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Application of systematic desensitization in a patient with agoraphobia: A single case study

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Abstract
Individuals with agoraphobia disorder tend to be afraid of being in open spaces and have difficulty leaving the house and driving alone. Systematic desensitization is one of the treatments considered effective in treating agoraphobia. The case study aims to determine the application of systematic desensitization in patients with agoraphobia through a single case study design. The participant was a 28-year-old female patient diagnosed with agoraphobia. Systematic desensitization intervention is carried out by following the steps of relaxation exercises, arranging anxiety hierarchies, and gradual exposure to the anxiety sources. The main measurement is carried out through the patient's self-report SUDS (Subjective Units of Discomfort Scale) score for each source of anxiety about open space. The results showed a change in SUDS scores before and after systematic desensitization. Discussion and limitations about this case study are provided for practitioners and researchers interested in systematic desensitization, supported by the explanation of the intervention stages.

Keywords: agoraphobia; relaxation; systematic desensitization

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Introduction

Anxiety disorders are classified by the DSM-5 (Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition) as maladaptive fear and anxiety towards specific objects or activities. Fear is an emotional reaction to a situation that one perceives as being dangerous, while anxiety is an emotional reaction to a situation that one believes will be dangerous (DSM-5, 2013). Phobias is one of the anxiety disorders. Phobic anxiety is characterized by irrational fear or anxiety, and this results in avoidance of specific objects or situations (DSM-5, 2013).

A phobia is an irrational fear of certain objects, places, or situations that do not pose any threat (Grace, 2017). These phobias can lead to a lot of anxiety and the wish to get away from the horrible thing, which may lead to the person being unable to carry out normal routines (Miltenberger, 2016). Someone who suffers from a phobia is not psychotic, that is, he or she does not lose touch with reality; he or she feels anxiety that is out of proportion to the situation (Grace, 2017; Nevid et al., 2005).

As written in the Indonesian Classification and Diagnosis of Mental Disorders III (PPDGJ-III), one of the phobic anxiety disorders is agoraphobia. Agoraphobia is the fear of open spaces, crowds, and the feeling that one cannot easily escape or find safety. Patients with agoraphobia tend to have feelings of fear where they must avoid leaving their homes, going out to shop, or traveling alone using bus systems (PPDGJ-III, 1993). The patients feel anxious when they are in situations that may render them helpless or unable to get help in case of an emergency (Zainuri & Wulandari, 2020).

Considering the possible consequences of anxiety disorders, particularly agoraphobia, adequate intervention customized to everyone's situation is essential. Systematic desensitization is an effective treatment for those with phobias (Telch et al., 2013). Joseph Wolpe created systematic desensitization in 1958 as a behavioral method of anxiety management that emphasizes progressive exposure paired with relaxation techniques.

Systematic desensitization focuses on helping patients maintain a relaxed response while imagining (imagery) or facing directly (in-vivo) situations or stimuli that provoke fear or anxiety. This process, referred to by Wolpe as reciprocal inhibition, involves reducing anxiety by promoting a contrasting response—moving from fear to relaxation, or in other words, suppressing sympathetic reflexes and gradually activating parasympathetic reflexes. Over time, a patient's sensitivity to the feared situation decreases, and anxiety subsides (Spiegler & Guevremont, 2009).

Wolpe outlined three key stages for systematic desensitization: (1) Patients must learn a relaxation technique; (2) Therapists and patients establish a fear hierarchy, organizing stimuli from least to most anxiety-provoking; and (3) Patients practice relaxation while therapists gradually introduce and manage the hierarchy of stimuli in a controlled and progressive manner (Miltenberger, 2016; Spiegler & Guevremont, 2009). This process combines counter-conditioning and extinction. In counter-conditioning, therapists introduce pleasant stimuli such as relaxation, creating a new condition where anxiety transforms into a relaxed state. Extinction follows, leading to the reduction or elimination of anxiety responses, as the fear has been countered and replaced by relaxation (Miltenberger, 2016; Spiegler & Guevremont, 2009).

Relaxation training is a strategy to reduce autonomic symptoms caused by the manifestation of fear and anxiety experienced (Miltenberger, 2016). Relaxation promotes various autonomic body responses, such as reducing muscle tension, lowering blood pressure, and slowing down breathing rates (Miltenberger, 2016). A fear hierarchy is then developed to determine the levels of stimuli that provoke fear. Each stimulus is assigned a range of discomfort values, referred to as the Subjective Units of Discomfort Scale (SUDS) (Miltenberger, 2016). These situations are arranged progressively, from the lowest to the highest SUDS value.

Numerous studies have demonstrated the effectiveness of systematic desensitization in addressing phobias. For instance, Herdiansyah and Sumampouw (2018) applied systematic desensitization to handling specific phobias, such as the fear of worms. Azmarina (2015) used

systematic desensitization with tasbih dhikr to reduce anxiety symptoms in individuals with specific phobias. Chiari and Mosticonl (1979) combined systematic desensitization with biofeedback for agoraphobia, yielding better results. Similarly, Solyom et al. (1972) used systematic desensitization to address agoraphobia effectively—lastly, James et al. (1983) specifically utilized in-vivo systematic desensitization to manage agoraphobia directly. Thus, this case study aims to explore the application of systematic desensitization in patients with agoraphobia through a single-case study design.

Method

Participants

The participant is a 28-year-old female patient who was sent from General Poli to the Psychology Poli at a primary health center in the Special Region of Yogyakarta (DIY). She complained of dizziness, rapid heartbeat, shortness of breath, and overwhelming fear when leaving the house. The participant works as a contract employee for a private company that uses a hybrid work arrangement. She displays herself properly, dressing professionally and keeping her appearance clean. Her body posture is petite, leaning towards a slimmer build. Communication, interaction, and an awareness of her condition are excellent. Before beginning the intervention, the participant was given informed consent and signed it.

The participant shared that since the death of her cat, she has frequently felt anxious, trembling, weak, and experiencing headaches, and palpitations when leaving the house. The process of her cat's death keeps replaying in her mind, leading her to fear experiencing a similar fate, resulting in a belief that "if I go out, I will have an accident and die." Whenever she forces herself to leave the house, her body experiences severe trembling, a rapid heartbeat, shortness of breath, dizziness, weakness, and the feeling of near fainting. She tends to avoid social interactions, such as not wanting to meet friends and refusing to leave the house without accompaniment. The participant consistently requests to work from home, reducing her work performance. Cognitively, memories of witnessing her cat's death repeatedly surface, making her fearful of experiencing similar events. Her focus becomes impaired as she continuously fixates on this thought of death.

Procedures of Intervention

Initial assessment

The initial assessment was conducted through interviews to gather information about the patient's background, social life, and work, as well as the patient's anxiety-related complaints; observations were made to assess interactions, appearance, behavior, and living environment; and psychological tests were administered, including the GAD-7 (Generalized Anxiety Disorder – 7) Test, to provide a general overview of the participant's anxiety condition. The assessment results served as indicators for diagnosing the agoraphobia experienced by the participant.

Implementation of Intervention

The intervention was divided into six sessions (conducted in 10 meetings), starting from building rapport, learning breathing relaxation, compiling an anxiety hierarchy and SUDS score, conducting systematic desensitization through imagery and in-vivo, and a termination session. The details of each session and its objectives are shown in Table 1.

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Table 1. Session and Purpose of Intervention

Session		Purpose
First session	Building rapport	Building and strengthening relationships with participants
	Informed consent	Explaining treatment procedures and agreement on interventions
	Relaxation	Train participants' breathing relaxation skills
Second session	Review of material	Reviewing the previous meeting material
	Evaluation of relaxation exercises	Evaluating the implementation of independent relaxation exercises
	Anxiety hierarchy	Develop an anxiety hierarchy and SUDS score for currently experienced fears.
Third session	Review of material	Reviewing the previous meeting material
	Relaxation	Feel relaxed, calm and comfortable so participant can minimize the feelings of anxiety and fear that will arise
	Imagery desensitization & evaluation of its implementation	• Facing situations that are sources of anxiety (based on hierarchy) imagery • Conducting an evaluation (either positively or negatively) of the desensitization procedure that has been undertaken
	Informed consent for treatment of patient and husband	• Explain the treatment procedures to be undertaken to the patient and husband • Obtain the husband's consent to help accompany the patient during the treatment session
Fourth session	Review of material	Reviewing the previous meeting material
	Relaxation	Feel relaxed, calm and comfortable so participant can minimize the feelings of anxiety and fear that will arise.
	In-vivo desensitization & evaluation	• Facing situations that are sources of anxiety (based on hierarchy) in-vivo • Conducting an evaluation of the desensitization procedure that has been undertaken
	Implementing independent in-vivo desensitization and strengthening conditions	Facing situations that are a source of anxiety (based on hierarchy) in-vivo in the form of tasks carried out independently, as well as reinforcement for the patient and husband before carrying out the task.
Fifth session	Review and evaluation of in-vivo desensitization tasks	Evaluating the implementation of independent in-vivo desensitization tasks
	In-vivo desensitization & evaluation	• Facing situations that are sources of anxiety (based on hierarchy) in-vivo • Conducting an evaluation of the desensitization procedure that has been undertaken
	Implementing independent in-vivo desensitization and strengthening conditions	Facing situations that are a source of anxiety (based on hierarchy) in-vivo in the form of tasks carried out independently, as well as reinforcement for the patient and husband before carrying out the task.
Sixth session	Review and evaluation of the implementation of in-vivo desensitization tasks	Evaluating the implementation of independent in-vivo desensitization tasks
	Termination	• Summarize and reinforce the results of the treatment that has been carried out • End the session

Measurement of Intervention Effectiveness

In a single-case experimental design, measurements are conducted repeatedly, both before and after the intervention (Kazdin, 2019). Measurements are performed using the SUDS (Subjective Units of Discomfort Scale) to assess the participant's level of anxiety regarding their phobia (Miltenberger, 2016). The SUDS scale ranges from 0 to 100, where 0 indicates the absence of anxiety and 100 represents the maximum level of anxiety or fear. A decrease in SUDS scores serves as an indicator of the achievement of intervention session goals. The GAD-7 Test, with a Cronbach's Alpha reliability of 0.89 (Zhong et al., 2015), is also used to assess the participant's overall anxiety condition (Nunes et al., 2021). In addition, a brief interview is undertaken to assess the participant's condition following the intervention session.

Analysis of Intervention Effectiveness

The primary data analysis is performed through visual analysis in the form of graphs, to understand the intervention's impact on the participant's condition in a single-case study (Barker et al., 2002; Coolican & Hugh, 2014; Lane & Gast, 2014). Visual analysis is applied to SUDS scores before and after the intervention. A non-parametric analysis using the Wilcoxon Signed-Rank Test is conducted as an additional analysis to compare paired conditions (Coolican & Hugh, 2014), specifically the participant's GAD-7 scores before and after the intervention.

Result and Discussion

Diagnostic Fulfillment Indicator

The diagnostic fulfillment indicators refer to the diagnostic guidelines from PPDGJ-III. The participant meets the diagnostic criteria for Agoraphobia with Panic Disorder (F40.01), which is defined by autonomic symptoms, anxiety limited to open situations, avoidance of phobic situations, and the onset of panic symptoms. This explanation is provided in Table 2.

Table 2. Diagnostic Fulfillment Indicator

F40.01 Agoraphobia with Panic Disorder		
Diagnostic Guideline (PPDGJ-III)	**Patient Condition**	**Fulfillment Status**
Psychological or autonomic symptoms that arise must be primary manifestations of anxiety and not secondary to other symptoms such as delusions.	Experiencing autonomic symptoms such as trembling hands, rapid heartbeat, shortness of breath, and weakness, due to anxiety and fear of leaving the house.	√
The anxiety must be limited to at least two of the following situations: being among many people, public places, traveling outside the home, and traveling alone.	Feelings of anxiety and fear arise when leaving the house, being in open public places, or being on busy roads filled with vehicles.	√
Avoidance of phobic situations must be a prominent feature.	Always requests to work from home (WFH) to avoid going to the office, only willing to leave the house if accompanied by her husband and for short distances.	√
Symptoms of panic disorder experienced.	Palpitations (rapid heartbeat), chest pain, difficulty breathing, dizziness; Fear of dying; Rush to leave places; Fear of experiencing panic attacks.	√

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The case conceptualization of agoraphobia experienced by the patient, viewed through the RACS (Response, Antecedents, Consequences, Response Strength) concept, is presented in the following Table 3.

Table 3. Case Conceptualization with RACS

Aspect	Description
Response Target	Fear of leaving the house ● Patients are afraid to leave the house, be in open public places, or be on busy roads.
Antecedents	Behavior may occur when the patient: ● Considers leaving the house ● Steps outside the house ● Is in a public location or on a busy roadway (full of vehicles).
Consequences	(-) Occurs shortly after the behavior ● Shaky hands, rapid heartbeat, shortness of breath, weakness, and feeling faint ● Feelings of intense fear and anxiety (-) Occurs quite a long time after the behavior ● Unable to go to the office, thus must always work from home. ● Difficulty carrying out daily activities that need mobility (e.g., buying necessities, visiting friends/parents) ● Feeling powerless and dependent on others to travel, leading to self-blame. (+) Occurs quite a long time after the behavior ● Feeling safe because of avoiding scary situations that can cause accidents and death (leaving the house)
Response Strength	● The condition occurs almost every day when the patient is aware that she has to leave the house to go to the shop, buy food, work, or to other places ● There is a recurring memory of witnessing the patient's cat die, thus reinforces the assumption that leaving the house will result in an accident and death.

Visual Analysis (Anxiety Hierarchy and SUDS)

The development of an anxiety hierarchy and the assignment of SUDS (Subjective Units of Discomfort Scale) scores are conducted during the second intervention session. As the systematic desensitization intervention progresses, the patient reports changes in SUDS scores. The changes in SUDS scores within the anxiety hierarchy, along with descriptions of the implementation during the intervention are shown in Table 4.

The results show that there was a change in SUDS scores before and after the systematic desensitization intervention. The patient experienced various situations accompanied or supervised by her husband, as well as alone. Before undergoing this in-vivo desensitization, the patient had undergone imagery desensitization assisted by the therapist and consistently practiced relaxation to maintain a feeling of calm and safety within herself. Meanwhile, the following graph shows the visual analysis of the change in SUDS scores between before (baseline) and after the systematic desensitization intervention.

Table 4. Anxiety Hierarchy and SUDS Scores

Code of Situation	Situation of Anxiety Hierarchy	SUDS	Activity Implementation	SUDS
A	Go to the small shop near the house (supervised/accompanied)	50	Watched by husband from the front of the garage	20
B	Go to the small shop near the house (alone)	50	Buying cat food and vegetables. Riding a motorbike by myself, feeling better, physical symptoms starting to decrease.	20
C	Go to the mini market 1 km away (accompanied/supervised)	60	With husband, buying something at a mini market.	20
D	Go to the mini market 1 km away (alone)	60	Withdrawing money at a mini market ATM. Feeling calm, physical symptoms decreasing	20
E	Go to parents' house or mini market (distance >5km) via a shortcut (accompanied)	60	Go to a mini market >5km with her husband. Feeling calmer and more stable, physical symptoms reduced, but palpitations when returning home because the road is crowded.	20
F	Go to parents' house or mini market that is >5km via a shortcut (alone)	70	Go to a friend's house within > 5km alone. Feeling calmer and more stable, physical symptoms reduced. But when returning home, palpitations occur because it was already night and stopped buying a drink.	30
G	Go to a fairly crowded public place and stay there for some time (accompanied)	80	Go to a crowded cafe with husband. Feeling calm and stable because busy with work and while listening to live music.	30
H	Go to another location that crosses the ring road and is >5km away (accompanied)	90	Go downtown the city and town square with husband. Feeling calmer, symptoms reduced. But when returning home anxious and palpitations because of traffic jams.	30
I	Go to the office that crosses the ring road and is >8 km away (accompanied / supervised)	90	Taking care of resignation applications and returning office laptops accompanied by husband. Feeling calm, but a little anxious because it is far and crowded.	30
J	Go to another location that crosses the ring road and is >15 km away (accompanied / supervised)	100	Go to Imogiri with husband to visit relatives. When leaving, I felt calm, but when returning anxious because of traffic jams and crowds.	40

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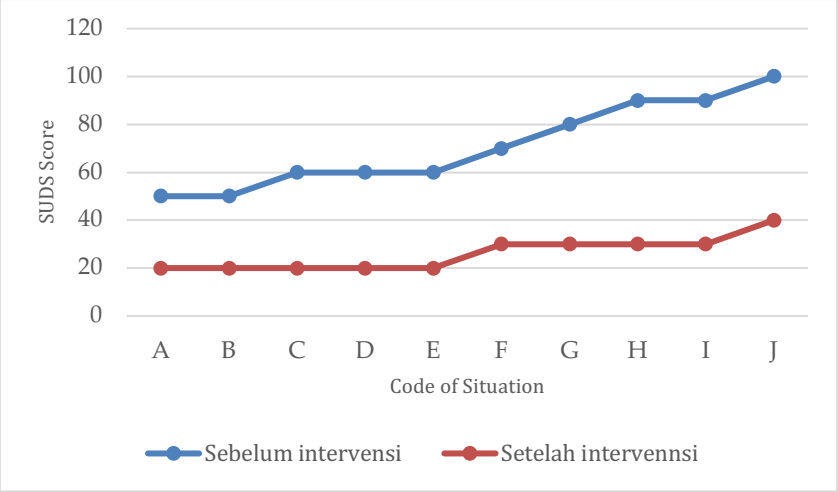

Figure 1. Graph of SUDS Score Change

Before intervention After intervention

Additional Analysis (Non-Parametric Analysis of GAD-7 Score)

The GAD-7 test was administered to assess anxiety levels before (initial assessment) and after systematic desensitization intervention. Table 5 presents the scores from the GAD-7 test.

Table 5. GAD-7 Score Change

Item Number	Item Score	
	Before Intervention	After Intervention
1	3	1
2	2	1
3	3	1
4	3	1
5	2	2
6	0	0
7	3	1
Total score	16 (*severe anxiety*)	7 (*mild anxiety*)

Meanwhile, Table 6 displays the findings of the Kolmogorov-Smirnov normalcy test on GAD-7 scores before and after the systematic desensitization intervention. The findings show a sig. value of 0.039 and 0.007, indicating the data does not follow a normal distribution (p<0.005).

Table 6. Normality Test Results of GAD-7

Sig. Before Intervention	Sig. After Intervention
0,039	0,007

Non-parametric analysis using the Wilcoxon Signed-Rank Test was then conducted because the data did not follow a normal distribution. The results in Table 7 show a sig. value of 0.034, indicating a significant difference (p<0.05) in the patient's anxiety condition before and after the systematic desensitization intervention.

Table 7. Wilcoxon Signed-Rank Test Results

Sig. Before-After Intervention
0,034

Discussion

The research findings indicate that the application of systematic desensitization in a patient with agoraphobia, through a single-case study, resulted in changes to the patient's condition. Literature reveals that in single-case studies, data visualization through graphs helps in evaluating changes and intervention performance (Barker et al., 2002; Lane & Gast, 2014; Morley & Adams, 1991). The results presented in Figure 1 reflect a decrease in scores across all contexts causing patient anxiety.

The reduction in SUDS (Subjective Units of Discomfort Scale) scores can be attributed to the consistent use of relaxation techniques before every systematic desensitization session, whether conducted through imagery or in vivo methods. Relaxation training is a strategy that reduces muscle tension (Miltenberger, 2016) and alleviates anxiety (Suyono et al., 2016). These findings are consistent with a non-parametric analysis of GAD-7 scores, which revealed changes in anxiety levels before and after the intervention. Specifically, breathing exercises encourage physical calmness by regulating slow, deep, and steady breathing, thereby reducing physical tension (Davis et al., 1995) and promoting a sense of tranquility (Miltenberger, 2016).

This calming effect aligns with Wolpe's condition that systematic desensitization must include a "relaxation training" phase as part of counterconditioning, creating a new state of calmness and relaxation (Miltenberger, 2016; Spiegler & Guevremont, 2009). This, in turn, promotes extinction, in which anxious responses fade as they are counteracted and replaced by calm feelings (Miltenberger, 2016; Spiegler & Guevremont, 2009). Once the patient has reached a state of calm, they can be taught to confront their sources of anxiety.

The sources of anxiety presented in this study are provided according to a Hierarchy of Anxiety. The goal is to align with the intensity of fear production and the patient's ability to process it (Miltenberger, 2016). After relaxation, patients are asked to imagine (imagery) situations that trigger anxiety, moving from the lowest to the highest SUDS scores. Since the exposure corresponds to the level of SUDS scores, the patient's shock can be minimized, allowing them to gradually try each situation one by one. This procedure adheres to the basic principle of systematic desensitization, which involves gradual exposure (Miltenberger, 2016). Similarly, relaxation training promotes a sense of calm, reducing or even eliminating anxiety (Spiegler & Guevremont, 2009). The reduction in SUDS scores (as shown in Table 4) serves as data demonstrating changes in the patient's condition due to systematic desensitization treatment.

Another factor that influences patient responsiveness to systematic desensitization is the therapeutic alliance or connection between therapist and patient (Stubbe, 2018). Therapists offer warmth and support, while patients demonstrate trust and contentment, ensuring that therapy goals are met efficiently (Moors & Zech, 2017; Stubbe, 2018). The therapeutic alliance enhances patients' psychological well-being, fostering a sense of empowerment and independence (Prusiński, 2022), which plays a crucial role in the recovery of agoraphobia patients.

This study has significant drawbacks. First, internal validity is threatened by a maturation threat (natural changes occurring over time within patients) and a history threat (events occurring concurrently with systematic desensitization deployment) (Hastjarjo, 2011). Second, there is an external validity threat regarding causal linkages between contexts (findings from one setting may not apply to others) (Hastjarjo, 2011). Third, social desirability bias (patients wishing to look better) and introspective ability bias (limitations in completely analyzing their state) may influence self-reporting of SUDS scores following systematic desensitization (Smith et al., 2022). Fourth, time and location constraints prevent the therapist from conducting comprehensive in-vivo desensitization alone. To address this, the patient's husband is trained to assist in the process, from relaxation to systematic desensitization. Lastly, this study did not include follow-up on the patient's condition, leaving the long-term maintenance of recovery unknown. However, the study demonstrates that systematic desensitization can effectively address agoraphobia.

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Conclusion

The study concludes that systematic desensitization in patients with agoraphobia, as demonstrated through a single-case study, resulted in noticeable improvements. The most significant change was observed in the SUDS (Subjective Units of Discomfort Scale) scores, which decreased after exposure to anxiety-inducing stimuli arranged hierarchically, combined with relaxation training. Thus, systematic desensitization had a clear positive impact on the patient. However, further research involving a substantial number, and a more diverse group of participants is required to confirm and generalize these findings.

Suggestion

Based on the research findings, several suggestions are provided for both patients and future researchers. Patients are encouraged to continue practicing relaxation exercises before engaging in activities related to their sources of anxiety. They should also consider regular check-ups with a psychologist or nearby healthcare providers to monitor their condition.

For future researchers, future studies should scale up by involving additional participants to confirm the effectiveness of systematic desensitization interventions observed in this case. Incorporating a broader range of participant ages and cultural contexts is also suggested, as these factors may influence patient recovery. The design of systematic desensitization interventions requires further development. For instance: 1) Refine the types and techniques of relaxation exercises and reassess their effectiveness. 2) Revising SUDS (Subjective Units of Discomfort Scale) scoring strategies to minimize bias, even though it is self-reported. 3) Review the number of tasks assigned to patients to reduce potential fatigue. 4) Adjusting the timing of the intervention to ensure patients do not feel rushed. Such enhancements seek to optimize the intervention's impact and applicability across diverse patient groups.

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