Dear Computer, Teach Me Manners: Testing Virtual Employment Interview Training

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Abstract

Expanding research on employment interview training, this study introduces virtual employment interview (VI) training with focus on nonverbal behavior. In VI training, participants took part in a simulated interview with a virtual character. Simultaneously, the computer analyzed participants' nonverbal behavior and provided real-time feedback for it. The control group received parallel interview training. Following training, participants took part in mock interviews, where interviewers rated participants' nonverbal behavior, and interview performance. Analyses revealed (a) that participants of VI training showed better interview performance, (b) that this effect was mediated by nonverbal behavior, and (c) that VI training has a positive influence on interview anxiety. These results have important practical implications for applicants, career counseling centers, and organizations.

Employment interviews are for applicants as crucial as they are for organizations. Since nearly every employing organization conduct employment interviews during personnel selection (Levashina, Hartwell, Morgeson, & Campion, 2014), practically every applicant will have to take part in at least one sometime (Moscoso, 2000). Whereas interviewers might have had professional or at least practice training before they enter the first employment interview, applicants are often thrown in at the deep end (McCarthy & Goffin, 2004). Exemplary ways applicants can prepare themselves are through consulting textbooks (e.g., Kennedy, 2012), websites, or participating in professional interview training.

Although the effectiveness of interview training has been documented by several studies (e.g., Maurer, Solamon, Andrews, & Troxtel, 2001; Tross & Maurer, 2008), these studies have so far been limited to classical training approaches (i.e., information sessions with trainer-led exercises). Such approaches can be time and space consuming and thus costly. Novel technologies allow for new, yet widely neglected training opportunities (Guzzo, Fink, King, Tonidandel, & Landis, 2015) that reduce costs, increase effectiveness, offer spatial mobility and utilize a big array of user data (McGregor, Bonnis, Stanfield, & Stanfield, 2015, Seidel & Chatelier, 2013).

In the present study, we introduce and evaluate virtual employment interview (VI) training: Participants of VI training took part in a complete virtual employment interview, where a virtual character interviews participants and reacts on participants' behavior. Furthermore, recent technology and software are used to analyze participants' nonverbal behavior and provide feedback for it in real-time.

Background and Hypotheses Development

Employment interviews

Nearly every organization uses employment interviews during applicant selection (e.g., Diekmann & König, 2015; Huffcutt, Van Iddekinge, & Roth, 2011; Ryan, McFarland,

Baron, & Page, 1999) Employment interviews are well accepted by applicants (Macan, 2009) as well as by selecting organizations (Barclay, 2001; Highhouse, 2008). More importantly, they have been shown to be valid predictors of work performance (McDaniel, Whetzel, Schmidt, & Maurer, 1994; see also Kepes, Banks, McDaniel, & Whetzel, 2012).

Organizations select applicants based on their performance in employment interviews, and applicants therefore want to know how to gain an advantage over competitors for the job (Klehe & Latham, 2006). Taking part in employment interview training is one possibility to improve interview skills (Tross & Maurer, 2008).

Employment Interview Training

Previous studies have confirmed that applicants' interview performance benefits from interview training (Maurer et al., 2001; Tross & Maurer, 2008). In a study of Maurer and colleagues (2001), interview performance was positively affected by taking part in two hour group sessions of training that provided participants with information on employment interviews in general and with role plays including recommendations for appropriate nonverbal behaviors. Tross and Maurer (2008) assigned participants to one of three group training sessions that differed in terms of depth of presented information and in the applied methods, which were similar to those used of Maurer and colleagues (2001). While participants in the more elaborate training group did not differ in their interview anxiety, they showed higher interview self-efficacy and demonstrated better interview performance.

Although previous research has shown that applicants benefit from classical interview training, new technologies offer ways to go beyond that. Previous interview training often needed a trainer to be present and was conducted as group sessions. This made the process time-consuming and less tailored to each individual´s needs. In contrast, VI training might not need any trainer at all and can be conducted individually, thus making the duration of the

training shorter and allowing participants more individualized training and feedback (Hornik, Johnson, & Wu, 2007; Salas, DeRouin, & Littrell, 2005).

Even more importantly, whereas aspects of nonverbal behavior might have been taught in previous interview training (e.g., describing good nonverbal behavior), trainers might struggle to assess trainees' nonverbal behavior, especially in group session training. However, recent advancements in technology like rapidly progressing computing powers and data gathering opportunities (Guzzo et al., 2015) make it possible to analyze various aspects of nonverbal behavior immediately and automatically (Onnela, Waber, Pentland, Schnorf, & Lazer, 2014). First, facial expressions and head movements like nodding can be analyzed (Sandbach, Zafeiriou, Pantic, & Yin, 2012), for example using Microsoft's Kinect camera and its face tracking opportunity. Second, data on gestures and body movement can be gathered separating the body into kinetic regions and observing the distance of body parts (e.g., arms) (Mahmoud, Morency, & Robinson, 2013). Third, posture can be evaluated regarding its dynamics or even affective states (Kleinsmith, Bianchi-Berthouze, & Steed, 2011). Fourth, software like OpenSMILE (Eyben, Weninger, Gross, & Schuller, 2013) allows it to recognize frameworks of voice characteristics (e.g., voice pitch, voice loudness) and to generate statistics for observed periods of time. Combining those opportunities leads to holistically recognizing of nonverbal behavior.

VI training merges these possibilities together and provides participants with precise real-time feedback for their nonverbal behavior (Wagner et al., 2013) in interviews and give them an opportunity to improve it (Hogarth, Gibbs, McKenzie, & Marquis, 1991). VI training can also exploit findings that training that is adaptive and that uses various didactical components is more effective (Kalyuga, 2009; Tross & Maurer, 2008). Readily, VI training can implement different didactical training methods, such as, role plays, feedback and reinforcement (e.g., Raybourne, 2007) to train further interviewee characteristics besides

nonverbal behavior that influence interview performance (e.g., anxiety, self-efficacy; Huffcutt et al., 2011).

Hypothesized Effectiveness of VI Training

In the present study, we developed VI training based on recent progress in virtual simulations and automatic recognition of nonverbal behavior. Our approach simulates an entire employment interview, providing participants with a role play. Using Microsoft's Kinect camera and special software (Bishop, 2011; Microsoft Corporation, 2015; Wagner et al., 2013; Zhang, 2012), we were able to automatically recognize participants' nonverbal behavior, to encode and analyze it, and to provide participants with direct feedback in real-time. Since VI training simulates an employment interview and offers feedback for nonverbal behavior, we expected that participants of VI training (experimental group) should perform better in an interview and should have higher chances of receiving a job offer than participants of a parallel classical employment interview training (control group), although participants of both groups received same pieces of information. Thus, we propose,

Hypothesis 1a. Overall, participants in the VI training will show better interview performance than participants in the control training group.

Hypothesis 1b: Participants of the VI training will receive more favorable hireability ratings than participants of the control training group.

The higher effectiveness (i.e., higher interview performance ratings) of VI training is assumed to be mediated by three factors that have been shown to influence applicants' interview performance (Huffcutt et al., 2011). These factors are participants' nonverbal behavior, interview anxiety, and interview self-efficacy; Figure 1 depicts the assumed mediator model.

Applicants' nonverbal behavior during interviews (i.e., smiling, eye contact, posture, gesture, and voice characteristics; N. Anderson, 1991, DeGroot & Motowidlo, 1999; DeGroot

& Kluemper, 2007) has consistently been found to influence their interview performance (Levine & Feldman, 2002; Schneider, Powell, & Roulin, 2015). While nonverbal behavior is brought into focus in both training conditions, participants in the VI training will benefit more as they will actively exercise nonverbal behavior and receive real-time feedback for it. Thus, participants in the VI training should make better use of their nonverbal behavior (i.e., smile more consciously, more appropriately). Since nonverbal behavior is the primary focus of VI training, we expect nonverbal behavior to be especially impacted by VI training and also to be the main mediator between training and interview performance. Thus, we propose,

Hypothesis 2a. The effect of VI training on participants' interview performance will be mediated by more effective use of nonverbal behavior.

Hypotheses 2b. The effect of VI training on participants' hireability ratings will be mediated by more effective use of nonverbal behavior.

During employment interviews, applicants' interview anxiety can undermine their interview performance (Carless & Imber, 2007; Feiler & Powell, 2015). Usually three reasons are to cause applicants' interview anxiety. First, applicants are often unfamiliar with the situation because they rarely had the chance to previously practice an employment interview (McCarthy & Goffin, 2004) and even expert interviewees likely feel anxious in employment interviews. Second, employment interviews are critical for applicants' professional future (Judge, Cable, & Higgins, 2000; cf. Proost, Derous, Schreurs, Hagtvet, & De Witte, 2008). Third, interviewees find themselves being in a competitive situation and evaluated by an unknown interviewer (Carless & Imber, 2007; Powell, 1991; Proost et al., 2008). Interview anxiety can impair applicants' information processing capabilities and presentation abilities, which makes it more difficult for them to understand and answer interview questions (Harris, 1989). Furthermore, Feiler and Powell (2015) showed that

anxious applicants appear less assertive to interviewers, which can also lower their interview ratings.

Empirically, interview anxiety should have been reduced by Tross and Maurer's training (2008), and it should have led to higher interview performance, but it did not succeed in decreasing Tross and Maurer's applicants' interview anxiety in the first place. Thus, it remains unclear as to whether interview training can reduce participants' interview anxiety. For our study we assume that VI training should reduce participants' interview anxiety in contrast to a control training group because it allows participants to individually experience and actively perform, which is more realistic of a job interview (Maurer, Solamon, & Lippstreu, 2008). Thus, we propose the following additional meditation mechanism:

Hypothesis 2c. The effect of VI training on participants' interview performance will be mediated by lower interview anxiety.

Hypotheses 2d. The effect of VI training on participants' hireability ratings will be mediated by lower interview anxiety.

Applicants' perceived high (vs. low) self-efficacy in interviews (i.e. the extent to which they are optimistic of their interview success; Bandura, 2006) seems to increase their interview performance (Tay, Ang, & Van Dyne, 2006; Tross & Maurer, 2008). Self-efficacy is strengthened through positive experience in past situations (Hmieleski & Corbett, 2008). Thus, interview self-efficacy could be built upon positive experiences in an interview simulation.

Interview self-efficacy was successfully increased by Tross and Maurer's training (2008), but research has yet to demonstrate whether training increases interview performance via increases in self-efficacy. By providing participants with more authentic interview experience (Bandura & Cervone, 1986), VI training should increase participants' interview

self-efficacy in contrast to the control training. Thus, we propose the following additional meditation mechanism:

Hypothesis 2e. The effects of VI training on participants' on interview performance will be mediated by higher interview self-efficacy.

Hypotheses 2f. The effect of VI training on participants' hireability ratings will be mediated by higher interview self-efficacy.

Method

Sample

Required sample size was determined based on suggestions of Fritz and MacKinnon (2007) for mediation hypotheses with moderate expected effects. After excluding two participant due to not fulfilling the training session adequately the final sample consisted of $N = 70$ students (71% female) of two German universities (74% psychology students), who participated to receive a free interview training. The mean age was 24.21 years ($SD = 2.65$).

Design and Procedure

Participants were randomly assigned to either the control group, which consisted of e-learning training, or to the experimental group (i.e., VI training group). Except for the training method, the experimental procedure was equal in both groups. All participants gave their informed consent.

Participants were asked to take a seat in front of a computer screen. After the training procedure started, the experimenter left the room and participants completed the training on their own. After training, participants first received an interview self-efficacy questionnaire. Participants then received a fictitious job advertisement and were asked to prepare for the subsequent interview. After three minutes of preparation an interviewer entered the room.[1] Trained interviewers were blind to participants' experimental assignment. Following the 20 to 25 minute interview, interviewer and participant completed additional questionnaires.

Manipulation

Both training groups were identical in terms of content such that all information given in VI training was also given in the control training. To prevent confounding effects of information, the control group was provided with slightly more pieces of information. Contents of both training groups were inspired by a website on professional applicant coaching ("Körpersprache", n.d.; "Vorstellungsgespräche", n.d.) as well as taken from research and books on interviews (Latham, Saari, Pursell, & Campion, 1980; Schuler, 2002; Schuler & Marcus, 2001).

Experimental Group Training

VI training was designed with the software Visual Scene Maker (Gebhard, Mehlmann, & Kipp, 2011). Participants' nonverbal behavior was recorded and encoded with Microsoft's Kinect camera and its appropriate Software Development Kit (Microsoft Corporation, 2015). Integrating the Social Signal Interpretation Framework (SSI; Wagner et al., 2013) into the Visual Scene Maker (Gebhard et al., 2011) allows automatic detection of relevant nonverbal behaviors and processing of these behavioral data into feedback for the participants. More precisely, the SSI translated participants' behavioral data into nonverbal signal streams and discrete nonverbal events (Wagner et al., 2013). An event displays an occurring behavior (e.g., smiling). Occurring events were then automatically translated into feedback. Feedback criteria, thresholds and algorithms were based on prior experience and on research towards nonverbal behavior (K. Anderson et al., 2013; N. Anderson, 1991, DeGroot & Kluemper, 2007; DeGroot & Motowidlo, 1999; McGinley, LeFevre, & McGinley, 1975; Ruben, Hall, & Schmid Mast, 2015; Schneider et al., 2015; Zenner, 2005). Table 1 shows feedback criteria and literature we considered to define them. Feedback was visually presented to the participants with seven signal lights at the right side of the computer screen. Each signal symbolized one aspect of a participant's nonverbal behavior: eye contact, smile,

nodding, body posture, gesture, voice loudness and voice pitch. Signals were either red if participants needed to modify their behavior or green if participant showed appropriate behavior.

VI training simulated an entire employment interview with nine phases, augmented by an interactive interface that guided VI training participants, and also provided participants with relevant pieces of information. The simulated interview was conducted by a virtual female interviewer character (see Figure 1). After being introduced to each interview phase, participants took part in a simulation of the respective interview phase. After each phase, participants were debriefed by the interface and introduced to the next phase.

Control Group Training

Participants of the active control group took part in an e-learning session covering the typical process of interviews, providing several sample questions and focusing on nonverbal behavior. The session included a presentation of a video (Bayern, 2011), several pictures illustrating appropriate nonverbal behavior, and text explaining the benefits of nonverbal behavior in interviews. It is noteworthy that research also supports the effectiveness of this kind of e-learning (Sitzmann, Kraiger, Stewart, & Wisher, 2006; Sitzmann, 2011; Tross & Maurer, 2008).

The Interview

After training and a short preparation time, participants took part in a mock interview with a trained interviewer. Every interview consisted of the same set of questions: four general interview questions (Huffcutt, Conway, Roth, & Stone, 2001) exploring interviewees' resumée, strengths, weaknesses and fit to the job, two biographical questions (Schuler & Marcus, 2001) assessing interviewees proactivity and critical thinking, and two situational questions (Latham et al., 1980) examining interviewees organizing ability and

persuasiveness. Additionally, interviewers were allowed to ask follow-up questions (cf. Macan, 2009).

To ensure a common understanding of interview questions, answers and ratings, the four interviewers (graduate students of industrial/organizational psychology) took part in a one-hour frame-of-reference training (cf. Roch, Woehr, Mishra, & Kieszczynska, 2012). This included a discussion of general interviewing guidelines (cf. Schuler, 2002) and role plays to enable a discussion on different possible participant answers and their adequate rating.

Measures

Dependent and mediator variables

Interview performance was measured with 14 items that ranged from 1 (*does not apply at all*) to 7 (*does apply entirely*) covering interviewers' ratings of the participants' interview performance. Items were: "The applicant was able to present his resumée", "The applicant showed interest", "The applicant showed stress resistance", "The applicant showed problem solving abilities.", "The applicant showed organizing abilities.", "The applicant showed persuasiveness.", "The applicant was able to present his/her strengths", "The applicant was able to present his/her weaknesses.", "The applicant was able to present himself/herself as a good candidate.", "The applicant is a good candidate.", "The applicant convinced me.", "The applicant fits to the job description.", "The applicant sold himself/herself well.", "On a scale from 0-100 I would give the candidate XX points."

Hireability was measured with the item "The applicant would get a job offer" (cf. Cuddy, Wilmuth, & Carney, 2012) with answering possibilities ranging from 1 (*does not apply*) to 7 (*does apply entirely*).

Nonverbal behavior was measured with eight items that ranged from 1 (*does not apply at all*) to 5 (*does apply*) and covered the interviewers' ratings of the participants' nonverbal behavior. Items were: "The applicant looked into my eyes.", "The applicant

showed adequate postures", "The applicant smiled adequately.", "The applicant talked adequately loud.", "The applicant kept track of his/her voice pitch.", "The applicant used nodding.", "The applicant showed adequate gestures.", "In general, the applicant showed adequate nonverbal behavior."

Interview self-efficacy was measured with nine self-report items for participants using a scale ranging from 0 (*cannot do it at all*) to 100 (*can do it most likely*) and was adapted from different studies (Bandura, 2006; Horvath, Ryan, & Stierwalt, 2000; Tay et al., 2006). Following Tross and Maurer (2008), interview self-efficacy was measured after training sessions. Items were: "I believe I can convince the interviewer to consider me for an internship.", "I can market myself and my abilities in the following interview.", "I will make the best impression during the following interview.", "I will get my points across in the following interview.", "I am good in performing interviews.", "I believe I can be better than 50% of the other candidates.", "I believe I can be better than 80% of the other candidates.", "I believe I can be better than 95% of the other candidates."

Interview anxiety of participants was measured with 20 items from the Measurement of Anxiety in Selection Interviews (MASI; McCarthy & Goffin., 2004), as recommended by Huffcutt and colleagues (2011). Four of the five MASI dimensions were used: communication anxiety, social anxiety, performance anxiety and behavioral anxiety. Participants responded on a scale ranging from 1 (*strongly disagree)* to 5 (*strongly agree).* A sample item is "During job interviews, my hands shake." Following Tross and Maurer (2008), interview anxiety was measured after the mock interview.

Questions for assessing alternative explanations

To rule out alternative explanations for group differences (following the recommendations of Spector & Brannick, 2011), we also assessed whether groups differed in their interview experience, their interview motivation, interviewers' characteristics and

participants' characteristics. All of these items were presented after the interview. Except from the question on interview experience, participants answered on a scale ranging from 1 (*does not apply at all)* to 5 (*does apply).*

Interview experience of the participant was assessed using the question "How many employment interviews did you participate in?" Answering possibilities ranged from *I never participated in an employment interview* to *I participated in more than three employment interviews or I was an interviewer once.*

Interview motivation of the participant was measured because Maurer and colleagues (2001) found that motivation in the interview can have an influence on the interview performance. The scale included five items adapted from Maurer and colleagues (2001) and Tross and Maurer (2008). Items were: "I will do my best in the interview.", "I take the interview seriously.", "I will act like in a real interview.", "I am very motivated to do well in the interview." and "I want to be one of the best in the interview."

Interviewer characteristics were measured because they possibly influence the behavior of the participant, namely sympathy for the interviewer (DeGroot & Motowidlo, 1999), attractiveness of the interviewer (Huffcutt et al., 2011), and behavior of the interviewer (Huffcutt et al., 2011). Items were: "The interviewer of the real interview was likeable.", "The interviewer of the real interview was attractive.", "The interviewer of the real interview behaved well."

Participants' characteristics were measured because they possibly influence interview ratings according to prior research. Four variables were measured: attractiveness (DeGroot & Kluemper, 2007), sympathy (DeGroot & Motowidlo, 1999), outfit (Barrick, Shaffer & DeGrassi, 2009), and perceived motivation of the participant (Maurer et al., 2001). Items were: "The applicant was likeable.", "The applicant was attractive.", "The applicant wore an adequate outfit.", and "The applicant was motivated."

Interrater Reliability

A trained rater that formerly worked at a HR department of a large German company rated the performance of 57 of the videotaped interviewees.[2] Interrater reliability in interview performance was $r = 0.45$, $p < .01$; interrater reliability in hireability was $r = 0.43$, $p < .01$. These reliabilities are expectable for a low to medium structured interview (Huffcutt, Culbertson & Weyhrauch, 2013).

Results

Effectiveness of VI Training

Table 2 provides an overview of descriptive statistics and intercorrelations. Hypothesis 1a, which stated that overall participants in the VI training would show better interview performance than participants in the control group was supported, $t(68) = 2.50$, $p < .05$, $d = 0.60$.

Hypotheses 1b that stated that Participants of the VI training have a higher probability of receiving a job offer than participants of the control training group, was confirmed: Participants of the VI training would have rather received a job offer than participants of the control training, $t(68) = 2.25$, $p < .05$, $d = 0.55$.

To test hypotheses 2a-f, we included all three mediators in a collective model (see Table 3); significance tests were conducted with PROCESS (Hayes, 2013). Four steps led to the conclusion that nonverbal behavior was the only significant mediator of VI training and interview performance respectively hireability. First, without any mediators considered in the model, training showed a significant influence on interview performance and hireability. Second, training also affected nonverbal behavior significantly. Third, with all mediators considered in the model, the influence of training on performance respectively hireability was not significant anymore and only the mediator nonverbal behavior showed a significant effect on performance respectively hireability. Fourth, taking part in VI training had a significant

indirect effect over nonverbal behavior on interview performance and hireability (see Table 4). These four steps provide support for hypothesis 2a and 2b. Furthermore, in the VI training group interview anxiety was significantly lower than in the control group, but no significant mean differences were found with interview self-efficacy. Additionally, the confidence intervals of the indirect effects of interview anxiety and interview self-efficacy included zero (see Table 4). Thus, hypotheses 2c-f were not supported. Interview self-efficacy and interview anxiety did not mediate the relationship between VI training and interview performance respectively hireability.

Ancillary Analyses

Several tests were conducted to examine if participants of the two groups differed in other variables (i.e., interview motivation, interviewer characteristics and participants' characteristics). We used a Bonferroni-corrected alpha of 0.006 because of conducting nine post-hoc t-tests. As Table 5 shows, no significant differences could be found. Furthermore, we tested whether groups differed in interview experience, using the non-parametric Mann-Whitney-U-Test because the response format of the interview experience variable did not allow parametric testing. No significant differences could be found, $z = 1.03$, $p = 0.31$.

Discussion

The aim of this study was to test whether virtual employment interview training can be more effective than a classical control training. Our results show that VI training reduces interview anxiety and improves interview performance and participants' hireability. Furthermore, nonverbal behavior mediated the effects of training on interview performance and hireability.

Using the latest approaches developed by computer scientists, the present study indicates that VI training can be useful for holistically preparing interviews and is more effective and efficient than classical interview training (as argued by Seidel & Chatelier,

2013). Not only does it reduce interview anxiety, advanced computer technology can also help people improve their nonverbal behavior, interview performance, and hireability independently of a trainer. In summary, applicants can benefit from VI training. The effects are even more robust given that the control group received training that was equal in content and designed to also affect participants positively (Sitzmann et al., 2006; Sitzmann, 2011). A weaker control group could have led to even larger effects (Lipsey & Wilson, 1993).

Furthermore, the present study confirmed previous findings on a positive relationship between nonverbal behavior and interview performance (Levine & Feldman, 2002; Schneider et al., 2015). Beyond this, nonverbal behavior also mediated the relationship between interview training and interview performance shedding light on the process underlying the effectiveness of VI training on interview performance.

Additionally, VI training significantly reduced participants' interview anxiety, which is an important advantage over previous interview training (Tross & Maurer, 2008). Offering applicants an opportunity to experience and practice an entire employment interview in a virtual environment seems to enable them to embrace the previously unfamiliar interview situation (cf. Jarmon, Traphagan, Mayrath, & Trivedi, 2009). At the same time, we could not support the hypothesized mediation of interview anxiety on training and interview performance. Although this is in line with Tross and Maurer (2008), it contradicts findings and propositions of other studies (Carless & Imber, 2007; Feiler & Powell, 2015; Harris, 1989). It is possible that the use of mock interviews was not perceived by participants as threatening or as anxiety-provoking as a real interview (Duffy, Ng, & Ramakrishnan, 2004).

Interview self-efficacy did not differ between the experimental groups (but see Tross & Maurer, 2008). A reason for this could be that participants' self-efficacy in the control group was equally positively affected. Control training participants expected to receive employment interview training and they were provided with even slightly more pieces of

information than the VI training group. Therefore, control training participants may have perceived themselves as equally well prepared as VI training participants, thus no differences in self-efficacy could be found.

More generally, this study shows the potential that the latest development in computer science has to offer industrial/organizational psychology (Guzzo et al., 2015). The rapidness with which data can be collected and analyzed can lead to faster insights – the "era of Big Data" (Lewis, Zamith, & Hermida, 2013, p. 34). Up to now psychologists have been fairly cautious regarding Big Data (Guzzo et al., 2015) maybe because there are unsolved problems like how to find valuable pattern inside of giant piles of data (Snijders, Matzat, & Reips, 2012). Admittedly, the quantity of data we collected is not enough to call our approach a Big Data approach; still it could be seen as a "Biggish Data" approach (Leng, Hu, Liang, Wang, & Chen, 2015, p. 7009), as we analyzed vast amount of nonverbal behavior data and tried to find valuable pattern of nonverbal behavior, while at the same time testing explicit hypotheses. Such an approach might attract psychologists into Big Data research because it does not represent the explorative approach that is typical for Big Data (Mahrt & Scharkow, 2013).

Limitations, future research, and implications

As in all studies, there are possible limitations that need to be considered. First, we decided to have no pretest in the present study because we did not want to influence people through a pre-interview (i.e., cause a practice effect). Consequently, it is not possible to identify any improvements of participants through the training over time but only the advantages of the VI training in comparison to the control training. Furthermore, the design does not allow testing the sustainability of the training effects. Therefore, future research should evaluate such training using a longitudinal design. Second, all of the participants were students, and results might therefore not easily generalize to older applicants. Still, most of

the participants will soon graduate from university, so at least our results should apply for young professionals (cf. Highhouse & Gillespie, 2009). Third, participants were provided with feedback to seven different nonverbal behaviors. It might have not been possible for participants to keep attention to all seven feedback signals. In future studies, it could thus be beneficial to provide feedback for only some of the nonverbal behaviors in each phase of the interview. Fourth, we used mock interviews that might not have evoked the same feelings in participants as real interviews so results might not generalize to high stake selection interviews. However, especially in industrial/organizational psychology, laboratory and field studies correlate substantially (Mitchell, 2012). Furthermore, interviewers were trained and graduate students of industrial/organizational psychology, so at least their interviewer skills were likely not that different from professional interviewers who often have received no or only limited training (Posthuma, Morgeson, & Campion, 2002; Roch et al., 2012). In addition, participants were told that they would receive employment interview training within this study, so at least they should have tried their best to get the most out of this training. Fifth, we developed feedback for the experimental group based on literature consisting mostly of studies with Western samples, and what we used as appropriate nonverbal behavior might not hold for Eastern cultures (cf. König, Wong & Cen, 2012).

Results of the present study can be a starting point for further applications of the system we introduced in this study. For example, the system could also be used for selection purposes. Research could explore if such a system contributes to the validity of a test battery. Furthermore, applicant reactions on virtual interviews need to be assessed, as applicants might feel uncomfortable being interviewed by a virtual character that analyzes their nonverbal behavior and even has decision-making power. In addition, if training can reduce interview anxiety this could be a fruitful aspect for further studies because reduced interview

anxiety could also lead to better validity of interviews in personnel selection (McCarthy, 2004).

This study has also important practical implications, since all stakeholders involved in employment interviews could benefit from implementing VI training. Applicants can use VI training to experience customized interview situations whereby they can reduce their interview anxiety and improve the use of their nonverbal behavior as well as enhancing their chances for a job offer. Schools, career centers at universities, and employment agencies could offer VI training as a cost-efficient and effective approach for preparing their students and customers career (re-)entry. According to our study, meaningful effects can be achieved by training as short as 20 minutes and independent of trainers. Finally, organizations might also benefit from using VI training to train their interviewers.

Conclusion

This study shows benefits that VI training can have for preparing for employment interviews. Participants who participated in VI training reported less interview anxiety, showed more appropriate nonverbal behavior, and had better interview performance. VI training could provide applicants, schools, and organizations with an innovative and promising approach for improving employment interview processes.

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Footnote

1 In the case of eight interviews (four in each experimental condition), no interviewer was available. For administrative reasons, the experimenter conducted the interview and later, an interviewer watched the recorded interview and rated the interview performance, nonverbal behavior, hireability and interviewee characteristics based on the videos.

2 Some participants chose the option of not allowing videotaping, and some videos could not be rated because of bad technical quality, so that our rater was able to rate only 57 videos.

Table 1.

Criteria for Experimental Group Training Feedback

Behavior	Green light	Red light	Based on
Smiling	1-7 times[a]	> 7 times	N. Anderson, 1991, DeGroot & Motowidlo, 1999; Ruben et al., 2015
Eye contact	Ratio of analysis time and ECT > 0.8	Ratio of ECT and NECT < 1.6	N. Anderson, 1991; Brooks, Church, & Fraser, 1986
Posture	Upright, slightly leaned forward	Leaned backward	DeGroot & Motowidlo, 1999
Gesture	Arms not crossed	Arms crossed	DeGroot & Motowidlo, 1999
Nodding	1-10 times [a]	> 10 times	Ruben et al., 2015
Voice volume	> 57 dB	< 57dB	Zenner, 2005
Pitch variability	>20 Hz	< 20 Hz	DeGroot & Motowidlo, 1999

Note. ECT = eye contact time (in seconds), NECT = non-eye contact time (in seconds). If the red light appeared, it stayed for the rest of the phase (except for eye contact). After every phase, lights were reset so that feedback restarted at the beginning of every phase. For eye contact we added a reset function to ensure that on the one hand, people were not penalized too hard for past bad behavior and on the other hand not rewarded too much for past good behavior. ECT, NECT and analysis time was reset when the red light appeared. It was also reset when the ratio of analysis time and ECT was higher than 0.8 and analysis time was more than 10 seconds.

[a] = This was dependent of the anticipated duration of the respective phase and on the phase itself.

Table 2.

Means, Standard Deviations, Cronbach's Alpha and Correlations among Study Variables

	Scale	M_{EG} (SD_{EG})	M_{CG} (SD_{CG})	Cronbach's Alpha	1.	2.	3.	4.	5.
1.	Interview self-efficacy	68.89 (15.81)	66.38 (15.31)	.94	-				
2.	Interview anxiety	2.63 (0.58)	2.87 (0.58)	.84	-.59**	-			
3.	Nonverbal behavior	4.37 (0.51)	4.16 (0.51)	.81	.07	.10	-		
4.	Interview performance	5.67 (0.76)	5.19 (0.84)	.93	.12	.04	.79**	-	
5.	Hireability	5.57 (1.31)	4.83 (1.45)	-	.08	.07	.73**	.93**	
6.	Training	-	-	-	.08	-.20	.20	.29*	.26*

Note. Coding of the training variable: -1 = control group (CG), 1 = experimental group (EG). n_{EG} = 35, n_{CG} = 35.
*$p < .05$, **$p < .01$

Table 3.

Regression Results for the Mediation of Nonverbal Behavior, Interview Anxiety and Self-Efficacy between Training and Interview Performance (Respectively Hireability)

Model	Coefficient	*SE*	$p_{one\text{-}tailed}$	90% Confidence Interval
Model without mediators				
Training → Performance (Hireability)	0.29 (0.26)	0.11 (0.11)	.01 (.01)	[0.10, 0.48] ([0.07, 0.45])
Model with single effects on mediators				
Training → Nonverbal behavior	0.20	0.12	.05	[0.003, 0.39]
Training → Interview anxiety	-0.20	0.12	.05	[-0.39, -0.00]
Training → Interview self-efficacy	0.08	0.12	.25	[-0.12, 0.28]
Model complete				
Training → Performance (Hireability)	0.14 (0.13)	0.08 (0.09)	.08 (.14)	[-0.08, 0.23] ([-0.02, 0.28])
Nonverbal behavior → Performance (Hireability)	0.76 (0.69)	0.08 (0.09)	<.01 (<.01)	[0.63, 0.89] ([0.55, 0.84])
Interview anxiety → Performance (Hireability)	0.03 (0.06)	0.10 (0.11)	.75 (.60)	[-0.13, 0.19] ([-0.12, 0.24])
Interview self-efficacy → Performance (Hireability)	0.07 (0.05)	0.09 (0.11)	.45 (.62)	[-0.08, 0.23] ([-0.12, 0.23])

Note. Coding of the training variable: -1 = control group, 1 = experimental group. The 90% confidence interval for the effects is obtained by the bias-corrected bootstrap with 10,000 resamples. Results for hireability are presented in parenthesis.

Table 4.

Results for the Indirect Effects of Training over Nonverbal Behavior, Interview Anxiety and Self-Efficacy on Interview Performance (Respectively Hireability)

Model	IE_{med}	SE_{Boot}	90% Confidence Interval
Training → Nonverbal behavior → Performance (Hireability)	.15 (.14)	0.09 (0.08)	[0.003, 0.30] ([0.002, 0.28])
Training → Interview anxiety → Performance (Hireability)	.00 (.00)	0.03 (0.03)	[-0.06, 0.02] ([-0.07, 0.02])
Training → Interview self-efficacy → Performance (Hireability)	.01 (.00)	0.02 (0.01)	[-0.01, 0.05] ([-0.01, 0.05])

Note. The 90% confidence interval for the effects is obtained by the bias-corrected bootstrap with 10,000 resamples. IE_{med} = completely standardized indirect effect of the mediation. SE_{Boot} = Standard error of the bootstrapped effect sizes. Results for hireability are presented in parenthesis.

Table 5.

Means, Standard Deviations, and p-values for the Bonferroni-corrected independent t-tests (p has to be lower than .006)

Variable	*EG* *M* (*SD*)	*CG* *M* (*SD*)	*P*	*SE*
Attractiveness of interviewer	4.51 (0.74)	4.14 (0.77)	.04$^{n.s.}$	0.18
Sympathy of interviewee	4.14 (0.94)	3.71 (1.05)	.08	0.24
Sympathy of interviewer	4.74 (0.61)	4.60 (0.50)	.29	0.13
Behavior of the interviewer	4.60 (0.55)	4.66 (0.48)	.65	0.12
Attractiveness of participant	3.77 (1.03)	3.48 (0.98)	.24	0.24
Participant's outfit	3.97 (0.89)	3.40 (1.04)	.02$^{n.s.}$	0.23
Perceived motivation of participant	4.26 (0.82)	4.03 (0.86)	.26	0.20
Reported motivation of participant	4.17 (0.67)	4.35 (0.43)	.19	0.14
Duration training	21.51 (3.74)	19.83 (3.84)	.07	0.91

Note. $\alpha_{\text{Bonferroni-corrected}} = .006$. EG = experimental (virtual training) group, CG = control group. $^{n.s.}$ = non-significant difference because of the Bonferroni-corrected α. $n_{EG} = 35$, $n_{CG} = 35$.

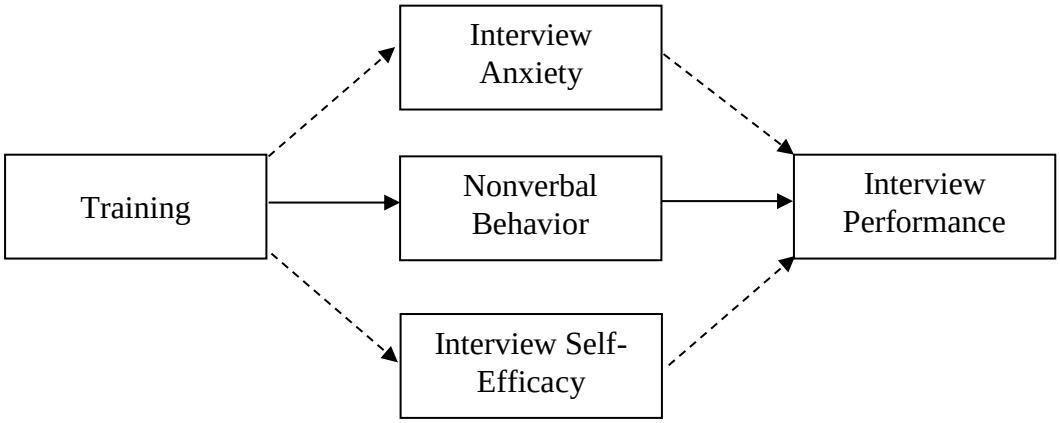

Figure 1. Assumed mediator model. The continuous line indicates the assumed main mediation path.