**Virtual versus Face-to-Face Assessment Center:**

**Candidates’ and Assessors’ Viewpoints**

**Abstract**

Human resources selection processes, are influenced from communication technology progress. The use of advanced technology make it possible to conduct a virtual assessment process based on synchronic video conference (VC). The restrictions due to the COVID-19 pandemic has expanded the use of a virtual assessment center (VAC) with very little published research about it. The current research focuses on the way candidates and assessors perceive VAC. This paper includes two field studies among candidates and assessors in two types of assessment centers (AC) for various military positions: 1) VAC; 2) Face-to-Face (FTF) AC. The assessors and the candidates were requested to fill an anonymous questionnaires concerning their perceptions about these assessment centers. The first study focused on the assessors’ (N=41) and demonstrated that their level of confidence in VAC is lower than FTF. In addition, we found that their level of confidence varied between exercises and depended on the assessors’ experience in VAC. The second study focused on the fairness perceptions among the candidates (N=4,762). We found that the fairness perceptions are similar between the two assessment centers. This research helps in the understanding of the transition from FTF AC to VAC and can help in the implementation of VAC.

 Keywords: Virtual assessment center, Virtual simulation, Virtual leaderless group discussion, personnel selection, fairness perception,

**Introduction**

 The rapid advancement of innovative technologies has led to the emergence of a wide variety of new selection tools used for human resources selection processes (McCarthy et al., 2017). Variety of virtual selection tools are cheap, fast, and accessible to more candidates (Chapman & Rowe, 2001; Chapman & Webster, 2001, 2003; Galen Kroeck & Magnusen, 1997). For example, expanding the use of video conference (VC) to conduct a job interview for the purpose of being hired (Sears et al., 2013). The COVID-19 pandemic that broke out in late 2019 made it difficult to perform face-to-face selection in the face of restrictive guidelines which accelerated to the use of selection processes in a virtual format (Jones & Abdelfattah, 2020; Joshi et al., 2020). Therefore, it can be expected that the use of VC technology will also expand for assessment centers.

 However, a review of the literature indicates, that no research has yet been conducted focusing on virtual assessment center (VAC). The small number of studies conducted on virtual selection tools have focused on other technology-based selection tools for example, web-based tests (such as cognitive tests) or VC-based interviews (Stone et al., 2013). Woods et al., (2020) pointed to the existence of this research gap in the field of digital selection procedures in general, and regarding internet-based techniques in particular. While the rate of development and use of a digital selection procedures in practice is raising rapidly, there is no scientific research on it.

 Several researchers suggested that technological selection tools are fundamentally different from traditional selection tools, and as such there is a need to understand the unique challenges of technological selection (Chamorro-Premuzic, Winsborough, Sherman, & Hogan, 2016; Tippins, 2015; Woods et al., 2020). Some organizations use new technologies without knowledge of how they affect the perceptions of the candidates and the assessors, which can lead to a possible harm to the organization (Woods et al., 2020). Candidates who perceive the selection process as unfair, will have negative reactions to it and may consequently exhibit poor performance and motivation during that process, and even stop participating in the middle of it (Smither et al., 1996; Hausknecht et al., 2004). Assessors who will have difficulties dealing with technical and other issues in a VAC (e.g., video lag issues) may experience lack of confidence in their assessments that may be less accurate and impair the AC's validity.

 The purpose of the present work is to deepen the understanding of the candidates' and assessors' perceptions of the selection tools of a VAC, while comparing them with perceptions of the face-to-face assessment center. As far as we know, this is the first study that examines the candidates' and assessors' perceptions towards a VAC, and therefore has a unique and significant contribution to the field. The first focuses on the assessors' reactions towards a VAC in comparison to a FTF AC. The second study focuses on candidates' reactions to VAC in comparison to reactions to FTF AC. The findings of the two studies could help managers in organizations to better understand some of the implications of using VAC instead of FTF AC, and to make decisions based on empirical evidence that was not available before.

**Face-to-Face Assessment Center Vs. Virtual Assessment Center**

 The goal of selection processes is to select the candidates who have the maximum suitability for the job requirements to which they are being classified (Stone et al., 2013). The “assessment center” selection tool has been in use for over fifty years, and is one of the most accepted methods for in human resource selection around the world (Howland et al., 2015; Kleinmann & Ingold, 2019). Unlike other selection tools, such as a questionnaires or interviews, which do not involve actual interpersonal communication and are based on the candidate's self-report, the uniqueness of the AC is in the interpersonal communication that takes place in it. In each exercise there is social communication between the candidates in the context of the exercise which evokes actual behaviors (Kleinmann & Ingold, 2019). Assessors at the AC assess the behaviors of the candidates, while the candidates are performing a variety of exercises that simulate work-related situations e.g., role-plays and group discussion (Kleinmann & Ingold, 2019).

 Technological advances in the last decade, and the availability of VC for anyone with a modern laptop, smartphone or tablet (Bohannon et al., 2013), are producing a trend of wide use of VC in organizations in general and also in personnel selection specifically. A growing number of organizations have begun to use VC in recruitment and selection, including for an interview that serves as an adjunct or as an alternative to a face-to-face interview (Vadi et al., 2016). The use of VC helps organizations to deal with increasing pressure to expand recruitment and selection activities while streamlining and reducing recruitment and selection costs, and save time (Chapman & Rowe, 2001; Chapman & Webster, 2001, 2003). The combination of technological advances and the organizational need to streamline and reduce selection processes has led organizations to move and use an ACs on a virtual platform based on synchronous VC.

 The FTF AC and the VAC have several common key characteristics, the first being the goal. The goal of AC is to gather relevant information about candidates for a defined target position in in order to make decisons regarding acceptance or rejection of candidates. The second is to perform group and individual tasks, such as: group exercise, theme presentation exercises or role-playing exercises that produce actual behaviors. The third is an evaluation by assessors who observe the performance of the candidates and evaluate them according to a predefined metrics. Unlike other corporate communication tools, VC-based communication, replicates as much as possible the face-to-face communication experience. Participants can see the responses of others in the conversation (e.g., if they are smiling, grimacing, uninterested, or enthusiastic) with the help of cues, voluntary or involuntary, from the audio channel and the visual channel (Campbell, 1998; Croes et al., 2019; Palmer & Simmons, 1995).

 The main difference between these two ACs is the platform through which the AC is transmitted. In the FTF AC, the communication between the candidates and the assessors takes place face-to-face, and the candidates performing the group and individual tasks at the selection site in the presence of other assessors and candidates. In comparison at the VAC the communication among the participants is done through a video call (for example, synchronous Zoom and Skype software) where the candidates and assessors do not meet each other in the same location and are connected in "real" time from different places.

The use of the term “VAC” in this study does not refer to conducting remote tests or video-based interviews, but only to exercises in which there is video call-based communication between participants and assessors. The emergence of a new type of AC - a VAC, raises questions about the candidates’ and assessors' perceptions of this new AC in relation to the traditional AC.

**Study 1- Assessors' level of confidence in Virtual Assessment Center**

**Virtual Assessment Compared to Face-to-Face Assessment** Scanning of studies examining the effect of virtual assessment (via VC) on selection processes revealed that studies published so far focused on assessment via VC only in interviews (Blacksmith et al., 2016; Chapman & Rowe, 2001). We didn't find at all papers on a video-based AC, which this research will be focused on. Some features of an interview based synchronous VC, are similar to those of a VAC. In both, video-mediated communication takes place through technological means (such as a computer, tablet or mobile phone) and participants as well as assessors are not present in the same physical environment (Croes et al., 2019). In both, the interpersonal communications take place between the assessor and the candidate in "real time” (Wegge, 2006). These similar characteristics allow us to learn from studies that examined video-based interviews on a video-based VAC.

 The studies on the interviews point to two main differences between video-based virtual communication and face-to-face communication: The first focuses on conveying non-verbal cues (Joshi et al., 2020). Human communication consists of a combination of verbal and non-verbal cues of various kinds. According to Media richness theory, different communication channels differ in the amount of communication cues and the information they convey (e.g., verbal, visual, emotional and behavioral) in a given period of time. The more communication paths are used in transmitting information by the sender, the better the recipient understands the information and the risk of incorrect communication is reduced (Daft et al., 1987). While face-to-face communication is the richest and conveys cues of many kinds naturally (Daft & Lengel, 1986), video interviews, due to the lack of physical encounter, limit participants' ability to convey and observe non-verbal cues and behavior (Chapman & Rowe, 2001).

 In VC there are fewer non-verbal behaviors of the candidates, such as eye contact and body language, which challenge the ability to assess the candidates’ abilities (McColl & Michelotti, 2019; Sears et al., 2013). Eye contact is one of the most important non-verbal cues for communication. The feeling that the person one is communicating with is looking at his or her eyes is important, and also leads to a high sense of trust (Bohannon et al., 2013). In video-based communication, direct eye contact is impaired because the image resolution is insufficient and the camera angle is not appropriate (Sellen, 1995). The camera is placed on the screen and therefore it seems that the conversation partner is looking downwards but in fact he is looking straight into his or her partner's eyes on the screen and thus a mismatch is created and the eye contact is damaged (Bohannon et al., 2013).

 In addition, body language information is significantly reduced in VC because participants are presented with upper body and above (Joshi et al., 2020). As a result, participants are unable to convey all the cues that exist in face-to-face conversation (Croes et al., 2019), for example the possibility of observing non-verbal behaviors as hand gestures is reduced (Sellen, 1995). In order for more non-verbal cues to pass, it is important that the camera captures the hands and arms in photography as well (Bohannon et al., 2013). Evaluation processes have been found to be influenced by the degree of exposure to nonverbal behavior (DePaulo, 1992). In the context of AC it is hypothesized that communication in a face-to-face assessment center is richer than a video-based AC just as communication in a face-to-face interview is richer than a video interview.

 The second difference between the two types of communication: virtual and face-to-face, focuses on signal distortion due to the technological involvement in video-based communication. While face-to-face communication has no technological aspects at all, VC based communication, takes place on a technological platform and thus is limited by the capabilities of the platform. Technological difficulties and problems, such as: delays in the transmission of verbal messages, lack of synchronization between audio and video signals, interruptions in conversation and more, pose significant challenges for professionals. These technological problems, may raise the need to repeat what is being said, or rephrase questions that directly affect the media (McColl & Michelotti, 2019). Due to lower levels of non-verbal information and lower technological capabilities in VAC in comparison to AC we hypothesize that:

 *Hypothesis 1:* Assessors’ level of confidence in their assessments will be lower in virtual assessment center than in a face-to-face assessment center.

Due to the limitations of home camera through which the VAC is performed which presents a restricted field of view, all the exercises in this AC are performed in a sitting position. In contrast, in the face-to-face assessment center some of the exercises are performed in a sitting position and some in a standing position. It is assumed that the degree of confidence of the assessors towards different exercises in a VAC will vary depending on the degree of similarity between how the exercise is performed in a FTF AC and how the corresponding exercise is performed in a VAC. A high degree of similarity refers to a "sitting exercise" that the candidate performs both in a FTF AC and in VAC by a sitting statically. In contrast, a low degree of similarity refers to a "standing exercise" that the candidate performs in a FTF AC in a standing position, while moving in the room. However, in the VAC candidates performs it in a sitting position.

According to the theory of "media richness" (Daft et al., 1987), there are a number of communication channels that transmit information. In a "standing exercise" in a FTF AC, the information passes through a number of channels which are reduced in a VAC, where the exercise is performed in a sitting position. Therefore, much of the body language information that existed in a "standing exercise" at a FTF AC is lost when it is transmitted in a VAC. In contrast, in a “sitting exercise”, the candidate performs the task in a sitting position both in the two AC. Reducing the communication channels for a "standing exercise" that delivers in a VAC will lead to a reduction in the existing information about the candidate, and therefore may impair the level of confidence in evaluating these exercises in a VAC.

*Hypothesis 2:* The assessors’' level of confidence in a VAC will vary between the different exercises depending on the degree of similarity between how the exercise is performed in a FTF AC and how the corresponding exercise is performed in a VAC. The level of confidence in providing assessments in a VAC will be higher towards "sitting exercise" than towards "standing exercise".

 A question arises as to whether and how the assessors' level of confidence to a video-based VAC will change with experience at work? According to Bandura's learning theory (Bandura, 1977) performance improves with practice and becomes more successful. The more people gain experience at work, the more expertise and knowledge they develop and their performance at work improves (Hunter, 1986; Ree et al., 1995; Schmidt et al., 1986). For example, in a meta-analysis by Quińones et al. (1995) found a relationship between experience and performance. Therefore, as part of this study, it is assumed that the more assessors gain experience in evaluating within a virtual assessment center the more they will acquire expertise and knowledge and their assessment is likely to improve. It is hypothesized that an improvement in assessment ability is likely to have a positive effect on feelings of confidence in providing assessments among evaluators.

 *Hypothesis 3:* The assessors’ level of confidence in providing assessments in a VAC will improve over time, as the assessors will have more experience in VAC assessing.

The differences between exercises (presented in hypothesis 2) should also influence the improvement in confidence over time (presented in hypothesis 3), and not just the level of confidence. We suggest that the experience gained over time have the potential to help assessors in assessing “standing exercises” in VAC, which are different than the exercises in FTF AC the assessors previously assessed, and had experience with. On the other hand, since for the "sitting exercise" the assessors have already had experience in similar exercises from FTF AC, there will be little contribution for more experience in VAC. In other words, the improvement will depend on the degree of similarity between how the exercise is performed in a FTF AC, and how the exercise is performed in a VAC.  In exercises that are performed and assessed in a similar manner (“sitting exercise”) the experience gained in FTF AC will be valid and help the assessors in VAC, thus the assessors will not need further experience. In exercises with low degree of similarity in comparisons to exercises from FTF AC ("standing exercise"), the assessors will not be able to based their assessments on previous experience, and will need to learn from experience in the VOC how to assess these exercises.

 *Hypothesis 4:* The assessors’ improvement in level of confidence in providing assessments in a VAC will vary according to the type of exercise. The improvement will be small in "sitting exercise" than in a "standing exercise".

**Methodology**

*Participants and Procedure*
 In this field study, 53 participants who are in the role of assessors within AC at a large selection institute, participated. After elimination of 12 assessors with experience only in the VAC and without experience in the FTF AC, 41 participants remained in the final sample. The participants were graduates of a military diagnostician position or students in the social sciences, in the age range 22 to 36 (M = 27.40, SD = 2.92). All have experience in assessment at a FTF AC and a VAC. The data were collected after the questionnaire was sent to all the assessors and they were invited to participate in the study voluntarily. They were assured that the use of the information would be for research purposes only.

 The questionnaire was administered twice with five-month intervals in order to examine whether there was a change in level of confidence over time as assessors gained more experience in assessment at the VAC. The assessors' level of confidence were examined at two time points: the first in a short time of 1-3 weeks after the start of the operation of the VAC, when all the assessors had little experience in virtual assessment. The second was after a lengthy operation of the VAC for about five months, in which the assessors already had extensive experience in virtual assessment. The study was approved by the Ethics Committee (385/20).

*Description of the selection in a virtual and face-to-face assessment center*
 A few weeks before the selection day, the candidates for military service received summons with information about the selection in which they were asked to confirm their participation. The division into the type of selection is affected by the timing of the outbreak of the covid-19 epidemic that led to transfer from a FTF AC to a VAC. Before March 2020 the candidates and assessors participated in FTF AC and after March 2020in VAC. Each group included two assessors and 6 candidates in VAC, and 8 candidates in FTF AC. The selection day included two group exercises and one individual exercise, in which the analysis will be focused (on this study), as well as performing computerized cognitive tests. At the FTF AC, the two parts were performed at the selection site in the presence of candidates and assessors. On the other hand, In the VAC, the candidates connected to the selection from different places when they were physically distant from each other and did not meet at all. The candidates performed the tests independently on a dedicated computer platform and the exercises in a synchronous VC on the computer. The VC was based on "Zoom" software when the candidates and assessors connected to the conference from a stationary or mobile computer (not over the phone). The webcam was placed on the computer monitor so that they could see the head and the participants' torso and could heard each other clearly.

 During the VC, three exercises were performed that lasted about three hours. One exercise was performed in a sitting position both in the FTF AC and in VAC. This exercise examines the interpersonal sensitivity and involves two role-plays, (For example, Teacher and student or Seller and customer) each role was different for each candidate in a personal conversation with the assessor. The assessor was the second role holder in the role play. As part of the role play, a variety of abilities of the candidate relevant to the treatment of the person can be seen, for example the degree of sensitivity and empathy for the other.

 The other two exercises are "standing exercises" performed while the candidates were standing and moving in the room in the FTF AC. In contrast they were performed while sitting in VAC due to the technological requirements. The first exercise was a group exercise that examines teamwork ability and leadership. The exercise included several tasks in a sequence that participants were required to perform as a group (e.g., group debate or preparing a joint product together). In order to perform the tasks, the participants were required to cooperate with each other and work together.

 The second "standing exercise" was an oral presentation that examines instructional ability. In this exercise each candidate delivered a short lecture to the group. At the FTF AC the candidate physically stood in front of the group and delivered the lecture, while in the VAC he delivered the lecture in a sitting position. As part of the exercise, the candidate expressed his relevant abilities for instruction, such as the ability to express himself orally, adjust the content and create interest among the participants. After each of the three exercises, the assessors filled out an assessment form for the candidates and assessed the relevant abilities for each exercise, according to Table 1 on a scale ranging from 1 (= very low ability) to 5 (= very high ability).

**Table 1**: Dimensions and exercises in the assessment center

|  |  |  |
| --- | --- | --- |
| Sitting exercise | Standing exercises |  |
| Roleplay | OralPresentation | Groupexercise | ExercisesDimensions |
|  |  | X | Teamwork skills |
|  |  | X | Leadership skills |
|  | X |  | Presentation skills |
| X |  |  | Interpersonal sensitivity |

*Measures*

 **Assessors' level of confidence Questionnaire**: In the absence of an appropriate questionnaire that fits the study, a new questionnaire was developed for the assessors' level of confidence (Kronbach's alpha reliability = 0.743) asking them to rate each of the three exercises in the AC in two aspects: (1) The level of success in the assessment: "How much did you succeed in assessing the candidates’ abilities?" (2) The level of confidence in the assessment: "How confident did you feel in the grade you gave?". The scale was of 5 levels (1 = the Virtual selection is less good than the FTF selection, 3 = the Virtual selection is as good as the FTF selection, 5 = the Virtual selection is better than the FTF selection). The questionnaire included a written explanation of its purpose and duration. This questionnaire was delivered at two time points: one near the beginning of using the VAC when assessors had little experience with VAC; and the other one after about five months in which assessors had extensive experience with the VAC.

**Results**

*Analysis of the assessors’ level of confidence*

 In the first stage, the relationships between the level of confidence and the level of success in assessment for each exercise were calculated. According to the social sciences, r = 0.1 is a small effect size, r = 0.3 is a medium effect size and r = 0.5 is a large effect size (Cohen, 1988). The relationships found at the first point in time, when the assessors had little experience were high: for the group exercise r = 0.534, p <0.01; for topic presentation exercise r = 0.628, p <0.01; and for role-playing exercise r = 0.768, p <0.01. The relationships found at the second point in time where assessors had extensive experience were medium-high: For group exercise r = 0.44, p <0.01; for topic presentation exercise r = 0.581, p <0.01; and for role-playing exercise r = 0.632, p <0.01. These medium-high relationships allowed us to calculate a new measure called the “assessors' level of confidence” which is the mean of the level of success and level of confidence in the assessment for each of the three exercises at the two time points in which we conducted the questionnaire. Table 2 shows the mean and the standard deviation of the assessors’ level of confidence towards each of the three exercises separately, and for all three together at two time points: with little experience or with extensive experience in the VAC.

 Hypothesis 1 suggested that assessors will feel less confident in providing assessments in a VAC than in a FTF AC. All the results presented in Table 2 demonstrate that the assessors reported that they are less confident in VAC than in FTF AC as all the reports are below 3 (the middle of the scale in which the VAC equals the FTF AC). In other words, in all the reports of the assessors regardless of the experience and the exercise the assessors reported that they are less confident of VAC than of FTF AC. In order to test if this is significant a one sample t-test was performed comparing the assessors' level of confidence regardless of the experience and the exercise to value 3 which means that the VAC is the same as a FTF AC. The analysis revealed that assessors' level of confidence in the assessment towards a VAC is lower than towards a FTF AC (t (52) = 10.890, p <.001).

 In order to examine hypotheses 2, that the level of confidence in providing assessments in a VAC will be higher towards "sitting exercise" than towards "standing exercise", one way ANOVA with repeated measures was performed. The analysis found a significant effect (F (2, 104) = 41.432, p <0.001). In support of hypothesis 2 follow-up tests found that assessors' level of confidence in VAC “sitting exercise” (Role Play: M=2.811, SD=0.499) were higher than “standing exercise” (Group exercise: M=2.386, SD=0.510, Oral Presentation: M=2.084, SD=0.518).

 In order to examine hypotheses 3, that the assessors' level of confidence in providing assessments in a VAC will improve with more experience, paired-samples t-test was performed. The analysis found a significant effect (t(40)=2.795, p<0.01). In support of hypothesis 3, assessors' level of confidence in providing assessments with little experience in a VAC (M=2.296, SD=0.429) was found to be lower than with extensive experience in a VAC (M=2.491, SD=0.408).

 In order to examine hypotheses 4, that the assessors’ improvement in level of confidence in providing assessments in a VAC will vary according to the type of exercise, a two-way ANOVA analysis with repeated measures (experience and type of exercise) was performed. The analysis found a significant interaction effect (F (2, 80) = 3.325, p <0.05) and therefore follow-up tests were performed. The results supported hypothesis 4. The results demonstrate that the effect of experience on level of confidence, was dependent on the type of exercise. T tests were performed for dependent samples and found that there is a significant difference between the assessment with little experience and the assessment with an extensive experience only in the standing exercises: in the group exercise (t (40) = 4.326, p <.001), and in the topic presentation exercise (t (40) = 2.012, p <.05). In contrast, in the sitting exercise (role-playing exercise) no significant difference was found in the assessors' level of confidence between the two time points with little or extensive experience (t (40) = 0.224, p> .05). These findings demonstrate that the type of exercise is a boundary condition to the effect of experience on level of confidence. As demonstrated in Figure 1 the assessors' level of confidence to the standing exercises (group exercise and topic presentation exercise) in a VAC improve as the assessors have more experience in assessment at this type of center. In contrast, the assessors' level of confidence to the sitting exercise (role-playing exercise) in a VAC are similar with or without experience.

**Table 2**: Averages and standard deviations of the assessors' level of confidence according to the type of exercise and level of experience

|  |  |  |  |
| --- | --- | --- | --- |
| Total | Extensive experience | Little experiece | Exercis |
| SD | M | SD | M | SD | M |  |
| 0.486 | 2.341 | 0.541 | 2.512 | 0.554 | 2.171 | Group exercise |
| 0.500 | 2.048 | 0.626 | 2.159 | 0.539 | 1.939 | Oral presentation |
| 0.457 | 2.792 | 0.534 | 2.805 | 0.612 | 2.780 | Role play |
| 0.354 | 2.394 | 0.408 | 2.491 | 0.429 | 2.296 | All exercises |

Note: N = 4; M= Mean; SD= Standard Deviation

**Figure 1**:Averages of the assessors' level of confidence according to the type of exercise and the level of experience of the assessors:

Note: N=41

**Discussion**

 This study examines assessors' level of confidence in providing assessments at a VAC with respect to assessment at FTF AC. The findings show that the assessors felt less confident with the assessment at the VAC than at the FTF AC. Also, the level of confidence in the "sitting exercise", )in which both the FTF AC and the VAC assessors, are exposed only to the upper body( was higher than the level of confidence in the "standing exercise" )in which the FTF AC assessors are exposed to the entire body language and in the VAC only the upper body(.

 The literature points on two major differences in assessment between verbal virtual computer-mediated communication and Face-to-face communication. The first, of technical problems that exist only in the virtual communication (McColl & Michelotti, 2019). The second, differences in the extent of nonverbal behavior that assessors observe and the level of visualization of the other person (limited to head and torso by videoconferencing or all the body) (Joshi et al., 2020). It is possible that these two differences contributed to differences also in the assessors' level of confidence towards the two kinds of assessment centers and impair the level of confidence in assessment within a VAC. The assessors' level of confidence towards "sitting exercise" is higher than toward "standing exercise" within the VAC. It seems that the way the exercise is delivered, sitting, or standing, affects the extent of the nonverbal behavior that the assessor is exposed to in a VAC is similar to the nonverbal behaviors the assessor is exposed to in a FTF AC. In a "standing exercise" performed in FTF AC, such as a topic presentation exercise, the assessor sees the entire body language and body position in the candidate's standing position in the space of the selection class. This exercise performed as part of the VAC becomes a "sitting exercise" and therefore the participants' ability to convey and observe non-verbal cues and behavior is significantly reduced, which probably was the reason to the low level of confidence assessors had in their assessments compared to the FTF AC. In contrast, the FTF AC's exercise performed in a sitting position, and the assessors exposed only to the upper body, there was probably little reduction in the assessors' information about the candidate in the VAC also performed in sitting position. Hence, when less information is lost in the transition between face-to-face communication and virtual communication, there is less damage to the confidence of the assessors while transforming from FTF AC to VAC.

 In terms of the effect of the assessor's experience on their level of confidence, it seems that the experience has an effect on the level of confidence in evaluation among the assessors, mainly for the "standing exercises" to which the level of confidence was low at little experience. Assessors' level of confidence have improved in these exercises over time, as assessors gained experience in virtual assessment. Only in the "sitting exercise" (role-playing exercise) the assessors' level of confidence have not improved with more experience in virtual assessment. The assessors have already had experience in a similar exercises from FTF AC, therefor there is no contribution for more experience in VAC. The lack of improvement may be due to high levels of confidence even in assessments with "little experience" in VAC. Thus, it seems that a "ceiling effect" was created, following which it is difficult to see further improvement over time with more experience in virtual assessment.

 The findings of this research can serve in planning which exercises are recommended to perform in a VAC. The findings also point to the need for training assessors on how to evaluate nonverbal behaviors in a VAC. These trainings and exercises are necessary for the benefit of the assessors' level of confidence.

 The limitations of the study are firstly the small number of participants (41), and secondly the uniqueness of the period in which it was conducted at the height of the Covid-19 pandemic. Due to the guidelines prohibiting a gathering during the pandemic, the assessors were forced to work from their home and did not physically arrive at the selection site to carry out a FTF AC as usual. It is possible that this change and other characteristics of the period, which was saturated with pressures and a sense of uncertainty, had an indirect effect on the reactions of the assessors. Given the lack of research, and empirical evidence regarding VAC it is clear that more studies are needed to replicate the first step that was taken in the current research. Future research should collect more data that may help in understanding the effectiveness of VAC. In study 2, we take a step further and focus on the fairness perceptions of candidates toward VAC in comparison to FTF AC.

**Study 2- candidates' perceptions of fairness in virtual assessment center**

**Candidate reactions to selection processes**

 Beyond understanding the selection processes from the organization's point of view, researchers also emphasized the need to understand the candidates' point of view. The study of candidate responses developed in the 1980s and gained momentum in recent years (McCarthy et al., 2017). Candidates' responses to selection can explain elements of motivation in the selection (Visser & Schaap, 2017) and even performance during the selection (Hausknecht et. al., 2004). This is based on the assumption that not only organizations select employees but also employees choose which organization they will apply to, and which organization they want to work for (Anderson et al., 2004; McCarthy et al., 2017; Truxillo et al., 2018).

 The term candidate’s reaction refers to a person's position, influence, or recognition of a process (Chapman et al., 2003). Most research on candidates' reactions in the field of selection focuses on how candidates perceive and respond to different selection methods (e.g., interviews or tests) (Ployhart, 2006) with an emphasis on fairness in selection processes (Gilliland, 1993). Candidates with positive responses to the selection process tend to see the organization more positively, are more willing to accept a job offer, and are more likely to recommend the employer to others (Hausknecht et al., 2004). Candidates who perceive the selection process as unfair are likely to develop negative attitudes toward the organization, and even cease their participation in the selection process (Smither et al., 1996).

 Web-based selection format may influence candidates' responses (Konradt et al., 2013). Due to the acceleration in the rate of technology development in recent years, there has been a number of studies that examined responses to a video-based virtual interview (Blacksmith et al., 2016; Chapman et al., 2003; Proost et. al., 2020; Sears et al., 2013; Straus et al., 2001, Toldi, 2011). Despite the revolutionary changes personnel recruitment and selection technologies, and the great scientific interest in how these technologies affect the responses of candidates (McCarthy et al., 2017), no research has yet been conducted on responses towards a VAC. In the absence of this type of research, we will examine the findings of the studies on responses to a video-based interviews and learn from them about possible responses to the VAC.

 A review of studies examining responses towards video-based interviews suggests that there are inconsistent trends. While there are studies that have found a preference of candidates for face-to-face interviews compared to video-based interview (Blacksmith et al., 2016; Chapman et al., 2003; Proost et. al., 2020; Sears et al., 2013; Straus et al., 2001), other studies have actually indicated that candidates preferred the use of video interviews in the selection process (Ployhart & Ryan, 1997; Toldi, 2011). Video interviews were perceived as effective and innovative in relation to traditional face-to-face selection processes (Toldi, 2011).

 The present study examines the responses of the candidates towards a video-based AC. It also provides a comparison to responses towards a FTF AC, following the call by Anderson (2003) for such comparisons. In addition, the current study is based on a natural design with real candidates which make it possible to examine the responses among candidates for whom selection has real employment implications (Truxillo et al., 2002), which may be different from responses of those participating in selection only for the benefit of the study.

**Fairness in a virtual assessment center**

 The main theoretical basis of most researches in the field of candidates’ responses to selection processes is the Gilliland's model of procedural justice (Gilliland, 1993), which relates to the fairness of selection's processes. According to this model the question that the candidates ask in the selection process is "Was it fair?" And their responses to the selection process are influenced by the answer. This model includes ten procedural rules of justice, associated with three categories: The first one is of the formal characteristics of the selection and includes: job-relatedness, chance to perform, consistency and reconsideration opportunity; The second category of explanation includes feedback, information knowledge, and openness; The third category of interpersonal treatment includes two-way communication, treatment, and propriety of questions. The perceptions about the extent to which each of the rules is met or violated in the selection process are combined together and create an overall assessment of fairness in the selection process (Gilliland, 1993).

 In order to deepen the understanding of whether and why the candidates' responses to the FTF AC differ from their responses to the VAC, we examined the extent to which these rules of justice are applied in a VAC compared to a FTF AC. This examination revealed that the rules of justice are applied to a similar extent between these two ACs. For most rules of justice there is no difference in their application between a FTF AC and a VAC: in terms of consistency, defined as a standardization of the process so that each candidate performs the selection process in the same way as other candidates (Truxillo et al. 2018), there is a similarity between two ACs. All the candidates in the group performed from the selection site or all the candidates in the group performed remotely. There was no situation where some of the candidates performed the face-to-face assessment center at the selection site and others in the same group performed it remotely.

 In terms of job relevance, defined as the degree to which the selection process is relevant to the job for which the selection is intended (Truxillo et al., 2018). Because the AC in our study examines suitability for a variety of roles, the online setting is suitable for some positions, and the face-to-face setting for others. Also, the technological knowledge and experience required in a VAC may be relevant for some of the roles to which they are classified. Therefore, in an AC of this type that examines suitability for a variety of roles with diverse work environments, it is assumed that the perception of fairness will be similar towards a FTF AC and a VAC.

 In terms of the opportunity to perform, defined as the ability to express a person's true abilities (Truxillo et al., 2018), the studies are inconsistent. There are studies that claim that video-based selection properties, in which non-verbal cues are difficult to transmit through a computer, reduce the likelihood of expressing abilities and therefore lead to adverse reactions (e.g., Straus et al., 2001). On the other hand, other studies have actually found that candidates felt in a video interview that they were able to express themselves (Toldi, 2011). It is also possible that the young population in this study feels more natural and more comfortable in the online environment and therefore can be better expressed in it. Hence, the extent to which the candidates feel they can express themselves probably depend on the characteristics of the individual as some will feel more fair in this regard in a FTF AC and others in a VAC. It is hypothesized that the ability to be expressed beyond candidates is similar between two ACs.

 In terms of explanation, there were no differences in the organizational processes in this context between a FTF AC and a VAC. The amount and manner of information and feedback in these two ACs were similar, so in this context it is assumed that the reactions of fairness will be similar towards the two this ACs. In terms of communication between candidates and assessors and the extent to which they treat candidates with warmth and respect, and fairness in questions (Truxillo et al., 2018), it seems that the assessors' attitude towards the candidates remains similar between the two ACs. In the VAC may have a greater sense of distance due to the screen and the lack of physical encounter, but on the other hand in the VAC the number of candidates in each group is smaller than the FTF AC. In each group at the VAC there are two regular assessors who accompany the candidates throughout the selection (as opposed to alternating assessors at the FTF AC). Therefore, it is assumed that in general the attitude of the assessors towards the candidates will remain similar. Also, the questions and instructions for the different exercises also remained similar between these two assessment centers. Therefore, there seems to be a similarity in the way all rules of justice are applied (Gilliland, 1993). A VAC was developed accordingly and maintained the same principles in terms of the fairness of a FTF AC, so it is assumed that there will be no difference in the perception of fairness between two ACs.

 *Hypothesis 5:* Candidates' perception of fairness towards a VAC will be similar to the perception of fairness towards a FTF AC.

**Methodology**

*Participants and Procedure*

 The participants in this field study are candidates in an AC for a variety of positions in the army. All participants are women (the selection is for women only) in the age range 16.2 to 24.5 (M = 17.3, SD = 0.5) before recruiting to the army. Of the respondents to the questionnaires 779 performed a FTF AC, and 3,983 performed a VAC, based on a synchronous VC. The division into the type of classification is affected by the timing of the outbreak of the covid-19 epidemic that led to transfer from a FTF AC to a VAC (see study 1). At the end of the AC, the candidates filled out a process justice perception questionnaire towards the AC in both type of AC (FTF and VAC). While the candidates in the FTF AC filled out the questionnaires with paper and pencil at the selection site, the candidates in the VAC filled them out on the computer. The questionnaires were completed in both groups before the candidates received feedback on the AC they conducted. In the two ACs, the candidates were assured that the use of information from the questionnaires is for research purposes only and will not affect decisions regarding them. The study to be presented was approved by the Ethics Committee (385/20).

*Description of the selection in the assessment centers*

 At the FTF AC, the candidates arrived at the selection site, where they performed computer tests and exercises in a group setting, in which other candidates participated, and in each exercise two assessors that are assigned to the specific exercise were present (different assessors for each exercise). In the VAC the candidates performed the tests remotely (mostly from home) and performed the group exercises as part of a synchronous VC with additional candidates and two assessors who also connected remotely, without physically meeting with each other. The same two assessors assessed all the exercises in the VAC. For more information, see method in study 1.

*Measures*
 **Perception of fairness questionnaire**- The questionnaires allow organizations to examine the impact of their selection processes on the fairness perceived by candidates (Bauer et al., 2001). These questionnaires are based on the Selection Procedural Justice Scale (SPJS) (Bauer et al., 2001) developed on the basis of Gilliland's organizational justice rules (1993) and served as the basis for a wide range of studies. The questionnaires in this study include 11 items out of 39 items developed by Bauer et al. (2001) and has an alpha reliability of Kronbach 0.773. The fairness perception questionnaires in this format were transmitted at the FTF AC for the benefit of organizational control and learning even before the transition to a VAC and the decision to conduct research on this subject. The original questionnaire was reduced because some of the questions were not relevant to the current selection process or to the timing of the questionnaires transfer (e.g., it is not possible to ask about feedback to the candidates as they have not yet seen their scores when filling out the questionnaire).

 The decision to use this limited version of the questionnaire stemmed from the constraint of field research and the desire to meet the need for research comparing candidates' responses toward technological selection and responses toward the traditional one (Anderson, 2003). In order to compare the candidates' perception of fairness between the FTF AC and the VAC, it was decided to ask the same questions at the VAC as in the previous questionnaire at the FTF AC. The transition to the VAC was sudden due to the constraints of the Covid-19 epidemic and could not be anticipated and submit in advance the full questionnaire of Bauer et al. (2001). It was decided to use the limited questionnaire that allows comparison between the two Acs. This will have a greater contribution to the study, than using the complete questionnaire that would not allow such a comparison. Examples of the items: "I had enough information in advance about the selection format"; "I received fair and considerate treatment during the selection process." Candidates were asked to answer honestly and to assess their degree of agreement with each item on a 5-level Likert scale (1="strongly disagree" to 5="strongly agree").

**Results**

*candidates' perceptions of fairness*

 Hypothesis 5, suggested that there will be no difference between the candidates' perception of fairness towards the VAC and towards the FTF AC. In order to compare the candidates' perceptions of fairness towards the two selection processes, the differences in the perception of fairness towards the various ACs were examined with Cohen's index **d** (statistic that used in comparisons of big groups). The d index calculated to examine the differences between the perception of fairness towards the VAC was (M = 4.265, SD = 0.457) and the perception of fairness towards the FTF AC was (M = 4.197, SD = 0.585) d = 0.140. The difference is not significant because of Cohen's rule of thumb (Cohen, 1988) which defines d <0.20 as lack of effect. Therefore, hypothesis 5 is supported and both there is not difference in the perceptions of fairness between VAC and FTF AC.

**Discussion**

 It is very important for organizations to understand candidates' responses to a VAC, as they affect how the organization plans and executes its selection processes (Anderson & Goltsi, 2006). Consistent with the research hypothesis, we found that the fairness perceptions of candidates towards the VAC were similar to the perceptions of fairness towards the FTF AC. It is important to note that the present study was conducted on young age of the candidates designated for the rank of Private, which is the lowest in the military organization. In order to deepen the understanding of the perception of fairness beyond the specific population in this study, it is recommended to examine these responses also among an older population. The responses of young candidates accustomed to accessibility and widespread use of mobile phones and the internet are referred to as "digital natives" (Prensky, 2001), may be different from those of an older population. It is also advisable to examine these responses also among candidates for more senior positions (Straus et al., 2001). It is possible that candidates who participate in a VAC for a senior position may expect the employer to make more effort in their recruitment and they may expect the personal contact they may receive in FTF selection more than in VAC (Chapman et al., 2003). For example, an organization that conducts interviews by phone calls, may indicate a low level of value imposed on potential employees compared to an organization that invests time, effort, and expense in conducting a FTF interviews (Chapman et al., 2003). In the present study the candidates differentiated into positions at the rank of private which is the lowest in the military organization, so it is possible that their reactions were more positive towards a virtual assessment center that matched their expectations. It is worthwhile to delve deeper into the question of whether the level of the position affects the candidates' reactions to a VAC in the future.

 Beyond the limitations related to population characteristics, it is important to note that the study is based on data from an AC conducted over two different time periods in each of which all candidates performed the same type of AC. All the candidates before the outbreak of the Covid-19 performed a FTF AC together and after the outbreak that they all performed a VAC. This study didn't examine a situation in which candidates for the same positions perform different ACs, some FTF AC and others a VAC. It is recommended in further studies to examine the fair responses of candidates in this combined situation.

**General Discussion**

 The purpose of this study was to examine a new selection tool of a VAC while focusing on comparing the perceptions of candidates and assessors towards it and towards a FTF AC. The need to examine this new selection tool is the revolutionary changes in recruitment and selection technologies alongside organizations dealing with Covid-19 epidemic limitations (Jones & Abdelfattah, 2020; Joshi et al., 2020) that have expanded the use of a VAC for selection purposes. It was found that using a VAC, along with the organizational benefits of saving time and money and expanding the scope of relevant candidates (Chapman & Webster, 2001, 2003), also produces similar perceptions of fairness as in FTF AC among candidates. However, Assessors' level of confidence in FTF selection tool are higher compared to a virtual selection tool.

 These findings present for the first-time empirical evidence on candidates' and assessors' perceptions towards VAC, and thus make a significant contribution to organizations that want to understand some of the implications of operating VAC instead of FTF AC. The findings help professionals in occupational-organizational psychology and HR make decisions about how to implement a VAC. For example, based on the findings, organizations operating a VAC are advised to invest in in-depth training and conducting VAC experiences for assessors to strengthen their level of confidence in assessments. It also appears that selection tools that are primarily based on the transmission of information in a verbal channel and do not demand moving in the room and communicating with body are particularly suitable for execution within an VAC. Beyond these findings, in order to see the complete picture of this new AC, it is necessary to delve deeper and examine whether there are differences in the assessment characteristics and validity of a VAC compared to a FTF AC.

 The current study provides first step in building a body of research regarding VAC. It presents empirical comparison of assessors’ and candidates’ responses to VAC in comparison to FTF AC. We hope, that future research will follow and answer remaining research gaps regarding this topic. Future studies should not only replicate comparisons made in the current study with older population and not during Covid-19 unique pandemic period, but also test differences in the actual assessments in VAC in comparison to FTF AC (concurrent validity), test the ability of VAC to predict role performance (predictive validity), and the level of reliability of assessments in VAC comparing to FTF AC.

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