

# Physiological phenomena occurring in the psychodynamic psychotherapy process: a Pilot study

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## Abstract

**Aim of the study:** The aim of the study was to examine the physiological activity in patients and psychotherapists during psychodynamic psychotherapy in relation to: gender, presence of personality disorder traits and anxiety symptoms.

**Subject or material and methods:** Physiological data of 24 patients with a diagnosis of neurotic disorders and/or personality disorders were analysed. Psychotherapy was conducted by two psychotherapists. Most patients had an anxiety disorder or a specific personality disorder. Physiological data were collected using a galvanometer and a pulsometer.

**Results:** The physiological activity of the psychotherapists differed, probably due to their professional experience. The physiological activity of the patients differed due to the psychotherapist providing therapy, gender, personality traits, and level of neurotic symptoms.

**Discussion:** Differences in the physiological parameters of psychotherapists could be related to individual differences between them: gender, age, education, and length of professional experience. Length of the experience and gender of therapists could have influenced patients' physiological reactions. Patients' dominant symptoms could be related to the intensity of their physiological reactions. Due to the significant and interesting results of the study it would be worth repeating it on a larger number of patients and psychotherapists.

**Conclusions:** The physiological state of the psychotherapists correlate with the physiological reactions of the patients. The results suggest higher EDA (electrodermal activity) and lower HR (heart rate) in neurotic disorders and higher HR activity and lower EDA in personality disorders.

physiological phenomena; psychotherapy; heart rate; electrodermal activity; psychophysiology

## INTRODUCTION

Psychodynamic psychotherapy is a method of treatment that aims to understand the interaction of an individual's relationship with their environment, both external and internal. The approach includes a developmental perspective and assumes the influence of the unconscious,

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the presence of internal conflicts, the internal representation of interpersonal relationships, defense mechanisms and the possibility of assigning complex meanings to experience [1]. The assignment of meaning takes place through a particular type of conversation in which the patient and psychotherapist jointly construct meaning through multiple modalities of communication. The positive relational context promotes the attribution of new meanings to experience and the reformulation of the patient's subjectivity [2]. In the psychoanalytic approach, the key factor required for change is insight [3]. Change takes place through the influence of the setting and the psychotherapeutic relationship [4].

The psychodynamic view of the therapeutic relationship has evolved over the years. Initially, the relationship was viewed as a more 'internal' process, which over time began to be also perceived as an 'external' phenomenon between patient and psychotherapist [5]. This idea was influenced by the evolution of general systems theory, which assumes that any interpersonal relationship can be modulated in terms of mutual regulation between interacting subsystems [6]. According to Safran and Muran (2006), the therapeutic alliance should be seen as a constantly changing quality of the therapeutic relationship [7], and the patient-psychotherapist interaction should be understood not as a collaboration, but as a continuous process of negotiation between its participants [8]. Kramer and Stiles (2015) believed that the therapeutic relationship largely depends on the responsiveness of the therapist, i.e. their ability to respond and to attune in to the patient's reactions [9]. Through the relationship with the psychotherapist, the patient can experience the phenomenon of mirroring their affect, holding, or containing [4]. The therapeutic relationship in the context of psychodynamic theory has so far been studied in terms of various constructs [8]. These included, for example, the therapeutic alliance [10], intersubjectivity [11], or transference-countertransference [12].

Transference in psychotherapy is defined as a phenomenon in which representations of important and formative relationships in the process of psychological development (such as the relationship with parents and siblings), can be imputed to other relationships. This unconscious process occurs in the relationships between psy-

chotherapists and patients, and although there may be real aspects of this experience, it often represents a cognitive distortion. An important feature of transference is that some aspects of it are associated with internal conflicts and defense mechanisms [13].

The classical definition of countertransference assumes that it is based on the unconscious internal conflicts of the psychotherapist, a reaction to the patient's emerging transference [14]. Later concepts of countertransference, developed on the basis of object relations theory, supplemented this view, with the assumption that all reactions of the psychotherapist to the patient are relevant and that they should be investigated, and that countertransference is an inevitable reaction of the psychotherapist to patient contact [15]. According to Gelso and Hayes (2001), psychotherapists' reactions during psychotherapy are not limited to countertransference and not all of these reactions are defensive or unconscious [16]. Although the concept of countertransference is derived from psychoanalytic theory, the therapist's emotional reactions are considered an important aspect of the therapeutic process, regardless of the clinician's theoretical orientation [17]. The extensive literature on the subject indicates the presence of specific patterns of psychotherapists' emotional response in various psychiatric disorders [18-20]. Moreover, during the different phases of treatment, the type of psychotherapist's countertransference may change, have a different meaning, and take different forms, depending on the personality of the therapist [21]. Hayes distinguished the main components of countertransference [22] including the manifestations of countertransference, which can manifest as cognitive, emotional, behavioral and bodily reactions [15].

The phenomenon of 'embodied countertransference' considers the analyst's body as an organ of information about the patient and the psychotherapy process. The bodily experiences of the therapist are thus valuable information regarding the intersubjective space between therapist and patient, which is important in understanding the therapeutic processes. The construct of 'embodiment', refers to both the reactions of the psychotherapist and the patient, whose experiences are treated as one embodied phenomenon [23, 24].

In the face of the above information, the phenomena that occur in psychotherapy should not be considered without reference to bodily processes. Research is increasingly including non-verbal, affective and embodied aspects of communication in the study of interpersonal interactions [25]. The therapeutic alliance between psychotherapist and patient is a fundamental factor shared by all psychotherapeutic approaches. Probably one of the key aspects of the therapeutic alliance is the interpersonal bodily reactions in response to the exchange taking place between therapist and patient, which includes, inter alia, the physiological reactions of both sides of the dyad [26, 27].

Studies on the physiological arousal exchanges between patient and psychotherapist in psychodynamic psychotherapy, indicate a number of dependencies. In the study by Voutilainen et al. (2018) manifestations of empathy expressed by psychotherapists, were associated with an increase in physiological arousal and a decrease in arousal of the patient [28]. According to the results of a study by Marci and Riess (2005), suppression of affect may be associated with increased autonomic arousal, which in psychoanalytic terms can be understood as intrapsychic conflict [29]. Another group of recent studies analyzing autonomic arousal in psychotherapy focused on the physiological synchrony between patient and psychotherapist [26]. In these studies, the phenomenon of physiological synchrony has been demonstrated [29-33]. The strength of a synchrony was correlated, inter alia, with the degree of the patient's perceived empathy of the psychotherapist [29, 30]. In a study by Liu et al. (2016), it was found that during face-to-face interactions, participants of the interaction showed greater physiological synchrony of electrodermal activity (EDA) than during back-to-back contact [34], which may be an objective justification for the now widely accepted face-to-face psychodynamic psychotherapy practice [35]. Despite some relatively consistent findings, research on interpersonal physiology in psychotherapy is still underdeveloped, characterised by methodological and conceptual diversity that makes it difficult to draw overarching conclusions [36, 37]. These observations and conclusions emphasise the complexity of the therapeutic encounter and support the view that it is

important to consider the non-verbal (and presumably unconscious) aspects of the interaction when studying the psychotherapy process [5].

In the broader context of psychology and psychopathology, physiological responses have been used, inter alia, in studies on stress levels [38], introversion/extroversion [39], neuroticism [40], anxiety disorders [41], or as an indicator of the effectiveness of psychopharmacological treatment of anxiety disorders [42], depressive disorders [43], psychopathy [44], schizophrenia [45].

Heart rate (HR) and EDA are the most commonly used physiological parameters in research on psychotherapy. HR is a complex bodily activity that is regulated by the antagonistic activity of the sympathetic and parasympathetic autonomic nervous system [26]. EDA is a term used to describe autonomic changes in the electrical properties of the skin, which are controlled solely by the sympathetic nervous system. Skin conductance (SC) is a marker of emotional, physiological or cognitive arousal [27]. The measurement of SC is most commonly used in the publications on psychophysiology. SC is the slowly changing tonic activity (skin conductance level, SCL) and the fast phasic components (skin conductance responses, SCR), which reflect a response to a stimulus or a non-specific response. The SCR can be described by, inter alia, its amplitude (SCR amp.), rise time (SCR ris.t.), frequency (SCR freq.), half-time recovery (SCR rec.tc) [42].

## AIM

The aim of the present study was to analyse physiological phenomena – EDA and HR in patients and psychotherapists during the initial sessions of the psychodynamic psychotherapy process. EDA was studied by measuring SCL, SCR amp., SCR freq. The intensity of physiological reactions was examined according to: the gender of the patient and the psychotherapist, psychiatric medication intake, the presence of personality disorder traits (MMPI-2 Inventory), the presence of neurotic symptoms (Symptom Checklist "O"), the intensity of neurotic personality traits (Neurotic Personality Questionnaire KON-2006), the presence of dominant person-

ality or anxiety disorders and the psychotherapists' experience.

## Materials and methods

### Study participants and the Applied Treatment

The study involved 24 patients with a diagnosis of neurotic disorders (F40-F48) and/or personality disorders (F60-F61) according to ICD-10. The characteristics of the study group are described in Tables 1 and 2. The mean age of the participants was  $M=32.4$ ,  $SD=7.2$ . Women represented 62.5% of the participants ( $n=15$ ). The majority patients had an anxiety disorder (F41) or a specific personality disorder (F60). The determination of whether the patient had a dominant personality disorder or an anxiety disorder was evaluated jointly by a psychiatrist and a psychologist.

Participants were hospitalised for 12 weeks in a day hospital for neurotic and behavioural disorders treatment, where they received group psychotherapy 5 times a week (3 sessions per day of 45 minutes each) and an individual psychotherapy session once a week (45 minutes each time). The psychotherapy was conducted according to the psychodynamic approach and was carried out by two psychotherapists – a 50-year-old man and a 28-year-old woman. The male psychotherapist, who is a psychiatrist, had 25 years of experience in psychotherapy, the female psychologist had 2 years of experience.

**Table 1.** Sociodemographic characteristics of participants

	n	%	M	SD
Age:	24	100	32.4	7.2
Gender:				
Woman	15	62.5		
Men	9	37.5		

**Table 2.** Characteristics of the Study Group – Diagnosis and Pharmacotherapy

	n	%
Diagnosis:		
F40 Phobic anxiety disorders	1	4.2
F41 Other anxiety disorders	14	58.3
F42 Obsessive-compulsive disorder	1	4.2
F43 Reaction to severe stress, and adjustment disorders	1	4.2
F45 Somatoform disorders	1	4.2
F50 Eating disorders	1	4.2
F60 Specific personality disorder	14	58.3
F61 Mixed and other personality disorders	5	20.8
Dominant disorders:		
Personality	9	39.1
Anxiety	14	60.9

Note. Some patients had more than one diagnosis. One patient had neither a dominant anxiety disorder nor a depressive disorder (an eating disorder).

## Apparatus

EDA was measured using a galvanometer (GRS logger sensor NUL-217). The unit of measurement was microsiemens ( $\mu S$ ). SC data were recorded at a frequency of 5 Hz. BMP was measured with a pulsometer (Heart Rate & Pulse logger sensor NUL-208). The devices were produced by NeuLog.

## Questionnaires

In the present study, we used the Symptom Checklist "O" [46] – to measure the severity of neurotic symptoms over the past 7 days, the KON-2006 Neurotic Personality Questionnaire – to determine the total severity of neurotic personality traits [47], and clinical scales and the additional scale "ego strength" from the Min-

nesota Multidimensional Personality Inventory MMPI-2 – to obtain data on patients' personality traits [48].

### Research Procedure

HR was measured using a sensor consisting of an infrared LED transmitter and a matching infrared phototransistor receiver. The sensor was placed on the second finger of the non-dominant hand. SC was measured using dry Ag – AgCl electrodes placed on the fingertips of the second and fourth fingers of the non-dominant hand [42, 49].

Physiological responses were measured individual psychotherapy sessions (lasting 45 minutes each time). At the beginning of the psychotherapy process, patients were surveyed with the Symptom Checklist "O", the KON-2006 Questionnaire and the MMPI-2 Inventory.

### EDA Calculation Program

The EDA-Para program by F. Schaefer, recommended by Boucsein (2012), was used to process the SC raw data [42]. A scaling factor of 10 was used to process the data, due to the low calibrated sensitivity of the galvanometer. The recommended standard criterion of 0,01  $\mu\text{S}$  was used to calculate the SCR. A low-pass filter with a cut-off frequency of 0.5 Hz was used, resulting in smooth curves without possible artefacts. SCL, SCR freq., SCR amp. values were calculated for each minute, during each psychotherapy session.

### Statistical Analysis

Statistical analysis was performed using the licensed statistical package STATISTICA PL. The Mann Whitney U test and Spearman's rank correlation analysis were used. A significance level of 0.05 was applied in each analysis.

The first part of the statistical analyses included data from all 96 psychotherapy sessions conducted. The device correctly recorded 170 physiological data files – 88 physiological measurements of the psychotherapists and 82 measurements of the patients (artefacts, incorrect use of the device). Data from the initial 16 psychotherapy sessions (2nd or 3rd session) were used for further analyses. The first psychotherapy session is an organisational meeting to define the goals of psychotherapy and to familiarise the patient with the treatment procedures, so the measurement started from the second or third session. It was decided to analyse only the initial sessions of psychotherapy so that the treatment process would not affect the factors examined in the statistical calculations – for example, a reduction in the severity of neurotic symptoms, personality disorder traits.

### Bioethics Committee

The study was conducted with the approval of the Jagiellonian University Bioethics Committee No. 1072.6120.66.2020. The information obtained from this study was used with the consent of the patients. All data were stored and processed anonymously.

## RESULTS

**Table 3.** Comparison of Physiological Reactivity of Psychotherapist With Shorter (1) and Longer (2) Experience

Variable	Therapist	M	Mdn	SD	Z
HR	1	83.83	83.00	5.96	-16.61***
	2	88.31	88.00	8.93	
SCL	1	19.98	18.40	9.77	-19.73***
	2	14.86	12.36	10.45	
SCR freq.	1	6.31	6.00	2.89	-6.40***
	2	5.77	6.00	2.73	

SCR amp.	1	3.82	2.87	3.58	-21.11***
	2	1.94	1.03	2.52	

Note. The Mann Whitney U test was used. A significance level of 0,05 was applied. Number of sessions analysed in the younger therapist (1)  $n=55$ , in the older therapist  $n=33$ . HR – heart rate, SCL – skin conductance level, SCR freq. – skin conductance responses frequency, SCR amp. – skin conductance responses amplitude.

First, the physiological reactivity of the two therapists was compared. The performed analysis showed statistically significant differences in terms of physiological reactivity between the therapist with shorter and longer experience (Table 3). Differences were found for all parameters studied: HR ( $Z=-16.61$ ,  $p<0.05$ ), SCL ( $Z=-19.73$ ,  $p<0.05$ ), SCR freq. ( $Z=-6.40$ ,  $p<0.05$ ) and SCR amp. ( $Z=-21.11$ ,  $p<0.05$ ). According to Table 3, a higher mean and median for pulse was recorded for the therapist with longer training. The therapist with shorter experience, meanwhile, had higher means for SCL, SCR freq. and SCR amp.

A comparison of physiological reactivity parameters of patients according to the psychotherapist providing psychotherapy was further analysed.

**Table 4.** Comparison of Physiological Reactivity of Patients of Therapist 1 and 2

Variable	Therapist	<i>M</i>	<i>Mdn</i>	<i>SD</i>	<i>Z</i>
HR	1	87.18	87.00	8.47	-2.85**
	2	86.68	86.00	8.56	
SCL	1	26.69	25.14	14.77	-6.25***
	2	26.60	19.46	21.91	
SCR freq.	1	5.70	6.00	2.62	-0.19
	2	5.72	6.00	3.03	
SCR amp.	1	5.89	3.39	6.97	-3.05**
	2	6.29	2.93	8.02	

Note. The Mann Whitney U test was used. A significance level of 0.05 was applied. Number of analysed sessions of younger therapist (1) patients  $n=50$ , older therapist (2) patients  $n=32$ . HR – heart rate, SCL – skin conductance level, SCR freq. – skin conductance responses frequency, SCR amp. – skin conductance responses amplitude.

The performed analysis (Table 4) showed statistically significant differences in the physiological reactivity of patients depending on which therapist led the therapy (with longer or shorter experience). Differences were shown for the parameters: HR ( $Z=-2.85$ ,  $p<0.05$ ), SCL ( $Z=-6.25$ ,  $p<0.05$ ) and SCR amp. ( $Z=-3.05$ ,  $p<0.05$ ) – Table 4.

The median scores for the physiological reactivity parameters are lower in the patients of the therapist with longer experience. The large differences are mainly related to parameters such as SCL and HR. For SCR amp. the values of the descriptive statistics were statistically significantly different, but the differences were not as large as for the other physiological reactivity parameters.

Another analysis was performed to examine how the physiological reactivity of patients in the first sessions of psychotherapy varied by gender (Table 5).

**Table 5.** Comparison of Physiological Reactivity of Male and Female Patients in the Initial Psychotherapy Sessions

Variable	Gender	<i>M</i>	<i>Mdn</i>	<i>SD</i>	<i>Z</i>
HR	Woman	87.97	89.00	8.40	-1.68
	Men	87.78	86.00	8.16	
SCL	Woman	31.34	24.33	27.61	-4.38***
	Men	36.61	26.89	23.44	
SCR freq.	Woman	6.18	6.00	3.17	-0.92
	Men	6.40	6.00	2.55	
SCR amp.	Woman	6.17	2.50	8.60	-6.42***
	Men	11.86	6.45	11.75	

Note. The Mann Whitney U test was used. A significance level of 0.05 was applied. Woman:  $n=11$ , men:  $n=5$ . HR – heart rate, SCL – skin conductance level, SCR freq. – skin conductance responses frequency, SCR amp. – skin conductance responses amplitude.

According to the results presented in Table 5, statistically significant differences between male and female patients were recorded for physiological reactivity parameters such as SCL ( $Z=-4.38$ ,  $p<0.05$ ) and SCR amp. ( $Z=-6.42$ ,  $p<0.05$ ). A higher median was recorded for the male group in both SCL ( $Me=26.89$ ) and SCR amp. ( $Me=6.45$ ). Thus, that indicates a higher physiological reactivity of men in the initial psychotherapy sessions.

These results were deepened by an analysis that included the person of the therapist as a variable (Table 6).

**Table 6.** Comparison of Physiological Reactivity of Male and Female Patients in the Initial Sessions for Therapist 1

Variable	Gender	M	Mdn	SD	Z
HR	Woman	88.84	87.00	7.678	-2.546*
	Men	89.18	90.00	7.404	
SCL	Woman	27.78	26.88	17.902	-6.033***
	Men	47.62	41.88	26.582	
SCR freq.	Woman	5.94	6.00	2.727	-6.727***
	Men	8.15	8.00	2.170	
SCR amp.	Woman	5.74	2.69	6.193	-7.381***
	Men	16.52	15.02	13.117	

Note. The Mann Whitney U test was used. A significance level of 0.05 was applied. Woman:  $n=7$ , men:  $n=2$ . HR – heart rate, SCL – skin conductance level, SCR freq. – skin conductance responses frequency, SCR amp. – skin conductance responses amplitude.

Analysis showed statistically significant differences between all physiological reactivity parameters: HR ( $Z=-2.55, p<0.05$ ), SCL ( $Z=-6.03, p<0.05$ ), SCR freq. ( $Z=-6.73, p<0.05$ ) and SCR amp. ( $Z=-7.38, p<0.05$ ). The analysis showed that men scored higher median for all physiological reactivity parameters. The largest differences between male and female scores were noted primarily for SCL and SCR amp.

**Table 7.** Comparison of Physiological Reactivity of Male and Female Patients in the Initial Sessions for Therapist 2

Variable	Gender	M	Mdn	SD	Z
HR	Woman	85.33	85.50	8.69	-1.06
	Men	87.42	85.00	8.79	
SCL	Woman	36.36	16.27	36.72	-1.43
	Men	26.93	18.28	14.65	
SCR freq.	Woman	6.52	6.00	3.69	-3.67***
	Men	4.86	5.00	1.74	
SCR amp.	Woman	6.78	2.20	11.14	-2.43
	Men	7.77	3.08	8.57	

Note. The Mann Whitney U test was used. A significance level of 0.05 was applied. Woman:  $n=4$ , men:  $n=3$ . HR – heart rate, SCL – skin conductance level, SCR freq. – skin conductance responses frequency, SCR amp. – skin conductance responses amplitude.

For therapist 2, a statistically significant difference between men and women was shown for SCR freq. ( $Z=-3.67, p<0.05$ ) where a slightly higher median was found for women ( $Me=6.00$ ) – Table 7.

The following analysis examined the physiological reactivity of the patients in the initial psychotherapy sessions according to their predominant disorders – anxiety or personality (Table 8).

**Table 8.** Comparison of Physiological Reactivity of Patients in the Initial Psychotherapy Sessions With Predominant Anxiety Disorders

Variable	Dominant anxiety disorder	M	Mdn	SD	Z
HR	No	82.76	83.00	7.54	-0.35
	Yes	85.23	86.00	7.50	
SCL	No	29.92	18.72	20.49	-11.96***
	Yes	34.44	27.15	29.33	
SCR freq.	No	6.57	6.00	3.27	-2.21
	Yes	6.05	6.00	2.84	
SCR amp.	No	5.00	2.53	6.04	-3.65***
	Yes	9.32	3.48	11.24	

Note. The Mann Whitney U test was used. A significance level of 0.05 was applied. Predominant anxiety disorders – yes:  $n=9$ , no:  $n=7$ . HR – heart rate, SCL – skin conductance level, SCR freq. – skin conductance responses frequency, SCR amp. – skin conductance responses amplitude.

According to the results presented in the table above, statistically significant differences between patients with and without dominant anxiety disorders were noted for physiological reactivity parameters such as: EDL ( $Z=-11.96, p<0.05$ ) and SCR amp. ( $Z=-3.65, p<0.05$ ). Higher median scores were reported for those with dominant anxiety disorders for both SCL ( $Mdn=27.15$ ) and SCR amp. ( $Mdn=3.48$ ). Patients with dominant anxiety disorders were characterised by higher physiological reactivity during the initial therapy sessions.

**Table 9.** Comparison of Physiological Reactivity of Patients in the Initial Psychotherapy Sessions With Dominant Personality Disorders

Variable	Dominant personality disorder	M	Mdn	SD	Z
HR	No	85.47	86.00	7.60	-12.59***
	Yes	94.05	94.00	6.81	
SCL	No	36.98	29.24	29.13	-4.89***
	Yes	22.40	16.66	14.20	
SCR freq.	No	6.33	6.00	2.90	-1.32
	Yes	6.01	6.00	3.26	

SCR amp.	No	9.90	4.89	10.96	-7.90***
	Yes	2.45	1.96	2.15	

Note. The Mann Whitney U test was used. A significance level of 0.05 was applied. Predominant personality disorders – yes:  $n=6$ , no:  $n=9$ . HR – heart rate, SCL – skin conductance level, SCR freq. – skin conductance responses frequency, SCR amp. – skin conductance responses amplitude.

The conducted analysis (Table 9) showed statistically significant differences between patients with and without dominant personality disorder in terms of physiological reactivity parameters such as HR ( $Z=-12.59$ ,  $p<0.05$ ), SCL ( $Z=-4.89$ ,  $p<0.05$ ) and SCR amp. ( $Z=-7.90$ ,  $p<0.05$ ). Analysing Table 9, it can be seen that patients with dominant personality disorder obtained a higher median for HR ( $Mdn=94$ ), while for SCL ( $Mdn=16.66$ ) and SCR amp. ( $Mdn=1.96$ ) they obtained a significantly lower median than patients with dominant neurotic disorder.

## DISCUSSION

### Differences in the Physiological Parameters of Psychotherapists

The results of our study showed that all EDA parameters were significantly higher for psychotherapist 1 – the younger psychotherapist with shorter experience – than for psychotherapist 2 – the older psychotherapist with longer experience. HR was higher for the psychotherapist with longer experience.

The most important factor differentiating psychotherapists in terms of the therapy they provided was their experience. A study by McCarron and Appel found that inexperienced psychotherapists (medical students) showed, when applying confrontational interventions to patients, a lower amplitude of SC responses than experienced psychiatrists. The authors hypothesised that inexperienced individuals may not be as sensitive or aware of the potential effects of the therapeutic interventions used, and therefore show lower autonomic reactivity in these situations [50]. This is not consistent with our results, according to which higher EDA scores were obtained by the psychotherapist with less experience. This may be due to the fact that this psychotherapist was not a medical student, but a psychotherapist beginning his pro-

fessional practice, who may therefore have experienced higher emotional reactivity, more uncertainty and distress than an experienced psychotherapist. This assumption is consistent with the available literature on the relationship between psychotherapist age and emotional burnout [51]. Simionato and Simpson (2018) found that younger age and less professional experience were risk factors for burnout in psychotherapists [52]. Steel et al. (2015) found that, when faced with psychological professional demands, older age (but not length of clinical experience) helps psychotherapists protect themselves from professional and emotional burnout [53].

Another factor differentiating psychotherapists was gender. Women generally show higher SCL, whereas men tend to show higher EDA under stimulation. However, these results can be influenced by many other factors such as a woman's menstrual cycle, differences in EDA between men and women depending on temperature, season and age. With age, a decrease in SCL parameters is observed, as well as SCR amp. [42].

### Physiological Activity of the Patients in Relation to Psychotherapist Conducting the Therapy

All the physiological parameters examined were higher in the patients of the younger psychotherapist, except for the parameter SCR freq. which was not statistically significantly different between the patients of psychotherapist 1 and psychotherapist 2. From the above data, it can be seen that the younger psychotherapist showed higher physiological arousal, similarly to his patients, and the psychotherapist with more experience showed lower physiological arousal, similarly to his patients. We formulated three hypotheses that may explain the above phenomenon. The following hypotheses are not mutually exclusive.

According to the first hypothesis, the psychotherapist with longer experience had a greater ability to regulate his emotional and physiological reactions in order to then be able to influence his patients' reactions. A psychotherapist with less experience could absorb a large part of the affect, physiological reactions from patients and had more difficulty regulating this state than the



more experienced psychotherapist. The above hypothesis is related to the results of a study by Ham and Tronick (2009), who related physiological reactions in mother-child dyads to the therapeutic relationship between patient and psychotherapist [54]. There is less physiological synchrony during mother-child play than during interactions in which the mother tries to calm the child's difficult emotions. The fact that synchrony is lower during play was linked by the authors to the assumptions of Winnicott's concept of potential space. According to this concept, when the 'holding' in physical and emotional terms was sufficient and adequate, the infant was free to take the initiative in the interaction, which, according to Ham and Tronick (2009), can also apply to physiological reactions [54]. The stronger physiological synchrony between mother and infant during difficult situations is probably related to the fact that mothers use autonomous physiological contagion to regulate their children's arousal levels. Mothers calm themselves emotionally and physiologically to, in effect, calm their infants [54]. In addition to the fact that the mother's physiological reactivity influences the child, physiological synchrony is also influenced by the child's actions [55]. According to a study by Manini et al. (2013), the direction of influence of physiological reactivity between mothers and their daughters was bilateral and varied depending on the context of the discussion [56]. As this research shows, the physiological interaction between mothers and infants is therefore bidirectional, with infants being active, intentional interaction partners [54]. Similar relationships to those described above may occur during psychotherapy between patient and psychotherapist. The comparison of the results of the psychotherapist-patient and mother-infant dyad studies is not unjustified. According to the relational approach to psychotherapy, difficulties occurring in the mother-child relationship can be mirrored through parallel processes in adult psychotherapy, where they can be restructured into healthier relational patterns through treatment [57]. Juxtaposing the above data with our results, it can be suspected that both psychotherapists exerted emotional and physiological effort to 'reassure' their patients, but that the younger psychotherapist had less ability to regulate

her emotional states, through which the patients' emotions and physiology influenced her more than the older psychotherapist.

According to the literature, a psychotherapist's ability to be empathic and at the same time able to self-regulate their own affective arousal involves significant costs, both physiological and cognitive. These skills are particularly important in individuals in helping professions, treating others. Furthermore, full emotional resonance with another person's suffering, and the associated autonomic arousal response, can hinder empathy and treatment, as entering too deeply into another person's suffering activates fear associated with avoidance or self-protection. Furthermore, an overabundance of affective arousal experienced by the empathising psychotherapist consumes cognitive resources, which can hinder the construction of in-depth psychotherapeutic intervention. The above information demonstrates the need to incorporate tools and information on regulating one's emotional arousal into the training courses and supervision of psychotherapists [58].

According to the second hypothesis, it is possible that both psychotherapists delved into the emotional states of their patients (same direction of intensity of response), but that the psychotherapist with shorter experience did so to a greater extent, through more intense work, emotional involvement and a stronger reflection of these states. The above assumption may be related to the phenomenon of physiological contagion. This phenomenon is a form of primary affective empathy [58] and involves an internally generated, implicit, emphatic physiological response towards the patient [59]. This response is largely unconscious [27]. It has been described, for example, in the physiological contagion of laughter during psychotherapy. Referring to our results – the patient and the psychotherapist could therefore "infect" each other with emotional arousal, both in terms of its direction and intensity, depending on the intensity of the psychotherapy process.

The third hypothesis is that the older psychotherapist, due to his age and experience, was calmer and inspired a greater amount of trust in patients where the younger therapist could introduce more anxiety. According to a study by McCarron and Appel (1971), patients who had

contact, with medical students playing the role of a psychotherapist, tended to have significantly higher SC scores than patients who spoke to experienced psychiatrists. This demonstrates the calming effect of an experienced psychotherapist on the patients interviewed [50]. According to a study by Messina et al. (2013) experienced psychotherapists were perceived by patients as more empathetic, which was also associated with greater interpersonal synchrony between patients and psychotherapists [60]. Furthermore, the prestige of the psychotherapist and the associated suggestion is a non-specific healing factor in psychotherapy [61], which may also have influenced patient reactions.

### **The Physiological Reactions of Patients in Relation to Their Gender and the Gender of the Psychotherapist**

According to our results, the physiological activity of patients in the initial psychotherapy sessions differed by gender in the parameters SCL and SCR amp. This indicates a higher physiological activity of EDA in men. According to the literature, women generally show higher SCL, while men tend to show higher EDA under stimulation [42]. During psychotherapy sessions, patients experience different types of emotional and cognitive stimulation. This may be the reason why higher EDA was observed in men in our study.

An in-depth analysis for the patients of the younger female psychotherapist showed that the male patients had significantly higher physiological parameters in every domain examined than the female patients. In the case of the older male psychotherapist, there were no significant differences in the physiological responses of the patients by gender – only the parameter SCR freq. was slightly higher in the female patients. The above results may be related to the phenomenon of erotic transference [62] and the fact that in men the EDA response is stronger when exposed to an erotic stimulus, than in women [63]. Therefore, it is likely that male patients showed significantly higher EDA when working with a female psychotherapist, and female patients showed slightly higher physiological activity when working with a male psycho-

therapist. However, since we did not investigate the types of transference in patients in our study, this conclusion is only a hypothesis and should be confirmed in further studies.

### **Physiological Reactions in Relation to the Dominant Mental Disorder of Patients**

Another analysis examined how physiological reactivity of patients in the initial psychotherapy sessions varied according to their dominant disorders – anxiety or personality. Patients with a dominant anxiety disorders showed greater physiological activity in the SCL and SCR amp. parameters. It implies that patients with dominant anxiety disorders had greater physiological reactivity of the sympathetic system in the initial therapy sessions than patients without dominant anxiety disorders. Patients with a dominant personality disorder had higher scores on the HR, SCL and SCR amp. than patients without a dominant personality disorder. The above-mentioned corresponds to the assumptions presented in Fowles' article [64]. According to this author, ectodermal activity correlates with anticipatory anxiety – worry about something harmful happening or likely to happen in the future, while HR refers to fear of a present threat [64]. The opposite direction of the intensity of ectodermal and cardiovascular system responses is also linked to the fact that an increase in EDA is considered to be a specific indicator of anxiety (or introverted emotional lability), whereas an increase in HR reflects impulsivity (or extroverted emotional lability) [65]. In contrast, patients with dominant personality disorders would show fear of an ongoing psychotherapy session, where the perceived threat might be the relationship with the psychotherapist and possibly the patient's impulsivity.

The strengths of the study are mainly the multiplicity of perspectives from which physiological reactions during psychotherapy were considered. The characteristics of psychotherapists, such as their gender, age and their professional experience, were taken into account. Physiological measurements of patients were analysed according to their gender, level of neurotic symptoms, severity of personality traits, medication intake, and predominant psychiat-

ric disorder. Another advantage of the study was the use of several EDA physiological parameters (SCR amp., SCR req., SCL.) and HR. According to the literature, in the study of interpersonal physiology, it is important to compile its results in different modalities in order to better understand its dynamics in the therapeutic relationship and the psychotherapy process [66]. The majority of studies on psychophysiology mainly use the measurement of SCL [37], which may not always be an adequate measure, as each person may have a different individual baseline level of SCL [42]. Furthermore, each physiological measure may reflect unique processes in the autonomic nervous system. Examining multiple modalities simultaneously may lead to the determination of greater specificity of processes associated with each physiological system [37].

A limitation of the study was the use of not sophisticated equipment, due to which the galvanometer was able to sample at a low frequency of 5 Hz. On the other hand, the results of the study are consistent, suggesting that the sampling frequency was sufficient. Another limitation of the presented study was the fact that only two psychotherapists participated in the study. However, in the studies published so far, the number of therapists participating was also not large, ranging from one therapist [49] to 13 therapists [60].

## CONCLUSIONS

The results obtained in the presented study suggest that psychotherapists with longer professional experience probably have greater skills in regulating their physiological reactions, which is most likely directly related to better affect regulation skills. The results indicate that the intensity of the therapist's physiological reactions is related to the patient's physiological activity. Therefore, it is important that during psychotherapy training, therapists learn to regulate and understand their own emotions, which manifest through physiological arousal.

Our findings show that patients with dominant personality disorders are characterized by higher cardiac activity (HR) and lower electrodermal activity (EDA). Conversely, higher EDA and lower HR are most likely associated with neurotic disorders.

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