement of humans by robots and the greater autonomy of intelligent machines. In addition, the analysis revealed that people with more knowledge in the field of robotics declare greater acceptance of the autonomous work of robots and in terms of replacing people with robots in the work environment, they also have fewer concerns about the market situation compared to those who do not consider themselves knowledgeable in this area.

Keywords: robots; robotization; social attitudes; education.

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The appearance of robots in society can bring a number of benefits to humanity both in private (Fortunati, 2017) and professional (Pham et al., 2018) spheres. They can be used to save lives by helping to perform dangerous tasks (Shell & Matarić, 2005), support people with disabilities (Carnevale, 2015) or seniors (Robinson et al., 2014). Nevertheless, many people feel afraid of them, mainly due to the threat to the labour market. Constant monitoring of social opinions on modern technological solutions seems to be crucial for shaping the state policy in the field of education, training, or systemic solutions on the labour market.

Fear of Artificial Intelligence and Robots

Fears towards technology can have different intensity and background depending on the psychodemographic characteristics of culture of a given country. Research has shown that almost a quarter of Americans report fear of autonomous robots and artificial intelligence (Liang & Lee, 2017), and the British public expresses more concern than excitement in this regard (Cave et al., 2019). Even in Japan, where modern technology has been present in the workplace for years, about 30% of employees fear that their jobs will be replaced by artificial intelligence and robotics (Morikawa, 2017).

The introduction of robots as collaborators can be seen as a major change in itself, and organisational changes often evoke fear and anxiety (Meissner et al., 2020). However, social concerns do not only concern the labour market. Fear of robots is also associated with other types of fear: general technophobia (McClure, 2018), fear of the strange (Oh et al., 2017), or fear of loneliness (Liang & Lee, 2017). In addition, some people believe that intelligent robots will become increasingly intelligent and take control over people (Vollmer, 2018), and devices equipped with artificial intelligence will enable cyber attacks and one day lead to the destruction of humanity (Gherheș, 2018).

“Robot” is defined by the Oxford English Dictionary as “a machine capable of carrying out a complex series of actions automatically”. According to this definition, it can take many different forms (including digital ones), although most people associate robots with human-like robots (Haring et al., 2014). Most of us see humanoid robots in pop culture, and usually in a negative context—playing various roles similar to human actors. This shapes a strong image of killer robots and the threats of artificial intelligence (Lemay et al., 2020). As research has shown (Liang & Lee, 2017), those who watch science fiction films are more likely to be afraid of autonomous robots and artificial intelligence.

Acceptance of Robots in Various Work Environments

Robots enjoy different acceptance depending on the industry. In the catering industry, for example, there is a lot of enthusiasm in this area (Lai & Tang, 2019). Customers also seem to have nothing against being served by a humanoid waiter, especially when it is human-like, as they interact with them more often (Belanche et al., 2020).

Robots are also perceived positively in the hospital environment (Andtfolk et al., 2022), but there is no lack of ambivalence on the part of patients, as many of them would prefer to be cared for by humans (Vallès-Peris et al., 2021). In the case of care for the elderly, positive attitudes are also generally observed, but only if robots are cast in appropriate roles (Niemelä & Melkas, 2019). These include all tasks that physically relieve seniors, as well as various forms of indirect care (Turja, 2019).

There are also relatively positive opinions regarding the use of robots in childcare (Lee et al., 2022). However, there are studies in which taking care of children by a machine is considered the least acceptable activity (Ivanov & Webster, 2019). For example, parents using a storytelling robot reported concerns about the potential impact on their child's development through the daily use of the robot, and also felt a threat to their own parenting (Lin et al., 2021).

With regard to education, there is also no clear opinion on the use of robots. Research conducted among students of Swedish schools showed the predominance of positive opinions when it comes to the use of robots in education, but at the same time students were against giving robots the freedom to make decisions and completely replacing teachers with them (Serholt & Barendregt, 2014). In turn, German students express greater reluctance to learn in cooperation with robots, accepting the use of them in teaching science rather than humanities (Reich-Stiebert & Eyssel, 2015).

Robots are increasingly cast as security guards, soldiers, or policemen (Holley, 2019; Voth, 2004). They are also particularly desirable to perform dangerous tasks, including those related to search and rescue (Katz & Halpern, 2014). Concerns about surveillance robots are particularly related to the threat to privacy, control, and the potential for hacking into their systems (Carlsen et al., 2014). In general, research has shown a lower preference for machines in performing security tasks (Katz & Halpern, 2014).

The acceptance of robots may vary depending on the industry or position in the organisational structure. In general, people in managerial positions, specialists, and people with higher education show a more positive attitude towards robotization than manual and white-collar workers, as well as less educated people (Dekker et al., 2017; Turja, 2019). Office and manufacturing workers see a greater risk of losing their jobs due to the introduction of robots to the market (Morikawa, 2017). In turn, people working in healthcare and education are not significantly afraid of being replaced by machines in professional activities (Morikawa, 2017). When Polish teachers and therapists of children with disabilities were shown a film featuring a robot in educational activities with a child, the respondents gained a positive attitude towards it (Kossewska & Kłosowska, 2020). This is confirmed by the results of very different studies indicating the role of knowledge and experience in the acceptance of robots (e.g. Ivanov & Webster, 2019; Papadakis et al., 2021; Turja et al., 2018; Turja, 2019).

Differences in the Perception of Robots by Gender

In general, men, compared to women, show more favourable attitudes towards interaction with intelligent machines (Giger et al., 2017; Łupkowski & Jański-Mały, 2020; Piçarra et al., 2016a, 2016b; Pochwatko et al., 2015) a lower level of anxiety (Liang & Lee, 2017) and greater openness to this type of cooperation (McClure, 2018). Wasielewska and Łupkowski (2020) clearly stated that differences among genders show at such early age.

The reasons for this state of affairs can be sought in upbringing and education, which still socialise boys towards a greater interest in technology (cars, computers, etc.) compared to girls (Mammes, 2004). Other potential reasons can also be indicated here—namely, fundamental beliefs about the uniqueness of human nature that determine the attitude towards intelligent devices (Giger et al., 2017). And according to research, men believe in the uniqueness of men less than women (Łupkowski & Jański-Mały, 2020).

Another explanation has to do with the perception process of robots. When people first encounter a smart machine, they tend to quickly categorise it based on observational data (Maj & Zarzycki, 2019). Through the process of anthropomorphization, robots are assigned human characteristics, such as rational thinking or consciousness, and this fosters positive attitudes towards them (Pochwatko et al., 2015). It turns out, however, that women, being more convinced of the uniqueness of human nature, anthropomorphize robots less (Piçarra, 2014), which in turn may explain their more negative attitude towards them. In some studies (Piçarra et al., 2016b) it was shown that the more human-like a robot was, the less willing it was to work with it, but what is important—this was particularly evident in a group of women.

Another possible reason for the occurrence of the relationships described above is also a different perception of the role and function of robots in our lives. For example, for men, usability is more important, while for women, it is the pleasure of using this type of technology (Forgas-Coll et al., 2021). Women also think more about the use of smart machines in the context of household work, while men think more about industrial applications (Piçarra et al., 2016a, 2016b).

The fear of autonomous machines and artificial intelligence technology may also be due to the fear of losing a job as a result of technological progress (McClure, 2018). Female employees are more pessimistic here and generally prefer working with people rather than machines (Morikawa, 2017).

Differences in the Perception of Robots and AI by Knowledge

Perception of robots and AI can vary depending on an individual's knowledge about these technologies. A study of the effect of robot programming education on attitudes towards robots found that after the experiment, participants had significantly more positive attitudes towards robots compared with measurements before the experiment (Kim & Lee, 2016). An excellent way to change negative attitudes towards robots is to involve user participation in a robot prototyping process (Reich-Stiebert et al., 2019). After 30 minutes of interaction with the robot, residents of a retirement home developed a positive attitude towards robots designed to assist the elderly (Stafford et al., 2010).This indicates that if one has even a basic knowledge of something then they can see its potential and benefits.

Education, knowledge and experience in dealing with robots are of great importance in relation to attitudes towards robots. People with lower education are more likely to be afraid of developing technology (McClure, 2018). In turn, people with experience in dealing with intelligent machines evaluate and trust robots better (Nomura, 2014; Sanders et al., 2017), they also feel less tension and anxiety in relations with them (Nomura et al., 2020).

The Present Study

The main aim of the presented research was to ascertain if there were any distinct gender-based differences in the levels of acceptance and concerns about robots in the workforce. Moreover, the study aimed to understand the contrasting viewpoints of individuals who perform physical work compared to those in other professions. An additional dimension of the research was to determine the influence of one's familiarity or expertise in robotics on their overall perception, especially in terms of accepting robots in job roles and any concerns related to potential market shifts.

The research results so far and the theoretical premises lead us to leave the hypothesis that the lower acceptance of the presence of robots in society will occur in people less knowledgeable in the field of robotics, performing manual (physical) work and in case of women. Thus:

H1: Women compared to men will be characterised by a lower rate of:

a) acceptance of robots in various occupations,
b) acceptance of robot autonomy,
c) acceptance of robots as full members of society,
d) expression of positive emotions towards robots,
e) agreeing to replace humans with robots,
f) seeing a positive impact on the labour market,
g) seeing a positive impact on solving social problems.

H2: People who are less knowledgeable about robotics compared to those who are knowledgeable in this field will be characterised by a lower rate of:

[similarly as H1 (a–g)]

H3: People performing manual or physical work compared to those who performing other work will be characterised by a lower rate of:

[similarly as H1 (a–g)]

METHOD

Participants

A national study of individuals aged 18 and above in Poland. The sample ($N = 1044$) was selected to be representative of the population in terms of gender, age, and size of place of residence. The respondents had an average age $M_{age} = 44.00$, $SD_{age} = 15.59$.

Measures

Independent variables:

– gender declared in the questionnaire,
– orientation in the subject of robotics,
– the type of performed work.

Dependent variables:

– acceptance of robots in various occupations,
– acceptance of robot autonomy,
– acceptance of robots as full members of society,
– expression of positive emotions towards robots,
– agreeing to replace humans with robots,
– seeing a positive impact on the labour market,
– seeing a positive impact on solving social problems.

A total of 25 questions were included in the survey, and from this, we selected a few of the most interesting questions for further analysis. The following analyses were based on responses to questions that could be related to fears and acceptance of robots in Polish society. Gender in the questionnaire was measured by declaration (female, male, other), Orientation in the field of robotics was measured on 4-point scale (0 = *I'm not oriented at all*, 1 = *I'm rather clueless*, 2 = *I'm rather oriented*, 3 = *I am very well-oriented*). The type of performed work was measured by selecting one answer from the list (manual or physical work, managing others, working directly with clients, data processing or analyses, none of the above).

It's worth adding that we chose not to use existing tools for examining attitudes towards robots, such as NARS (Pochwatko et. al., 2015), because our study specifically focused on attitudes towards robots in relation to the labor market. Supplemental Material 1 contains a description of all the questions that were treated as dependent variables in the analyses.

Procedure

The study was conducted using the Computer Assisted Web Interview (CAWI) method on the Ariadna national research panel (https://panelariadna.pl). As a standard, the panel sends registered participants proposals for participation in various surveys, and for participating in them, respondents receive points that allow them to obtain various benefits (like shop discounts or small gifts).

Data Analyses

To assess the underlying number of factors, we examined the results of parallel analyses using 5,000 simulated analyses (Horn, 1965). The number of factors is determined through the assessment of when the actual eigenvalues are larger than those from simulations. The analysis was conducted using the psych package (Revelle, 2022) in R (R Core Team, 2022). After establishing the underlying number of factors, we evaluated whether the identified structure is well-fitted to the data. For this purpose, we used the Exploratory Structural Equation Modelling (ESEM; Asparouhov & Muthén, 2009), which integrates the best features of exploratory (EFA) and confirmatory factor analysis (CFA; Marsh et al., 2014). In this vein, ESEM is a hybrid statistical procedure, as for instance, similarly to EFA, ESEM does not require to formulate a priori assumptions about the factorial structure (and thus, it is plausible to estimate cross-loadings), and similarly to CFA, it provides information about the degree to which the analysed measurement model finds its representation within the empirical data (i.e., fit indices, which are not commonly provided in EFA approach). Moreover, as in CFA, in ESEM it is also possible to test for multigroup models through the assessment of measurement invariance (multi-group ESEM; MGESEM; Marsh et al., 2014; Meredith, 1993). Thus, ESEM seems to ideally reflect the nature of the current data. The ESEM analyses were carried out in Mplus (v. 7.2.; Muthén & Muthén, 2012). All of the models were estimated using the Weighted Least Squares with Means and Variances adjusted (i.e., WLSMV) and given the binary character of data, were based on tetrachoric correlation matrices. In all ESEM models, we used geomin rotation. No correlations between the residuals were added into the model.

Evaluation of Model Fit

In the assessment whether the ESEM model fits the data well or not, we considered the commonly reported fit indices: the Comparative Fit Index (CFI), whose values above .95 suggest an acceptable model fit, and the Root Mean Square Error of Approximation (RMSEA), whose values below .08 suggest an acceptable model fit (Schermelleh-Engel et al., 2003). In MGESEM, we compared whether the measurement model is invariant across a) orientation towards robotics (oriented vs not), b) type of work (physical vs other), and c) gender (of the participant). For this purpose, we evaluated two subsequent models with increasing levels of constraints—that is, configural and scalar (Meredith, 1993). The configural model is an unconditional model, where no constraints are imposed. In the scalar model, not only the values of item thresholds but also the intercepts are constrained to be equal across compared groups. Although in the literature one might find an in-between model (i.e., the metric model), in the assessment of categorical (and thus, binary) data, it is recommended to directly compare the configural with the scalar model. To evaluate if the results across groups are invariant, we relied on standard recommendations (Chen, 2007), that is, we deemed a model as invariant if the values of the ΔCFI and ΔRMSEA did not exceed .010. Given that we compared the configural with scalar model directly, with the omission of the metric model, we considered the acceptable ΔCFI and ΔRMSEA thresholds as .020. After establishing scalar invariance, it is plausible to compare the differences in latent means across compared groups, which was also reported within the current manuscript.

RESULTS

We started our analysis with factor analysis and verification of hypotheses related to the acceptance of robots in various professions (H1a, H2a, H3a). As can be seen on the screen plot presented in Figure 1, the results of the parallel analyses suggested retaining three factors. The fit to the data of this three-factor model as tested in ESEM was good ($\chi^2_{(63)} = 117.24$, $p < .001$; CFI = .980; RMSEA = .029 [.020, .037]). The standardised factor loadings of the three-factor model are presented in Figure 2. The first factor grouped items about seeing a robot in customer service jobs such as household help, salesmen, receptionist, waiter, and courier. The second factor grouped items about seeing a robot in public-trust works: doctor, therapist, teacher, lawyer, recruiter, and politician. Finally, the third factor grouped the items about seeing a robot in emergency response professions: policeman, soldier, and firefighter. Within the model, we noticed two cross-loadings between the public trust jobs and emergency response. Specifically, seeing robots as a doctor and as a policeman were cross-loading between these factors, however the strength of these loadings was considerably smaller as compared to other within-factor variables. One of the items (i.e., seeing robot as a caregiver) had a small loading (i.e., < .30) on all factors, thus, cannot be considered as a valid indicator of either of the distinguished factors. Summing up, the tested three-factor model found support in empirical data.

Figure 1

Empirical and Simulated Eigenvalues From Parallel Analysis

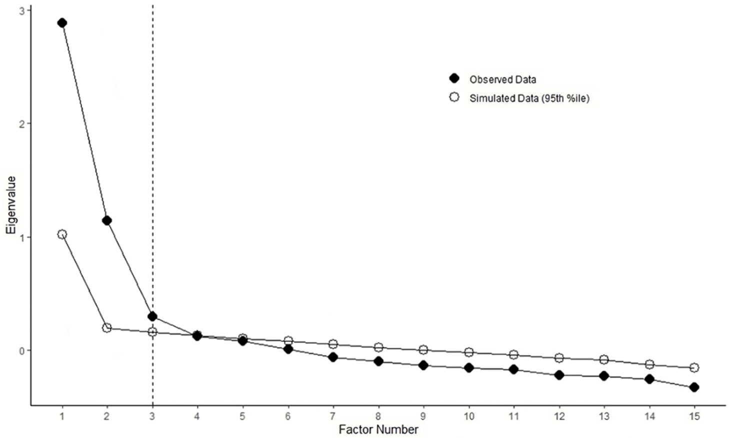
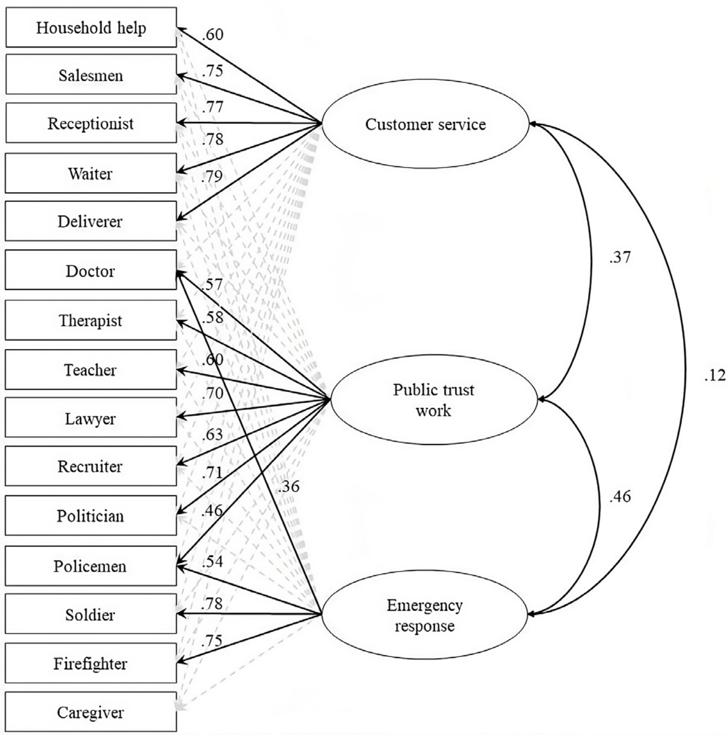


Figure 2

Standardised Factor Loadings of the Three-Factor Model



Note. For the sake of clarity, the estimates which were ≤ .30 are presented as dashed and greyed lines.

Next, we analysed measurement invariance of the three-factor model across three groups. The results of the invariance testing are presented in Table 1. All of the tested configural models were adequately fitted to the data and thus, could be further interpreted. The differences in fit indices between configural and scalar models across all groups were within the acceptable boundaries, thus, it is plausible to compare differences in latent means across groups. Those who declared themselves as oriented in robotics, scored higher on public trust jobs ($Z = 0.87$, $p = .008$). Also, those who declared the physical type of work scored higher on customer service ($Z = 1.44$, $p < .001$) as opposed to those who selected "other" type of work. We did not find any gender differences in either of these factors. Thus, only partial confirmation of Hypothesis H2a was obtained, and in the case of H3a a result contrary to our predictions was obtained.

Table 1
Results of the Measurement Invariance Analysis

Group	Configural		Scalar		Δ	
	CFI	RMSEA	CFI	RMSEA	CFI	RMSEA
Orientation towards robotics	.98	.03	.99	.02	0	.01
Type of work	.98	.03	.99	.02	.01	.01
Gender	.97	.03	.98	.02	.01	.01

Note. In two models (i.e., orientation towards robotics and type of work) one of the items (i.e., receptionist) have had a small negative residual variance, which for the sake of interpretability was constrained to be zero. This constraint did not altered the fit indices.
$^*p < .05$, $^{**}p <$ 01, $^{***}p < .001$.

Between-Subjects Comparison of Declared Attitude (b–g Hypothesis)

To examine other hypotheses (H1, H2, H3 b–g) we conducted a series of non-parametric Mann–Whitney *U* tests. The higher the mean, the more positive attitude towards the question was.

Men vs Women

Women ($M = 1.34$, $SD = 0.59$) were less acceptable to robotic autonomy than men ($M = 1.44$, $SD = 0.64$) and they also declare that robots shouldn't have the possibility to make autonomic decisions, but the effect size is small (r_{bc} = –.09). Women (*M* = 2.34, *SD* = 0.94) are more unwilling to replace human work with robots than men (*M* = 2.70, *SD* = 0.93), and the size effect is medium (r_{bc} = –.21). Women (*M* = 1.63, *SD* = 0.85) declare higher apprehension of the labour market compared to men (*M* = 1.98, *SD* = 1.05), considering that the number of jobs will decrease (with a small effect size: r_{bc} = –.18). Thus, Hypotheses H1b,e,f were fully confirmed. All results are presented in Table 2.

Table 2
Women (W) and Men (M) Comparison

Item	Gender	*M*	*SD*	*U*	*p*	r_{bc}
Acceptance of the robot autonomy	W	1.34	0.59	83887.00	.008	–.09
	M	1.44	0.64			
Acceptance of robots as full members of society	W	1.84	0.83	95412.00	.223	–.04
	M	1.94	0.93			
Expression of positive emotions towards robots	W	4.11	0.73	57812.50	.965	0
	M	4.09	0.86			
Agreeing to replace humans with robots	W	2.34	0.94	62965.50	< .001	–.21
	M	2.70	0.93			
Seeing a positive impact on the labour market	W	1.63	0.85	79389.00	< .001	–.18
	M	1.98	1.05			
Seeing a positive impact on solving social problems	W	2.60	1.15	68239.50	.141	–.06
	M	2.70	1.05			

Oriented vs Non-oriented Towards Robots

Oriented (*M* = 1.45, *SD* = 0.64) were more acceptable to robotic autonomy than non-oriented (*M* = 1.35, *SD* = 0.59); they also declare that robots should have the possibility to make autonomic decisions (the effect size is small: r_{bc} = –0.08). Oriented (*M* = 2.03, *SD* = 0.93) more than non-oriented (*M* = 1.80, *SD* = 0.83) believe that robots should become full and equal members of society, but the effect size is small (r_{bc} = –0.14). Oriented (*M* = 2.68, *SD* = 0.93) are more willing to replace human work with robots than non-oriented (*M* = 2.41, *SD* = 0.96; the effect size is small: r_{bc} = –0.16). Oriented (*M* = 1.92, *SD* = 1.07) declare smaller apprehension of the labour market compared to non-oriented (*M* = 1.72, *SD* = 0.88), considering that the number of jobs will decrease, however the effect size is small (r_{bc} = –0.08). All results are presented in Table 3.

Table 3

Oriented (O) vs Non-Oriented (N) in Robots and AI Comparison

Item	Orientation	*M*	*SD*	*U*	*p*	r_{bc}
Acceptance of the robot autonomy	N	1.35	0.59	82301.50	.014	–.08
	O	1.45	0.64			
Acceptance of robots as full members of society	N	1.80	0.83	8283.00	< .001	–.14
	O	2.03	0.93			
Expression of positive emotions towards robots	N	4.07	0.78	51379.00	.051	–.08
	O	4.14	0.81			
Agreeing to replace humans with robots	N	2.41	0.96	64066.00	< .001	–.16
	O	2.68	0.93			
Seeing a positive impact on the labour market	N	1.72	0.88	86268.00	.032	–.08
	O	1.92	1.07			
Seeing a positive impact on solving social problems	N	2.68	1.12	73096.00	.46	.03
	O	2.61	1.08			

Physical vs Other Workers

Physical workers (*M* = 2.02, *SD* = 0.91) are more likely than other workers (*M* = 2.02, *SD* = 0.91) to believe that robots should become full and equal members of society (the effect size is small: r_{bc} = –0.08). For this comparison, none of the hypotheses were confirmed, and in the case of H3c the opposite result was obtained. All results are presented in Table 4.

Table 4
Physical (P) and Other-Workers (O) Comparison

Item	Type of work	*M*	*SD*	*U*	*p*	r_{bc}
Acceptance of robot autonomy	P	1.35	0.57	71766.00	.475	–.03
	O	1.40	0.63			
Acceptance of robots as full members of society	P	2.02	0.91	87389.00	.007	.11
	O	1.84	0.86			
Expression of positive emotions towards robots	P	4.14	0.81	51156.00	.17	.06
	O	4.08	0.79			
Agreeing to replace humans with robots	P	2.46	0.93	60152.50	.295	–.05
	O	2.54	0.96			
Seeing a positive impact on the labour market	P	1.78	1.04	73694.00	.193	–.05
	O	1.81	0.94			
Seeing a positive impact on solving social problems	P	2.69	1.08	57356.50	.603	.02
	O	2.64	1.11			

DISCUSSION

The research carried out in Poland confirmed the partial hypotheses. Factor analysis made it possible to divide the jobs into three groups, which we called: customer service, public trust jobs, emergency response. Our study showed that orientation in the field of robotics promotes greater acceptance of the presence of robots in trust works, which is consistent with the predictions contained in the hypothesis H2a. At the same time, it turned out that people who declared performing physical work have a more affirmative attitude to the participation of robots in customer service occupations than those who perform other types of work. This is the opposite of our assumptions in H3a, but somewhat explainable. It is very possible that manual workers provide various services at the same time and also see the need to introduce various forms of automation or robotization in this area (e.g. couriers, employees of factories, shops or warehouses). It is worth mentioning that Poland is a country with a very low rate of robotization in industry—there are only

52 robots per 10,000 employees (IFR, 2021). Employees performing physical or manual work have the right to be overloaded and it is in robotization that they may see a chance to free themselves from a number of strenuous physical works. This need may overcome potential fears of losing a job in Poland, a country with a relatively low unemployment rate. This also corresponds to the results of the analyses verifying the H3 hypotheses. The only hypothesis that was confirmed in this case showed that people performing physical work accept the autonomy of the robot to a higher degree compared to people performing other types of tasks. This is an important practical tip for digital transformation specialists that by implementing robotization in companies, you can expect less resistance from employees who use muscle strength in their work on a daily basis.

It turns out that women are more concerned about the increased presence of robots in the labour market, they are less accepting of replacing people with robots and the greater autonomy of intelligent machines. Therefore, our predictions H1b,e,f have been confirmed and this seems to be consistent with the results of studies conducted in other countries (e.g. Giger et al., 2017; Kucuk & Sisman, 2020; Łupkowski & Jański-Mały, 2020; Piçarra et al., 2016a, 2016b; Pochwatko et al., 2015). Without comparative research, it is difficult to say whether these fears are greater than in other countries, however, as a possible factor of Polish women's concerns about robotization, we can point to the high tradition and conservatism of Polish society, where technical issues are the responsibility of men, and women are socialised in towards greater sensitivity to people (e.g. Królikowska, 2011). It is also possible that the issue of roles, norms and social approval of Polish women and men was important here (Suwada, 2021). The surveyed men, through their answers, wanted to show their technical openness, progressiveness, and lack of fear of what is new. In turn, women, in accordance with social norms, may present greater humanism, and thus increased sensitivity to the issue of replacing people by robots in the workplace.

In the group of hypotheses H2, the most confirmations of our assumptions were obtained. As we predicted, people with more knowledge in the field of robotics declare greater acceptance of the autonomous work of robots, and, in terms of replacing people with robots in the work environment, have lower concerns about the market situation compared to those who do not consider themselves robotics-versed. These results fully correspond to the results of previous studies discussed in the theoretical part (Kim & Lee, 2016; Reich-Stiebert, et al., 2019; Stafford et al., 2010). At the same time, they show how important it is to educate the public on the possibilities of using robots, their limitations, and all ethical dilemmas.

The limitation of the presented study is undoubtedly the adopted research methodology and the reliance on declarative data. Such terms as the autonomy of a robot or the replacement of a human by a robot are imprecise and poorly known to the respondents. Therefore, it is worth considering verification of the declared level of knowledge in the field of robotics in future research. Although robotics is becoming more and more common, many of the people surveyed may not have actually had direct experience with a robot, and the interaction greatly influences the perception of this type of machine (Nomura, 2014; Sanders et al., 2017). Moreover, laboratory research could also be enriched with observations and qualitative interviews to better know and understand various fears and resistance to robotization.

CRediT Author Statement

Konrad Maj (40%): conceptualization, methodology, software, validation, formal analysis, resources, writing (original draft), supervision, writing (review and editing).

Kacper Sawicki (30%): formal analysis, resources, writing (original draft).

Karol Samson (30%): supervision, writing (review and editing).

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SUPPLEMENTAL MATERIAL

Description of the Questions Treated as Dependent Variables

No.	Dependent variable	Question content
Q5	*Acceptance of robots in various occupations*	In what functions would you be willing to accept service by a robot, i.e. would you use the services of a robot performing a given job? Select below all occupations in which you would use robot service or select the option: doctor, therapist, domestic help, teacher, guardian, seller, receptionist, waiter, lawyer, supplier, job recruiter, a police officer, politician, soldier, fireman, none of the listed
Q9	*Acceptance of the autonomy of robots*	To what extent should robots be autonomous and able to make decisions independently? a) robots should be able to work only under the strict supervision of a human, and their key decisions should require human approval; b) robots should be able to make independent, autonomous decisions based on strictly programmed; c) robots should be able to make completely independent and autonomous decisions with very limited; d) it is hard to say
Q10	*Acceptance of robots as full members of society*	Do you believe that robots can become full members of society in the future? A) definitely not, b) rather not, c) rather yes, d) definitely yes, e) It's hard to say
Q11	*Expression of positive emotions towards robots*	In your opinion, which of the following relationships would you be able to establish with a robot in the future? a) feeling hatred for a robot, b) arguing with a robot, c) not getting along with a robot, d) getting along with a robot, e) making friends with a robot, f) falling in love with a robot, g) none of the above
Q13	*Agreeing to replace humans with robots*	Imagine that you are an employer and have the opportunity to replace a human with a robot, whose work will be at least as good as a human and cheaper in the long term. As an employer, would you replace a human with a robot? a) definitely not, b) rather not, c) rather yes, d) definitely yes, e) it's hard to say
Q14	*Seeing a positive impact on the labour market*	In your opinion, what can be the consequences of increasing the number of robots working with humans in the labor market? a) definitely negative, b) rather negative, c) neutral, d) rather positive, e) definitely positive, f) it is hard to say
Q15	*Seeing a positive impact on solving social problems*	What do you think are the general social consequences of increased presence of robots among humans? a) social problems will definitely increase, b) social problems will probably increase, c) the number of social problems will not change, d) social problems will probably decrease, e) social problems will definitely decrease