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Face-to-face versus online psychotherapy: a single-subject evaluation study

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Abstract. The objective of this study was to evaluate face-to-face versus online psychotherapy using a single-subject experimental design. Physiological indices of brainwave activity, pulse variation, and voice stress level revealed greater emotional reactivity and stress during a face-to-face psychotherapy session than during an online session. During the online psychotherapy session, more cognitive activity and engagement occurred than during the face-to-face session. No difference emerged between psychotherapy modalities on a measure of the psychotherapeutic working alliance. We offer suggestions for future research and clinical practice.

Keywords: in-person psychotherapy, online psychotherapy, treatment evaluation, single-subject design

Introduction

Advances in digital Internet technologies have made available new tools and means of communicating that depart markedly from the parameters of in-person communication. This contemporary and evolving reality has made the delivery of online psychotherapy not only possible, but also increasingly accepted as an alternative to conventional face-to-face psychotherapy. It has proven itself to be particularly valuable during the COVID-19 pandemic. Yet, our review of the psychological literature identified relatively few studies that evaluated differences between face-to-face and online modalities of psychotherapy, especially in Romania (Berle et al., 2015; Cook & Doyle, 2002; Hammond et al., 2012; Kaiser et al., 2021). We wanted to contribute to the Romanian literature by comparing physiological and self-report responses to face-to-face versus online psychotherapy using a single-subject experimental design.

Method

Participant

The participant in our study was a 38-year-old man with a high school education who worked as a freelancer in the field of computerized image design. He lived with his parents. He has Romanian and German ancestry and is a practicing Catholic. He has never been married and did not report being in a stable romantic relationship. He reported good physical and psychological health, although he admitted to suffering from low self-esteem and difficulty in social adjustment. The participant was a current client of the first author, who provided him with a blend of cognitive-behavioral and brief solution-focused therapies.

In keeping with the ethical mandates of the Romanian College of Psychologists *Deontological Code for the Free Licensed Psychologist Profession*, the participant was informed about the general nature and risks of the study, as well as his rights and obligations as a research participant. He was also told that the two psychotherapy sessions, one face-to-face and the other online, would be delivered free of charge. In addition, the participant was promised interpretive feedback based on the physiological and self-report data collected once the study was completed. He then gave his informed consent to voluntarily participate.

Instruments

We compared face-to-face and online variants of psychotherapy using an A1B1-A2B2 single-subject experimental design, in which the participant was kept blind to the purpose of the study. The A1B1-A2B2 design involved sequential introductions and withdrawals of the psychotherapy interventions, along with the measurement of dependent variables during each phase, in order to determine the effect of face-to-face and online psychotherapy on selected indices of physiological responding. We also administered a self-report measure of the psychotherapeutic working alliance immediately after completion of face-to-face and online psychotherapy sessions.

The following physiological responses were recorded and stored on a laptop computer:

- Brainwaves during psychotherapy sessions were measured with a NeuroSky NeuroExperimenter EEG monitor and software. Choi et al. (2012) demonstrated comparability between the monitor and software that we used and other well-known EEG tools (see Teplan, 2002 for additional details).

- Pulse variation during psychotherapy sessions was measured with Pulse Capture, an open source software. Pulse Capture requires a webcam attached to a laptop computer to measure pulse. Although reliability and validity have been reported for this software, we pretested the concordance between the data gathered with Pulse Capture and a widely used commercial pulse measurement device, resulting in a 90% rate of concordance.

- Voice stress during psychotherapy sessions was measured with Prevaricator open source software. Prevaricator is mini-polygraph tool that records the level of vocal stress. The technology used by Prevaricator is easy to use and relatively noninvasive, and has adequate sensitivity (i.e., accurate identification of the presence of voice stress) and specificity (i.e., accurate identification of the absence of voice stress) in the hands of a seasoned administrator (Hopkins et al., 2005).

The SRS-V3.0 is a 4-item visual analogue measure that has moderate-to-high internal consistency and test-retest reliability as well as concurrent validity with self-report instruments

that purport to assess the quality of the psychotherapeutic working alliance (Duncan et al., 2003). We elected not to translate and adapt the SRS-V3.0 because the participant was determined to have high proficiency in the English language, notably in reading comprehension.

Procedure

The A1B1-A2B2 single-subject experimental design consisted of two alternating baseline and treatment phases, with each phase separated by a period of two days. Phase A1 baseline involved a 20-minute neutral laptop computer activity followed immediately by Phase B1 treatment, a 20-minute face-to-face psychotherapy session. Two days later, Phase A2 baseline, comprised of another 20-minute neutral laptop computer activity, was introduced, followed immediately by Phase B2 treatment, consisting of a 40-minute online psychotherapy session. Thus, the key experimental manipulation in our study's was the modality of psychotherapy and the environmental condition in which the two psychotherapy sessions were delivered. The SRS-V3.0 was administered only after face-to-face and online psychotherapy sessions (A2 and B2) because the neutral baseline activity did not involve any psychotherapeutic interaction.

The face-to-face psychotherapy session focused on collaboratively establishing treatment goals of reducing stress, finding a romantic relationship, and resolving dental problems. The online psychotherapy session centered on previously negotiated treatment goals vis-à-vis the application of problem-solving strategies derived from cognitive-behavioral and brief solution-focused paradigms. Specifically, the therapist and participant worked together in a manualized fashion on operationally defining problems, generating multiple solutions to problems, prioritizing two solutions predicted to be successful, applying these solutions in session, evaluating in session their pragmatic qualities and likely outcomes, and setting realistic objectives to be pursued in ongoing psychotherapy and in vivo.

After the procedures were concluded, the participant received feedback on his baseline and treatment brainwave, pulse variation, and voice stress levels, as well as on his two SRS-V3.0 ratings.

Results

Data were analyzed using open source R software with RcmdrPlugin.SCDA. Significant differences between face-to-face and online psychotherapy modalities were found on physiological indices of affect and cognition.

Alpha brainwave levels were significantly higher during online psychotherapy (B2) than during face-to-face psychotherapy (B1) (see Figures 1 and 2 below). This difference suggests that emotional reactivity and stress may be greater during face-to-face psychotherapy than during online psychotherapy, which would dovetail with related studies (Choi & Gutierrez-Osuna, 2009; Hammond et al., 2012; Kassam & Mendes, 2013; Rochlen, Beretvas, et al., 2004). Moreover, online psychotherapy appears to be more relaxing when contrasted to everyday situations (see Teplan, 2002).

Figure 1
Alpha Brainwaves during Baseline and Face-to-Face Psychotherapy (A1B1)

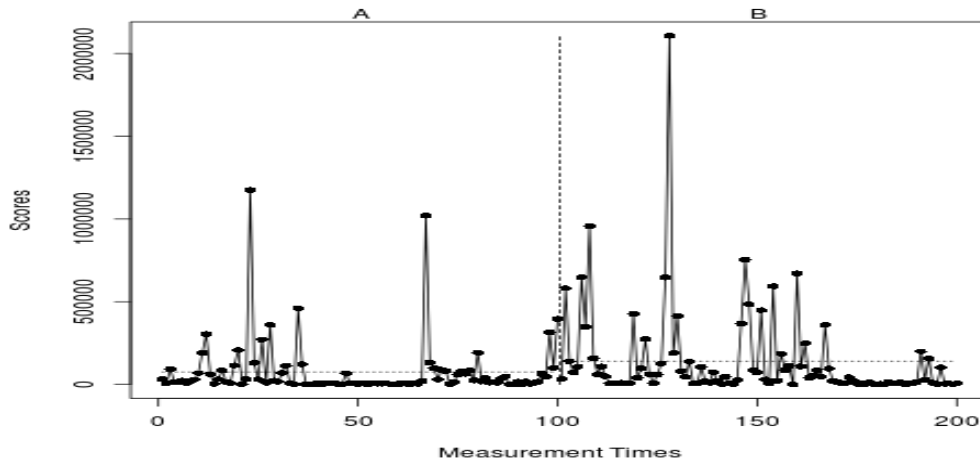
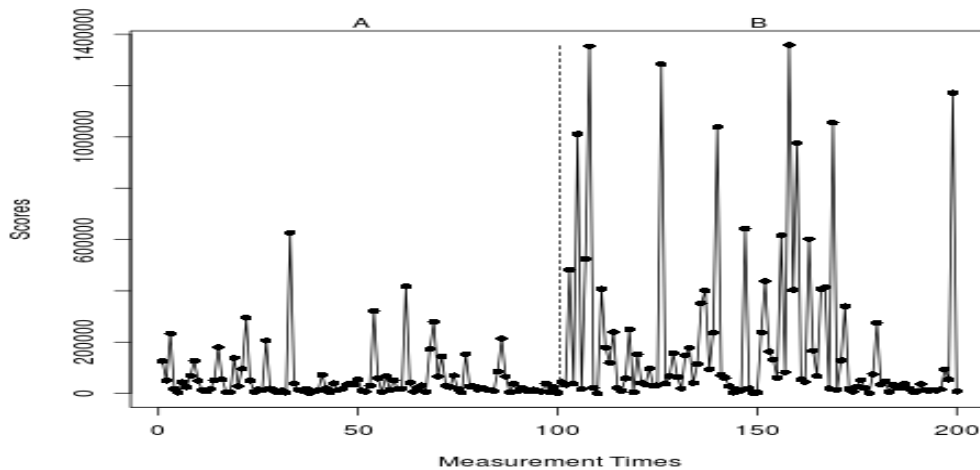


Figure 2
Alpha Brainwaves during Baseline and Online Psychotherapy (A2B2)



Beta brainwaves levels were significantly higher during online psychotherapy (B2) than during face-to-face psychotherapy (B1) (see Figures 3 and 4 below). This finding offers additional evidence of the presence of cognitive activity and engagement during online psychotherapy, as well as during a variety of other human-computer interactions, perhaps owing to its novelty as a modality for treatment (see Berger, 1929 for a more detailed discussion of brainwaves and cognitive activity).

Figure 3

Beta Brainwaves during Baseline and Face-to-Face Psychotherapy (A1B1)

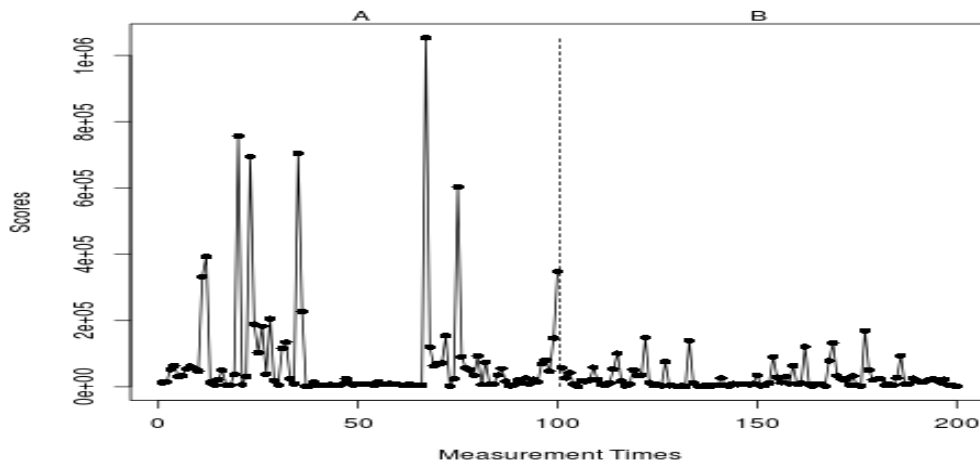
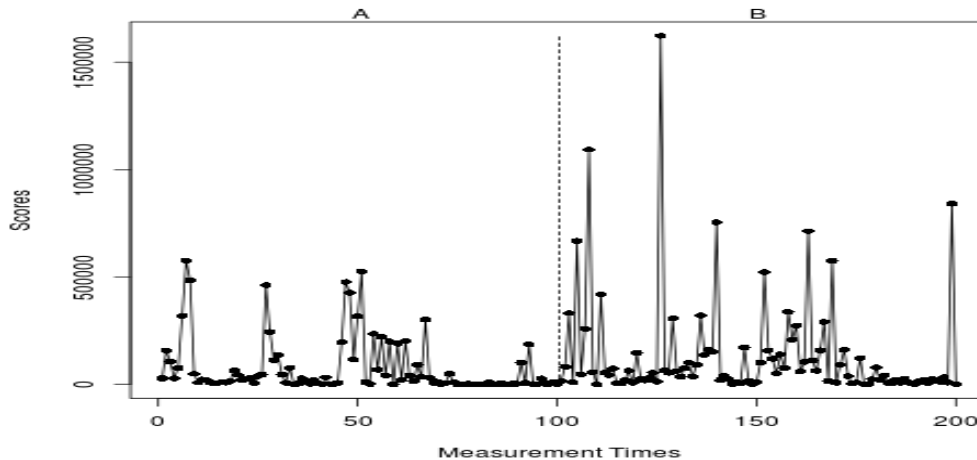


Figure 4

Beta Brainwaves during Baseline and Online Psychotherapy (A2B2)



Pulse level was significantly higher during face-to-face psychotherapy (B1) than during online psychotherapy (B2) (see Figures 5 and 6 below). This finding suggests that emotional reactivity and stress may be greater during face-to-face psychotherapy than during online psychotherapy, which is supported by related research (Choi & Gutierrez-Osuna, 2009; Hammond et al., 2012; Kassam & Mendes, 2013; Rochlen, Beretvas, et al., 2004).

Figure 5
Pulse Variation during Baseline and Face-to-Face Psychotherapy (A1B1)

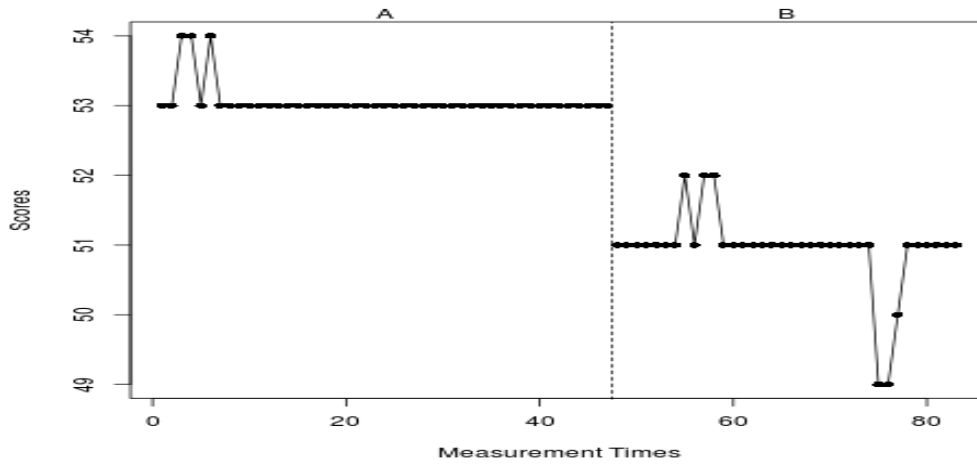
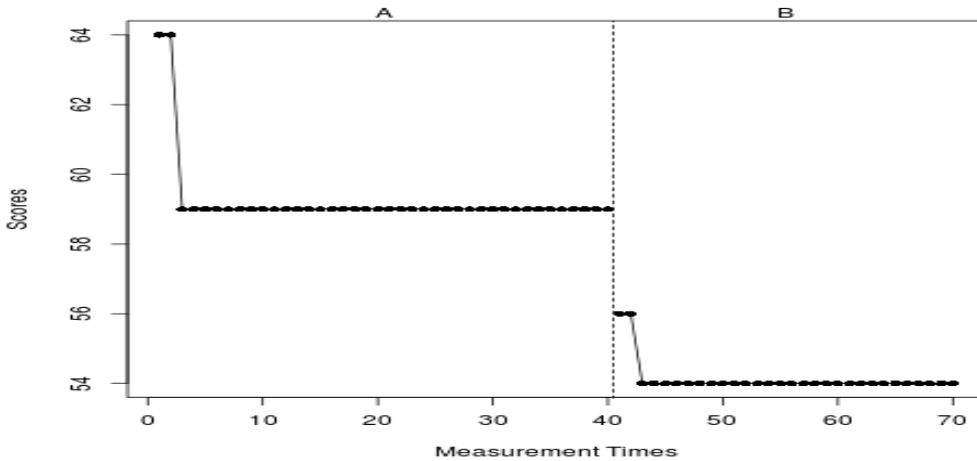


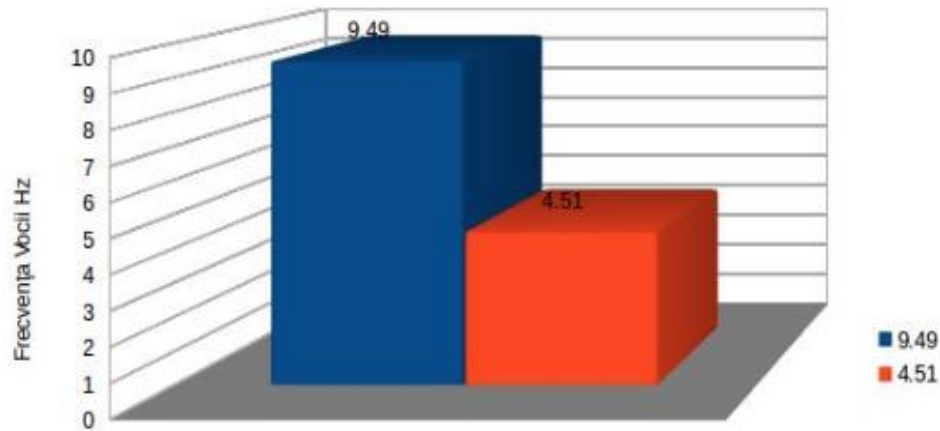
Figure 6
Pulse Variation during Baseline and Online Psychotherapy (A2B2)



Voice stress level was significantly higher during face-to-face psychotherapy (B1) than during online psychotherapy (B2) (see Figure 7 below), which indicated a higher level of emotional reactivity and stress (Scherer, 1986) and complements alpha brainwave and pulse variation recordings in this and other studies (Choi & Gutierrez-Osuna, 2009; Hammond et al., 2012; Kassam & Mendes, 2013; Rochlen, Beretvas, et al., 2004).

Figure 7

Voice Stress Levels for Face-to-Face (B1-Blue) and Online Psychotherapy (B2-Red)



Differences in SRS-V3.0 ratings for face-to-face and online psychotherapy sessions, were negligible.

Discussion

During the current COVID-19 pandemic, online psychotherapy has become an attractive alternative to conventional face-to-face psychotherapy, owing in large part to advances in digital Internet technologies. This single-subject evaluation study found differences between face-to-face and online modalities of psychotherapy. These differences appeared valid because (1) recorded levels of physiological activity during baseline (A1 and A2) and psychotherapy sessions (B1 and B2) departed markedly from each other, (2) there were no trends during baseline (A1 and B1) that confounded the effect of either face-to-face or online psychotherapy (A2 and B2), and (3) the two-day interval between A1B1 and A2B2 was sufficient to ensure a return to baseline (A2) following exposure to face-to-face psychotherapy (B1).

Alpha and beta brainwave levels were higher during the online psychotherapy session than during the face-to-face session. Pulse variation and voice stress levels were greater during the face-to-face psychotherapy session than during the online session. These findings dovetail with literature showing that face-to-face psychotherapy can be experienced as more emotionally demanding and uncomfortable than online psychotherapy (Choi & Gutierrez-Osuna, 2009; Hammond et al., 2012; Kassam & Mendes, 2013; Rochlen, Beretvas, et al., 2004). In addition, Rochlen, Land, et al. (2004) found that men who have difficulty with expressing emotions, such as the participant in our study, tended to prefer online psychotherapy. In working with male clients, we would advise clinicians to consider the relative benefits of online psychotherapy, which might be experienced as less interpersonally uncomfortable than face-to-face treatment. As for the subjective experience of the psychotherapeutic working alliance, SRS-V3.0 ratings for face-to-face and online sessions did not differ significantly, most likely due to the fact that the therapist had already established such an alliance with the participant (Cook & Doyle, 2002; Duncan et al., 2003).

The limitations of the current study included possible experimenter bias, the lack of equivalence in content between face-to-face and online psychotherapy sessions, and the potential influence of confounding variables (e.g., unknown changes affecting the participant during the two-day interval between A1B1 and A2B2). Future experimental research should correct the aforementioned methodological limitations (e.g., introducing double-blind conditions to control for experimenter expectations) and utilize (1) cross-sectional and longitudinal designs to evaluate changes in physiological and self-report responses over time, (2) representative sociodemographic samples (e.g., men and women) formally diagnosed with a variety of mild-to-moderate psychiatric disorders, (3) diverse psychotherapeutic approaches delivered face-to-face and online, and (4) qualitative measures of the subjective experience of treatment in order to shed additional light on the conditions in which online psychotherapy is particularly beneficial.

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