Repelled at first sight? Expectations and intentions of job-seekers reading about AI selection in job advertisements

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ABSTRACT

Artificial intelligence (AI) is increasingly used in personnel selection to automate decision-making. Initial evidence points to negative effects of automating these procedures on applicant experiences. However, the effect of the prospect of automated procedures on job-seekers' pre-process perceptions (e.g., organizational attractiveness) and intentions (to apply for the advertised job) is still unclear.

We conducted three experiments (*Study 1* and *Study 2* as within-subjects designs, *Study 3* as a between-subjects design; $N_1 = 36$, $N_2 = 44$, $N_3 = 172$) systematically varying the information in job advertisements on the automation of different stages of the selection process (*Study 1*: screening stage conducted by a human vs. a non-specified agent vs. an AI; *Study 2* and *Study 3*: human screening and human interview vs. AI screening and human interview vs. AI screening and AI interview).

Results showed small negative effects of screening conducted by an AI vs. a human (*Study 1*, *Study 2*, *Study 3*), but stronger negative effects when also interviews were conducted by an AI vs. a human (*Study 2*, *Study3*) on job-seekers pre-process expectations, perceptions, and intentions.

Possible reasons for these effects are discussed with special consideration of the different stages of the recruiting and selection process and explored with a qualitative approach in *Study 2*.

1. Introduction

Recruiting and selection involves a multi-stage mutual decision-making process in which job-seekers and hiring organizations both acquire information about each other. At each stage, they evaluate whether they still find the other party attractive and decide whether they want to proceed with the process or not (Li & Song, 2017; Uggerslev, Fassina, & Kraichy, 2012). Reading job advertisements is often the first instance when job-seekers[1] and hiring organizations get in contact and thus the first critical point in the process as job-seekers decide at this stage whether or not they will enter the recruiting process (Reeve & Schultz, 2004). Job-seekers' so-called pre-process expectations and perceptions affect important outcomes like application intention or test-taking motivation (Bell, Ryan, & Wiechmann, 2004; Derous, Born, & De Witte, 2004). Thus, it is important for organizations to understand what influences these initial expectations, perceptions, and

corresponding intentions, in order to design job advertisements and recruiting procedures accordingly (Reeve & Schultz, 2004). However, despite the undisputed importance of job advertisements for job-seekers' perceptions, expectations, and intentions regarding a hiring organization, evidence-based research regarding the effects of information provision and job-seekers' processing of information provided in job advertisements is still quite limited (e.g., Jones, Shultz, & Chapman, 2006; Petry, Treisch, & Peters, 2021; Schmidt, Chapman, & Jones, 2014).

Currently, considering job-seekers' expectations and perceptions in recruiting and selection is gaining momentum due to the novel technologies employed (e.g., AI-enabled processes like automated analysis of application documents, automated decision-making in screening applicants, automated analysis of interview data, etc.). Howardson and Behrend (2014) suggest that organizations that use such novel technologies for recruiting can also use information about their novel and

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[1] With the term *job-seekers* we denote persons that are generally looking for a (new, different, etc.) job with varying degrees of urgency. With the term *applicants* we denote persons that de facto have applied to a certain hiring organization and by that have entered the multi-stage mutual decision-making process with this organization.

innovative hiring-procedures for marketing purposes to generate interest in the organization, spice up their image and thus attract job-seekers. Similarly, van Esch and Black (2019) recommend that organizations deliberately communicate that applying for their jobs is trendy, novel and leading-edge due to AI-based recruiting processes. In addition, data protection laws of various countries and state unions now require that users are explicitly informed when their data is collected, stored, electronically processed and especially when they are subject to a decision based on automated processing (e.g., the General Data Protection Regulation of the European Union, Art. 22, Dreyer & Schulz, 2019). Therefore, job-seekers' pre-process expectations and perceptions regarding such novel technologies used in recruiting and selection are a new factor to consider for organizations that want job-seekers to decide to apply for advertised jobs (Howardson & Behrend, 2014; van Esch, Black, & Ferolie, 2019). After all, succeeding in attracting suitable applicants in sufficient numbers is an important determinant of organizational success: When job-seekers don't apply because they are estranged or scared off by announced selection procedures, smaller applicant pools, potentially losing out on suitable and highly qualified candidates, will be the result.

In contrast to the suggestions by Howardson and Behrend (2014) and van Esch and Black (2019) to communicate the use of novel technologies in recruiting and selection to attract job-seekers, previous research on applicant experiences has shown that the use of automation in the recruitment process is often experienced negatively (Acikgoz, Davison, Compagnone, & Laske, 2020; Langer, König, & Hemsing, 2020; Langer, König, & Papathanasiou, 2019; Langer, König, Sanchez, et al., 2020). To our knowledge, research shedding light on this question, namely, whether it would attract or repel job-seekers when the use of novel technologies like AI is communicated in job advertisements, is so far lacking.

Moreover, AI-based processes can be implemented in different stages of the recruiting and selection process, for example in application screenings as well as in job interviews. But most research so far focused on later stages of the recruiting and selection process, specifically the interview stage, with few studies examining such effects at the preceding stages (i.e., the stage of screening applicants based on submitted resumes or selection tests, see for exceptions Mirowska, 2020; Noble, Foster, & Craig, 2021). Based on existing research, it is not clear whether job-seekers and applicants evaluate the use of AI in the recruiting and selection process similarly across the different stages or not. Thus, a differentiated evaluation of the consequences of the use of such technologies on job-seekers' and applicants' experiences and attitudes is important and related to different expectations they may hold with regard to the different stages. This raises the question of how the disclosure of the use of automation in different stages of the recruiting and selection process affects job-seekers in this initial phase of the recruitment process.

To shed light on this important topic, this work sets out to examine the influence of information in job advertisements about automated decision-making in the selection process on job-seekers' pre-process expectations, perceptions, and corresponding behavioral intentions in three experimental studies.

1.1. Digitization and automation in recruiting and selection

The use of technology has increased enormously in the field of personnel recruiting, selection and assessment, in its digital form often referred to as e-recruiting (Stone, Deadrick, Lukaszewski, & Johnson, 2015). Woods, Ahmed, Nikolaou, Costa, and Anderson (2019) use the term *digital selection procedures* to denote "any procedure that makes use of digital communication technology (i.e. computer-, internet- or mobile-based) for the purposes of assisting organizations during recruitment and selection" (p. 65). Digital selection procedures such as application submission via web-based platforms or technology-mediated interviews are nowadays established alternatives

to traditional, analog applications via letter post or on-site interviews and enable organizations to handle larger applicant populations more efficiently, to reach a more globalized labor market, to save time, mail, and travel costs, and to implement environmentally sustainable practices compared to traditional procedures (e.g., Blacksmith, Willford, & Behrend, 2016; Konradt, Warszta, & Ellwart, 2013).

In recent years, tremendous progress in AI[2] could be witnessed, a field "concerned with the automation of intelligence and the enablement of machines to achieve complex tasks in complex environments" (Batarseh, 2018, p. 1). Organizations around the globe try to take advantage of these technological progresses, leading to the development of new AI-based applications that allow to automate decision-making processes that were previously carried out by humans in organizations (e.g., Behrend & Landers, 2019; Ferràs-Hernández, 2018; Leicht-Deobald et al., 2019; Parry, Cohen, & Bhattacharya, 2016). Thus, after the transition from *traditional, analog* procedures to *digital* procedures in recruiting and selection, the next step seems to be *AI-based, automated* procedures. Advantages that organizations expect from automated recruiting and selection procedures are, for example, even greater savings regarding time and money compared to traditional or digital procedures and more valid and bias-free selection decisions (even if these are not necessarily backed-up by scientific evidence, e.g., Leicht-Deobald et al., 2019; Tippins, Oswald, & McPhail, 2021). But automating recruiting and selection may also have downsides and unintended negative side-effects (Woods et al., 2019). Until today little is known about *applicants'* experiences of and reactions to AI-based selection procedures, and the effects on their perception of organizational attractiveness or their decision to accept a job (Acikgoz et al., 2020). However, even less is known about *job-seekers'* pre-process perceptions and expectations regarding the use of AI and automation in recruiting and selection and the effect these have on their decision to apply at all for an advertised job.

1.2. Applicant reactions to digital and automated selection procedures

Research in line with the social process perspective on personnel selection (e.g., Derous & De Witte, 2001) stresses the role of job-seekers and applicants as active decision-makers in the recruiting and selection process (Born, Hiemstra, & Oostrom, 2018). Within this perspective, applicants' experiences with selection tools and processes and resultant consequences for their attitudes, intentions, and behaviors, are investigated under the term *applicant reactions*. Based on Gilliland's original justice-focused model (1993), applicants' perceptions of the selection process' fairness are still at the center of later models on applicant reactions and can affect attitudes (e.g., the perceived attractiveness of hiring organizations), intentions (e.g., intention to pursue a specific job), as well as behaviors of job-seekers (e.g., acceptance of job offers and even later job performance) (Hausknecht, Day, & Thomas, 2004; McCarthy et al., 2017; Ryan & Ployhart, 2000).

Empirical evidence points to profound differences in *applicant reactions to traditional vs. digital selection procedures*. Blacksmith et al. (2016) found in their meta-analysis on applicant reactions to employment interviews that – compared to traditional face-to-face forms – technology-mediated forms negatively impact applicant reactions. As possible reasons for this effect, the authors put forward that applicants might perceive less opportunity to manage their impression, receive less or no information regarding how well they are performing, and evaluate the communication exchanges as being awkward due to technical problems (Blacksmith et al., 2016). However, interviews are just one element of the recruiting and selection process and the review by

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[2] We use the term AI to refer to the field in computer science and refrain from going into details regarding its subdisciplines, like Machine Learning or Neural Networks, that denote the distinct approaches towards achieving intelligence in machines (Batarseh, 2018).

McCarthy et al. (2017) suggests different effects regarding different elements or stages of the process: While indeed applicant reactions to technology-mediated interviews seem to be less positive, applicant reactions to web-based application platforms and testing seem to be predominantly positive.

Empirical evidence regarding *applicant reactions to automated selection procedures* is still rather sparse due to the nascent stage of technologies like AI-based selection applications and their still limited diffusion in the field. It could be assumed that negative applicant reactions due to general technological aspects (e.g., technical problems that may cause stress and awkward communication quality) are generalizable from digital to automated selection procedures. However, we argue that there is a fundamental qualitative difference between digital and automated selection procedures that may cause applicant reactions to differ substantially. In digital forms of personnel selection, applicants still interact with a human – but just technologically mediated – who takes the selection decisions throughout the different stages of the process. In contrast, applicants place themselves in the decision-making power of AI-technologies when entering an automated selection process. As argued by Lee (2018) and Wesche and Sonderegger (2019), humans being subject to automated decision-making are in a fundamentally different role than humans being users or consumers of technology. It turns the established hierarchy between humans and technology upside down, where humans are accustomed to clear (human) master - (technology) slave relationships and now are confronted with constellations, where their fate depends on decisions made by AI-technology.

Systematic between-group comparisons of employment interviews with and without automated decision-making show that participants' perceived control over and attractiveness of the procedure (Langer et al., 2019), perceived opportunity to perform (Langer, König, & Hemsing, 2020), as well as perceived organizational attractiveness (Langer, König, Sanchez, et al., 2020) were impaired under automated decision-making. Regarding perceived fairness of selection procedures, initial evidence is mixed: Acikgoz et al. (2020) found negative effects of automation on fairness while Suen, Chen, and Lu (2019) did not.

1.3. Job-seekers' expectations regarding digital and automated selection procedures

As mentioned above, job-seekers' experiences with hiring organizations begin long before they actually apply and take part in selection procedures (Li & Song, 2017). In this respect, reading job advertisements can be considered one of the first experiences of job-seekers with hiring organizations in the recruiting and selection process. Reeve and Schultz (2004) argue that early in this process, job-seekers typically know relatively little about the organizations or jobs for which they could apply. Thus, in the absence of direct information, they rely on various informational cues encountered as signals of salient organizational and job attributes (cf. signal theory, Bangerter, Roulin, & König, 2012; Spence, 1973). Based on that, Reeve and Schultz (2004) argue that selection methods used by organizations (e.g., interviews, work-sample tests, personality tests) can serve as informational cues for job-seekers and, in line with their assumption, showed that respective information in job advertisements is a crucial factor for job-seekers' pre-process perception of organizational attractiveness and intention to apply. Howardson and Behrend (2014) applied this line of thought to technologies used for selection purposes and showed that job-seekers' pre-process expectations regarding the usability of this technology affected their perception of organizational attractiveness.

First findings on job-seekers' *pre-process* expectations, perceptions, and intentions regarding AI-based selection procedures seem to be in line with the above presented findings regarding applicants' *post-process* reactions to AI-based selection procedures: Mirowska (2020) found in a between-subject study with job advertisements specifying that recorded interviews would be reviewed either by a human evaluator (a company representative) or an AI assessment software a small but consistent negative effect: Job-seekers reported lower intentions to apply for and pursue a job when the job advertisement specified that an AI assessment software (compared to a human) would evaluate their interviews.

Bell et al. (2004) propose that job-seekers' pre-process expectations and perceptions regarding the selection methods they face are influenced by direct (own) and indirect (others') experiences with comparable selection procedures as well as existing beliefs (e.g., belief in a just world). Such existing beliefs can also pertain to technology: For example, representative surveys in Germany (Fischer & Petersen, 2018) and Europe (Grzymek & Puntschuh, 2019) as well as a large-scale survey in the USA (Smith & Anderson, 2017) showed that large parts of the respondents are critical of the use of AI-based technologies and automated decision-making for several purposes but also specifically for personnel selection purposes.

In addition, job-seekers' pre-process perceptions and expectations regarding automated recruiting and selection methods might be influenced by doubts regarding the capabilities of AI technology, specifically their capability to make personnel selection decisions in a meaningful way. The main objective of personnel selection is to identify whether applicants have the knowledge, skills, abilities, and other characteristics needed to perform effectively in particular jobs (e.g., Lievens, 2017), necessarily including applicants' fit to the job, the team, and the organization. In this regard, there is a wide-spread belief that the assessment of subjective qualities (e.g., applicants' fit to a job, a team, or an organization) cannot be (well) performed by automated systems but is part of the unique capabilities and expertise of humans (Chamorro-Premuzic & Ahmetoglu, 2016; Lee, 2018; Newman, Fast, & Harmon, 2020; Smith & Anderson, 2017).

Moreover, job-seekers might expect that they will have less control over the course of the selection procedure and thus less opportunities to perform if it is automated (e.g., Langer et al., 2019; Langer, König, & Hemsing, 2020). For example, applicants might want to direct interviews rather to their strengths instead of their weaknesses or want to draw attention to individual, non-standard assets (e.g., particular experiences from volunteer work, special language skills, etc.) that might not get assessed in highly standardized procedures. In addition, applicants usually use impression management in job interviews with human interviewers in order to present themselves as suitable for the given vacancy and organization (e.g., Chen & Lin, 2014). To be able to do so, applicants use different cues to adapt their behavior to the situation (e.g., interviewers' patterns of speech or nonverbal behaviors). Research on digital selection interviews (e.g., interviews via phone or video-conference) has shown that access to such cues might be limited due to the use of communication technology, which can lead to the perception of reduced control and in consequence to more negative attitudes regarding digital compared to face-to-face interviews (Blacksmith et al., 2016). In automated job interviews this shortcoming seems to be even more accentuated because no human cues are available and because it is basically unclear how impression management can be used in the face of AI, resulting in an expectation of reduced control and reduced opportunities to perform.

Such doubts and expectations could influence job-seekers' pre-process expectations in such a way that they expect lower fairness in AI-based decisions compared to human decision-making in recruiting and selection. Moreover, research on post-process applicant reactions shows that applicants indeed perceive AI-based, automated selection procedures as less fair compared to selection procedures with human decision-making (Acikgoz et al., 2020). Thus, job-seekers' pre-process expectations and perceptions regarding AI-based, automated selection procedures might also be influenced by their own or others' previous experiences with comparable selection procedures (Bell et al., 2004). Based on that, we propose:

Hypothesis 1. Job-seekers report lower justice expectations regarding selection processes that include AI-based, automated decision-making compared to selection processes that include human decision-making.

In addition, job-seekers may believe that automated systems are primarily employed for time- and money-saving reasons and thus perceive hiring organizations that employ AI-based procedures in recruiting and selection as lacking appreciation and social recognition of job-seekers and applicants. For instance, Lee (2018) reports that participants described being subject to automated selection without human contact as frustrating, disrespectful, and demeaning. Moreover, for job-seekers' decision to apply to an organization, it is important that they perceive the hiring organization as an attractive place to work for themselves. In this context, positive social relations and the feeling of being appreciated and supported by one's organization have been shown to be decisive factors for employee performance and well-being at work (e.g., Riggle, Edmondson, & Hansen, 2009) and job-seekers' therefore look for cues signaling whether a hiring organization is a good place to work (Wilhelmy, Kleinmann, Melchers, & Lievens, 2018). In this line of thought, automating recruiting and selection procedures might be interpreted by job-seekers as a signal (Bangerter et al., 2012) of lack of appreciation: An organization that does not invest the time to get to know its potential future employees personally but rather implements time- and money-saving self-service technology might similarly not invest time and money to care for their employees. Among other possible reasons, we assume based on these deliberations that job-seekers might perceive a hiring organization as a less attractive place to work, if they read in job advertisements that the organization uses an AI-based, automated selection process.

Hypothesis 2. Job-seekers report lower pre-process perceptions of organizational attractiveness when reading in job advertisements that hiring organizations use selection processes with AI-based, automated compared to human decision-making.

Taken together, the discussed rather disapproving beliefs and expectations job-seekers might hold regarding AI-based, automated selection procedures might make them less inclined to apply for an advertised job with a hiring organization, if the job advertisement specifies AI-based (and not human-lead) selection procedures. Mirowska (2020) showed such a negative effect for AI-based compared to human-lead selection procedures on pre-process intentions and Acikgoz et al. (2020) for post-process intentions. Based on that, we propose:

Hypothesis 3. Job-seekers report lower intentions to apply for advertised jobs when reading in respective job advertisements that hiring organizations use selection processes with AI-based, automated compared to human decision-making.

As a last point, we argue that job-seekers have different expectations regarding different stages of the selection process and the respective tasks and interactions happening in these stages (Li & Song, 2017). For instance, even in traditional selection procedures, applicants usually have no personal contact with people from the hiring organization in the screening stage and expect to be selected for the next stage merely based on their formal application documents. In the interview stage, however, applicants usually come into personal contact with people from the hiring organization and thus have the opportunity to impress with more than just facts from their application documents (e.g., with their personality, creativity, or impression management).

The different stages differ also with regard to the current state of technological development and practical adoption of automation and AI-based technology. While automated procedures in the early stages of the recruitment process (i.e. automated screening of large numbers of applications) are nowadays widely applied in corporate industry (Derous & Ryan, 2018; Noble et al., 2021), this is less the case for the later stages (e.g. the job interview). Therefore, negative beliefs such as the assumption that AI-based technology lacks necessary capabilities are expected to be more influential in this later stage of the recruitment process. In addition, it has been shown that own previous experiences or experiences of peers influence the acceptance of new technology (Venkatesh & Bala, 2008). In this respect, it can be assumed that more

(positive) experiences lead to more positive assessments of automated screening procedures due to their greater prevalence compared to the less widespread automated interviews.

Taken together, different stages of the selection process are tied to different expectations regarding personal contact and may thus be differentially sensitive to negative effects due to digitization and, all the more, automation. An observation from McCarthy et al. (2017)'s review of applicant reactions to digital selection procedures supports this argument. They report that while applicants respond positively to internet-based testing in screening stages, they respond less positively to technology-mediated interviews. Hence, we propose:

Hypothesis 4. The described negative effects of AI-based, automated vs. human decision-making in selection on job-seekers' a) justice expectations, b) pre-process perception of organizational attractiveness, and c) intention to apply are stronger when not only applicant screening but also applicant interviews are automated.

In contrast to the above discussed beliefs, expectations, and attitudes potentially impinging on job-seekers' pre-process perceptions and intentions regarding hiring organizations that employ automated selection processes, other authors pointed out potential positive effects of communicating the use of such trendy and leading-edge recruiting and selection methods on the reputation of a hiring organization (e.g., van Esch & Black, 2019). Owing to this contradiction, it is important to address the question of positive or negative effects of AI-based selection procedures for job-seekers empirically.

The above presented set of possible reasons for a negative assessment of the use of AI-based, automated selection methods is neither comprehensive nor conclusive, but is intended to substantiate our hypotheses 1–4. However, a more precise understanding of the reasons for positive or negative attitudes towards such methods is extremely important for the understanding of the underlying processes. Therefore, one aim of this work is to gather first exploratory insights (cf. qualitative part of Study 2) into the various reasons for positive and negative pre-process expectations, perceptions, and intentions regarding AI-based, automated selection procedures.

1.4. The present studies

In order to test the above presented hypotheses, we conducted two experiments using a within-subjects approach (*Study 1* and *Study 2*) and one adopting a between-subjects approach (*Study 3*). In all three studies, information about the use of AI-based technology in the applicant screening (*Study 1, Study 2,* and *Study 3*) as well as in the applicant interview stage (*Study 2* and *Study 3*) of the selection procedure was manipulated experimentally. In addition, as an exploratory research question, we were interested in the underlying reasons and beliefs regarding the use of AI-based tools in personnel selection, that influence job-seekers' pre-process perception of organizational attractiveness and intention to apply and collected them following a qualitative research approach in *Study 2*.

Furthermore, also in a rather exploratory approach, we manipulated the information on job benefits in *Study 1* with the aim of comparing the effect of information on AI-based tools in personnel selection against other communicated attributes in job advertisements that have been shown to be highly influential regarding job-seekers' and applicants' attraction to organizations (see the meta-analysis by Uggerslev et al., 2012). Recently, Petry et al. (2021) assessed the relative importance of different attributes of advertised jobs and hiring organizations communicated in job advertisements on participants' intention to apply. They found that communicated benefits (i.e., salary range and developmental opportunities) by far outweighed other information, for example, whether the hiring organization was well-renown and what tasks were associated with the advertised job. However, to our knowledge, research comparing the effects of information on these attributes with the effects on information on AI selection is lacking. Therefore,

information on job benefits was used as a benchmark to contrast the relative effect size of information on AI selection on job-seekers' intention to apply.

2. Study 1

Study 1 addressed the first stage of the recruiting and selection process and aimed at exploring how information in job advertisements regarding AI-based, automated vs. human screening of application documents affects job-seekers' pre-process perceptions (*H2*: perceived organizational attractiveness) and intentions (*H3*: intention to apply) and how strong this effect is relative to other, highly important factors (here: information on employee benefits, cf. Petry et al., 2021). For this purpose, we simulated job-seekers' browsing through job advertisements in job portals and asked participants to read and rate several fictitious job advertisements from different hiring organizations.

2.1. Method

2.1.1. Participants

36 participants from German speaking regions completed the study, 58.33% of them identified as female, 38.89% as male, and 2.78% did not state their gender identification. Participants were aged between 21 and 61 years ($M = 32$, $SD = 10.15$). The majority of participants were employees ($n = 24$) or students ($n = 9$), two participants were self-employed and one participant was retired.

Regarding participants' application experience, 19.44% stated to have sent no applications, 61.11% stated to have sent between 1 and 10 applications, 16.67% stated to have sent between 11 and 25 applications, and 2.78% stated to have sent between 26 and 50 applications in the last five years. Only two participants (5.56%) stated to have prior experience with algorithms in a selection context.

We used G*Power for sample size estimation of repeated measures main effects (Faul, Erdfelder, Lang, & Buchner, 2007). Based on previous research (Reeve & Schultz, 2004), a medium effect of $\eta^2_p = .059$ was assumed. Assuming an error probability of $\alpha = 0.05$, and an estimated correlation for repeated measures of 0.50, $N = 34$ participants would be necessary to achieve a power of $1 - \beta = 0.80$.

2.1.2. Experimental design

Study 1 was realized as an online-experiment following a 3×2 within-subjects design. Similar to the procedure suggested by Reeve and Schultz (2004), participants were instructed to imagine that they are seeking a new job and rate six job advertisements in which two factors were experimentally manipulated: Factor 1: information on the automation of the screening stage of the selection process (manipulated at three levels: non-automated vs. automated vs. control condition i.e., no information). Factor 2: information on employee benefits (manipulated at two levels: information vs. no information).

The job advertisements consisted of three sections: 1) generic information on the hiring organization and the advertised vacancy, 2) information on employee benefits (Factor 2), and 3) information on the selection procedure (Factor 1). Six versions for section 1 were developed that contained comparable information on the hiring organizations, the industry and the jobs, that were worded differently. In addition, the organizations were given neutral names, such as "B5" or "2 GT". Similarly, three versions for section 2 were developed, each containing comparable but differently worded information on employee benefits (e.

g., opportunities for training and development, job autonomy, as well as 30 days[3] of vacation). Information on the selection procedure (i.e., section 3) stated that either a human evaluator or an algorithm would review the application documents or simply stated that the application documents would be reviewed without further specification.

The experimental materials were developed with due care: To avoid contamination by unintended differences in the descriptions of the organizations and benefits, the job advertisements were pre-tested on a small sample of participants ($N = 10$) that were precluded from taking part in the main study. Participants read the six descriptions of the organizations and the three descriptions of employee benefits and rated each one on a six-point Likert scale regarding their intention to apply and their perception of organizational attractiveness (Reeve & Schultz, 2004). Repeated measures ANOVA showed no significant differences in neither intention to apply nor organizational attractiveness between the six organization descriptions ($F_{intention\ to\ apply}$ (5, 45) = 1.50, $p = .21$, $\eta^2_g = 0.08$; $F_{organizational\ attractiveness}$ (5, 45) = 0.88, $p = .50$, $\eta^2_g = 0.05$) and between the three benefit descriptions ($F_{intention\ to\ apply}$ (2, 18) = 0.80, $p = .46$, $\eta^2_g = 0.01$; $F_{organizational\ attractiveness}$ (2, 18) = 2.25, $p = .13$, $\eta^2_g = 0.12$). Despite these statistical results, an inspection of the mean values indicated that the description of one organization was rated lower relatively to the five others. Its wording was revised accordingly. All descriptions are documented in Appendix B.

2.1.3. Procedure

For recruiting participants, invitations with a link to the online survey (EFS Survey, QuestBack, 2019) were posted on social media platforms and shared via listservs. Reaching the online survey, participants were informed that the study addressed job-seekers' reactions to job advertisements, but remained blind about the specific research purpose of the study. After the confirmation of the informed consent (regarding procedure and duration of the study, data protection and use, voluntariness of participation, etc.), participants were asked to read and evaluate different job advertisements, imagining that they were currently seeking a new job. The six job advertisements were presented individually on the screen in a randomized order without time restrictions. At the end, participants were thanked and informed about the purpose of the study. Study participation took about 10–15 min.

2.1.4. Measures

The *Job-Ad Reactions*-scale by Reeve and Schultz (2004), assessing intention to apply and organizational attractiveness with one item each, was administered after presentation of each job advertisement (see Appendix A for all items). Participants rated all items on six-point Likert scales indicating their agreement with the statements (1 = *strongly agree*, 6 = *strongly disagree*; These values were later recoded so that higher values represent higher intention to apply and higher perceived attractiveness).

At the end of the survey, sociodemographic variables were assessed: age, gender, highest educational and highest professional degree, current occupation, prior experience with algorithms in the selection context and application experience (i.e., number of sent applications in the last five years).

2.1.5. Data analysis and preparatory analyses

Two-factorial repeated measures ANOVAs were computed with Greenhouse-Geisser correction applied in cases of violations of the assumption of sphericity (Mauchly's test). Post-hoc analyses using

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[3] In Germany, 30 days of paid vacation corresponds to the annual vacation entitlement of full-time employees working a 5-day week in the public sector. Across all sectors, the German Federal Vacation Act sets 20 days as the minimum annual vacation entitlement for full-time employees working a 5-day week. Therefore, the specified employee benefits present a good offer but are not exceptionally generous.

Bonferroni corrections were calculated in case of significant main effects.

To control for systematic differences between the six organization descriptions and the three benefit descriptions, one-factorial repeated measures ANOVAS were computed, indicating no significant differences between the six organization descriptions regarding the dependent variables ($F_{intention\ to\ apply}$ (5, 45) = 1.50, p = .21, η^2_g = 0.08; $F_{organizational\ attractiveness}$ < 1) and between the three benefit descriptions ($F_{intention\ to\ apply}$ < 1; $F_{organizational\ attractiveness}$ (2, 18) = 2.25, p = .13, η^2_g = 0.12).

2.2. Results

A summary of the descriptive data as well as the results of the post-hoc analyses can be found in Table 1. Data analysis revealed small but significant main effects of *information on automation* on intention to apply, F(1.48, 51.76) = 6.31, p = .01, η^2_g = 0.05, and perceived organizational attractiveness, F(1.59, 55.62) = 4.08, p = .03, η^2_g = 0.04. Post-hoc analyses showed significantly higher ratings for job advertisements describing a human compared to an automated decision agent, while comparisons with the no-information condition did not reach significance level (cf. Table 1).

Information on benefits showed comparably larger effects on participants' intention to apply F(1, 35) = 22.07, p < .001, η^2_g = 0.11, and perceived organizational attractiveness F(1, 35) = 19.93, p < .001, η^2_g = 0.11, with higher ratings for job advertisements specifying benefits compared to the no-information condition. The interaction terms of both factors regarding both dependent variables were not significant (both Fs < 1).

2.3. Discussion

Results of *Study 1* support the tested hypotheses, namely, that the prospect of undergoing an AI-based, automated application screening procedure compared to undergoing a traditional screening procedure with human decision-makers reduces participants' pre-process perception of organizational attractiveness (**H2**) and intention to apply (**H3**). These effects were however rather small. This becomes apparent when comparing the effect sizes of the two independent variables. Information on employee benefits, known to be very important for job-seekers' attraction to organizations (Petry et al., 2021; Uggerslev et al., 2012), showed stronger effects on job-seekers' pre-process perceptions and intentions compared to the information on the automation of the screening procedure. This indicates that the negative consequences of communicating the use of AI-based technology in the screening stage of recruiting and selection processes on job-seekers' reactions is rather small.

A reason for this rather modest effect could be that the use of automation and AI-technology in the screening process is relatively easy to implement and is already rather common in practice (Derous & Ryan, 2018; Noble et al., 2021). However, based on our previous reasoning (cf.

arguments for **H4**) it could be argued that these effects on job-seekers' pre-process perceptions and intentions change (i.e., get stronger) when they read in job advertisements that AI-based technology is not only used in the screening stage but also in a later stage of the recruitment process, for example, the interview stage.

3. Study 2

Findings of *Study 1* showed that information in job advertisements about the automation of the screening stage tends to provoke less positive responses from job-seekers in comparison to traditional methods based on human decision-making. However, *Study 1* pertained to automation of the screening stage only, that is the initial selection stage, when organizations pre-select applicants based on the evaluation of their application documents. As outlined above, we argue that job-seekers hold different expectations for different stages of the recruiting and selection process. In particular, expectations regarding getting in personal contact, having individual opportunities to perform, and receiving appreciation might be higher regarding the interview stage than regarding the screening stage. Moreover, pre-selection based on factual qualifications in application documents might seem a "better automatable" task than applicant selection based on an estimated person-organization or person-team fit in the interview stage. Therefore, we proposed above that negative effects of automation might be more pronounced if AI-based, automated systems are not only employed in the screening stage but also the interview stage (**H4**).

Accordingly, *Study 2* sets out to examine job-seekers' pre-process responses to automation of different stages of the selection process, namely the screening and the interview stage. In this regard, a similar design as described in *Study 1* was adopted, with the experimental manipulation of job advertisements containing information on selection procedures that vary with regard to the use of AI-based, automated systems for the screening stage and for the job interview. In order to reduce complexity of the experimental design, the factor 'employee benefits' was not considered in *Study 2*.

3.1. Method

3.1.1. Participants

A total number of 55 participants took part in the experiment. Manipulation checks revealed that eleven participants provided at least one wrong answer and therefore were excluded from data analysis. The final sample therefore consisted of 44 participants aged between 18 and 62 years (M = 28.86, SD = 10.07). 61.4% identified as female and 38.6% as male. Participants were recruited among students enrolled in the fields of business administration, human resources and neighboring domains, in different universities in German speaking regions via mailing lists and advertisements in newsletters and social media. This restriction to a specific field of studies (i.e., business administration) allowed to formulate the job advertisements specifically for this group of

Table 1

Study 1: Means and standard errors of measures as well as results of post-hoc tests as a function of information about automation of the screening stage of the selection process and employee benefits.

Measure	Non-automated screening		No information on automation of screening		Automated screening		Post-Hoc Tests	Information on benefits		No information on benefits		Post-Hoc Tests
	M	SE	M	SE	M	SE		M	SE	M	SE	
Intention to apply	4.36	.15	4.07	.14	3.67	.16	auto | n-auto ** auto | n-info n.s. n-auto | n-info n.s.	4.44	.12	3.62	.12	***
Perc. org. attractiveness and prestige	4.42	.13	4.10	.12	3.88	.15	auto | n-auto * auto | n-info n.s. n-auto | n-info n.s.	4.50	.10	3.76	.10	***

Notes. ***p < .000, **p < .01, *p < .05; n.s. = not significant, perc. = perceived, org. = organizational, auto = automated screening, n-auto = non-automated screening, n-info = no information given.

participants and thus as realistic and credible as possible. Participants' application experience ranged from 0 to 100 sent applications ($M = 13.5$, $SD = 18.53$). Four participants (9.1%) stated to have prior experience with algorithms in a selection context.

For the a priori sample size estimation (Faul et al., 2007), an effect of $\eta^2_p = .039$ was assumed based on effects reported in *Study 1*. With the error probability set to $\alpha = 0.05$, the estimated correlation among repeated measures to $r = 0.50$, and nonsphericity correction to $\varepsilon = 0.7$, $N = 35$ participants are required to achieve a power of $(1 - \beta) = 0.80$.

3.1.2. Experimental design

Following a one-factorial within-subjects design, information on the automation of the selection process was manipulated at three levels: non-automated (human screening and human interview) vs. semi-automated (automated screening and human interview) vs. fully automated (automated screening and automated interview) selection.

Three comparable but differently worded job advertisements were developed. These were presented to participants in a randomized order, in combination with descriptions of the selection procedure (representing the experimental manipulation), which were also presented in a randomized order. The presented job advertisements and descriptions of the selection procedure are documented in Appendix B.

3.1.3. Procedure

The procedure of *Study 2* was identical to that described for *Study 1* in section 2.1.3, with the difference that fewer job descriptions (3 instead of 6) were presented due to the change in experimental design.

3.1.4. Measures

In addition to the *Job-Ad Reactions*-scale by Reeve and Schultz (2004) assessing intention to apply and organizational attractiveness (cf. section 2.1.4), expected *fairness of the selection procedure* was assessed with one item (see Appendix A for all items). In addition, two items were administered in order to assess the writing of the job advertisements and determine whether the three job advertisements differ in terms of eloquence. All items were answered on Likert scales ranging from 1 (*I don't agree*) to 6 (*I fully agree*).

Furthermore, a manipulation check was administered after each presentation of a job advertisement. The question: "How did you understand the application process?" could be answered with one of three answering options: 1) *The selection process involves exclusively human decisions*, 2) *The selection process exclusively involves automated decisions made by artificial intelligence*, and 3) *The selection process involves both, human decisions and automated decisions made by artificial intelligence*.

Finally, participants were asked to describe how they feel about the application process presented to them by providing a short text answer (with the instruction text: "Please briefly describe how you feel about the application procedure described above").

3.1.5. Data analysis and preparatory analyses

In order to test our hypotheses, one-factorial repeated measures ANOVAs were computed, with Greenhouse-Geisser correction applied in cases of violations of the assumption of sphericity (Mauchly's test). Post-hoc analyses using Bonferroni corrections were calculated in case of significant main effects. To control for unintended effects of the three job advertisements, a one-factorial repeated measures ANOVA was computed, revealing no significant effect on any of the dependent variables and the control variables ($F_{intention\ to\ apply} < 1$; $F_{organizational\ attractiveness}(2, 42) = 1.34$, $p = .27$, $\eta^2_g = 0.03$; $F_{expected\ fairness} < 1$; $F_{well\ written} < 1$; $F_{interesting\ job}(2, 42) = 1.05$, $p = .35$, $\eta^2_g = 0.02$).

Qualitative data (participants' comments on how they felt about the described application processes) was analyzed relying on an adapted version of the inductive thematic analysis methodology (Braun & Clarke, 2006). After reading all answers, two coders independently defined a set of preliminary codes. These codes were then compared and discussed, before the coders proceeded to independently code the data.

Several meetings were organized to compare and discuss the coding, as well as to make sure that the analysis was comprehensive, coherent and reflecting the actual data. The inter-rater reliability of the final solution was assessed using Cohen's kappa and showed to be satisfactory ($k = 0.81$). The few differences in coding were solved through discussion.

3.2. Results

3.2.1. Quantitative data

Data analysis indicated a significant main effect of information about automation on intention to apply, $F(2, 86) = 27.67$, $p < .001$, $\eta^2_g = 0.39$ (**H3**), perceived organizational attractiveness, $F(2, 86) = 20.95$, $p < .001$, $\eta^2_g = 0.33$ (**H2**), and expected fairness of the procedure $F(1.65, 71.17) = 18.19$, $p < .001$, $\eta^2_g = 0.30$ (**H1**; cf. Table 2 for descriptive statistics and details). Bonferroni-corrected post-hoc analyses revealed that for all three dependent variables, ratings of the non-automated and the semi-automated selection procedure were more positive compared to the fully automated procedure (**H4**), while ratings of non-automated and semi-automated selection differed for intention to apply and organizational attractiveness but not for fairness of the procedure (cf. Table 2 for details).

3.2.2. Qualitative data

The qualitative analysis of participants' comments on the use of AI in recruiting revealed seven categories of negative comments and five categories of positive comments. The negative comments were classified into the following categories: 1) Lack of capabilities, 2) Missing human factor, 3) Mutual selection procedure, 4) Lack of control and possibilities to perform, 5) Lack of appreciation towards applicants, 6) Lack of explanation and 7) Missing inclusiveness. The positive comments were grouped within the categories 1) Combination of AI and human decision making, 2) Fair, objective and unbiased procedure, 3) Efficiency and speed, 4) Innovative and modern, and 5) Convenient and stress-free. In the following, the negative categories are described first, followed by the positive ones (for an overview, see Table 3).

Lack of capabilities: This category summarizes comments in which doubts were expressed regarding the ability of the described technology (in general or at the current time) to make such decisions in a reasonable way.

> "AI cannot yet sufficiently analyze the chemistry between people." (participant 68)

> "Artificial intelligence works according to binary principles, which can only do justice to the wealth of human life experience with great sacrifices." (participant 125)

Missing human factor is a category summarizing comments regarding the belief that an automated selection procedure is missing the human touch or personal component which is considered important in personnel selection.

> "But from my point of view, the human element is missing a lot and it also seems very impersonal." (participant 66)

> "In the end, however, the human component is still important. Does the candidate fit into the team etc.? This should be decided by a person." (participant 71)

The category *Mutual selection procedure* contains comments that emphasize the belief that in the recruiting and selection process, not only the hiring organization chooses among various candidates but also the candidates choose among various hiring organizations. This mutual selection would hence become difficult or impossible if the job interview with a human representing the future workplace was replaced by an automated job interview.

Table 2
Study 2: Means and standard errors of measures as well as results of post-hoc tests as a function of information about automation of the selection process.

Measure	Non-automated recruiting (Human Screening & Human Interview)		Semi-automated recruiting (Autom. Screening & Human Interview)		Fully automated recruiting (Autom. Screening & Autom. Interview)		Post-Hoc Tests (Bonferroni)
	M	SE	M	SE	M	SE	
Intention to apply	4.32	.12	3.73	.18	2.77	.21	n-auto | s-auto ** n-auto | f-auto *** s-auto | f-auto ***
Perc. org. attractiveness	4.34	.15	3.84	.18	3.05	.18	n-auto | s-auto * n-auto | f-auto *** s-auto | f-auto ***
Exp. fairness of the procedure	4.30	.15	4.00	.23	2.84	.19	n-auto | s-auto n.s. n-auto | f-auto *** s-auto | f-auto ***

Notes. ***$p < .000$, **$p < .01$, *$p < .05$; n.s. = not significant, perc. = perceived, org. = organizational, exp. = expected; n-auto = non-automated recruiting, s-auto = semi-automated recruiting, f-auto = fully automated recruiting.

"An application is about a mutual selection. On the one hand, the company wants to find the best employee, and for this it is true that an automated application process can be beneficial. However, on the other hand, the person looking for a job also wants to make a decision about whether he/she wants to work in this company or rather in another one." (participant 87)

"As an applicant you have no possibility to judge whether you fit to this company, because the contact person is a system." (participant 106)

The category *Lack of control and possibilities to perform* contains comments describing the belief that there is less opportunity to actively influence decision-making in the context of automated personnel selection.

"I have the feeling that I can sell myself better to a human being." (participant 75)

"I'm afraid that as a candidate I might fall through the AI filter if I don't have the classic CV for the job, but still think I'm suitable because I have experience elsewhere and would like to develop there." (participant 106)

Lack of appreciation towards applicants summarizes comments that express the belief that a hiring organization must make a certain effort to convince candidates to accept a job offer. Participants expressed that by using automated selection procedures, hiring organizations do not show enough appreciation towards applicants.

"It is important to me that the company also shows that it takes time for me." (participant 126)

"But still, the labor market is changing and companies have to learn that they might have to look for employees at some point, especially in certain target groups - > war for talents. You should get to know the candidates personally and convince them of the company (not the other way around)." (participant 58)

The category *Lack of explanation* summarizes comments emphasizing participants' concerns of not having enough knowledge and understanding about how the automated selection procedure works and makes decisions.

"The lack of transparency in how the AI makes its selection is problematic." (participant 69).

Missing inclusiveness is the category describing concerns about possible discrimination against specific groups of people as a result of automated selection procedures.

"In addition, such application procedures sometimes exclude older generations, as they are more critical of the process." (participant 68).

The positive comments were grouped into the following five categories:

The category *Combination of AI and human decision making* contains comments expressing positive attitudes towards a selection process in which decisions in the screening stage are taken by an AI while the interview is conducted by a human. This combination was described as common practice in in the field.

"Standard" (participant 136)

"Very good, because of the 2 components. Electronic preselection makes sense." (participant 212)

"Find it good that neither only humans, nor only machine / AI makes decisions" (participant 259)

Fair, objective and unbiased procedure. This category contains all comments highlighting an objective, unbiased decision-making process in which nepotism and favoritism are not possible.

"The application process is fair in that my qualifications, etc., are assessed objectively and all candidates have an equal chance." (participant 66)

"Above all, the advantage of getting a job through vitamin B (German expression for nepotism) is no longer there." (participant 71)

The category *Efficiency and speed* summarizes statements indicating the efficiency and time-saving of using automation in the recruitment process.

"I think it's good to use technology to simplify long processes." (participant 125)

"Seems to be an efficient selection procedure in a sympathetic way." (participant 252)

Innovative and modern as category groups statements that emphasize the innovative and modern character of the process.

"Innovative." (participant 126)

"Very modern and innovative, more artificial intelligence than human employees involved." (participant 246)

The category *Convenient and stress-free* summarizes statements expressing a positive attitude towards the use of AI due to the simplification of the process and a reduction of stressful experiences through the

Table 3
Study 2: Summary of categories of positive and negative comments regarding the use of AI recruitment.

Meta-Category	Category Name	Category Description	Number of Mentions
Negative			
1	Lack of capabilities	Doubts about the ability of AI to take selection decisions in a reasonable way	57
2	Missing human factor	Beliefs that an AI-based selection procedure is missing the human touch or personal component	34
3	Mutual selection procedure	Beliefs that recruitment consists of a mutual selection process which is not possible in an AI-based procedure	26
4	Lack of control and possibilities to perform	Beliefs that there is less opportunity to actively influence decision-making in the context of AI selection	15
5	Lack of appreciation towards applicants	Beliefs that hiring organizations do not show enough appreciation towards applicants when using AI selection procedures	12
6	Lack of explanation	Concerns about not having enough knowledge and understanding of how the AI selection procedure works and makes decisions	3
7	Missing inclusiveness	Concerns about possible discrimination against specific groups of people as a result of the AI selection procedure	1
Positive			
1	Combination of AI and human decision making	Positive evaluation of a selection process in which decisions in the screening stage are taken by an AI while the interview is conducted by a human	31
2	Fair, objective and unbiased procedure	Beliefs that AI selection procedures allow for more objective, unbiased decision-making without nepotism or favoritism	17
3	Efficiency and speed	Beliefs that using AI in the recruitment process is efficient and time-saving	4
4	Innovative and modern	Positive impact on the image of hiring organizations through the use of innovative and modern technologies	4
5	Convenient and stress-free	Positive evaluation of the use of AI due to the simplification of the process and a reduction of stressful experiences	4

assessment situation.

> "Simple, practical and as if you have little to lose because you're only dealing with a machine for the time being anyway." (participant 251)

> "I think I would feel less 'watched' and maybe even less nervous than in the usual interview setting." (participant 268)

3.3. Discussion

The quantitative results of *Study 2* indicated that fully automated application procedures are generally viewed rather negatively by job-seekers. However, the study has also shown that job-seekers are not fundamentally negative about the use of automated selection procedures

in the recruitment process. This is reflected in the rather positive evaluation of the description of the semi-automated process (as compared to the fully automated procedure) in quantitative data as well as the many positive comments about the combination of AI and human decision making reported in the qualitative data (highlighting also the assumption that this is already common practice in some industries). These findings indicate that the automation of the screening stage seems to be regarded less critically compared to the automation of the interview stage. In this respect, the analysis of the qualitative data showed that this is mainly due to the fact that job-seekers think that technology for automating job interviews is not capable of meaningful performance of the selection tasks, that such a method lacks appreciation, humanity, and information, that it does not transmit the information necessary for a mutual selection, that it reduces individual control, and that it might not be inclusive.

However, some participants also highlighted positive aspects of the use of AI such as an increase in fairness through the reduction of nepotism and favoritism, better efficiency and time-saving as well as the reduction of experienced stress due to the elimination of a social evaluation situation (i.e., the job interview with representatives from the hiring organization) that many people consider unpleasant. Nevertheless, the analysis of the quantitative data indicated that the negative assessments regarding the use of AI for the job interview outweigh these positive arguments. This suggests that previously proposed positive effects of the use of AI technology in the recruitment process (Howardson & Behrend, 2014; van Esch & Black, 2019) were not confirmed in this study.

4. Study 3

The purpose of *Study 3* was to evaluate the effect of information provided in job advertisements about the automation of the selection process on job-seekers' pre-process expectations, perceptions, and intentions more thoroughly using a between-subjects design. As the within-subjects design used in *Study 1* and *Study 2* allowed only for short measurement instruments, the constructs of interest were assessed using one-item scales. In contrast, the between-subjects design of *Study 3* allows to analyze job-seekers' pre-process expectations, perceptions, and intentions in greater breadth and depth by using more elaborate scales, since each participant has to evaluate only one job advertisement. Specifically, *Study 3* sets out to test the negative effect of information on the automation of the selection procedure on justice expectations (**H1**), perceived organizational attractiveness (**H2**), intention to apply (**H3**), as well as the assumption that these negative effects are more pronounced if not only the screening but also the interview is described as being automated (**H4**).

4.1. Method

4.1.1. Participants

172 participants from German speaking regions voluntarily completed the study, 60.47% of them identified as female. Participants were aged between 18 and 67 years ($M = 27.28$, $SD = 9.26$). Participants' experience with job applications varied considerably: in the last 5 years they sent between 0 and 200 written applications ($M = 16.53$, $SD = 28.99$) and took part in 0–44 job interviews ($M = 5.44$, $SD = 6.13$).

Sample size estimation (Faul et al., 2007) assuming a medium between-groups effect of $\eta^2_p = .059$ based on previous research (e.g., Acikgoz et al., 2020), with $k = 3$ groups in a balanced one-factorial ANOVA and an error probability of $\alpha = 0.05$, indicates that $N = 159$ participants would be necessary to achieve a power of $1 - \beta = 0.80$.

4.1.2. Experimental design

To address the above detailed hypotheses, we examined job-seekers' pre-process expectations, perceptions, and intentions in response to a job advertisement in a randomized between-subjects design.

Information about the automation of the selection process was manipulated at three levels: non-automated (human screening and human interview) vs. semi-automated (automated screening and human interview) vs. fully automated (automated screening and automated interview) selection using the same descriptions as in *Study 2* (All descriptions are documented in Appendix B.).

4.1.3. Procedure

For recruiting participants, invitations with a link to the online survey (SoSci Survey, Leiner, 2019) were posted on social media platforms and shared via listservs. Similar to *Study 1* and *Study 2*, participants were informed on the landing page about the basics of the study (e.g., procedure and duration of the study, data protection and use, voluntariness of participation, etc.) and asked to confirm their informed consent. Afterwards, they were briefed that the study addressed job-seekers' reactions to job advertisements, but remained blind about the specific research purpose of the study (i.e., possible effects of automation of personnel selection processes).

Participants were instructed to imagine that they were seeking a new job and that they found a job advertisement that corresponds to their professional competences and interests on the internet. With this situation in mind, they were randomly assigned to view one of three job advertisements (containing the identical organization and job description but varying systematically the level of automation of the specified selection procedure). After reading the job advertisement, participants were asked to report their perceptions of it by answering standardized questionnaires for the study variables. Afterwards, participants were thanked, debriefed, and, if applicable, received course credit.

4.1.4. Measures

All items are displayed in Appendix A. Means, standard deviations, and intercorrelations of all study variables are displayed in Table 5. Item order within each scale was randomized across participants. Participants rated all items on five-point Likert scales indicating their agreement with the statements (1 = *strongly disagree*, 5 = *strongly agree*), respectively for the technical affinity scale (1 = *not true at all*, 5 = *very true*).

4.1.4.1. Dependent measures. Participants' *intention to apply* was assessed using a translated version of the five-item scale "Intentions to Pursue" by Highhouse, Lievens, and Sinar (2003) that showed satisfactory internal consistency in our study (Cronbach's α = 0.85).[4]

Perceived organizational attractiveness and prestige was assessed with the translated respective 5-item scales by Highhouse et al. (2003) and combined to an overall value. The combined scale showed good internal consistency in our study (Cronbach's α = 0.91).

Finally, participants' *expected justice of the selection process* was assessed by using the seven-item procedural justice sub-scale of the questionnaire on the perception of organizational justice (Colquitt, 2001; German version: Maier, Streicher, Jonas, & Woschée, 2007). The scale showed unsatisfactory internal consistency in our study (Cronbach's α = 0.65). This finding has been reported also in other works using this scale for comparing perceptions of procedural justice between automated and human decision agents (Schlicker et al., in press) but not in studies using scales with summative subjective evaluations of fairness (e.g., see above Study 2, section 3.1.4., or Newman et al., 2020). Based on these observations, we assessed the underlying structure of the scale with principal component analysis. This method is adequate for

formative measurement as the items of the scale assess to what extent certain aspects are given in a specified procedure that together contribute to the overall evaluation of this procedure as procedurally just rather than reflecting a single underlying quality of the procedure itself (see also Jonathan-Zamir, Mastrofski, & Moyal, 2013).

Method agreement procedure to determine the number of components to extract suggested two components. Accordingly, principal component analysis with varimax rotation was conducted with the specification of two components. After rotation, the first component accounted for 31% of the variance, and the second component accounted for 23% of the variance. In line with the recommendation by Matsunaga (2010), we retained those items that loaded strongly onto one component (>0.5) while showing weak loadings onto other components (<0.2). Application of this decision rule led to the retention of two items per component (see Table 4): Component 1 (Item 1: "*To what extent would you be able to express your views and feelings during the recruiting and selection process?*" and Item 2: "*To what extent would you have influence on the result of the recruiting and selection process?*") reflects possibilities for voice, while component 2 reflects unbiased consistency (Item 3: "*To what extent would the recruiting and selection procedure be applied consistently?*" and Item 4: "*To what extent would the recruiting and selection procedure be free of bias?*"). As these two components are thematically in line with the results by Schlicker et al. (in press), we used the two components as dependent variables in our analyses.

4.1.4.2. Sociodemographic and manipulation-check measures. To learn more about the participants in our study, we assessed the following sociodemographic variables: age, gender, educational degree, and the industry in which participants worked. In addition, participants reported their application experience (i.e., quantity of sent applications and quantity of job interviews). Moreover, we assessed participants' technical affinity via the subscales *enthusiasm* (5 items) and *competence* (4 items) of the Technology Affinity questionnaire by Karrer, Glaser, Clemens, and Bruder (2009).

To evaluate whether the experimental manipulation was effective, participants answered two purpose-built items addressing their perception of the selection process ("*I found the selection process highly automated." "I found the selection process highly personal.*").

Table 4
Study 3: Standardized loadings after principal component analysis with Varimax rotation of the items of the procedural justice scale.

Item Number		RC 1	RC 2	h^2
2	To what extent would you have influence on the result of the recruiting and selection process?	**.79**	-.07	.62
1	To what extent would you be able to express your views and feelings during the recruiting and selection process?	**.78**	-.15	.63
5	To what extent would the recruiting and selection procedure be based on accurate information?	.58	.50	.59
7	To what extent would the recruiting and selection process meet ethical and moral standards?	.55	.30	.39
6	To what extent would you have the possibility to appeal the results of the recruiting and selection process?	.47	.18	.26
3	To what extent would the recruiting and selection procedure be applied consistently?	-.13	**.80**	.66
4	To what extent would the recruiting and selection procedure be free of bias?	.13	**.75**	.60
% of variance		31	23	

Notes. Items 5, 6, and 7 were dropped due to cut-off values for item retention recommended by Matsunaga (2010). Bold loadings indicate retained items. RC = rotated component; percentage of variance is post-rotation. h^2 = communality coefficient.

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[4] Additionally, participants' *intention to apply* was measured with a purpose-built single-item: "It is very likely that I will apply for a job at ALIA [the fictitious hiring organization]". While its descriptive statistics for the three experimental groups resembled those for the "intentions to pursue" multi-item scale, the single-item was not sensitive enough to detect significant differences between the three experimental groups. We thus refrain from reporting the respective results.

Table 5
Study 3: Means, standard deviations, and correlations among study variables.

Variable	M	SD	1	2	3	4	5	6	7	8
1. Intention to apply	3.01	0.81	*.85*							
2. Perc. org. attractiveness and prestige	3.11	0.76	.81**	*.91*						
3. Exp. procedural justice - voice	2.68	0.93	.41**	.46**	*.65*					
4. Exp. procedural justice - consistency	3.43	0.90	.15	.19*	.02	*.51*				
5. Age	27.52	9.09	-.26**	-.30**	-.13	-.08				
6. Technology affinity - enthusiasm	2.94	1.06	-.03	.05	.12	.03	-.07	*.87*		
7. Technology affinity -competence	3.64	0.85	-.09	-.07	.08	.04	-.08	.57**	*.77*	
8. Experience (writing applications)	16.53	28.99	.17*	.17*	-.02	.05	-.01	-.01	-.05	
9. Experience (interviews)	5.44	6.13	-.03	.02	-.03	.09	.07	.15	.10	.49**

Notes. *$p < .05$, **$p < .01$, perc. = perceived, org. = organizational, exp. = expected; Values for Cronbach's α are presented in the diagonal.

4.1.5. Data analysis and preparatory analyses

Data was analyzed with one-factorial ANOVAs. Post-hoc analyses using Tukey's HSD corrections were calculated in case of significant main effects.

To test *successful randomization* of participant assignment to the three experimental conditions, we analyzed distributions of relevant sample characteristics (i.e., age, gender, technical affinity enthusiasm and competence, and experience with job applications and with job interviews). Pearson's Chi-squared test showed no differences across experimental conditions with regard to gender ($\chi^2(2, N = 172) = 1.65$, $p = .43$, $\eta^2_g = 0.01$), and one-factorial ANOVAs indicated no differences across experimental conditions with regard to age ($F(2, 169) = 1.47$, $p = .23$, $\eta^2_g = 0.02$), technical affinity enthusiasm ($F(2, 169) = 1.54$, $p = .22$, $\eta^2_g = 0.02$), technical affinity competence ($F(2, 169) = 1.33$, $p = .27$, $\eta^2_g = 0.02$), and experience with job applications (for both the number of written applications as well as completed interviews, $F(2, 163) = 0.83$, $p = .44$, $\eta^2_g = 0.01$, and $F(2, 164) = 0.76$, $p = .47$, $\eta^2_g = 0.01$).

To *test whether the experimental manipulation was successful*, participants' ratings of two items regarding the perception of the selection process were compared between the experimental groups. Analyses indicated a successful manipulation of automation of the selection process for the first item (*perception as highly automated*), $F(2, 169) = 40.59$, $p < .001$, $\eta^2_g = 0.32$, with participants in the fully automated condition reporting higher values compared to the semi-automated and non-automated conditions (see Table 6 for descriptive data). The post-hoc comparison between the semi-automated and non-automated condition also reached significance. A similar (but inverted) effect pattern was observed for the second item (*perception as highly personal*), $F(2, 169) = 22.12$, $p < .001$, $\eta^2_g = 0.21$, providing a second indication for the successful manipulation of automation in the selection process. Participants in the fully automated condition evaluated the selection process as less personal compared to participants in the semi-automated and the non-automated condition, while the comparison between semi-automated and non-automated condition did not reach significance (see Table 6 for descriptive data).

4.2. Results

A summary of the descriptive data as well as the results of the post-hoc analyses can be found in Table 6.

Intention to Apply. Data analysis revealed that participants' intention to apply was lower in the fully automated condition compared to the semi-automated and the non-automated condition, $F(2, 169) = 7.29$, $p < .001$, $\eta^2_g = 0.08$. While mean values differed significantly between the fully automated and semi-automated and non-automated conditions, post-hoc analyses revealed no difference between the latter two conditions.

Perceived Organizational Attractiveness and Prestige. Participants' perception of organizational attractiveness and prestige was lower in the fully automated condition compared to the semi-automated and non-automated conditions, $F(2, 169) = 3.83$, $p = .024$, $\eta^2_g = 0.04$. Post-hoc analyses revealed significant differences between the non-

Table 6
Study 3: Means and standard errors of measures as well as results of post-hoc tests as a function of information about automation of the selection process.

Measure	Non-automated recruiting (Human Screening & Human Interview)		Semi-automated recruiting (Autom. Screening & Human Interview)		Fully automated recruiting (Autom. Screening & Autom. Interview)		Post-Hoc Comparisons (Tukey's HSD)
	M	SE	M	SE	M	SE	
MC 1: recruiting perceived as automated	3.07	.13	4.14	.13	4.72	.13	n-auto | s-auto *** n-auto | f-auto *** s-auto | f-auto **
MC 2: recruiting perceived as personal	2.52	.13	2.18	.13	1.36	.13	n-auto | s-auto n.s. n-auto | f-auto *** s-auto | f-auto ***
Intention to apply	3.16	.10	3.18	.10	2.69	.10	n-auto | s-auto n.s. n-auto | f-auto ** s-auto | f-auto **
Perc. org. attractiveness and prestige	3.22	.09	3.21	.11	2.88	.10	n-auto | s-auto n.s. n-auto | f-auto * s-auto | f-auto n.s.
Exp. procedural Justice - Voice	3.03	.13	2.71	.12	2.29	.10	n-auto | s-auto n.s. n-auto | f-auto *** s-auto | f-auto *
Exp. procedural Justice - Consistency	3.16	.12	3.48	.11	3.66	.12	n-auto | s-auto n.s. n-auto | f-auto ** s-auto | f-auto n.s.

Notes. ***$p < .001$, **$p < .01$, *$p < .05$; n.s. = not significant, MC = manipulation check, perc. = perceived, org. = organizational, exp. = expected, n-auto = non-automated recruiting, s-auto = semi-automated recruiting, f-auto = fully automated recruiting.

automated and fully-automated conditions.

Expected Procedural Justice. Data analysis showed significant effects of automation on the two assessed components of expected procedural justice: consistency and voice: $F(2, 169) = 4.85$, $p = .009$, $\eta^2_g = 0.05$ and $F(2, 169) = 10.34$, $p < .001$, $\eta^2_g = 0.11$, respectively. Post-hoc analyses revealed that in the fully automated condition, participants expected significantly less possibility for voice than in the semi- and non-automated condition, while the latter ones did not differ significantly from each other. Regarding the expected consistency of the selection procedure, post-hoc tests revealed that participants expected significantly more consistency in the fully-automated compared to the non-automated condition, while the other conditions did not differ significantly from each other.

4.3. Discussion

The results of *Study 3* are in line with the findings of *Study 1* and *Study 2* regarding the negative effects of information about automated selection procedures on job-seekers' pre-process expectations, perceptions, and intentions (*H1*, *H2* and *H3*). Moreover, *Study 3* corroborates the findings of *Study 2* assessing the use of AI for different stages of the recruiting and selection process individually: In line with the findings from *Study 2*, the results show that the prospect of having both an automated screening and job interview is linked with rather negative pre-process responses, while the prospect of being subject to 'just' an automated screening process seems to be perceived as being less problematic. Results regarding the two components of expected organizational justice indicate interesting differentiated effects regarding the automation of the screening and the interview stage: The positive assessment of increased consistency is already incurred by the semi-automated condition (without significant difference from the fully-automated condition), while the negative assessment of reduced possibilities for voice and process control is significantly higher in the fully-automated condition, while the semi-automated condition does not significantly differ from the non-automated condition. Based on that, these results indicate that the semi-automated condition (i.e., automated screening and human interview) represents the most preferable combination regarding the different components of expected procedural justice.

5. General discussion

5.1. Summary

Data analysis revealed significant effects of automation of the selection procedure specified in job advertisements on participants' initial intention to apply and pre-process perception of organizational attractiveness. Specifically, our results indicate that participants were indeed deterred by the prospect of undergoing an automated selection procedure (*Study 1, Study 2,* and *Study 3*) and specifically by the prospect of having an automated job interview (*Study 2* and *Study 3*). Yet as *Study 1* showed, the specified benefits of the job offer (here: job autonomy, training possibilities, and vacation entitlement) are also very important for participants' attractiveness perception and application intention. Consistent across the dependent variables in *Study 2* and *Study 3*, participants in the condition with the highest degree of automation (automated screening and automated interview) gave the lowest ratings (with reverse effects for expected consistency), while values between semi-automated (automated screening and human interview) and non-automated (human screening and human interview) selection procedures did differ to a lesser extent. This indicates that participants mainly expressed issues with automated job interviews while automated screening procedures showed a smaller effect on their attitudes and behavioral intentions.

The general effect that automated selection procedures (compared to traditional or digital selection procedures) negatively affect applicant reactions, such as expected opportunity to perform, control, and fairness, but also respective outcomes, like perceived organizational attractiveness and intention to apply and pursue, is in line with previous research on post-process applicant reactions (Acikgoz et al., 2020; Langer, König, & Hemsing, 2020; Langer et al., 2019; Langer, König, Sanchez, et al., 2020) and initial research on pre-process applicant reactions (Mirowska, 2020). However, these studies collected applicant reactions to vignettes simulating completely automated or non-automated selection procedures (*all-or-nothing perspective*) and do not inform us about potential differential reactions to automation implemented in different stages of the selection process. Furthermore, these previous studies did neither manipulate nor assess other aspects of the job offer (e.g., differences in specified employee benefits or salaries) that also influence perceived attractiveness and application intention (Petry et al., 2021), which would allow for a comparison of the relative strength of this effect.

Therefore, we will focus our discussion on these two aspects: 1) Differential expectations job-seekers might associate with different stages of the selection process (Li & Song, 2017) regarding social interaction and evaluative criteria as potential explanatory mechanisms for our findings, and 2) the relative strength of the general effect of (information about) automation of selection procedures on job-seeker and applicant reactions.

5.2. Limitations

Before we elaborate on the theoretical and practical implications of our findings, we want to clearly point out the limits of the informative value and possible validity threats of our studies.

First, our studies deal with the effect of information in job advertisements about automated decision-making in personnel selection on job-seekers' pre-process expectations, perceptions, and intentions. In terms of the multi-stage model of the personnel selection process by Li and Song (2017), they address the very first stage: organizations devising and posting job advertisements and job-seekers starting their search with gathering information on vacancies and potential employers. Therefore, the informative value of this work is limited to this first stage and does not cover job-seekers' later experiences when actually going through such selection procedures. However, this first stage can be considered a crucial one as it affects whether and what kind of job-seekers apply at all and thus whether the following stages of the selection process can build on a large and well-fitting applicant pool (Mirowska, 2020; Reeve & Schultz, 2004).

Second, this work focusses on job-seekers' initial perceptions of automated decision-making in a very specific context (i.e., personnel selection) and not on the prolonged experiences of actual employees working under automated decision-making on a daily basis.[5] In general, initial perceptions of automation change over time and with relevant experience (Manzey, Reichenbach, & Onnasch, 2012). Similarly,

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[5] On a positive side however, job-seekers do present a particularly interesting sample: As they are free in their choice to which organization they apply, they are also free to decide whether or not to submit to an automated decision-system. Due to this freedom of choice, one could expect a greater amplitude in their ratings compared to, for example, employees who are employed by an organization that introduces automated decision-making. (Job-seekers who do not want to work in an organization that automates decision-making simply do not apply there, while employees that do not want to work with automated decision-making have to actively quit their jobs if organizations introduce it.)

perceptions of and reactions to automated selection procedures in particular might change with job-seekers' experience with that specific technology (Bell et al., 2004). Currently, automated selection procedures are not yet common practice, for example, in all our samples less than 10% reported to have prior experience with automated selection procedures.[6] However, this is expected to change in the near future, which will affect job-seekers' familiarity with the procedures as well as the 'zeitgeist' (Black & van Esch, 2020), both influencing job-seekers' existing beliefs towards the use of automation in this domain. Thus, the informative value of our current work is limited to initial expectations, perceptions, and intentions of job-seekers without or with little prior experience with automated selection procedures.

Third, similar to previous studies on applicant reactions to automated selection procedures (Acikgoz et al., 2020; Langer, König, & Hemsing, 2020; Langer et al., 2019; Langer, König, Sanchez, et al., 2020), our studies used hypothetical scenarios. However, in contrast to previous studies, we did not ask participants to imagine going through a specified selection procedure and report their hypothetical experiences and reactions to it, but simply asked them to report on their perception and hypothetical reaction to a specific job advertisement. Accordingly, participants' imagination was not particularly strained as there were no other aspects to imagine apart from the advertisement that was directly presented to them in writing. However, this does not change the fact that our experimental studies used simulation. As participants in our studies were potential job-seekers and not necessarily urgently looking for a job at the time of the study, it is possible that their responses diverge from the responses of actual job-seekers, that could be both more or less selective about organizations they apply to, depending on how urgently they are looking for a job and on how well they rate their own employability. Nevertheless, we argue that potential job-seekers present a well enough approximation to actual job-seekers' reactions to job advertisements.

5.3. Theoretical implications and future research

Personnel selection comprises several stages from the initial attraction of a possibly large and qualified applicant pool, over screening for suitable applicants, to testing and interviewing the final candidates and the last stage of the selection decision (e.g., Li & Song, 2017). Organizations may digitize tasks in each of these stages (Stone et al., 2015; Woods et al., 2019): In the screening stage, they can use digital application platforms to record applicants' autobiographical data or administer online-tests to gather personality and performance data. In the stage of job interviews, they can use technology-mediated interviews (video-conferencing) or collect applicants' video-responses on digital platforms. The tremendous technological progress in AI allows organizations to even go a step further (Behrend & Landers, 2019) and have the digital applicant data at each stage analyzed and selection decisions taken by automated systems (e.g., Acikgoz et al., 2020).

Results from *Study 1* suggest that the effect of information about automation of the screening procedure is negative (as opposed to assumptions put forward by other authors suggesting a potentially positive effect of communication using novel selection technologies, e.g., Howardson & Behrend, 2014; van Esch & Black, 2019) but rather small compared to the effect of information about employee benefits on job-seekers' reactions (i.e. intention to apply and organizational attractiveness). Based on the established literature on vacancy

characteristics (e.g., Rynes & Cable, 2003) and attributes of job advertisements (Petry et al., 2021) this is not surprising, as information on job benefits is known to be highly influential for job-seekers' reactions.

Results of *Study 2* and *Study 3* suggest, that participants in the condition with the highest degree of automation (automated screening and automated interview) gave the lowest ratings, while values between semi-automated (automated screening and human interview) and non-automated (human screening and human interview) selection procedures did differ to a lesser extent. This indicates that participants were mainly put off by the prospect of using AI-technology in the job interview stage.

But what are possible explanations for this finding that job-seekers dislike automated selection methods and automated interviews in particular? Lukacik, Bourdage, and Roulin (2020) build upon theories of justice-based applicant reactions, social presence, interview anxiety, and impression management to propose a framework of how design features (specifically of technology-mediated interviews with and without automated decision-making) impact applicant reactions and outcomes. Other researchers turn to specific aspects of the human-technology interaction, finding that perceived ease of use and perceived usefulness are associated with attitudes towards technology-mediated interviews (Brenner, Ortner, & Fay, 2016). However, while these approaches are helpful to inform the design of the many relevant details of a specific interview procedure, they may be less helpful in explaining job-seekers' pre-process perceptions and expectations regarding automated selection methods (i.e., at a time when they do not know any details about the specific procedure in terms of e.g., ease of use, response preparation time, etc.).

The discussed reasons that might explain job-seekers' dislike of automated selection procedures (see section 1.3) received support and could be extended based on the findings of the qualitative analysis of participants' comments from Study 2 (see section 3.2.2). These potential explanations need not to be mutually exclusive, for instance, job-seekers might well both expect a lack of capability on the side of the used technology and also a lack of appreciation by the organization when reading a job advertisement specifying an automated selection interview.

The analysis of the qualitative data has also shown that the use of AI in the selection processes can also be linked with positive consequences. For example, increased efficiency, time-savings, fairness and the prevention of nepotism were mentioned by job-seekers in *Study 2* as positive arguments for implementing AI-based personnel selection methods. Similarly, participants in *Study 3* rated automated selection procedures higher in the perceived justice component unbiased consistency than non-automated, human-led procedures. While these findings are mainly based on qualitative data, future research adopting a quantitative approach might evaluate the importance and interplay of those different mediating factors.

5.4. Practical implications

As Reeve and Schultz (2004) argue, the relationship between a person and an organization does not begin at the person's first day on the job, but at the first point of contact between the person and the organization, which often is in the form of reading job advertisements. In this regard, Reeve and Schultz (2004) stress that organizations should be interested in understanding what influences job-seekers' decisions to continue or withdraw from the relationship prior to becoming an actual applicant and in designing their job advertisements and recruiting procedures accordingly. However, our understanding on how job advertisements stimulate job-seekers' expectations, perceptions, and intentions and in particular of actual application behavior is surprisingly limited (Petry et al., 2021; Schmidt et al., 2014).

Considering the results of the here presented studies, organizations should carefully evaluate whether, and if so, in which stages of the selection process they implement automation and how they communicate

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[6] It may well be that more of our participants have already taken part in selection procedures with algorithmic screening, but were not aware of it. As the screening stage (in contrast to the interview stage) does usually not take place in the presence of applicants and as organizations were not required to disclose whether and how applicant data was being processed before the new data protection laws were introduced, it may simply not have come to their attention.

it in job advertisements. In contrast to arguments put forward in previous works (e.g., Howardson & Behrend, 2014; van Esch & Black, 2019) suggesting positive effects of communicating the use of novel technologies in recruiting and selection on the perception of the organization as trendy and leading-edge, findings of the present studies indicate that such communication in job advertisements, especially when it comes to the use of novel technologies to replace the job interview, has rather negative effects on job-seekers' perceptions of the organization. Although the qualitative data contain some positive remarks summarized in the category 'innovative and modern', it seems that these do not compensate for the general negative assessments of the use of AI in the recruitment process.

As a possible way to alleviate potential negative effects of communicating the use of automated selection procedures (e.g., when organizations are obliged to do so due to data protection laws) could be to counteract the information with additional information that may positively target job-seekers' beliefs regarding AI-based selection tools, for instance, appreciation and support from the organization, the validated capabilities of the AI-tools used, or opportunities to demonstrate individual strengths (see section 1.3 and the qualitative results in 3.2.2.).

5.5. Conclusion

As our results suggest that the information about automated personnel selection negatively affects job-seekers' pre-process perceptions of organizational attractiveness as well as application intentions, organizations should carefully evaluate whether, and if so, also in which phase of the selection process they implement automation. As has been called for by many researchers in line with the social process perspective on personnel selection (e.g., Derous et al., 2004), organizations should consider not only costs and validity of selection procedures but also job seekers' and applicants' reactions. This is in line with calls from current research in the specific field of automated selection procedures (Acikgoz et al., 2020; Langer, König, & Hemsing, 2020; Langer et al., 2019; Langer, König, Sanchez, et al., 2020). Weighing up the advantages and disadvantages regarding the different attributes (e.g., financial costs, time, validity, applicant reactions) for the different procedures (e.g., data acquisition, data evaluation, decision-making) in the different stages of the recruiting process (e.g., screening, interviewing, selecting) is a demanding and complex task. However, we strongly believe that it is worth the effort and that psychologists play an important role in guiding the development of automation in personnel selection for the good of all involved (Tippins et al., 2021).

Declaration of competing interest

Jenny S. Wesche and Andreas Sonderegger declare that they have no conflicts of interest.

Appendix A and Appendix B. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.chb.2021.106931.

Author contributions

Jenny S. Wesche: Conceptualization (Study 1, 2, 3), Methodology (Study 1, 3), Investigation (Study 1, 3), Formal analysis (Study 1, 3), Writing- Original draft preparation, Reviewing and Editing. **Andreas Sonderegger**: Conceptualization (Study 2), Methodology (Study 2), Investigation (Study 2), Formal analysis (Study 2), Writing- Reviewing and Editing. **Supporting students**: Data collection was supported by two student groups of Freie Universität Berlin supervised by J. S. Wesche (Study 1: Susanne Kahn, Sören Kluge, Tianqi Wang, Svenja Luise Witte; Study 3: Alina Denz, Johanna Führ, Michèle Kienzle, Alessia Valentina Neyjahr, Tim Schneegans). Analysis of qualitative data (Study 2) was

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